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iCiE-TVET 2025

INTERNATIONAL CONFERENCE IN EDUCATION TECHNICAL AND VOCATIONAL EDUCATION AND TRAINING

TRANSFORMATIVE PATHWAYS: BRIDGING SKILLS, TECHNOLOGY, AND SUSTAINABILITY IN TVET

09 - 10 AUGUST 2025

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Published in October 2025

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Published by:

Politeknik Tuanku Sultanah Bahiyah
Kulim Hi-Tech Park
09090 Kulim, Kedah
Malaysia

https://ptsb.mypolycc.edu.my
International Conference in Technical and Vocational Education and Training (TVET)

eISSN 3083-8517

iCiE-TVET 2025

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PREFACE

Welcome to the official e-proceedings of the International Conference in Education-Technical & Vocational Training 2025 (iCiE-TVET 2025). We are excited to present this vibrant collection of research, which reflects the success of the conference and the collaborative spirit of everyone involved. Under the timely theme, "Transformative Pathways: Bridging Skills, Technology, and Sustainability in TVET," this publication captures the insightful discussions and innovative ideas shared during the event. It is more than just a record; it is a valuable resource designed to expand the reach of the research presented and inspire ongoing progress in the TVET field.

Our sincere thanks go to all the authors who contributed their research, the presenters who sparked engaging discussions, and the dedicated reviewers who upheld the academic standards of this work. We also extend our heartfelt congratulations and gratitude to the organizing committee, led by Cendana Polytechnic, along with our esteemed co-organizers: Tuanku Sultanah Bahiyah Polytechnic, Metro Tasek Gelugor Polytechnic, and Arau Community College. Your hard work and dedication were key to making this event a great success. We invite you to explore the diverse and insightful papers within these pages, confident that they will make a significant contribution to the ongoing transformation of TVET.

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DRONES IN LOGISTICS: THE CHALLENGES AND IMPACTS FOR DELIVERING THE FUTURE

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Abstract

The increase in e-commerce activities over time has led to a surge in the number of parcels that need to be sent to users across the country. This phenomenon clearly demonstrates that the logistics sector, particularly in the context of last-mile delivery, plays a crucial role in meeting customer demand. However, the increase in the number of parcels makes the delivery process increasingly challenging, especially in ensuring that customers' goods arrive on time. Furthermore, worsening traffic congestion further complicates deliveries, especially using ground vehicles such as trucks, cars, and motorcycles. In this context, drones emerge as one of the innovative solutions with the potential to overcome challenges in modern logistics. The objective of this study is to identify the challenges of using drones in logistics activities and to examine the impact of their use on the effectiveness of the delivery process. This research employs a mixed-methods approach, integrating secondary data from a literature review with qualitative insights obtained through semi-structured interviews with representatives from Real Sky System Sdn. Bhd. The findings reveal that the primary challenges in drone delivery include battery life, tracking at high speeds, legal limitations, and navigating cities effectively. The impact of using drones in future delivery can be to deliver quicker, improve rural access, increase efficiency, and minimize carbon footprint, while simultaneously decreasing labor costs and supporting rural enterprises. This study provides insights and practical recommendations for implementing the use of delivery drones, particularly in areas with high demand density.
Keywords: E-commerce; Logistics; Last mile.

1. Introduction

The rapid spread of e-commerce has led to a significant increase in the volume of parcel deliveries, especially in urban areas (Borghetti et al, 2022). Furthermore, after the occurrence of the epidemic situation of COVID-19, it caused a sudden increase in e-commerce activities in every sector, such as the food sector, daily goods, clothing, and so on (Fuad et al, 2021). Most buyers also switch to buying goods online because it is easier, efficient, and cheaper than the market price. The sudden growth of e-commerce activities has made the logistics or delivery process a critical matter to ensure that the goods reach the customer according to the time that has been set (Mohammad et al., 2023). The use of trucks, vans, or motorcycles to deliver goods directly to customers nowadays seems less relevant because the increased use of these vehicles contributes to several problems of traffic congestion, environmental pollution, and bad health effects (Boysen et al., 2021). For instance, the number of parcel volumes reached 21.4 billion in 2023 compared to 21.5 billion in 2022. In addition, the average volume of shipped packages every second around the world was 687 parcels, equal to 59.3 million each day. Furthermore, the current volume of parcels worldwide is expected to grow further and reach a figure between 26.1 to 28.3 billion packages by 2028 (Verckens et al, 2024).
Unmanned Aerial Vehicle (UAV), Unmanned Aircraft System (UAS), and Remotely Piloted Aircraft (RPA) are other names for "drone" (Vlahovic N, Knezevic B, Batalic P, 2016). Drone technology helps facilitate the process of delivering goods in urban areas more efficiently and effectively (Nurgaliev et al., 2023). Furthermore, the existence of this drone technology

facilitates logistics activities, especially in the process of delivering goods directly to customers (last-mile delivery). Other than that, drones are not only used for the process of delivering goods to customers, but they are also used for safety and security sectors such as medicine, aerial surveillance, site inspection, and military activities (Ali et al., 2024). From (Jahani et al., 2024), the technology of using drones has developed so well with the addition of advanced instruments, especially in the Logistics and Supply Chain sector. The development of this drone technology indirectly helps to improve the efficiency of the delivery of customer goods to the final destination, as well as guaranteeing the perfection of traffic and the immediate release of vehicles. In line with several Sustainable Development Goals (SDGs) of the United Nations, especially regarding SDG 13 (Climate Change) and SDG 9 (Industry, Innovation, and Infrastructure). This study was conducted to assess the challenges that may be faced in the development of drone technology, including technical, legal, and infrastructure aspects. In addition, this study also examines the impact of using drones in the process of delivering packages directly to customers, including the impact on logistics efficiency, operational costs, as well as the impact on the environment and society.

The literature review aims to provide a comprehensive overview of the existing research and theoretical foundations relevant to this study. By examining these areas, the research contextualizes the current state of knowledge, identifies gaps, and justifies the need for this research. The Sustainable Development Goals (SDGs), established by the United Nations in 2015, call for global action to end poverty, protect the planet, and ensure peace and prosperity by 2030. Sustainable Development Goal SDG13, which emphasizes action on climate change, is closely related to this study. The use of drones in last-mile delivery has the potential to reduce carbon emissions, thereby helping to reduce greenhouse gas emissions and supporting global efforts towards environmental sustainability(Bányai, 2022). In addition, this study is also closely related to Sustainable Development Goal SDG 9, which includes aspects of industry, innovation, and infrastructure. The study findings show that the use of drones in logistics implementation not only improves the efficiency of last-mile delivery but also increases access to services in previously difficult-to-reach rural areas (Kumbhani & Kant, 2024).

The SDGs address interconnected challenges across economic, social, and environmental dimensions. Studies show that businesses are increasingly reporting on their progress towards these goals, driven by institutional factors and organizational characteristics (Subramaniam et al., 2023). The SDGs also necessitate the engagement of various stakeholders, including businesses, cities, and civil society, to achieve sustainable development (Kota et al., 2021). However, while the SDGs have influenced policies and institutions, their impact on resource allocation and legislative action remains limited (Biermann et al., 2022). In higher education, the SDGs have prompted initiatives to promote sustainability (Serafini et al., 2022). Integrating the SDGs with energy efficiency analysis shows positive associations with sustainable economic and financial development (Zakari et al., 2022).

The concept of a green environment involves minimizing environmental impact through sustainable practices such as reducing carbon footprints, conserving resources, and promoting biodiversity. The logistics industry is notorious for its impact on the environment. This section explores the literature on drone technology in the logistics sector, focusing on the role of drone technology in fostering the sustainability of the sector. The increase in e-commerce has led to a rise in the number of packages, which in turn increases the demand for land transport to ensure that the delivery process can be carried out efficiently. This can directly increase vehicle smoke emissions, which contribute to environmental pollution. By changing the use of ground vehicles to drone technology to perform long-distance delivery, this helps reduce the process of CO_2 emissions (Rashidzadeh et al., 2021). Directly, it can also reduce air pollution. According to Borghetti et al. (2022), it states that drones can deliver goods to customers quickly because drones are not involved in traffic jams, and they are also

environmentally friendly because they use electronic motors. The use of drones for the delivery process is better than the use of traditional methods, as it is able to bypass challenges related to accessibility, especially related to traffic congestion, safety, and environmental pollution (She et al., 2020). In addition, drones have a very low impact on Greenhouse Gas (GHG) emissions and pollutant emissions (Moadab et al., 2022).

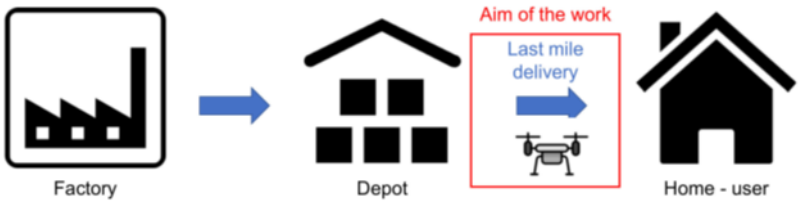

Fig. 1. Aim of the drone work

Last-mile delivery (LMD) was the final leg of the delivery process, where goods are transported from a transportation hub to the end consumer. It has garnered significant attention in academic and industry circles (Sorooshian et al., 2022). This critical stage significantly influences customer satisfaction, operational costs, and urban logistics. The increase in e-commerce sectors causes an increase in demand for LMD, this is because customers choose to make online purchases that are more flexible and easier. (Nils et al. 2020). The term "last-mile delivery" originated in the telecommunications industry and refers to the final stage of a delivery process. In other words, "last-mile logistics," "delivery," "distribution," and "transport" are employed in literature, depending on the context and scope (Jazairy et al., 2024). According to the Olsson et al., 2019, it states that LMD is an activity where physical goods are sent to the end customer according to the place that has been set. Last-mile delivery aims to deliver goods from a transportation hub to final customers(Olsson et al., 2019).

Overall, as explained by Noppakun (2018), the last-mile delivery can be divided into five main categories: receiving box, collection point, post office, attended home delivery, and unattended home delivery. This classification reflects the various approaches available to ensure goods reach consumers in the most efficient way and suit their needs.

Fig. 2. Last-mile deliveries concept

A drone is a flight vehicle that uses a battery to propel itself, and it does not require a pilot. Most of the logistics industry has taken the opportunity to use drone technology for the process of delivering goods to end customers, also known as last-mile delivery. But there are some challenges for drone technology to adapt to the logistics industry. According to Cıkmak et al. (2023), the challenges that need to be faced to apply drones in the logistics industry are terrorist attacks, lack of legal regulations, and the difficulty of the flight permit process, flight area limitations due to limited visual line of sight (VLOS), and personal data protection. The main challenges are limited flight time, the robustness of the signal, post-data analysis, multi-drone collaboration, weather conditions, and distractions to the traffic caused by drones (Fan & Saadeghvaziri, n.d.). According to Francesco et al,.2024, the findings of their research are

that drone-based delivery systems have hurdles in various sub-domains, including key issues with Beyond Visual Line of Sight (BVLoS) operations. Furthermore, the implementation of drones in the delivery process not only presents technical challenges but also involves issues in the legal system, infrastructure requirements, and implementation costs(Aggarwal et al., 2023).

Although the use of drones presents new challenges in the logistics sector, especially in the technical development section. It helps with various problems that can be solved with drone technology. Among them, from the study Koiwanit, 2018drone delivery is the most environmentally beneficial mode of transportation for online purchasing in various scenarios, according to observed results. For example, drone technology helps to reduce global warming, water acidification, and ozone layer depletion. Next, the study found that drone delivery has a lower global warming potential (GWP) per 1 km compared to motorbike delivery, and produces half the particles (Park et al., 2018). According to Meng et al., 2023, drone-assisted delivery decreased carbon emissions by 24.90%, total costs by 22.13%, and delivery time by 20.65% compared to traditional vehicle delivery. Drone delivery helps to improve efficiency, reduce transportation costs, and minimize environmental impact (Drone Delivery: Benefits, Use Cases, & Retailer Examples, n.d.).

The integration of drone delivery systems holds immense potential to revolutionize logistics and transportation, offering unprecedented speed, efficiency, and accessibility. However, significant challenges remain, including privacy concerns and the technical limitations of current drone technology. Addressing these issues requires a collaborative approach among governments, private sector innovators, and communities to establish clear frameworks, advance technology, and foster public trust.

2. Methodology

For this study, a mixed-method approach was employed, encompassing both secondary research and a semi-structured interview with an industry expert, a representative from SkyRealm Sdn Bhd. SkyRealms Sdn Bhd was selected as the case study organization because it met the study's objectives, which focused on the use of drones in logistics, especially last-mile delivery. The company is developing an on-demand drone delivery service, Sky Drop, which will be launched in 2027 and is expected to be a pioneer in Southeast Asia (*Invest in SkyDrop | PitchIN*, n.d.). The secondary method involved an extensive review of existing literature, reports, and publications related to drone technology in the context of last-mile deliveries, specifically in Malaysia. This method allowed for the gathering of foundational knowledge and insights into challenges and impact associated with drone delivery. The interview aimed to obtain first-hand perspectives and insights from a practitioner directly involved in or impacted by drone technology in the logistics area. The interview questions were designed to cover various aspects, including current opportunities for implementing drone technology in logistics industries, challenges and barriers faced, feasibility and implementation strategies, policy considerations, and future outlook. By combining secondary research with semi-structured interviews with industry experts, this mixed-method approach provided a comprehensive analysis of the concept of drone delivery in the logistics sector. The interview questions were developed by adapting from a previous study on drones as a service for last-mile delivery, which provided evidence of economic viability and demonstrated how semi-structured interviews were conducted to achieve their research objectives (Filiopoulou et al., 2025).

3. Results and Discussion

Table 2. Interview response

Section 1: General Background	
1. Can you please provide a brief overview of your role and responsibilities at Sky Real System Sdn Bhd?	My role at SkyRealm Sdn Bhd is as a Software Engineer, which responsible most of the software and hardware parts
2. How long have you been involved in the autonomous industries?	4 years
Section 2: Opportunities for Drone Delivery Implementation	
3. In your opinion, what are the key opportunities for adopting Drone Delivery in the logistics industry?	It provides faster delivery as it can reduce time taken to deliver the goods by skipping the long route and traffic and most important is it also provide better accessibility to rural area where sometime ground delivery is not very practical
4. How could drone delivery contribute to improving operational efficiency and sustainability in the logistics industry?	It could reduce time thus improve the efficiency, and reduce carbon footprint as it can be use with renewal energy to support for green initiative
5. What potential economic benefits do you foresee from the implementation of drone delivery in logistics industries?	Reduce labour cost by reducing human courier, open possible business opportunities for rural area
Section 3: Challenges and Barriers	
6. What are the primary challenges that you face in developing drone technology in the logistics industry?	Continue operation with battery life concern, precise object tracking at high-speed delivery
7. Are there specific regulatory or policy-related barriers that impact the implementation of drone technology in logistics industries?	Usage of cellular (4G/5G) communication is prohibited in UAV industry, thus may impact big scale multi-drone operation, cybersecurity attack
8. What technical or logistical challenges do you anticipate with integrating drone delivery in last-mile deliveries?	Limited battery capacity for long range delivery, fully autonomous navigation may require very mature and precise system especially in urban area
Section 4: Feasibility and Implementation Strategies	
9. What factors would most influence your decision to implement drone delivery in logistics industries?	Possible growth of more business in urban and rural drone delivers, thus generating viable future revenue
10. How do you think these challenges can be overcome?	Work closely with well-known food delivery service and encourage public to use drone delivery service
11. Are there any case studies or examples of other countries successfully implementing drone delivery that you find particularly compelling or informative?	Yes, example is Wing Aviation, they successfully complete around 300,000 deliveries of foods and other goods.
Section 5: Policy and Stakeholder Engagement	
12. What role do you believe government policies and incentives play in facilitating the adoption of drone delivery in logistics industries?	Financial support and trial testing
13. How important is stakeholder engagement, including with local communities and industry	Stakeholder engagement is essential for

partners, in the process of implementing drone delivery in logistics industries?	regulatory approval, public acceptance, and seamless industry integration, ensuring efficient and sustainable drone delivery implementation.
Section 6: Impact used drone technology in logistics	
14. How does drone delivery reduce the carbon footprint compared to traditional delivery vehicles?	Eliminate CO2 emission by using fully electric motor, increase efficiency by taking shortest distance for deliveries.
15. What operational challenges have logistics companies faced when implementing drone technology for deliveries?	Flight range and public safety
16. What regulatory hurdles must be overcome for drones to become widely adopted in logistics, especially for last-mile deliveries?	Reliable navigation and obstacle avoidance
Section 7: Future Outlook	
17. Where do you see the future of drone delivery being adapted in last-mile deliveries?	Drone delivery will enhance last-mile logistics in urban, rural, and emergency scenarios by enabling faster, contactless, and cost-effective deliveries. Challenges like regulations and battery life remain, but advancements will drive wider adoption.

A SkyRealm Sdn Bhd software engineer with four years of experience in the autonomous sector emphasized the potential of drone delivery for improved rural access, faster service, more efficiency, and a lower carbon footprint, as well as for reducing labour expenses and supporting rural enterprises. Battery life, high-speed tracking, legal limitations, and urban navigation are among the difficulties. Potential for growth in both urban and rural areas, cooperation with delivery services, and successful case studies like Wing Aviation are all necessary for feasibility. Stakeholder involvement and government backing are essential for public acceptance and regulatory approval. With electric motors, drone delivery lowers carbon emissions, yet there are issues with public safety and flight range. With the required improvements in rules and battery technology, the future of emergencies, urban, and rural delivery appears bright. To support the data obtained through interviews, this study also used secondary research methods. Previous studies have shown that the use of drones in final delivery has successfully reduced the amount of CO2 emissions by 24.90% (Meng et al., 2023). Research findings from (Borghetti et al., 2022) shows that last-mile delivery using drones not only reduces the impact on the environment but also increases the profits of transportation providers. Furthermore, there are several limitations to the use of drones for the final delivery process, including high cost, legality, and battery consumption (Balassa et al., 2023).

4. Conclusion

The study concludes that drone delivery has revolutionary potential for the logistics industry by improving sustainability, operational efficiency, and delivery accessibility. Despite current limitations, improvements in battery life, autonomous navigation, and supporting legislation are projected to encourage increased usage. To solve technological and operational challenges, effective implementation will need aggressive government initiatives, industry partnerships, and stakeholder participation. Strategic alliances with established distribution networks, as well as public education programs, will help to create confidence and accelerate acceptance. As technology advances, drone delivery is set to become an essential component of modern last-mile logistics on a worldwide scale.

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KEBERKESANAN PENGGUNAAN *THERMOCUBE* DALAM UJIAN BIOLOGIKAL DI KLINIK PERGIGIAN

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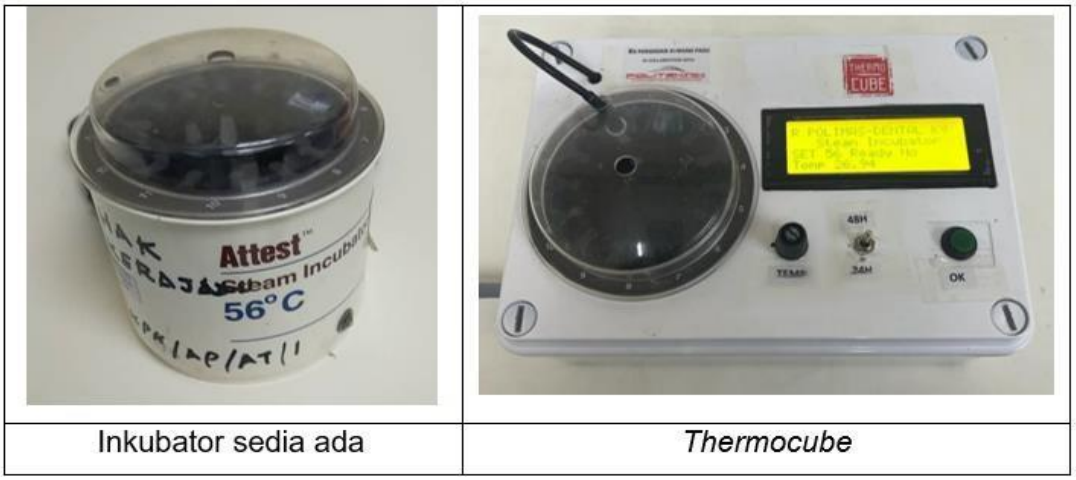
Abstrak

Kajian ini dijalankan bagi menilai tahap keberkesanan penggunaan projek inovasi '*thermocube*' berbanding inkubator konvensional yang digunakan sebelum ini di klinik pergigian sekitar daerah Kubang Pasu, Jitra. Seramai 20 orang kakitangan daripada empat klinik pergigian telah dipilih sebagai responden. Reka bentuk kajian adalah berbentuk kajian kes, dengan data diperoleh melalui borang soal selidik berskala Likert yang diedarkan selepas dua tahun penggunaan '*thermocube*' di lapangan. Analisis data dilakukan menggunakan perisian Microsoft Excel. Soal selidik merangkumi aspek-aspek berikut: ketepatan suhu inkubasi semasa operasi, masa yang diperlukan untuk mencapai suhu optimum, tahap kepuasan pengguna, dan bebanan kerja kakitangan. Dapatan menunjukkan bahawa responden secara keseluruhannya memberikan maklum balas yang sangat positif terhadap penggunaan '*thermocube*'. Nilai min yang diperoleh bagi '*thermocube*' adalah antara 3.75 hingga 4.00, manakala inkubator konvensional hanya mencatatkan nilai min antara 1.20 hingga 1.70 sahaja. Kesimpulannya, penggunaan '*thermocube*' terbukti lebih berkesan dari segi teknikal dan operasional, dengan peningkatan ketepatan suhu inkubasi, kecekapan proses pensterilan, penjimatan kos, serta peningkatan tahap kepuasan dan produktiviti kakitangan klinik pergigian.
Kata kunci: Thermocube; Pergigian; Inkubator.

1. Pengenalan

'*Thermocube*' merupakan sebuah peranti inovatif yang dibangunkan khusus untuk menentusahkan keberkesanan proses pensterilan peralatan pergigian menggunakan autoklaf melalui ujian biologikal. Ujian biologikal ini penting dalam menentukan sama ada mikroorganisma telah dinyahaktif sepenuhnya melalui proses autoklaf yang dijalankan.
Dalam amalan sedia ada, inkubator konvensional digunakan untuk pengeraman sampel ujian biologikal dan perlu dipanaskan sekurang-kurangnya selama 25 minit sehingga mencapai suhu operasi $56 \pm 2°C$ sebelum ujian dapat dijalankan. Walau bagaimanapun, beberapa kelemahan ketara telah dikenal pasti terhadap inkubator sedia ada, termasuk ketiadaan paparan digital bagi suhu dan masa, serta ketiadaan termometer bersepadu untuk mengukur suhu dengan tepat semasa pengeraman dijalankan (Faizal Amin Nur Yunus et al., 2018). Ketidakupayaan untuk menyelaras suhu mengikut piawaian pengeluar turut menimbulkan risiko terhadap ketepatan keputusan ujian.

Isu ini turut ditegaskan melalui teguran audit pematuhan piawaian ISO, yang telah mendorong kepada pembangunan satu penyelesaian inovatif dikenali sebagai '*thermocube*'. Rekabentuk '*thermocube*' dirangka bagi menangani keseluruhan kekangan yang wujud pada inkubator konvensional. Peranti ini bukan sahaja menyediakan pemantauan suhu dan masa secara waktu nyata (real-time), malah turut membolehkan pengguna menyelaras suhu pengeraman dengan lebih tepat dan konsisten mengikut spesifikasi yang ditetapkan oleh pengeluar kit ujian biologikal. Penggunaan '*thermocube*' telah diuji dan dilaksanakan di beberapa klinik pergigian sekitar daerah Kubang Pasu, Jitra, Kedah, dengan tujuan untuk menambah baik kecekapan teknikal dan keselamatan dalam proses kawalan mutu pensterilan peralatan pergigian.



Inkubator sedia ada | *Thermocube*

Rajah 1. Inkubator dan *Thermocube*

'*Thermocube*' merupakan projek inovasi yang direka bentuk untuk menambah baik fungsi inkubator sedia ada agar lebih efisien dan sesuai digunakan dalam persekitaran klinik pergigian. Inovasi ini melibatkan penambahan beberapa ciri baharu yang tidak terdapat pada inkubator konvensional, termasuk paparan digital suhu pengeraman bagi pemantauan yang lebih tepat, sistem pelarasan suhu yang membolehkan kawalan suhu yang lebih fleksibel, serta sistem auto-off berdasarkan tempoh operasi bagi meningkatkan keselamatan dan penjimatan tenaga (Mihai Tudor et al., 2018). Penambahbaikan ini bukan sahaja meningkatkan kecekapan teknikal peranti, malah mengurangkan risiko ralat operasi. '*thermocube*' telah digunakan secara praktikal di beberapa klinik pergigian sekitar daerah Kubang Pasu, Jitra, Kedah, dan perbandingan visual antara inkubator konvensional dengan '*thermocube*' ditunjukkan dalam Rajah 1.

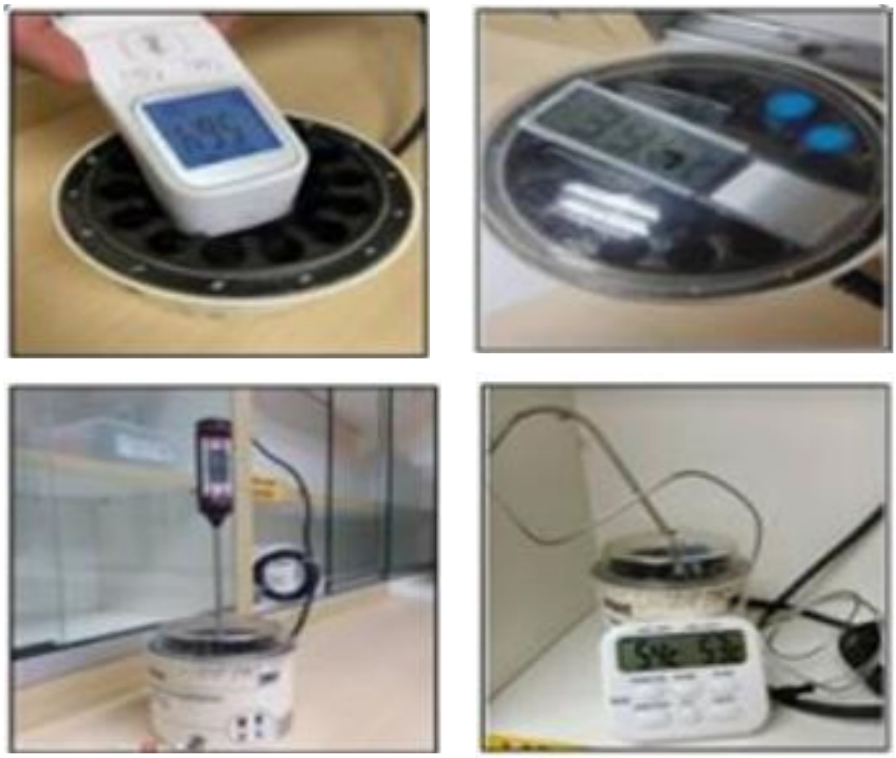
Antara permasalahan utama yang dikenal pasti oleh para responden semasa menggunakan inkubator konvensional ialah keperluan untuk memegang termometer secara manual bagi mengukur suhu inkubasi. Kaedah ini bukan sahaja menyukarkan pengguna, malah meningkatkan risiko ralat manusia (human error) yang boleh menyebabkan bacaan suhu menjadi tidak tepat. Tambahan pula, inkubator sedia ada tidak dilengkapi dengan sistem pelarasan suhu yang membolehkan suhu diselaraskan secara tepat mengikut piawaian yang ditetapkan. Keadaan ini menyebabkan masa yang diambil untuk mencapai suhu optimum menjadi lebih lama dan memerlukan pemantauan berterusan oleh kakitangan, sekali gus meningkatkan beban kerja serta mengurangkan kecekapan operasi klinikal.
Kajian ini diakukan untuk:

- Menilai keberkesanan penggunaan '*thermocube*' dalam ujian biologikal di klinik pergigian.
- Menganalisis persepsi staf klinik terhadap aspek teknikal dan kaedah operasi '*Thermocube*'.

2. Metodologi

Rajah 2 menunjukkan beberapa pendekatan yang telah diterapkan bagi mengatasi kekangan teknikal yang wujud sebelum penghasilan inovasi '*thermocube*'. Sebelum ini, jururawat atau pengendali di klinik pergigian terpaksa memegang termometer secara manual untuk mengukur suhu inkubator. Kaedah ini bukan sahaja terdedah kepada risiko ralat manusia (*human error*), tetapi juga menyebabkan bacaan suhu menjadi tidak konsisten dan tidak tepat. Selain itu, terdapat situasi di mana pengendali tidak menjalankan pengukuran suhu sebelum penggunaan, dan tidak mengetahui suhu sebenar serta tempoh pemanasan inkubator

semasa ujian biologikal dijalankan, yang boleh menjejaskan keberkesanan proses pensterilan.



Rajah 2. Kaedah manual yang diguna pakai

Sebagai respons terhadap isu ini, '*thermocube*' telah direka bentuk dengan sistem pemantauan dan kawalan suhu yang lebih maju dan automatik. Dapatan kajian ini disokong oleh kajian Alimuddin Alimuddin et al. (2021), yang menunjukkan bahawa integrasi sistem kawalan suhu secara automatik menggunakan pengawal mikro (microcontroller) membolehkan kawalan suhu yang konsisten dan stabil sepanjang tempoh inkubasi. Dalam ujikaji tersebut, bacaan suhu semasa, suhu minimum dan maksimum, serta tempoh operasi dipaparkan secara langsung melalui skrin, dan sistem turut dilengkapi dengan penggera yang akan berbunyi apabila suhu sasaran dicapai atau apabila tempoh inkubasi tamat.

'*Thermocube*' turut menyokong pelarasan suhu dalam julat 50°C hingga 60°C kerana julat ini sesuai untuk menguji keberkesanan proses nyahkuman atau pensterilan**.** Pengguna boleh memilih suhu inkubasi mengikut spesifikasi yang ditetapkan oleh pengeluar *biological indicator*. Tambahan lagi, sistem *auto-off* selama 24 jam dan 48 jam turut dibangunkan sebagai ciri keselamatan dan kemudahan. Fungsi ini amat berguna khususnya apabila klinik mengalami kekangan seperti kekurangan autoklaf atau semasa tempoh cuti panjang, kerana ujian boleh dijalankan secara automatik tanpa pengawasan langsung.

Rajah 3. *Thermocube*

Sistem 'thermocube' direka dengan tiga mod operasi utama, iaitu Mode Setting, Mode Default, dan Mode Run, yang dikendalikan secara berurutan bergantung kepada tetapan awal sebelum dan selepas sistem dihidupkan. Proses kerja bagi ujian biologikal menggunakan 'thermocube' adalah dengan menggunakan dua tiub sampel kuman dimana satu tiub disterilkan bersama peralatan pergigian menggunakan mesin autoklaf dan satu tiub tidak disterilkan sebagai kawalan. Kedua-dua tiub kuman kemudiannya dimasukkan ke dalam 'thermocube' untuk proses inkubasi selama 24 jam atau 48 jam pada suhu 56°C. Hasil dapatan diklasifikasikan berjaya jika tiub kuman yang telah disterilkan menunjukkan tiada perubahan warna (kekal terang) dan tiub kuman yang tidak disterilkan menunjukkan perubahan warna (menjadi gelap).

3. Dapatan dan Perbincangan

Kajian ini bertujuan untuk menilai tahap keberkesanan '*thermocube*' berbanding inkubator sedia ada dalam ujian biologikal di klinik pergigian sekitar daerah kubang pasu. Dapatan data diperolehi melalui kaedah edaran borang soal selidik yang diedarkan selepas tempoh 2 tahun '*thermocube*' digunapakai oleh para kakitangan klinik pergigian dalam ujian biological di klinik pergigian. . Kandungan borang soal selidik terdapat daripada 10 item sahaja seperti yang terdapat pada Jadual 1 dan Jadual 2. Responden adalah terdiri daripada para kakitangan klinik pergigian daerah kubang pasu seramai 20 orang yang terlibat dalam ujian biologikal di klinik pergigian. Menurut Mohd Najib (1999), soal selidik selalu digunakan sebagai instrumen kajian untuk mengukur konsep yang berkaitan dengan sikap, persepsi dan pandangan seseorang dengan menggunakan soalan bebas jawab (terbuka), senarai semak atau skala kadar . Kaedah soal selidik digunakan kerana dapat menjimatkan masa dan tenaga penyelidik. Proses pengumpulan data dilakukan dengan cepat kerana tidak melibatkan perbelanjaan yang besar, memudahkan kerja menganalisis data, lebih sesuai dan memudahkan responden membuat pemilihan jawapan.

Soal selidik yang digunakan dalam kajian ini dibahagikan kepada tiga bahagian, dan ia diedarkan setelah 2 tahun 'Thermocube' ini digunapakai di klinik pergigian Daerah Kubang Pasu. Bahagian pertama soal selidik merangkumi maklumat Am Responden yang menggunakan 'Thermocube'. Bahagian kedua mengandungi item penilaian yang terbagi kepada tiga bahagian utama iaitu bahagian A: ketepatan suhu inkubasi, bahagian B: masa untuk mencapai suhu optimum dan bahagian C: kepuasan dan beban kerja staf. Skala Likert dengan pilihan 1 hingga 4 digunakan untuk mengukur maklum balas para responden terhadap setiap soalan item yang dikemukakan.

Skala ini terdiri daripada:

1 = Sangat Tidak Setuju
2 = Tidak Setuju
3 = Setuju
4 = Sangat Setuju

Data yang diperoleh daripada borang soal selidik akan diproses menggunakan perisian Microsoft Excel. Untuk tujuan analisis dan interpretasi data, kajian ini menggunakan kaedah statistik deskriptif, dengan penekanan pada nilai skor min**.** Data di analisis dengan menggunakan perisian Microsoft Excel melibatkan 20 orang kakitangan klinik pergigian sekitar daerah kubang pasu yang pernah menggunakan inkubator sedia ada dan projek inovasi '*thermocube*'.

Jadual 1. Dapatan data responden menggunakan inkubator

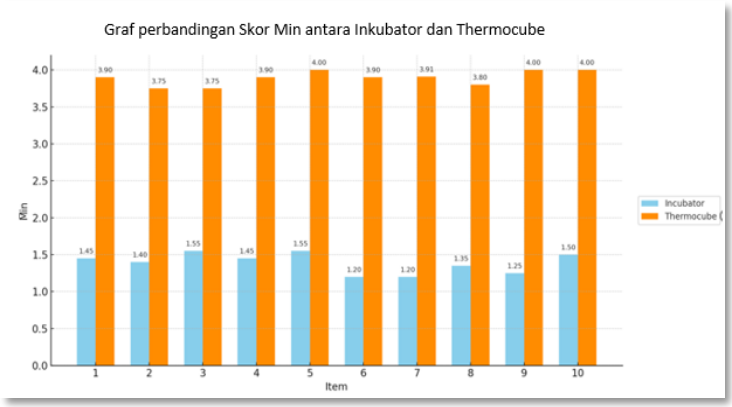
ITEM	Sangat Tidak Setuju		Tidak Setuju		Setuju		Sangat Setuju		Min
1. Inkubator mencapai suhu inkubasi yang tepat seperti yang ditetapkan.	9	45	11	55	0	0	0	0	1.55
2. Suhu inkubasi kekal stabil sepanjang tempoh ujian.	8	40	12	60	0	0	0	0	1.60
3. Hasil ujian biologikal boleh dipercayai.	8	40	12	60	0	0	0	0	1.60
4. Inkubator mengambil masa yang singkat untuk mencapai suhu optimum.	11	55	9	45	0	0	0	0	1.45
5. Masa pemanasan inkubator adalah lebih baik berbanding '*thermocube*'.	6	30	14	70	0	0	0	0	1.70
6. Kecekapan masa inkubator sedia ada dapat meningkatkan kelancaran operasi ujian biologikal.	15	75	5	25	0	0	0	0	1.25
7. Saya berpuas hati dengan penggunaan inkubator sedia ada.	16	80	4	20	0	0	0	0	1.20
8. Inkubator sedia ada mudah untuk dikendalikan.	14	70	6	30	0	0	0	0	1.30
9. Inkubator dapat membantu mengurangkan beban kerja harian saya.	15	75	5	25	0	0	0	0	1.25
10.saya mengesorkan penggunaan inkubator sedia ada kepada klinik pergigian yang lain.	10	50	10	50	0	0	0	0	1.50
							Min Keseluruhan		1.45

Jadual 1 memaparkan kadar peratusan responden yang memberi maklumbalas terhadap penggunaan Inkubator sedia ada Berdasarkan analisis terhadap skor min bagi 10 item penilaian, inkubator sedia ada mencatatkan min keseluruhan sebanyak 1.45, yang diklasifikasikan sebagai rendah dalam skala Likert empat mata. Skor min setiap item berada dalam julat 1.20 hingga 1.70, menunjukkan bahawa majoriti responden memberikan maklum balas negatif atau sangat tidak bersetuju terhadap prestasi peralatan ini. Aspek-aspek yang dikenal pasti mempunyai kelemahan termasuk lah ketidaktepatan dan ketidakstabilan suhu inkubasi, tempoh pemanasan yang tidak efisien, kesan penggunaan yang tidak menyumbang kepada pengurangan beban kerja atau kelancaran operasi dan tahap kepuasan pengguna yang rendah secara keseluruhan. Dapatan ini mencerminkan keperluan untuk penambahbaikan atau penggantian peralatan bagi meningkatkan keberkesanan proses ujian biologi di makmal atau fasiliti berkaitan.

Jadual 2. Dapatan data responden menggunakan *Thermocube*

ITEM	Sangat Tidak Setuju		Tidak Setuju		Setuju		Sangat Setuju		Min
1. '*Thermocube*' mencapai suhu inkubasi yang tepat seperti yang ditetapkan.	0	0	0	0	2	10	18	90	3.90
2.Suhu inkubasi kekal stabil sepanjang tempoh ujian.	0	0	0	0	5	25	15	75	3.75
3.Hasil ujian biologikal boleh dipercayai.	0	0	0	0	5	25	15	75	3.75
4. '*Thermocube*' mengambil masa yang singkat untuk mencapai suhu optimum.	0	0	0	0	2	10	18	90	3.9
5. Masa pemanasan '*thermocube*' adalah lebih baik berbanding sebelumnya.	0	0	0	0	0	0	20	100	4.00
6.Kecekapan masa '*thermocube*' ini dapat meningkatkan kelancaran operasi ujian biologikal.	0	0	0	0	2	10	18	90	3.90
7.Saya berpuas hati dengan penggunaan '*thermocube*' sedia ada.	0	0	0	0	2	10	18	90	3.90
8. '*Thermocube*' mudah untuk dikendalikan.	0	0	0	0	4	20	16	80	3.80
9. '*Thermocube*' dapat membantu mengurangkan beban kerja harian saya.	0	0	0	0	0	0	20	100	4.00
10.saya mengesorkan penggunaan '*thermocube*' kepada klinik pergigian yang lain.	0	0	0	0	0	0	20	100	4.00
					Min Keseluruhan				3.89

Jadual 2 memaparkan kadar peratusan responden yang memberi maklumbalas terhadap penggunaan '*Thermocube*'. Dapatan data jelas menunjukkan prestasi yang sangat baik dengan min keseluruhan sebanyak 3.89, hampir mencapai skor maksimum. Skor min bagi semua item berada dalam lingkungan 3.75 hingga 4.00, yang mencerminkan tahap kepuasan yang sangat tinggi dalam kalangan responden. Antara elemen yang menerima skor tertinggi termasuklah kecekapan masa pemanasan dan kestabilan suhu, Kebolehpercayaan hasil ujian biologi, pengurangan beban kerja harian, tahap kebolehgunaan dan kemudahan pengendalian dan syorkan penggunaan '*Thermocube*' kepada fasiliti lain.Penilaian ini menunjukkan bahawa '*Thermocube*' memenuhi keperluan dan kehendak pengguna sedia ada dalam melaksanakan ujian biological di mana ia dapat untuk beroperasi di makmal secara lebih efisien dan efektif



Rajah 4. Graf perbandingan penggunaan inkubator dan *Thermocube*

Berikut ialah graf perbandingan skor min antara Inkubator *sedia ada* dan '*Thermocube*' berdasarkan 10 item penilaian.Hasil pemerhatian mendapati skor min bagi '*Thermocube*' secara konsisten lebih tinggi berbanding inkubator dan penilaian yang lebih positif terhadap '*Thermocube*' dalam semua aspek., '*Thermocube*' mencapai skor maksimum (4.00) dalam beberapa item, termasuk masa pemanasan, pengurangan beban kerja, dan kesediaan untuk disyorkan serta menunjukkan keberkesanan dan penerimaan yang lebih tinggi terhadap '*Thermocube*' berbanding Inkubator sedia ada.

4. Kesimpulan

Keputusan kajian menunjukkan bahawa '*Thermocube*' adalah alat yang berkesan dalam ujian biologikal di klinik pergigian. Ketepatan suhu inkubasi dan masa pemanasan yang singkat memastikan keputusan ujian yang tepat dan cepat. Kepuasan tinggi dalam kalangan staf menunjukkan bahawa '*Thermocube*' mudah digunakan dan membantu dalam pengurusan beban kerja. Penggunaan '*Thermocube*' dalam ujian biologikal di klinik pergigian terbukti berkesan dari segi teknikal dan pengoperasian. Ia meningkatkan ketepatan dan kecekapan proses pensterilan dan meningkatkan kepuasan serta produktiviti staf.

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THERMAL ANALYSIS OF ENGINE PISTON WITH THERMAL BARRIER COATING USING THE FINITE ELEMENT METHOD

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Abstract

Efficient thermal management is critical for optimizing diesel engine performance, as excessive heat loss reduces energy efficiency and accelerates component degradation. This study investigates the thermal and mechanical behaviour of piston crowns, made of cast iron and coated with various thermal barrier coatings (TBCs) under high-temperature conditions. Finite Element Analysis (FEA) is utilized to model the thermal behaviour of piston crowns coated with Yttria-Stabilized Zirconia (YSZ), Aluminium Oxide–Titanium Dioxide (Al_2O_3+TiO_2), and Aluminium Oxide (Al_2O_3). The study aims to determine which coatings can endure extreme thermal conditions while minimizing induced thermal stresses. The simulation results show that the reduction of temperature difference between uncoated and coated are YSZ = 36.8%; Al_2O_3 + TiO_2 = 34.8% and Al_2O_3 = 36.2%. Therefore, YSZ has the highest reduction and exhibits the most favourable performance, attributed to its low thermal conductivity and excellent resistance to thermal shock. These findings highlight the importance of appropriate TBC selection in improving diesel engine efficiency, reliability, and long-term durability under severe operating conditions.
Keywords: Coating; Thermal barrier coatings (TBC); Piston.

1. Introduction

The global automotive and industrial sectors increasingly demand greater efficiency, lower emissions, and extended engine lifespans. Diesel engines, known for their durability and high thermal efficiency, nonetheless experience substantial thermal energy losses due to excessive heat dissipation. A large portion of this energy escapes through critical components such as the piston, which is subjected to extreme thermal and mechanical loads. These losses not only reduce overall efficiency but also accelerate component wear and shorten service life.

Thermal barrier coatings (TBCs) have emerged as promising solutions to mitigate heat-related challenges in engine components. By minimizing heat transfer, TBCs enhance combustion efficiency and improve resistance to wear and corrosion. Recent research has focused on the thermal performance and protective characteristics of materials such as Yttria-Stabilized Zirconia (YSZ), Aluminium Oxide (Al_2O_3), and Aluminium Oxide–Titanium Dioxide composites (Al_2O_3+TiO_2) in diesel engine environments.

Thermal barrier coatings (TBCs) play a critical role in enhancing the thermal efficiency and mechanical durability of internal combustion engine pistons. Sharma et al. (2024) demonstrated through finite element analysis (FEA) that functionally graded TBCs significantly reduce thermal stress, promote uniform temperature distribution, and improve piston longevity. Similarly, Hariram et al. (2022) applied FEA to evaluate different TBC materials on engine components, confirming reduced piston head temperatures and improved thermal

efficiency. Their study also emphasized that optimal coating thickness plays a vital role in ensuring maximum effectiveness without compromising structural integrity.

Dahal et al. (2023) explored the thermal behavior of diesel engine pistons, reinforcing the importance of thermal protection to minimize stress concentrations under high temperatures. Algin and Raj (2017) further supported this by comparing coated and uncoated pistons, concluding that TBCs enhance durability and reduce heat transfer significantly. Haddad (2023) focused on how varying TBC thickness affects thermal stress distribution, highlighting the delicate balance between insulation effectiveness and potential for coating delamination due to improper bonding.

In related research, Ahmaniemi et al. (2004) performed a thermophysical characterization of modified thick TBCs, revealing enhanced phase stability and lower thermal conductivity—both critical factors for improving engine component performance. Wang et al. (2018) examined the phase stability and thermophysical properties of ZrO_2-CeO_2-TiO_2 ceramics, emphasizing their potential in providing advanced insulation with higher phase resistance, making them ideal candidates for TBC applications.

Radhakrishnan and Park (2021) applied coupled CFD and FEM to analyze gas turbine combustor liners, finding that advanced TBCs significantly improve creep life prediction and overall thermal performance. Though not piston-specific, their simulation approach is applicable to similar thermal-stressed components. Krishna et al. (2023) investigated different piston head profiles using FEM, revealing that geometry also influences thermal distribution and that TBCs enhance performance further when matched with optimized design.

Sirigiri and Esanakula (2022) used automated CAD modeling and FEM analysis for piston design, showcasing how computational tools facilitate efficient TBC evaluation. Meanwhile, El-Mahallawi et al. (2014) studied composite piston materials reinforced with Al_2O_3 and TiO_2 nanoparticles, showing improved hardness and wear resistance, which complements the protective function of TBCs.

Collectively, these studies underscore the importance of combining material innovation, coating optimization, and computational modelling. FEA, in particular, proves essential for simulating thermal behaviour and guiding effective application of TBCs for piston performance and engine durability enhancement.

An effective strategy for reducing heat transfer within internal combustion engines involves the thermal insulation of components that are directly exposed to combustion gases. This is commonly implemented through the application of thermal barrier coatings (TBCs) which are engineered materials characterized by low thermal conductivity and high thermo-mechanical stability Ahmaniemi et al., (2004**).** In recent decades, ceramic and polymer-based TBCs have demonstrated significant potential in enhancing engine efficiency and thermal performance. Nevertheless, their widespread adoption requires comprehensive evaluation, considering both performance benefits and economic feasibility to ensure practical and cost-effective integration into engine systems.

Despite these advancements, existing studies often lack integrated simulations that assess both thermal and mechanical stresses on piston crowns under realistic combustion conditions. Additionally, the performance variations of TBCs when applied to different base materials—such as grey cast iron, aluminium alloys, and steel—remain underexplored, particularly in terms of their response to thermal fatigue.

This study aims to bridge these gaps by simulating the thermo-mechanical behaviour of coated diesel pistons and evaluating thermal stress distributions during combustion. Using finite

element (FE) thermal simulation tools, the performance of YSZ, Al_2O_3, and Al_2O_3+TiO_2 coatings applied to piston crowns made from grey cast iron is assessed.

2. Methodology

The piston material selected for this study is grey cast iron. This material was chosen due to its widespread application in engine components, attributed to its favourable mechanical strength, wear resistance, and thermal conductivity (Goriparthi et al., 2019). The mechanical and thermo-physical properties used in the simulation are detailed in Table 1. The piston geometry considered for the analysis has a diameter of 40 mm and a stroke length of 90 mm.

Table 1. Mechanical properties of grey cast iron. (Source: Sirigiri et al. 2020)

Parameter	Value
Density (kg/m^3)	7200
Young's Modulus (MPa)	110000
Coefficient of thermal expansion (1/K)	1.1 X10^{-6}
Poisson's Ratio	0.28
Elastic modulus (GPa)	124
Ultimate Tensile Strength (MPa)	240
Thermal conductivity (W/m/^{0}C)	52

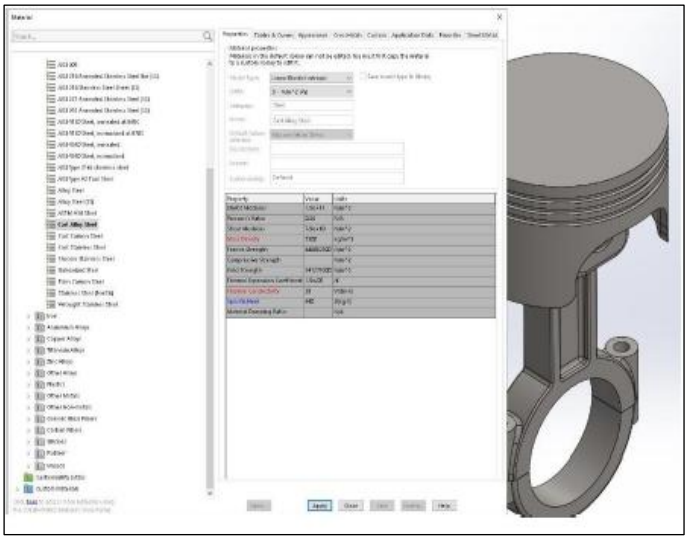

Fig. 1. Material specification input

The Figure 1 displays a SolidWorks interface showcasing the material properties of Cast Alloy Steel, assigned to a 3D piston model. Key thermal and mechanical properties include a thermal conductivity of 33 W/m·K, specific heat of 440 J/kg·K, and a mass density of 7300 kg/m³, which are crucial for simulating heat flow and thermal stress within an engine environment. With an elastic modulus of 1.6x10^{11} N/m² and tensile strength of 448 MPa, the material provides strong structural integrity. These properties are essential for assessing how the piston responds to high-temperature, high-load conditions during combustion in diesel engine analysis.

Three TBC materials were selected for evaluation based on their industrial relevance and prior research are Yttria-Stabilized Zirconia (YSZ), Al_2O_3+TiO_2 (Aluminium Oxide–Titanium Dioxide) and Al_2O_3 (Aluminium Oxide). The detail on these materials is shown in Table 2 and Figure 2. Material properties, including thermal conductivity, specific heat, Young's modulus and coefficient of thermal expansion, were obtained from literature and material databases. Each coating was modelled as a uniform 0.3 mm layer applied to the relevant surfaces.

Table 2. Thermal properties of TBC (Source: El-Mahallawi et.al. (2018))

Property	YSZ	Al_2O_3+TiO_2	Al_2O_3
Thermal Conductivity (W/m·K)	2.2 - 2.9	8	35
Coefficient of Thermal Expansion (μm/^oK)	12	9	5.4
Specific Heat(J/Kg.^0K)	552-653	740.6	880
Young's Modulus (GPa)	200	244	380

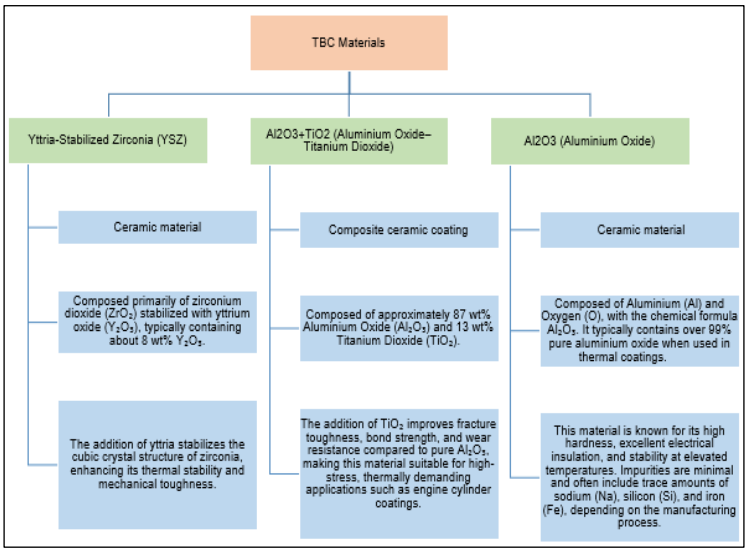

Fig. 2. Details on selected TBC

A detailed 3D finite element model of a diesel engine cylinder and piston crown was developed using ANSYS Workbench. The model geometry was simplified to reduce computational cost while preserving critical thermal and structural features. Meshing was performed using second-order tetrahedral elements, with refinement in regions of expected high thermal gradients.

Thermal loading conditions were based on typical diesel engine operation, with peak temperatures reaching up to 900°C at the piston crown surface and 600°C at the cylinder wall. A cyclic thermal profile was applied to simulate repeated engine firing conditions. Convective boundary conditions were applied to external surfaces, while heat flux was assigned to combustion-facing surfaces.

Structural simulations accounted for thermal expansion and temperature-induced stress using coupled thermal–structural analysis. Each model was subjected to the same number of thermal cycles to evaluate long-term performance.

Figure 3 presents a thermal simulation setup in SolidWorks, focusing on a piston assembly subjected to heat power loading. Specifically, a heat power of 350 Cal/s is applied to selected faces of the piston head to simulate combustion-induced thermal stress. This setup falls under the thermal Loads section and includes convection boundary conditions as well, indicating of heat dissipation to the surrounding media. This configuration allows for detailed finite element analysis (FEA) to evaluate the piston's temperature distribution, heat flux, and potential thermal deformation under operating conditions. Such simulations are essential for optimizing material selection and improving thermal performance in internal combustion engines.

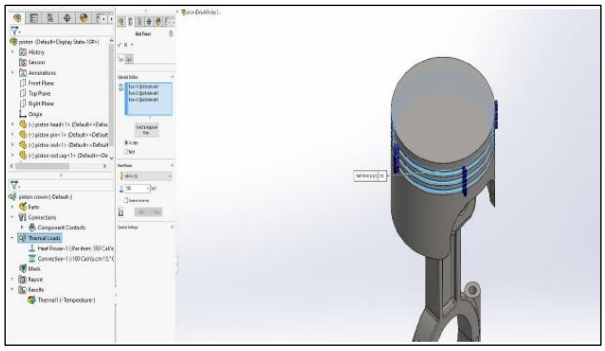

Fig. 3. Thermal load conditions setup

Figure 4 illustrates a thermal convection setup applied to a piston model in SolidWorks simulation. Selected external surfaces of the piston head are exposed to a convection coefficient of 100 Cal/(s·cm²·°C), with the ambient temperature set at 180 °C. This simulates the heat transfer from the piston to the surrounding air or coolant, a critical factor in thermal performance analysis. The applied boundary conditions help predict how the piston dissipates heat during operation, influencing its structural integrity and efficiency. This setup is vital for evaluating cooling effectiveness, preventing thermal fatigue, and guiding material and design choices in engine development.

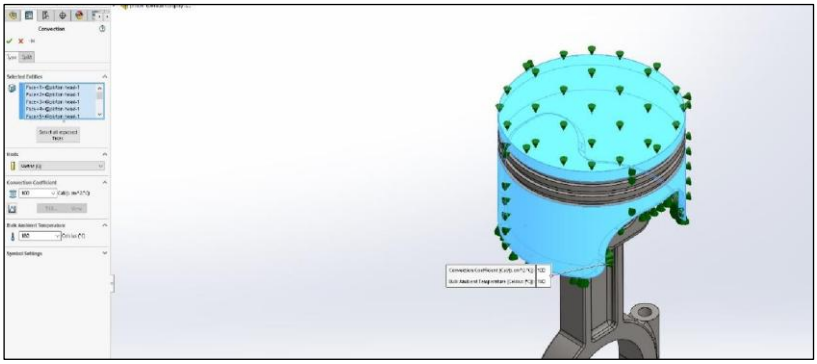

Fig. 4. Thermal convection setup

Thermal performance was assessed based on temperature distribution, thermal gradient across the coating, and maximum temperature at the substrate-coating interface. The primary performance indicators such as maximum operating temperature were compared across all three materials to determine the optimal coating for each engine component.

3. Results and Discussion

The simulation was conducted using thermal analysis to evaluate the performance of three different coating materials. Data were collected with a focus on the maximum temperature experienced by the piston crown. To analyze material qualities, many processes or a combination of various approaches may be necessary, depending on the purpose. This simulation is based on three coatings: YSZ, Al_2O_3+TiO_2, and AL_2O_3. Temperature data were collected with an emphasis on the maximum values observed on the piston crown for each type of coating, as illustrated in Figures 5, 6, 7, and 8.

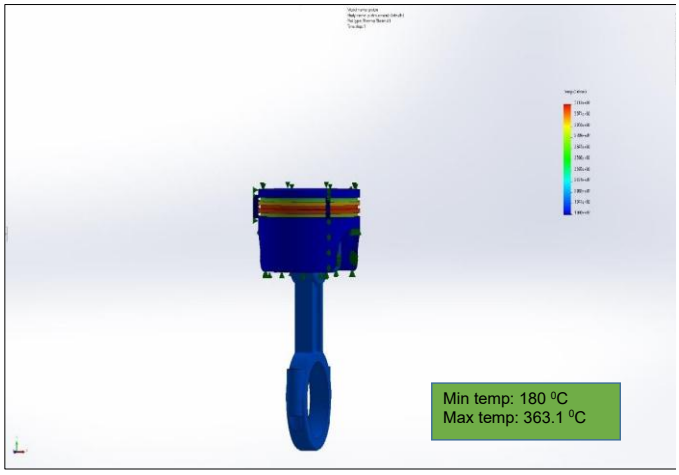

Fig. 5. Uncoated

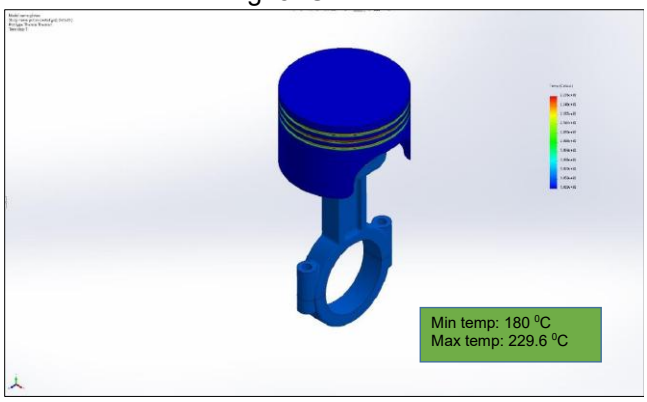

Fig. 6. Yttria-stabilized zirconia (YSZ)

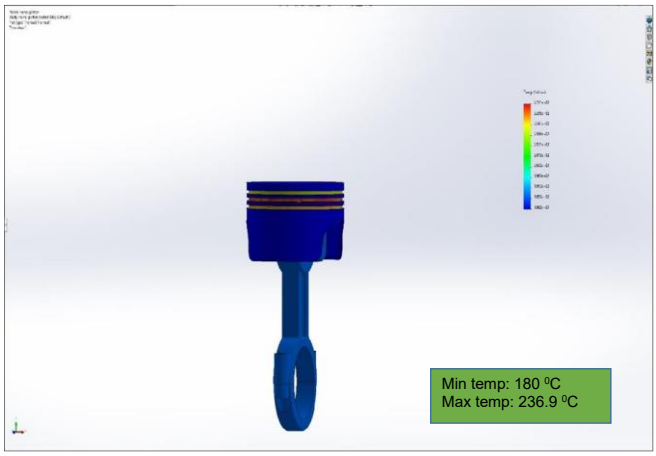

Fig. 7. Aluminium oxide–titanium dioxide (Al_2O_3+TiO_2)

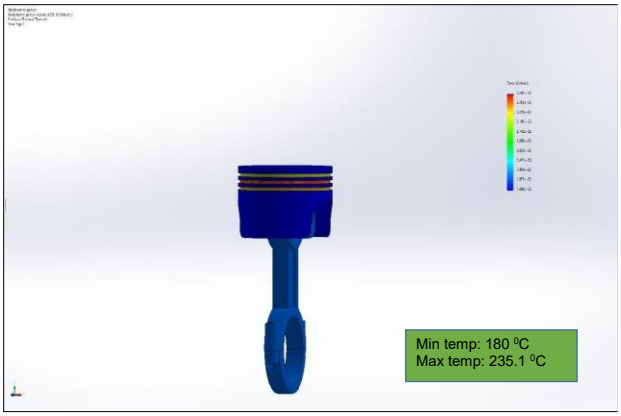

Fig. 8. Aluminium Oxide (Al_2O_3)

The thermal simulation of the piston crown under various coating conditions reveals a significant enhancement in thermal insulation compared to the uncoated configuration. In its uncoated state, the piston ring experienced the highest thermal exposure, with a maximum temperature of 363.1 °C and a minimum of 180.0 °C, indicating substantial heat transfer through the component surface. This wide temperature gradient highlights the extent of heat conduction through the piston ring material, suggesting limited resistance to thermal flow and high susceptibility to heat-induced wear and deformation.

By contrast, coated piston rings exhibit lower overall thermal loads, implying that the thermal barrier provided by the coatings effectively reduces heat transfer to the underlying substrate. The coatings act as a thermal shield, limiting the peak temperature experienced by the ring and promoting a more uniform temperature distribution across the surface. This not only contributes to improved thermal fatigue resistance but also enhances the durability and functional lifespan of the component under high-temperature operating conditions typical in internal combustion engines.

When coated with Yttria-Stabilized Zirconia (YSZ), the piston ring achieved the greatest thermal insulation performance, recording the lowest maximum temperature of 229.6 °C while maintaining the same minimum temperature of 180.0 °C. The YSZ coating effectively reduced heat transfer to the piston ring, demonstrating its superior thermal insulation properties. YSZ emerged as the most effective material, reducing the maximum temperature by 36.8%, in line with findings by Wang et al. (2018), who confirmed YSZ's superior phase stability and low thermal conductivity at elevated temperatures. This reduction in peak temperature suggests improved thermal fatigue resistance and greater durability of engine components, as previously emphasized by Sharma et al. (2024) and Hariram et al. (2022) in their respective FEM-based analyses of thermal stress and coating performance. This temperature reduction could potentially lead to improved engine efficiency and reduced wear on critical components. This reflects the superior insulating capability of YSZ under high-temperature conditions.

The Aluminium Oxide–Titanium Dioxide (Al_2O_3+TiO_2) coating yielded a slightly higher maximum temperature of 236.9 °C, with Aluminium Oxide (Al_2O_3) closely following at 235.1 °C. This slight difference in maximum temperature can be attributed to the unique thermal properties of the composite coating. The addition of Titanium Dioxide to Aluminium Oxide may have enhanced the overall thermal conductivity of the coating, leading to improved heat transfer characteristics.

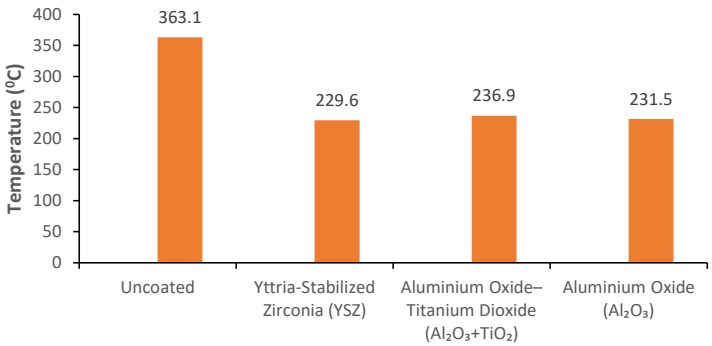

Fig. 9. Comparison of maximum temperature for the types of piston coatings

The bar chart in Figure 9 present the comparative thermal performance of piston rings subjected to different ceramic coatings: Yttria-Stabilized Zirconia (YSZ), Aluminium Oxide–Titanium Dioxide composite (Al_2O_3 + TiO_2), and pure Aluminium Oxide (Al_2O_3), in addition to the uncoated baseline. The primary variable evaluated is the maximum temperature (°C) reached during thermal simulation, which directly reflects the effectiveness of each coating in resisting heat transfer and insulating the substrate.

These results collectively indicate that ceramic coatings play a crucial role in the thermal management of piston rings. The reduction of temperature difference between uncoated and coated are YSZ = 36.8%; Al_2O_3 + TiO_2 = 34.8% and Al_2O_3 = 36.2%. The application of such coatings not only lowers the peak temperatures experienced by the component but also promotes a more uniform temperature distribution, thereby enhancing resistance to thermal gradients and mechanical fatigue. The findings support the strategic use of advanced ceramic coatings, particularly YSZ, in engine components operating under high-temperature conditions.

The study also highlights that Al_2O_3+TiO_2 and Al_2O_3 coatings offer notable improvements, though slightly less effective than YSZ. These results align with the conclusions drawn by El-Mahallawi et al. (2014), who observed improved hardness and wear resistance in composite ceramic coatings reinforced with TiO_2, supporting their role in thermal protection applications.

Overall, the application of thermal barrier coatings substantially reduced the thermal load on the piston. Among the coating tested, YSZ provided the most effective thermal protection, followed by Al_2O_3+TiO_2 and Al_2O_3. Currently, 6–8 wt.% Y2O3 stabilized zirconia (YSZ) is considered as a good choice for the ceramic top coat material due to its superior durability during thermal cycling, Wang et.al (2018). These results align with the thermal performance trends observed in the engine block, reinforcing the potential of ceramic-based coatings to enhance the thermal management of diesel engine components.

4. Conclusion

The primary objective of this study was to investigate the thermal insulation performance of three ceramic-based thermal barrier coatings (TBCs)—Yttria-Stabilized Zirconia (YSZ), Aluminium Oxide–Titanium Dioxide (Al_2O_3+TiO_2), and Aluminium Oxide (Al_2O_3)—applied to diesel engine piston crowns composed of grey cast iron. Using a finite element method (FEM) framework, the study sought to quantify thermal behavior and identify the most effective coating in mitigating thermal stress and peak temperature under combustion-representative loading conditions.

Among the evaluated materials, YSZ demonstrated the most superior thermal performance, reducing the peak temperature to 229.6 °C—a 36.8% decrease. Al_2O_3 and Al_2O_3+TiO_2 followed with reductions of 35.2% and 34.8%, respectively. These findings are consistent with

existing literature, particularly the work of Wang et al. (2018), which emphasized YSZ's low thermal conductivity and excellent phase stability under high-temperature cycling, and Sharma et al. (2024), who highlighted the benefits of ceramic coatings in reducing thermo-mechanical stress in piston components.

The outcomes of this study offer significant contributions to the field of engine thermal management by providing a comparative, simulation-based evaluation of widely used ceramic coatings. The quantified reduction in peak temperature across all coated cases not only confirms the efficacy of these materials but also emphasizes their practical relevance in improving thermal fatigue resistance and extending the operational life of critical engine components. In light of these findings, future research should incorporate experimental validation under real engine conditions to corroborate simulation accuracy. Additionally, the exploration of advanced coating architectures—such as multilayer or functionally graded systems, as proposed by Ahmaniemi et al. (2004)—could further enhance thermal performance and structural integrity. In summary, this study substantiates the effectiveness of ceramic-based TBCs, with YSZ emerging as the most thermally efficient coating for diesel engine pistons. These insights support the continued development and application of high-performance thermal protection systems in modern engine design.

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REKABENTUK MESIN PENGGELEK DOH BERASASKAN PENILAIAN ERGONOMIK (RULA DAN REBA)

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Abstrak

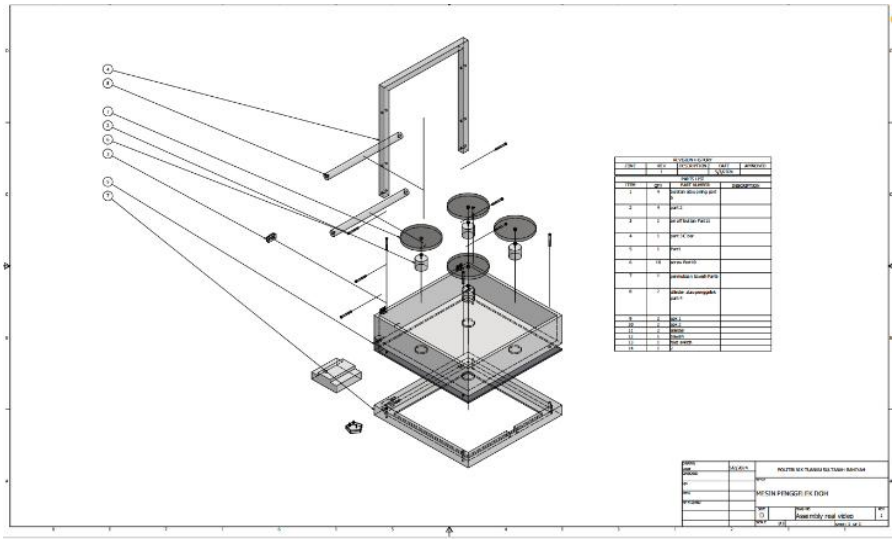
Tujuan projek ini dijalankan adalah untuk merekabentuk satu projek yang diberi nama *Kneading multi-bread.* Penggunaan mesin penggelek doh adalah penting dalam industri pembuatan roti seperti roti canai untuk meningkatkan keselamatan dan kualiti produk. Masalah yang timbul dari pembuatan doh secara manual kecederaan tangan akibat aktiviti berulang *repetition*, *contact stress*, ketepatan saiz doh, dan memerlukan tenaga pekerja untuk menggelek doh menggunakan tangan manusia. Oleh itu, kajian ini bertujuan untuk menghasilkan mesin penggelek doh yang tidak hanya memastikan kebersihan dan ketepatan saiz doh yang lebih baik, tetapi juga mengurangkan tenaga yang diperlukan oleh pengguna untuk mengelakkan kecederaan.Objektif utama adalah merancang mesin yang mampu menghasilkan doh dengan bentuk dan saiz yang seragam. Metodologi penyelidikan dijalankan menggunakan kaedah ujian campur tangan ergonomik dengan *Rapid Entire Body Assessment (REBA)* dan *Rapid Upper Limb Assessment (RULA)*. Analisis data telah dibuat terhadap inovasi ini menggunakan data sebelum dan selepas kaedah RULA dan REBA. Ujikaji juga dibuat dengan menentukan tahap kecederaan menggunakan prinsip faktor risiko yang boleh menyebabkan kecederaan pekerja dalam proses penghasilan doh untuk memastikan tahap kesihatan dan keselamatan pekerja.
Kata kunci: Rekabentuk; Mesin penggelek doh; Ergonomik.

1. Pengenalan

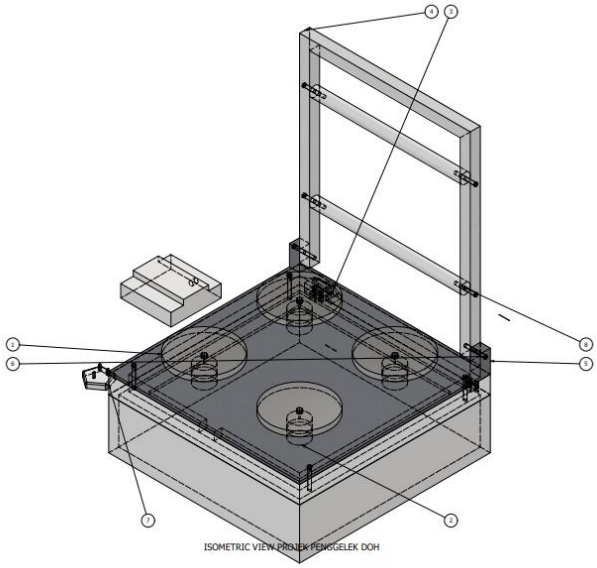
Perniagaan makanan tradisional adalah salah satu perniagaan yang paling popular pada masa kini. Salah satu daripadanya adalah perniagaan roti seperti roti canai, roti bom, roti Arab dan sebagainya. Hal ini kerana ia telah mengambil hati semua masyarakat berbilang bangsa di negara ini terutamanya bangsa Melayu. Doh roti diperbuat dari tepung gandum, air, sedikit minyak masak, telur gula, marjerin, pewarna dan sedikit garam. Roti berbentuk bulat kebiasaannya dibuat dengan kemas. Ia juga mudah diperolehi di kedai-kedai tepi jalan terutama semasa waktu pagi, yang merupakan sebagai juadah utama semasa sarapan pagi seperti roti canai.

Untuk menghasilkan doh roti ini, seseorang memerlukan teknik dan cara yang betul kerana jika tersilap langkah, ia akan tebal dan bentuknya tidak seragam seperti yang diinginkan. Doh roti dibuat menggunakan tangan ataupun acuan khas dan ia mempunyai pelbagai jenis acuan. Acuan yang paling mudah didapati di pasaran adalah acuan menguli roti canai. Dengan hanya membuat putaran, ia dapat menghasilkan doh roti (Roti Rolling Machine, 2019). Biasanya acuan ini digunakan oleh peniaga kecil-kecilan tetapi dengan menggunakan acuan ini, ia mengambil masa yang lama untuk menghasilkan sebiji doh. Tenaga juga banyak digunakan jika menggunakan acuan ini. Jadi dengan ini, projek yang bakal dilakukan ialah mesin uli doh roti atau *machine kneading multi-bread*. Penambahbaikan turut dilaksanakan dalam projek ini seperti membuat 4 doh dalam satu masa. Penjual roti dan suri rumah tidak perlu risau akan masalah yang dihadapi sebelum ini contohnya lenguh sakit pinggang dan sebagainya selain dapat menjimatkan masa apabila melakukan kuantiti doh roti yang banyak.

Rajah 1 adalah rekabentuk menunjukkan lukisan pemasangan dan pemasangan berserta *bill of material* yang memaparkan leraian setiap satu komponen mesin penggelek doh. Rangka dan struktur utama adalah pada bahagian bawah permukaan yang menggunakan besi tahan karat yang dijadikan tapak bertujuan untuk memberi ketahanan pada mesin penggelek doh. Bahagian seterusnya ialah keluli tahan karat *stainles steel*. Keluli tahan karat ini sesuai untuk produk makanan. Bahagian yang ketiga ialah motor yang berjenis DC berperanan menjadi penggerak mesin doh ini. Seterusnya, ialah *plate stainless steel* yang terdapat di mesin doh ini bertujuan untuk menggelakkan doh melekat dan tahan lasak. Bahagian yang kelima ialah penggelek yang bertujuan menggelek doh di atas permukaan *plate stainless steel*. Akhir sekali ialah besi yang beroperasi sebagai pemegang yang boleh digerakkan. Terdapat juga butang yang berfungsi sebagai 'tutup dan buka' apabila beroperasi dan tidak beroperasi. Tambahan pula, mesin ini mempunyai tempat cas yang bertujuan dapat beroperasi apabila ketiadaan elektrik. Skru adalah penyalur kepada penyambungan setiap item untuk mengukuhkan mesin doh. Rajah 2 menunjukkan lakaran keseluruhan mesin penggelek doh yang telah dicantumkan setiap komponen sehingga menjadi sebuah mesin pengelek doh.



Rajah 1. Lukisan pemasangan



Rajah 2. Lukisan keseluruhan projek

Kecederaan tisu disebabkan pengulangan kerja secara manual dalam proses menggelek bagi menyediakan makanan roti canai. Selain itu tahap risiko ergonomik, diperkenalkan dengan pendekatan RULA dan REBA. RULA menilai postur, gaya, dan gerakan suatu aktiviti kerja. Dengan pendekatan ini diharapkan risiko kecederaan dari pekerja dapat ditekan, biaya kesihatan akibat posisi yang salah dapat dikurangi, kenyamanan pekerja dapat ditingkatkan dan meningkatkan produktiviti dan prestasi pekerja *(RULA worksheet-USF health, 2024) (A Step-by-Step Guide to the REBA Assessment Tool, 2024)*. Proses pembuatan roti canai akan menyebabkan kecederaan seperti tangan tergeliat apabila meleperkan doh berulang kali. Selain itu masalah ketidakseragaman saiz doh apabila menggunakan cara manual (Jamil, 2009). Dengan menggunakan mesin ini separa automatik dapat mengurangkan kecederaan dan menjimatkan masa meleperkan doh.

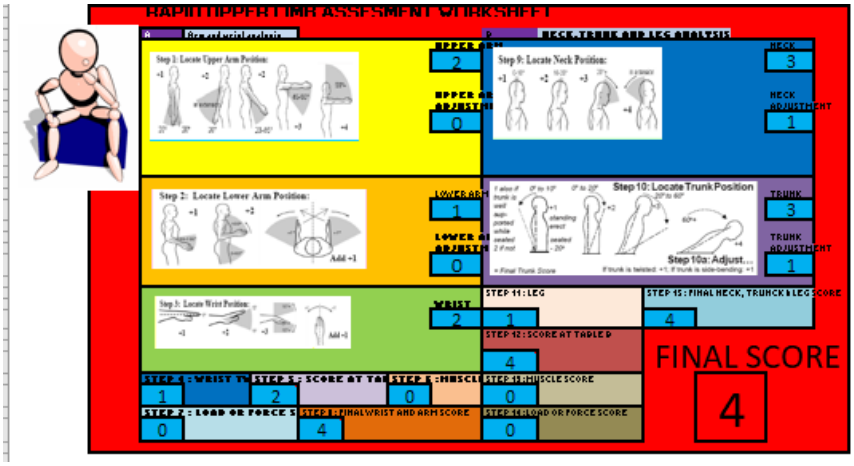
2. Metodologi

Penilaian berasaskan prisip ergonomik menggunakan kaedah RULA *(Rapid Upper Limb Assessment)* dan REBA *(Rapid Entire Body Assessment)* adalah dua alat penilaian ergonomik yang popular dan sering digunakan untuk menilai risiko gangguan muskuloskeletal (MSDs) yang berkaitan dengan postur kerja. Kedua-dua alat ini membantu pakar ergonomik mengenal pasti dan mengukur tahap tekanan fizikal pada pekerja, seterusnya membolehkan cadangan penambahbaikan dibuat. *(RULA worksheet-USF health, 2024) (A Step-by-Step Guide to the REBA Assessment Tool, 2024)*

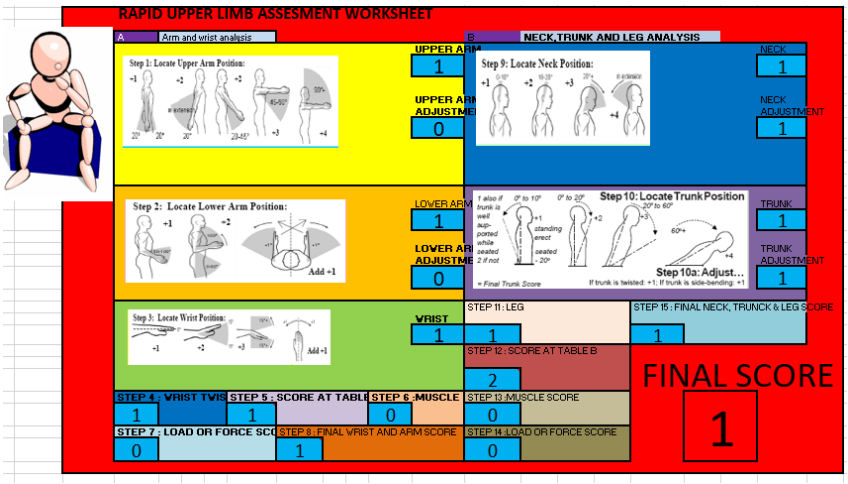
3. Dapatan dan Perbincangan

Cara kerja yang dijalankan secara manual adalah dari segi kerja yang berulang menggunakan tangan untuk mengelek doh iaitu pergerakan pengulangan *(repetition)* yang berulang kali dengan menggunakan tangan secara manual. Kesan ergonomik ialah tekanan sentuhan *(contact stress)* berlaku apabila sentuhan tekanan terkena permukaan yang kasar, contohnya proses menggelek doh dengan mengerakkan jari dan pengelangan tangan. Mesin penggelek doh membolehkan proses doh menjadi lebih cepat dan konsisten berbanding dengan cara manual. Ini membantu mengurangkan kerja manual dan pengelekan yang melibatkan tenaga pekerja. Seterusnya, produktiviti yang tinggi. Dengan menggunakan mesin penggelek doh, pengeluaran roti dapat ditingkatkan secara signifikan (ketara). Mesin ini mampu memproses jumlah doh yang besar dalam masa yang singkat, meningkatkan hasil pengeluaran secara keseluruhan. Di samping itu, ketepatan dalam ukuran dan bentuk. Mesin penggelek doh dapat diatur untuk menghasilkan doh dengan ukuran dan bentuk yang tepat mengikut keperluan. Lebih-lebih lagi, kawalan proses yang lebih baik, mesin ini dilengkapi dengan sistem kawalan yang canggih, membolehkan pengawalan kelajuan, dan parameter lain dengan lebih tepat. Ini membantu dalam mencapai hasil penggelekan yang optimum.

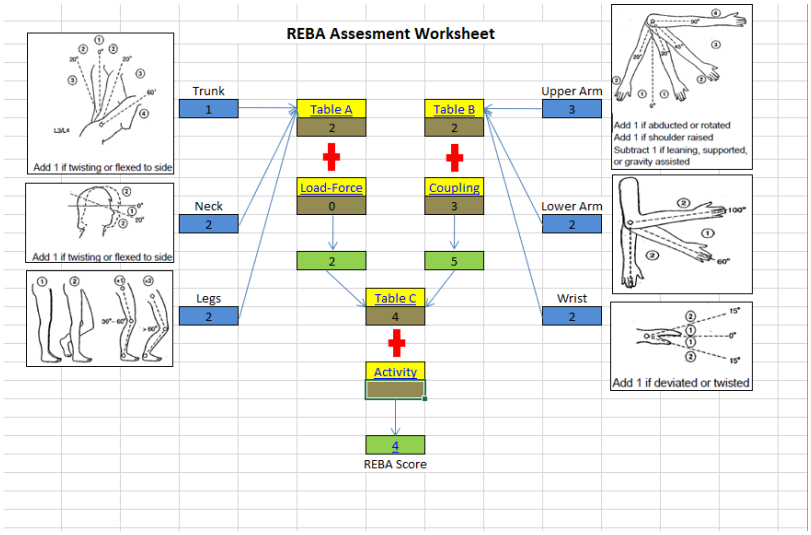
Kajian juga dibuat dengan menggunakan kaedah ergonomik iaitu RULA dan REBA. Kajian dijalankan dengan melihat pengurangan skor RULA dan REBA dan tahap risiko ergonomik tersebut dapat dikurangkan *(RULA worksheet-USF health, 2024) (A Step-by-Step Guide to the REBA Assessment Tool, 2024)*.Kajian ini mengenal pasti risiko ergonomik dalam proses manual penggelek doh menggunakan analisis RULA (skor risiko=4) dan REBA (skor=4), kemudian keputusan selepas merekabentuk mesin penggelek doh yang menurunkan skor risiko kepada 2 (RULA) dan 1 (REBA). Jadual 1 menunjukkan Skor tahap ergonomik menggunakan kaedah REBA dan RULA sebelum dan selepas menggunakan mesin penggelek doh.



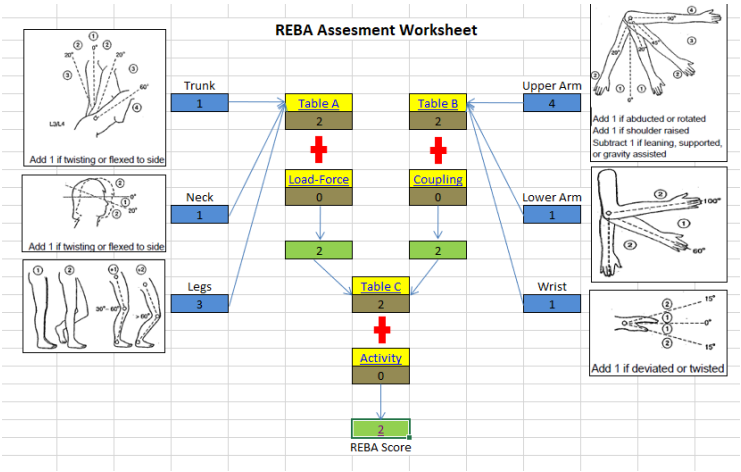
Rajah 3. RULA (sebelum)



Rajah 4. RULA (selepas)



Rajah 5. REBA (sebelum)



Rajah 6. REBA (selepas)

Jadual 1. Data skor REBA dan RULA sebelum dan selepas menggunakan mesin penggelek doh

Sebelum	Selepas
REBA (Skor 4)	REBA (Skor 2)
RULA (Skor 4)	RULA (Skor 1)

Rajah 7 dan 8 menunjukkan tahap bahaya dalam penilaian risiko REBA dan RULA yang melibatkan Postur kerja Sebelum dan Selepas menggunakan mesin penggelek doh. Rajah 7 menunjukkan pengurangan tahap risiko REBA iaitu nilai 2-3 adalah Risiko dapat diabaikan, tidak perlu tindakan. Rajah 8 menunjukkan pengurangan tahap risiko RULA iaitu nilai 1-2 adalah Risiko cedera muskuloskeletal sangat rendah atau tidak ada. Tidak ada tindakan perbaikan yang diperlukan.

REBA score	Risk Level	Action
1	Negligible	None necessary
2 - 3	Low	Maybe necessary
4 - 7	Medium	Necessary
8 - 10	High	Necessary soon
11 - 15	Very High	Necessary now

REBA score	Risk Level	Action
1	Negligible	None necessary
2 - 3	Low	Maybe necessary
4 - 7	Medium	Necessary
8 - 10	High	Necessary soon
11 - 15	Very High	Necessary now

Rajah 7. Skor risiko REBA sebelum dan selepas

Score	Action
1 or 2	Acceptable posture
3 or 4	Further investigation, change maybe needed
5 or 6	Further investigation, change soon
7	Investigate and implement change

Score	Action
1 or 2	Acceptable posture
3 or 4	Further investigation, change maybe needed
5 or 6	Further investigation, change soon
7	Investigate and implement change

Rajah 8. Perbezaan nilai skor RULA sebelum dan selepas

4. Kesimpulan

Kesimpulannya, rekabentuk dalam membangunkan peralatan ergonomik adalah penting dan kritikal. Tujuannya adalah untuk memastikan setiap peralatan, kemudahan, dan sistem yang digunakan dalam melaksanakan sesuatu aktiviti adalah sesuai dan serasi dengan manusia (M. C. Malek, M. A. F. Ujang, N. H. Mustapha, and A. Hashim, 2017). Ini bukan sekadar tentang keselesaan, tetapi merupakan pendekatan saintifik yang mendalam untuk mengoptimumkan interaksi antara manusia dan persekitaran kerja mereka. mesin penggelek doh dibangunkan menggunakan kaedah ergonomik agar tahan risiko bahaya dapat dikurangkan. Dengan penggunaan mesin penggelek doh pelbagai, proses penggelek menjadi jauh lebih efisien berbanding dengan penggelek manual. Mesin ini direka untuk menggelek empat doh sekaligus, yang secara drastik mengurangkan masa yang diperlukan untuk menyiapkan setiap doh. Akhir sekali, mesin penggelek doh ini yang dihasilkan ini mesra kepada pengguna, selamat dan mampu menjimatkan masa serta tenaga.

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SMART PARCEL BOX: AN IOT AND RFID-BASED SOLUTION FOR SECURE PACKAGE DELIVERY

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Abstract

The global rise of online shopping, driven by ease of use and a wide variety of products, has significantly transformed consumer behavior. In Malaysia, consumers frequently use platforms such as Shopee, Lazada, GoShop, and WowShop. However, this surge in e-commerce has exposed significant challenges in last-mile delivery, particularly in ensuring secure and weatherproof package receipt when recipients are not available. Addressing this gap, the Smart Parcel Box (SPB) prototype was developed as an innovative solution that integrates Internet of Things (IoT) technologies and Radio Frequency Identification (RFID) based security mechanisms. The SPB system employs an Arduino-powered motion detector to detect parcel insertion and sends real-time delivery notifications via Telegram, while its RFID-enabled door lock ensures restricted access. Evaluation results showed that the RFID system could detect cards accurately within a 10 mm range, achieving approximately 95% success. Meanwhile, Telegram alerts were delivered in an average time of 2 to 5 seconds, indicating the system's responsiveness and reliability. Additionally, the SPB prototype was designed to withstand Malaysia's variable climate, providing both security and weather resistance. This study presents the SPB as a cost-effective and scalable solution for improving parcel management, security, and user experience in Malaysia's growing e-commerce environment, while supporting Sustainable Development Goal 9 (SDG 9) by promoting innovation and resilient infrastructure.
Keywords: Smart parcel box; Internet of Things; Radio frequency identification detector.

1. Introduction

Online shopping has experienced global growth, particularly following the COVID-19 pandemic and Malaysia's Movement Control Order (MCO). It has become a preferred and safer option for consumers to meet their needs and wants, with increasing popularity observed across the country (Ru et al, 2021; Musa et al, 2022; Islam, 2024). This project explores the evolving trend of online shopping in response to increasingly busy lifestyles. This shift has transformed how people live, work, and shop in Malaysia, emphasizing the importance of enhancing business digitalization (Tajudeen et. al., 2025).

According to the Malaysian Communications and Multimedia Commission, 51.2% of the population participates in e-commerce, engaging in both buying and selling activities online (Syahirah, 2019). To attract consumers, online retailers employ various strategies such as discount vouchers, cash rebates, and enticing rewards. As a result, Malaysia's e-commerce market is rapidly becoming one of the largest in Southeast Asia (Nasution & T.A., 2023). Most Malaysians use their mobile phones for online shopping (Barry et. al., 2024), with platforms like Lazada, Shopee, Mudah.my, GoShop, and WowShop are gaining significant popularity.

Despite the surge in online shopping, consumer concerns persist. Common issues include delayed deliveries, non-receipt of products, inaccurate delivery time information, and poor after-sales services (Y. S. Lim & Wan Ahmad, 2024). Additionally, the absence of recipients during delivery presents another challenge. According to the Malaysian Ministry of

Communications portal, a total of 186 complaints regarding courier services were received by the Ministry of Domestic Trade and Consumer Affairs (KPDNHEP) from January to June 30 of this year. The highest number of complaints involved customers not receiving their ordered goods (94 cases), followed by lost packages (33), damaged items (14), and goods being delivered in incorrect packaging (8). These statistics highlight the urgent need for proactive measures to ensure deliveries are completed safely and securely, protecting both the consumer and the courier.

In response to these issues, this study introduces the design, development, and evaluation of a Smart Parcel Box (SPB) prototype aimed at enhancing the safety and security of delivered packages. The SPB provides secure and weatherproof storage, equipped with an RFID card-based locking system (Zainuddin et. al., 2024). It also integrates an IoT system to notify users of their deliveries, leveraging IoT's ability to analyze sensor data and facilitate interaction between physical and digital environments (Logeswaran et. al., 2024). Moreover, IoT technologies through the connectivity of devices, sensors, and systems enable real-time data acquisition and analysis, supporting the efficient management of infrastructure, resources, and urban services (Neoaz N., 2025).

The idea of the Smart Parcel Box (SPB) was sparked by recurring problems such as delivery items frequently being lost or damaged during the delivery process (Zarin et al., 2024; Zainuddin et al., 2023). This often occurs when recipients are not at home, typically due to work commitments, leading couriers to leave parcels unattended outside the house. Such unattended deliveries increase the risk of package theft and accidental damage. Moreover, items packaged in cardboard boxes are particularly vulnerable to environmental exposure, especially during rainy weather, which can result in significant damage to the contents (Ahamad et al., 2024; Zainuddin et al., 2023). These issues are compounded by the lack of secure, weatherproof storage solutions for parcels and the inefficiency of current notification systems, which may delay or fail to inform recipients promptly about delivery statuses. The objectives of this SPB are to:

- Design a theft-resistant and weatherproof parcel box.
- Develop a parcel box equipped with an RFID-based locking system.
- Implement real-time parcel arrival notifications via Telegram using IoT technology.

2. Methodology

Figure 1 shows the development process of the SPB prototype follows a structured workflow to ensure proper integration of both mechanical and electronic components. The process begins with the design phase, where the overall structure and system layout are conceptualized. Following this, the frame is constructed using external connections and welding techniques to ensure structural stability. Once the physical assembly is complete, the next step involves establishing the electronic circuitry for the RFID and IoT systems. The circuit is then subjected to a testing phase to verify its functionality. If the circuit test is unsuccessful, adjustments and modifications are made before retesting. However, if the circuit is found to be successful, it is then integrated into the final project. The workflow concludes with the finalization of the project, ensuring all components are functioning as intended.

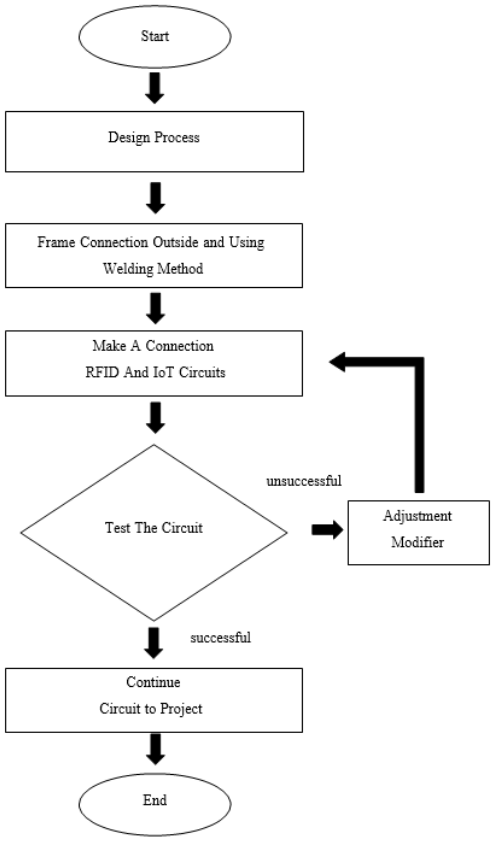


Fig. 1. Flowchart for SPB development

The flowchart in Figure 2 illustrates the operational process of the SPB prototype. The process begins when the sender places a parcel into the SPB. Once a sensor detects the parcel, the system automatically sends a notification to the recipient. To retrieve the parcel, the recipient must authenticate access by using an RFID card, which activates the locking mechanism.

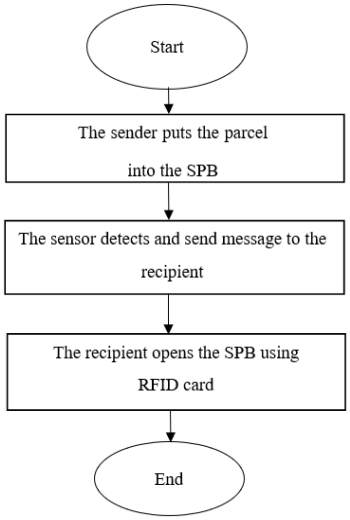


Fig. 2. Flow process of SPB

The product design specification will give a clear idea of the requirements needed to design the SPB. The main criteria considered for the product design are shown in Table 1 below. The mechanism determined includes sensor, RFID locking system and IoT.

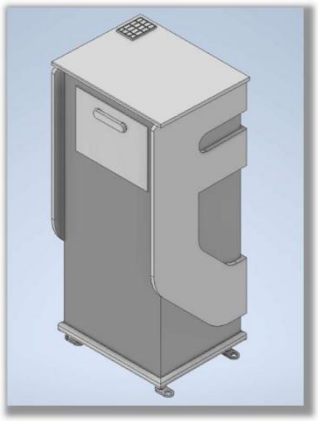
Table 1. Specification of SPB

No.	Description	Specification
1	Name	Smart Parcel Box
2	Mechanism	RFID (Mifare RC522), IoT (Esp32)
3	Target Customer	Landed house owner/rent
4	Process	Receiver, Locking
5	Material	Aluminum 5052 (casing); Mild Steel (Frame)
6	Safety	RFID lock
7	Sensor	Ultrasonic sensor

This section will explain the development of the SPB, including the proposed design, the final design, circuits, and programming. At the initial stage, there are three proposed designs that have the potential to be developed as shown in Table 2.

Table 2. Product design concept

Ideas	Design	Descriptive
1		Idea 1: The parcel box features a stainless-steel roof for durability, with aluminum side panels to keep the structure lightweight. The opening mechanism employs a gear system consisting of a driven gear and a crank to automatically release the package when inserted. To enhance security, the box is equipped with a manual padlock to prevent theft.
2		Idea 2: The SPB is constructed from 5052 aluminum and mild steel, a highly durable material known for its excellent resistance to corrosion and weather elements. To further enhance its longevity, the surface is coated with weather-shield paint specifically designed for metal, effectively slowing down the rusting process and protecting it from harsh conditions. One of the key features of the SPB is its spacious interior offering twice the storage capacity compared to typical options while maintaining an affordable price, addressing a common issue faced by many households.

3		Idea 3: Focuses on a modernized design approach. The sleek and advanced looking exterior offers strong visual appeal while maintaining the same level of functionality and durability as earlier designs. However, this concept comes with certain drawbacks namely, higher production costs and longer manufacturing time. Additionally, it lacks a bottom cushioning system, which means heavier parcels may suffer minor dents upon delivery.

After careful evaluation of all three concepts, Idea 2 was selected for prototype development. This design was chosen due to its balanced combination of durability, functionality, and user convenience. Constructed from 5052 aluminum and coated with weather-resistant paint, the SPB offers excellent protection against outdoor elements. Its spacious interior, twice as wide as standard options, and competitive pricing directly address key concerns faced by users.

Table 3. Comparison with previous design

Name	Smart Parcel Receiver Box (Zarin et. al., 2024)	e-Box (Ahamad et. al., 2024)	SPB
Material	Acrylic	Acrylic	Aluminum 5052 and mild steel
Locked System Design	QR code and database	QR and SG90 micro servo	RFID

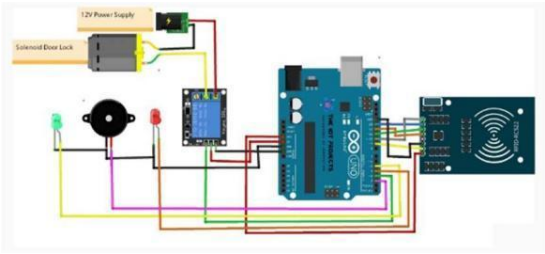
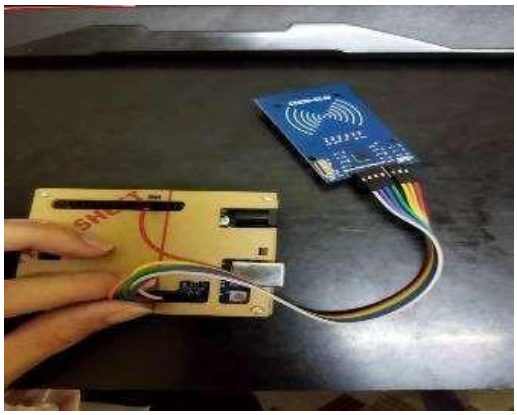
Table 3 presents a comparison between the SPB and two previous parcel box designs: The Smart Parcel Receiver Box (Zarin et. al., 2024) and the e-Box (Ahamad et. al., 2024). In terms of materials, the Smart Parcel Receiver Box and e-Box utilized acrylic. In contrast, the SPB is constructed using aluminum and mild steel, offering enhanced durability and weather resistance. For the locking mechanisms, the Smart Parcel Receiver Box employed a QR code and database system, whereas the e-Box combined a QR code with an SG90 micro-servo for access control. The SPB differentiates itself by integrating an RFID-based locking system, which offers a contactless and secure method of access. Visually, each design also reflects its functional approach, as shown in the accompanying images. Overall, the SPB advances beyond previous designs by incorporating stronger materials and more reliable access technology, making it a robust and scalable solution for secure parcel delivery.

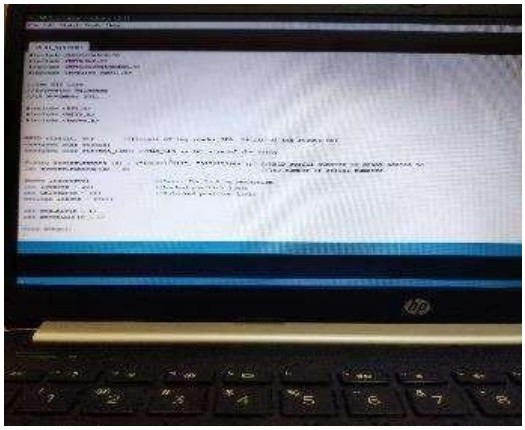
The material selection for the Smart Parcel Box (SPB) is based on its need to withstand outdoor conditions. Mild steel is used for the frame due to its natural resistance to corrosion and its ability to endure exposure to chemicals, fresh water, and salt water, making it ideal for harsh environments (Zhang et al., 2024). For the casing, aluminum 5052 is selected for its excellent corrosion resistance, lightweight properties, and high strength. This alloy is particularly suited for outdoor use as it resists rust and weather-related damage, ensuring long-term durability while keeping the structure easy to handle and install (Figure 3).

Fig. 3. Smart parcel box

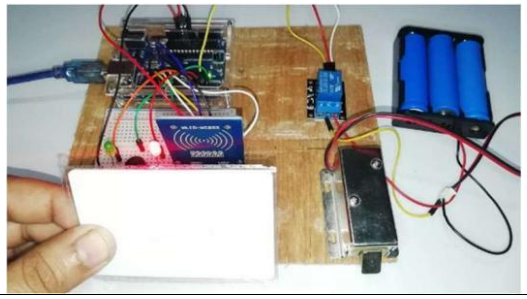
The setup process for the Arduino-based RFID system involves four key steps (Table 4). First, the printed circuit is labelled and printed clearly to ease circuit assembly. Second, the Arduino UNO R3 is connected to the MFRC522 RFID module according to the labelled circuit diagram, ensuring proper connections to avoid damage. Third, coding is performed using Arduino Software to upload the desired signal and test the functionality. Finally, the complete RFID system is installed with the Arduino and tag reader securely in place.

Table 4. RFID electrical fabrication process

Figure	RFID Process and Description
	The circuit layout should be clearly labeled prior to printing to simplify the wiring and assembly process. High-resolution printing is recommended to ensure visibility of all component markings.
	The process of connecting the Arduino UNO R3 circuit to Mifare RC522 which is a tag reader according to the printed circuit that has been printed and make sure the circuit connected is correct so that the tag reader module is not damaged.



The next step involves programming the Arduino using its development software to upload the desired instructions, followed by testing to confirm that the system operates as intended.



The last process is the installation of the Arduino with the RFID tag reader.

The SPB also incorporates an IoT system to notify users when a parcel has been delivered. The IoT setup includes an Arduino Uno, an ultrasonic sensor (HC-SR04), and a NodeMCU ESP32. This system is installed beneath the SPB. When a parcel is placed inside and hits the base, the ultrasonic sensor detects its presence. The Arduino Uno, functioning as the control unit, processes this signal and communicates with the NodeMCU ESP32, which provides internet connectivity via Wi-Fi or a mobile hotspot. Once the presence of a parcel is confirmed, a real-time notification is sent to the user's smartphone through the Telegram application using a programmed Telegram Bot. The ultrasonic sensor can accurately measure distances from 2 cm to 400 cm and is unaffected by sunlight or object colour, ensuring reliable performance. This system enhances user awareness and security by delivering instant alerts whenever a package arrives.

There are three types of technical drawings that have been prepared in this section. Figure 4 shows a 3-dimensional drawing in a 2-dimensional drawing by viewing along the parallel lines that are perpendicular to the plane of the drawing. Usually consist of Top view, Side view and adjacent items. Figure 5 shows all the components of the SPB.

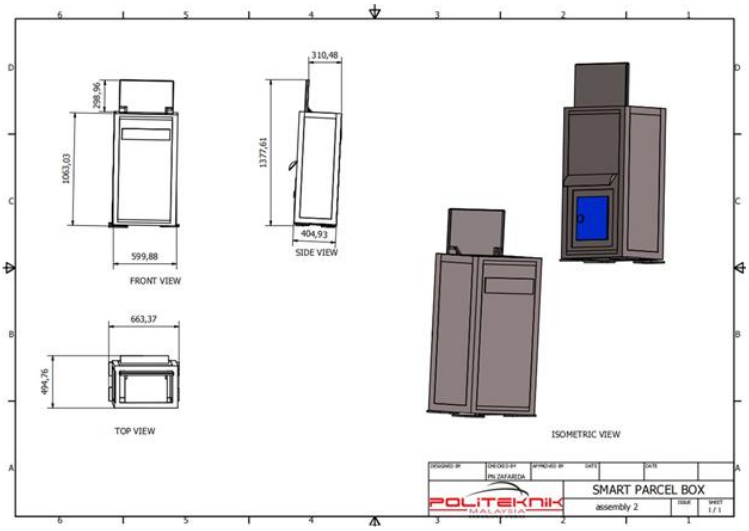


Fig. 4. Installation drawing

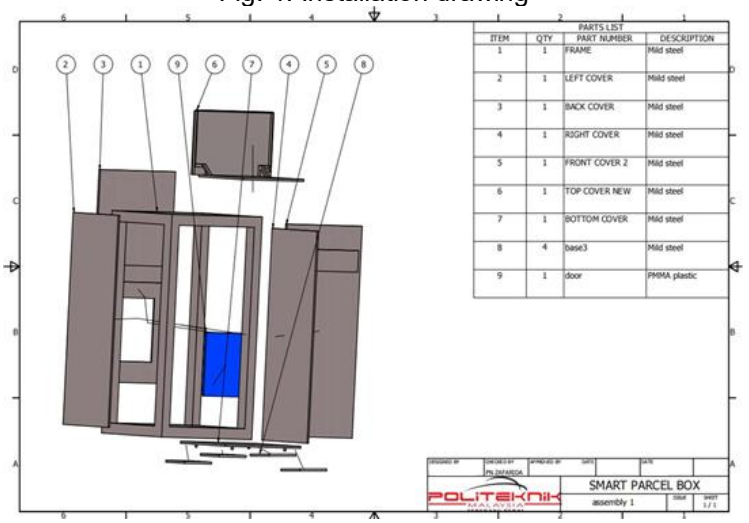


Fig. 5. Orthographic Drawing

Figure 6 shows a detailed drawing and provides a detailed description of the geometric form of a part of an object. They tend to be large-scale drawings that show in detail parts that may be included in less detail on general arrangement drawings. Detail drawing used to demonstrate compliance with regulations and other requirements.

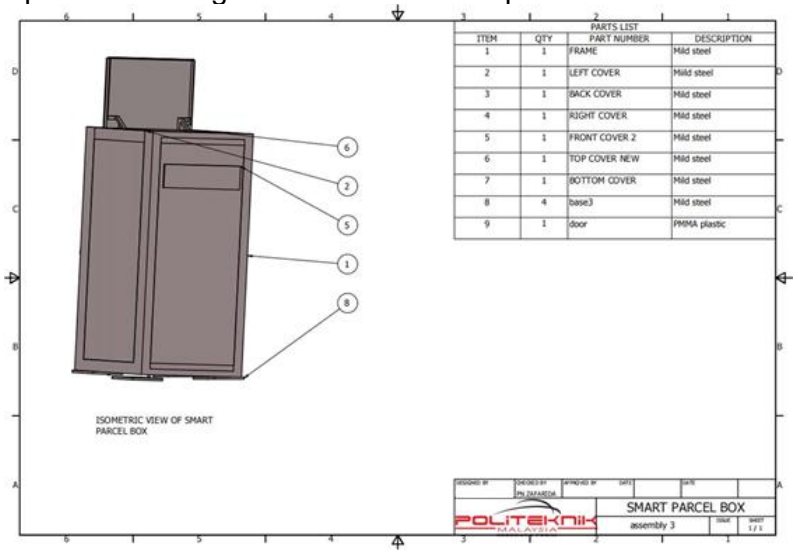


Fig. 6. Detail drawing

3. Results and Discussion

To evaluate the performance of the sensors used in the SPB prototype, a series of tests were conducted focusing on the detection rate and effective contact distance (Table 5). These tests aimed to determine how far the sensors could operate reliably and how quickly they responded. In Series 1, with a contact distance of 10 mm, both the RFID sensor and motion detection sensor successfully detected presence. In Series 2, at 50 mm, the RFID sensor failed to detect, while the motion sensor continued to respond accurately. In Series 3, with a 100 mm distance, both sensors failed to detect movement or tags. These results demonstrate that the RFID sensor operates most effectively within a short range of approximately 10 mm, while the motion detection sensor is more robust up to 50 mm. In addition, delivery notifications were successfully sent via Telegram within an average of 2–5 seconds, indicating that the IoT communication system is responsive and reliable. This testing highlights the importance of sensor placement and distance calibration in ensuring optimal performance for secure and timely parcel detection within the SPB system.

Table 5. Comparison rate of detection for the sensor

Test	Contact distance (mm)	RFID sensor detection	Motion detection sensor	Notification time frame (s)
Series 1	10	Yes	Yes	2
Series 2	50	No	Yes	4
Series 3	100	No	No	5

Based on the stated objectives, the SPB is designed to provide a safe, efficient, and user-friendly solution for receiving and storing parcels.

The primary goal of the SPB is to ensure that packages can be received securely and remain protected from environmental conditions. The design features a robust manually operated door system at the top, which allows for easy insertion of parcels while maintaining security. The bottom door, where the package is stored, is designed to be resistant to forced entry and repeated use. The use of durable materials such as mild steel for the frame and 5052 aluminum for the casing ensures weather resistance and structural integrity.

Security is further enhanced through the integration of RFID card technology as the locking mechanism. This system enables only authorized users such as the homeowner to access the parcel box. The door at the bottom opens and closes using the RFID key system, which offers a reliable and secure method for access control.

To improve user convenience, the Smart Parcel Box (SPB) uses an IoT system to send real-time notifications upon package delivery. The system includes an Arduino Uno, an HC-SR04 ultrasonic sensor, and a NodeMCU ESP32, which connects to the internet using Wi-Fi or a mobile hotspot. When a parcel is dropped inside the box, the sensor detects it and sends a signal to the user's smartphone. Notifications are delivered through the Telegram application.

4. Conclusion

The developed SPB prototype presents an innovative approach to overcoming key challenges in last-mile logistics, particularly related to theft, damage, and undelivered parcels. By providing a secure, weather-resistant, and tamper-proof storage system, SPB ensures that parcels remain safe until collected by the rightful recipient. Its secure locking mechanism, enhanced by RFID technology, allows for authorized access without the need for physical interaction between recipients and delivery personnel. The system further improves delivery efficiency by sending real-time notifications such as through Telegram upon parcel arrival,

streamlining the process and enhancing user convenience. This automation reduces the workload on delivery staff and eliminates the need for manual coordination, making it an ideal fit for high-volume urban environments.

SPB represents a significant step forward in parcel management, enhancing not only the user experience but also contributing to smarter and more resilient urban infrastructure. Its alignment with Sustainable Development Goal 9 (SDG 9) underscores its role in promoting innovation and sustainable industrial growth. As online shopping continues to rise, solutions like SPB will be essential to support efficient, secure, and scalable delivery systems. To accelerate its adoption and maximize impact, pilot testing in collaboration with major e-commerce platforms such as Shopee, Lazada, or Mudah.my is recommended. These partnerships can help validate the system's performance in real-world scenarios, build consumer trust, and guide future improvements. While challenges such as cost and scalability remain, the long-term benefits position SPB as a promising innovation for the evolving digital economy.

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MATHEMATICAL MODELLING ANALYSIS OF FLAT PLATE BASE-THERMAL CELL ABSORBER (FPBTCA)

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Abstract

Solar power has become a leading renewable energy option, replacing traditional sources because of its significant ecological and financial advantages. Solar energy is commonly utilized through solar collectors, one of its key applications. The fundamental challenge in solar collector analysis lies in characterizing the internal heat transfer mechanisms. By applying mathematical modelling, the heat transfer mechanism can be determined**.** Flat Plate Base-Thermal Cell Absorber (FPBTCA) under passive conditions. The modelling analysis was conducted over a 60-minute period, with peak solar radiation recorded at 860.034 W/m². Through iterative calculations, the heat input and output were compared until an energy balance with less than 5% error was achieved. The results indicate that the thermal cell's energy balance significantly influences FPBTCA performance. As expected, heat input rises with increasing solar radiation. The analysis revealed that FPBTCA achieves its highest efficiency (30.24%) at the 360-minute mark, while the Flat Plate Solar Collector (FPSC) reaches 21.81% efficiency at the same time. In terms of heat conduction (J), FPBTCA outperforms FPSC, recording 2424.91 J compared to FPSC 1749.06 J at 360 minutes when solar radiation was at its peak (860.03 W/m²). The thermal cell absorber is designed to store heat energy from solar radiation, ensuring usability even during cloudy conditions by transferring stored heat to the absorber base.

Keywords: Flat-surface solar thermal panel; Solar thermal absorption cell; Sun-powered heat collector.

1. Introduction

The primary function of a flat plate solar collector is to absorb incoming solar radiation and transform it into useful thermal energy. These collectors feature a flat, rectangular, and insulated surface with a dark-coloured absorber plate. A transparent cover, usually made of glass or plastic, traps incoming solar radiation, creating a greenhouse effect within the collector. Solar collectors harness sunlight and transform it into usable heat energy, playing a vital role in applications such as domestic use, water heating, and power generation. Solar collectors are available in multiple designs, each suited to applications. The predominant varieties include flat-plate, evacuated tube, and concentrating solar collectors (P. Kurniawati, 2017).

Mathematical modelling is essential for optimizing flat plate solar collector designs. It allows engineers and researchers to predict performance under various conditions, leading to more efficient and cost-effective systems [2]. The initial step in mathematical modelling involves understanding how the collector absorbs solar radiation. This analysis involves solving sophisticated equations that account for incident angle variations, absorber plate reflectance properties, and solar spectral characteristics. The absorbed solar energy undergoes thermal

transfer via conduction, convection, and radiation pathways within the collector system. Accurately modelling these processes is crucial for optimizing energy conversion. The effectiveness of flat plate solar collectors is primarily measured by their efficiency. Through mathematical models, engineers can calculate thermal efficiency, providing insights into the energy conversion capabilities of the collector.

The earliest stationary models for solar collectors, introduced by Hottel and Woertz (1942) and later refined by Hottel and Whillier (1958), were based on a zero-capacitance assumption, neglecting thermal inertia effects. These models assume a constant overall heat loss coefficient and instantaneous equilibrium with ambient conditions, simplifying analysis but ignoring dynamic environmental variations. Kalogirou (2004), demonstrated the advantages of transient modelling by simulating flat-plate collector performance in Cyprus, revealing efficiency gains through optimized designs. Unlike costly and limited experimental methods, computational modelling allows cost-effective testing across diverse conditions, enabling engineers to predict system behavior accurately using empirical correlations.

By modelling flat-plate collector performance in a transient state, the study established model accuracy through flow rate-controlled experiments (Saleh, 2012). The study confirmed that numerical predictions closely matched real-world efficiency, bridging gaps between theoretical and distributed models. Further insights came from the researcher (Hamed et al., 2014), whose parametric sensitivity analysis linked higher water flow rates to reduced output temperatures and heat loss coefficients. Their energy balance model showed that input temperatures rise proportionally with output temperatures.

There are other findings that applied a distributed mathematical model to solar dryer collectors, finding that excessive collector length diminishes returns due to weakened heat transfer driving forces (Amankwah et al., 2017). Their spatially discretized model validated simplified lumped-temperature assumptions, highlighting airflow velocity's role in heat loss and efficiency. The application of modelled a PV/T air collector using 1D energy balance equations in MATLAB (Wahida Khalili et al., 2019). Results confirmed that fluid-based heat extraction lowers operating temperatures, boosting efficiency, while solar radiation intensity critically impacts performance. This research paper focuses more on mathematical modelling analysis of the Flat Plate Base-Thermal Cell Absorber (FPBTCA) in outdoor conditions.

2. Methodology

The absorber plate temperature data were acquired through an Applent Technologies AT4208 Multi-Channel Temperature Meter (8 channels), while incident solar radiation was measured using an Apogee Instruments Pyranometer. Measurement accuracy was maintained by continuous solar flux monitoring with a TES-1333R Solar Power Meter featuring integrated datalogging functionality. All measurement devices were subjected to comprehensive calibration protocols prior to testing. To Controlled Testing Protocol, the investigation was performed in a laboratory environment with the following parameters:

Artificial solar radiation intensity: 700 W/m²
Test cycle:

- Charging phase: 300 seconds with active solar simulation
- Discharging phase: 300 seconds without radiation input

Operational conditions:

- Airflow velocity: 0.62 m^3/s (constant fan speed)
- Glass cover thickness: 2.0 mm

Temperature profiles were logged at 1-second resolution, with subsequent data processing and visualization. The carefully controlled experimental setup ensured repeatable conditions

for thermal performance characterization. Figure 1 FPSC Design: (a) and 1(b) illustrate the top and side views of the aluminum absorber within the flat plate solar collector (FPSC). The FPSC assembly includes key components such as:

- Flat plate absorber collector
- Glass cover
- Collector box
- Bottom plate
- An outlet fan
- Bottom-side insulation

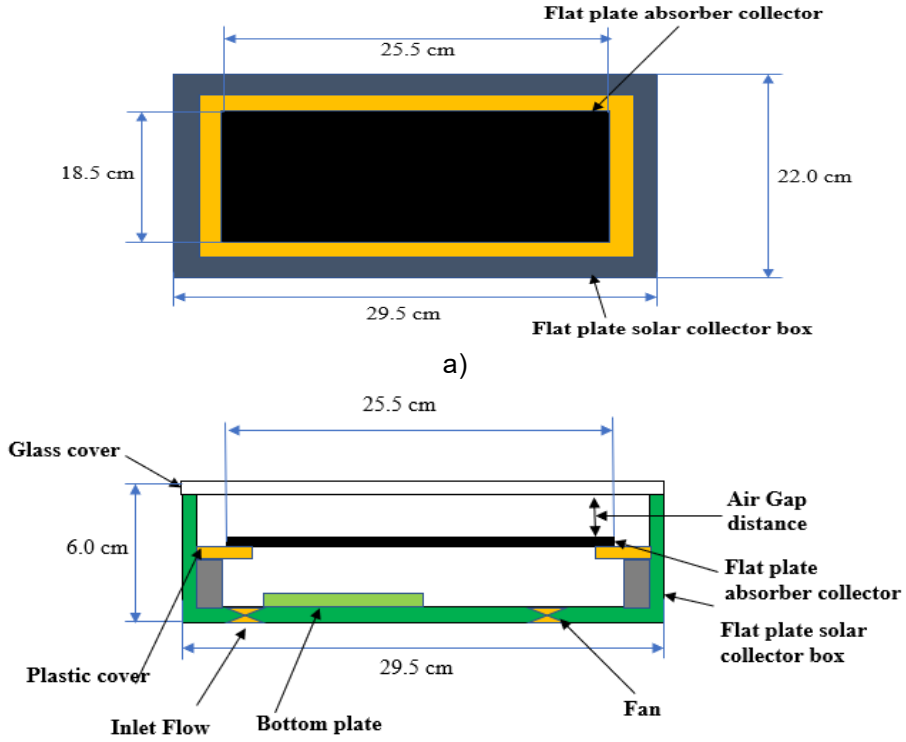

Fig. 1. FPSC Design: a) Top view, b) Side view of FPSC diagram

The thermal measurement setup for the FPSC is shown in Figure 2, which indicates the placement of three temperature sensors:

- T1 - positioned at the base (dummy load measurement)
- T2 - monitoring the drying chamber temperature
- T3 - recording the exhaust air temperature

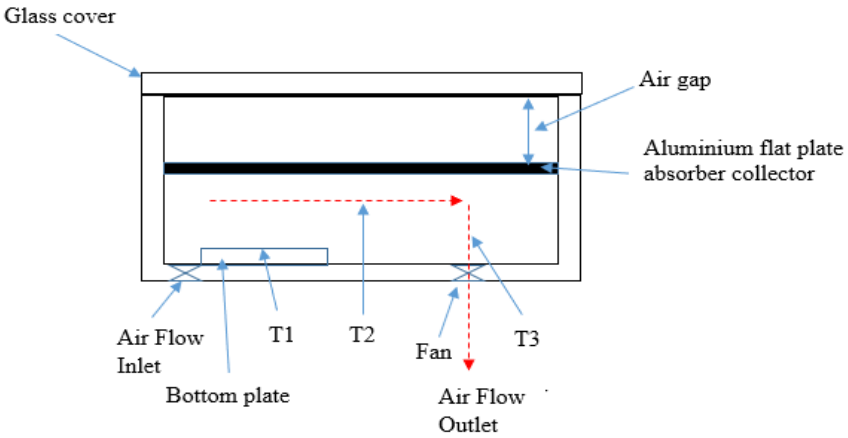

Fig. 2. Measurement setup for FPSC

Figure 3 displays the FPBTCA with thermal cell attachments (a) top view and (b) side view. The design compared aluminum and steel thermal cells within a system containing: absorber plate, test cells, glass cover, enclosure box, base structure, fan outlet, and insulation. A 1 cm air space separated components, with thermal cells mounted on the absorber surfaces.

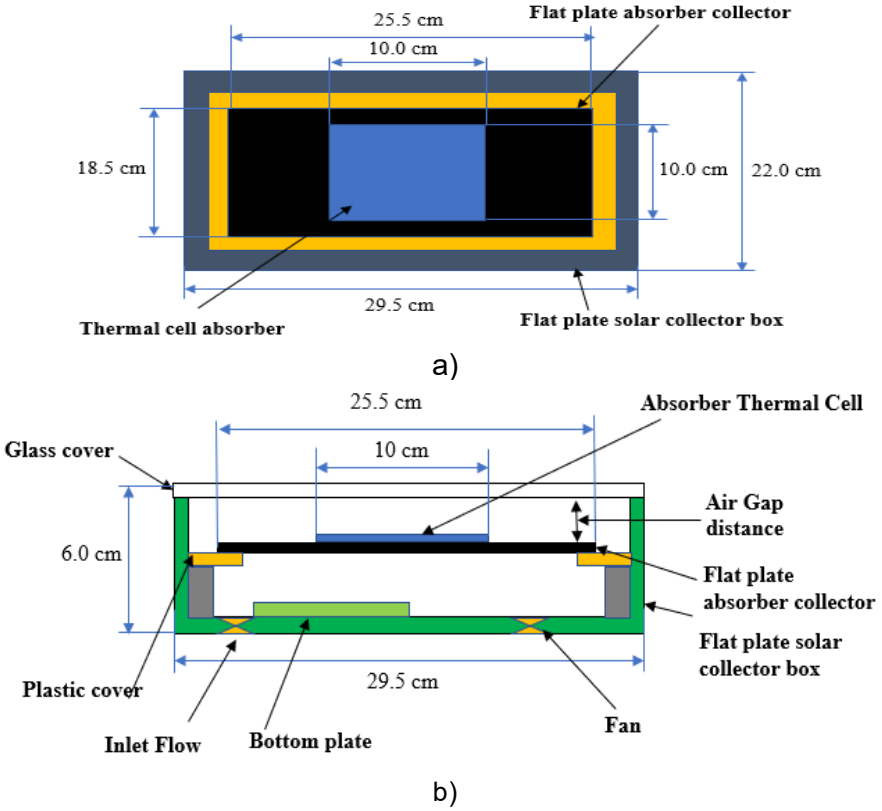

Fig. 3. FPBTCA Design: a) Top view of FPBTCA b) Side view of FPBTCA.

Figure 4 illustrates the thermal measurement setup implemented for the FPBTCA system, detailing sensor placement and data acquisition points. The experimental setup employed three strategically placed temperature sensors:

- T1: Positioned at the base plate (functioning as a dummy load)
- T2: Measuring internal drying chamber conditions
- T3: Recording exhaust air temperature at the fan outlet

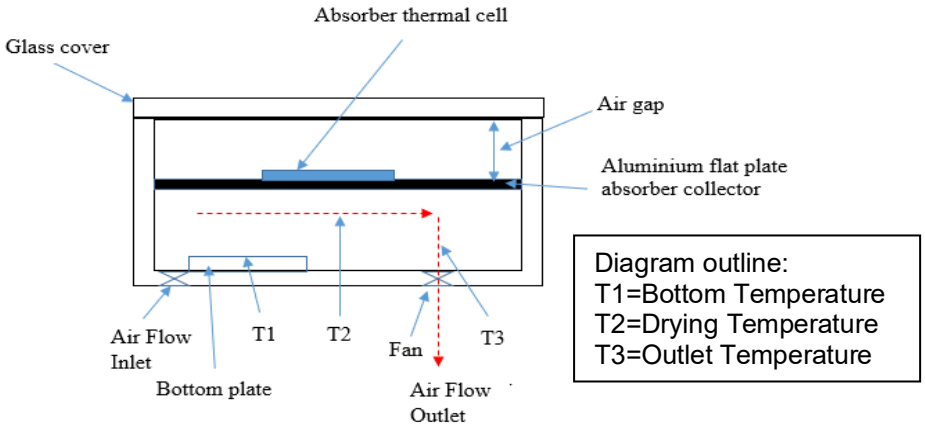

Fig. 4. Temperature sensor location for FPBTCA

Table 1 details the experimental setups for both collector types. The baseline FPSC configuration utilizes a 0.5 mm thick aluminum absorber plate (73 g mass) with dimensions 0.185 × 0.255 m. The modified FPBTCA design incorporates 1.0 mm thick stainless steel thermal cells (148 g mass, 0.01 × 0.01 m dimensions) mounted atop the aluminum absorber.

Table 1. Experiment table for FPSC and FPBTCA configurations

No	Type of case	Types of absorbers (base)	Thermal cell	Thermal cell thickness (mm)	Total weight (g)	Size (m)
1	FPSC	Aluminum	None	None	73	None
2	FPBTCA	Aluminum	Stainless Steel	1.0	148	0.010x0.010

Thermal energy, commonly referred to as heat, represents the transfer of energy between systems resulting from temperature gradients. This energy exchange occurs as systems transition between equilibrium states. The system's thermal equilibrium can be quantified using Equation (1), which establishes the fundamental energy balance relationship.

$$\dot{E}_{\text{in}} - \dot{E}_{\text{out}} = \frac{dE_{system}}{dt} \quad (1)$$

The FPBTCA's operational characteristics can be described through several carefully selected assumptions that balance computational simplicity with modelling precision (W. A. Duffie, 1991):

- The temperature gradient across the cover is negligible.
- The cover does not absorb solar energy.
- Minimal temperature drop occurs through the cover.
- The cover is opaque to infrared radiation.
- One-dimensional heat conduction applies to the back/side insulation and cover.
- Temperature gradients along the flow direction and between tubes are treated independently.
- Front and back heat losses occur at the same ambient temperature.
- The sky behaves as a blackbody for long-wavelength radiation at an equivalent sky temperature.
- Dust and dirt accumulation effects are negligible.
- Absorber plate shading is insignificant.
- Thermophysical properties remain constant (temperature-independent).
- The collector length is assumed sufficiently short to maintain uniform thermal characteristics throughout (Less than 10 m) (A. Fudholi et., 2008).

Figure 5 illustrates the thermal equilibrium schematic for the FPBTCA system, depicting the layered heat transfer structure from top to bottom, with Glass 1 (outer protective layer), Glass 2 (secondary glazing), Thermal cell (active component), Absorber base (primary heat collection surface), Dummy load (thermal mass), and Bottom insulation layer.

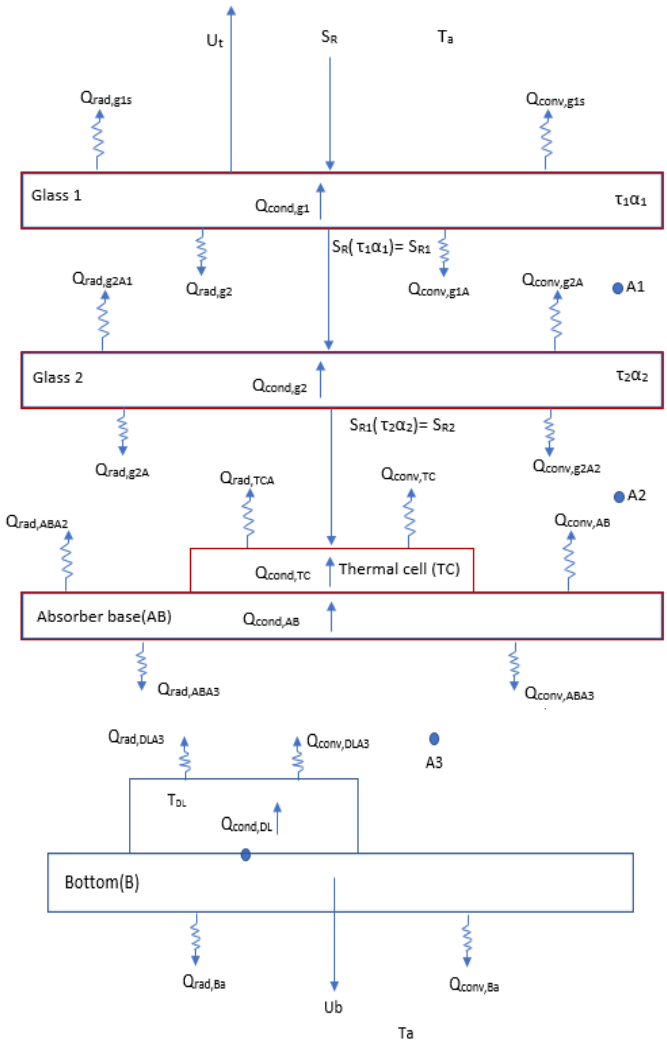

Fig. 5. Energy balance diagram for FPBTCA system

Were,

Energy balance for glass glass 1,
Energy in to the glass glass 1= Energy out of glass glass 1

$$S_R\tau_g\alpha_g + \dot{Q}_{rad,g1A1} + \dot{Q}_{conv,g1A1} = \dot{Q}_{rad,g1s} + \dot{Q}_{conv,g1s} + \dot{Q}_{cond,g1} \quad (2)$$

Energy balance for glass glass 2,
Energy in to the glass glass 2= Energy out of glass glass 2

$$S_{R1}\tau_g\alpha_g + \dot{Q}_{rad,g2A2} + \dot{Q}_{conv,g2A2} = \dot{Q}_{rad,g2A1} + \dot{Q}_{conv,g2A1} + \dot{Q}_{cond,g2} \quad (3)$$

Energy balance for thermal cell absorber,
Energy in to the thermal cell absorber= Energy out of thermal cell absorber

$$S_{R2}\tau_g\alpha_p = \dot{Q}_{rad,TCA2} + \dot{Q}_{conv,TCA2} + \dot{Q}_{cond,TC} \quad (4)$$

Energy balance for base absorber,
Energy in to the base absorber = Energy out of base absorber

$$S_{R2}\tau_g\alpha_p + \dot{Q}_{rad,ABA3} + \dot{Q}_{conv,ABA3} = \dot{Q}_{rad,ABA2} + \dot{Q}_{conv,ABA2} + \dot{Q}_{cond,AB} \quad (5)$$

Energy balance for dummy load,
Energy in to the dummy load = Energy out of dummy load

$$\dot{Q}dummy = \dot{Q}_{rad,DLA3} + \dot{Q}_{conv,DLA3} + \dot{Q}_{cond,DL} \quad (6)$$

Energy balance for bottom,
Energy in to the bottom = Energy out of bottom

$$U_b = \dot{Q}_{rad,Ba} + \dot{Q}_{conv,Ba} \quad (7)$$

$$Ut = \dot{Q}_{rad,g1s} + \dot{Q}_{conv,g1s} \quad (8)$$

$$UTotal = Ut + Ub + Ue \quad (9)$$

3. Results and Discussion

The mathematical modelling was conducted during peak solar irradiance conditions (860.034 W/m²) over a 60-minute evaluation period. Through iterative computational methods, the system's heat input (Q_{in}) and output (Q_{out}) were compared until an energy balance with <5% deviation was achieved. As presented in Table 2, the residual errors across FPBTCA components demonstrate satisfactory convergence:

- Glass Cover 1: 4.81%
- Glass Cover 2: 2.51%
- Thermal Cell: 3.98%
- Absorber Base-Collector: 3.67%

The analysis confirms that the thermal cell's energy equilibrium critically governs FPBTCA performance. Notably, the heat input exhibits a positive correlation with incident solar radiation intensity, as theoretically expected.

Table 2. Error between Q_{in} and Q_{out}

Solar collector component	Q_{in} (J)	Q_{out}(J)	Error (%)
Glass Cover 1	106.90	101.75	4.81
Glass Cover 2	112.58	109.75	2.51
Thermal Cell	446.25	428.47	3.98
Absorber base collector	1522.01	1466.14	3.67

Figure 6 illustrates the relative performance efficiencies of the thermal cell-enhanced collector FPBTCA and baseline FPSC across different time intervals and solar radiation conditions. Key observations include:

i. FPBTCA achieves superior peak efficiency (30.24% at 360 minutes) compared to FPSC (21.81%)
ii. FPBTCA demonstrates more stable efficiency during periods of declining solar radiation (120-180 minutes)
iii. Both systems show positive correlation between solar irradiance and efficiency
iv. Field performance data confirms FPBTCA's overall operational advantage

Design Optimization Considerations:

The FPBTCA's enhanced performance stems from its unique thermal cell absorber design, where:

i. Critical design parameters:
   - Optimal thickness of cell absorber
   - Appropriate mass configuration
   - System dimensional constraints (T. T. Chow, 2006)

ii. Performance relationships:
   - Increased absorber thickness/mass improves radiation absorption
   - Enhanced heat retention capacity boosts thermal performance

- Excessive mass may cause undesirable temperature drops (C. D. Ho, 2021)

iii.System implications:

- Thermal cell directly influences base plate temperature
- Design parameters affect drying chamber performance
- Requires careful balance between absorption and heat retention

The analysis demonstrates that proper sizing of the thermal cell absorber is crucial for maintaining optimal operating temperatures throughout the system while maximizing solar energy utilization.

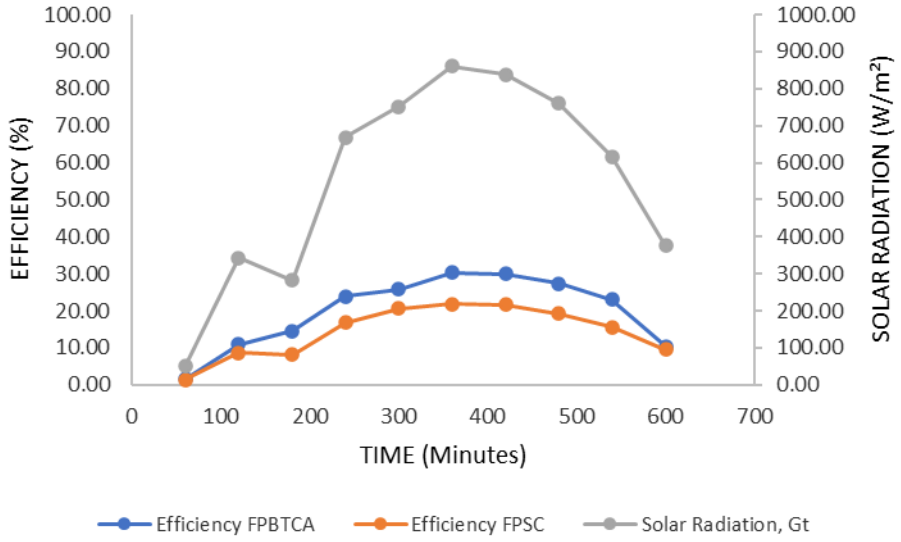

Fig. 6. Efficiency (%) for FPBTCA and FPSC

The fundamental principle of heat conduction in solar collectors involves thermal energy transfer between surfaces at different temperatures through direct molecular interaction. This process occurs spontaneously from higher to lower temperature regions until thermal equilibrium is established. Key factors governing conduction rates include material thermal properties, temperature gradient magnitude and effective contact surface area. Figure 7 depicts the Heat conduction, Q (J) for FPBTCA and FPSC. Performance analysis reveals that FPBTCA achieves superior heat conduction (2424.91 J at 360 min). FPSC also demonstrates lower conduction values (1749.06 J at the same interval). Both systems show peak performance coinciding with maximum solar radiation exposure. The comparative data clearly indicates FPBTCA's enhanced thermal transfer capability under identical operating conditions. This performance advantage stems from the system's optimized design parameters that facilitate more efficient energy transmission through the collector assembly.

There is a 675.85 J difference in heat conduction between FPBTCA and FPSC. The situation arises when solar radiation is 860.03 W/m^2, an elevated level. Collector efficiency in both configurations is fundamentally governed by the solar energy absorption capacity of their absorbed components. Reduced sun radiation also results in reduced heat conduction for FPBTCA and FPSC. Additionally, FPBTCA exhibits a higher level of continuous heat conduction compared to FPSC. The absorber base receives heat energy previously stored in the cell absorber. When sunlight diminishes, the thermal cell redirects its stored energy for absorption processes, subsequently channeling this heat to the drying chamber. Thermal energy storage capability allows the absorber cell to compensate for intermittent solar availability during cloudy conditions. When solar radiation diminishes, such as during cloudy conditions or nighttime, the solar thermal absorber remains crucial. It is during these periods that the stored heat energy within the absorber material becomes exceptionally valuable.

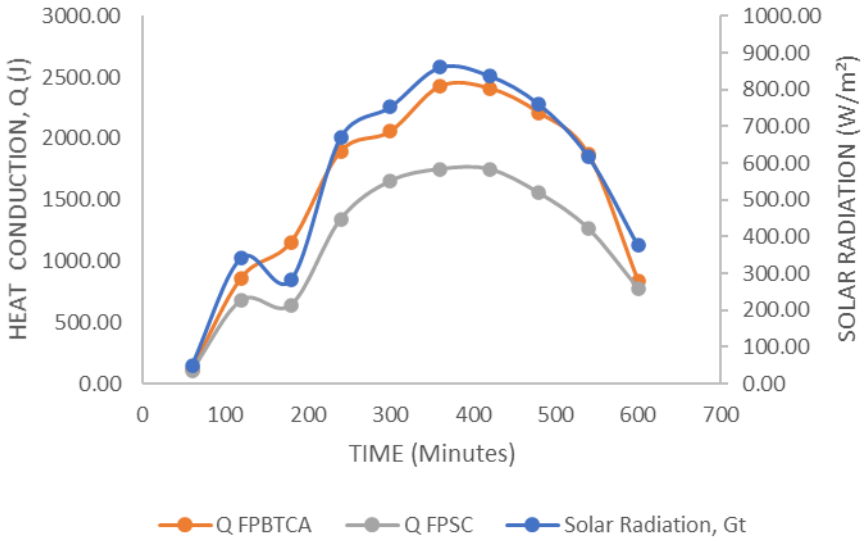

Fig. 7. Heat conduction, Q (J) for FPBTCA and FPSC.

4. Conclusion

Field testing under natural sunlight conditions yielded comparative performance data for different thermal absorber collector designs, with the following several conclusions, such as design modelling, performance comparison, and thermal performance characteristics. The model validation aspect shows that the developed mathematical model, based on comprehensive heat transfer analysis, successfully established FPBTCA's energy balance. Development of the FPBTCA mathematical model involved a comprehensive heat transfer evaluation to establish system energy equilibrium. The model indicated that the discrepancy between Q_{in} and Q_{out} is less than 5%, demonstrating that the energy balance equation effectively correlates Qin and Q_{out} for FPBTCA.

Comparative analysis between FPBTCA and FPSC demonstrated superior efficiency of the FPBTCA system. The performance advantage was particularly evident at the 360-minute mark, where FPBTCA showed significantly better energy conversion. Based on the peak solar radiation (860.03 W/m²), FPBTCA exhibited 675.85 J greater heat conduction than FPSC. This performance differential highlights the critical role of thermal cell absorber thickness, mass configuration and Optimal design parameters. While increased thickness and mass improves efficiency and heat conduction, designers must balance these factors against potential temperature reduction in the drying chamber and the overall system thermal dynamics. The findings emphasize the importance of careful thermal cell dimensioning in FPBTCA systems to maximize performance while maintaining operational stability. This research provides valuable insights for optimizing solar thermal collector designs in practical applications.

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INNOVATIVE EDUCATIONAL KIT DEVELOPMENT FOR PLC AND IOT INTEGRATION IN TECHNICAL VOCATIONAL EDUCATION

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Abstract

This research focuses on the development of an innovative and interactive educational kit specifically designed to enhance students' understanding of concepts and applications in the fields of Programmable Logic Controllers (PLC) and the Internet of Things (IoT). The kit is equipped with key PLC components such as a conveyor system that functions as an automatic movement mechanism simulating industrial processes and a tower light feature that indicates the system's operational status. On the IoT side, the kit integrates six types of sensors: humidity, temperature, water quality, ultrasonic, soil moisture and smoke sensors. It also includes wireless communication capabilities enabling data transmission to a smartphone via the Blynk application allowing students to monitor sensor readings in real time. Through practical exposure students can understand the basic operation of each sensor and subsequently apply this knowledge in developing real-world projects that simulate actual industrial scenarios. This approach better prepares students to face real-world challenges in automation and IoT-related job sectors. Overall, the educational kit serves as a comprehensive and high-impact learning platform, designed to bridge the gap between theoretical knowledge and practical implementation while fostering a culture of innovation and technical skill development among TVET students.
Keywords: Educational kit; Programmable logic controller; Internet of Things.

1. Introduction

In today's rapidly evolving industrial era, the integration of automation and the Internet of Things (IoT) has become a crucial driver of Industry 4.0. This shift demands a workforce that is not only knowledgeable in technical theory but also proficient in hands-on applications using real industrial tools (Abdulaziz et al., 2023; Zhou et al., 2023). However, a persistent challenge in Technical and Vocational Education and Training (TVET) is the disconnect between classroom theory and real-world practices. Many students struggle to apply concepts learned in lectures to practical environments due to limited access to industry-relevant equipment (Lee & Tan, 2022; Triatmaja et al., 2024).

The Malaysian Education Blueprint (Higher Education) 2015–2025 emphasizes the importance of equipping graduates with holistic skills and entrepreneurial mindsets through Shift 1 and calls for TVET transformation under Shift 4 (Ministry of Education Malaysia, 2015). This national direction highlights the need for competency-based and practical-oriented training that aligns with global technological demands (Hanafi et al., 2023; Salleh & Halim, 2023). In this context, integrating PLC and IoT technologies in teaching modules is essential to producing industry-ready graduates who can thrive in smart manufacturing environments.
To address this educational gap, the educational kit is developed. This interactive educational kit allows students to be directly involved with programmable logic controllers (PLCs) and IoT components in a structured and guided learning environment. Unlike conventional simulation-only approaches, the kit emphasizes real-time data monitoring, sensor-based input/output control, and cloud-based communication capabilities reflective of real-world industrial setups (Badshah et al., 2023; Cheong & Li, 2022).

Furthermore, previous studies show that experiential and problem-based learning, especially when involving actual industrial tools, significantly improves students' motivation, understanding and retention of technical skills (Tri Atmaja et al., 2024; Hussain et al., 2023). This trainer also supports hybrid or blended learning environments, enabling students to explore automation both in physical labs and remotely (Khairuddin et al., 2020; Chang et al., 2024). In conclusion, the educational kit is not merely an instructional tool; it represents a scalable solution aligned with national education reforms and IR 4.0 requirements. It empowers students through authentic, hands-on learning experiences and strengthens Malaysia's agenda of producing technically skilled, innovative, and industry-responsive graduates.

2. Methodology

These educational kits were developed as reference materials and instructional aids for lecturers during the teaching and learning process with students. In developing the system, several important aspects needed to be considered, including the workflow, circuit design, printed circuit board (PCB) layout, source materials, implementation, testing, and subsequent improvements. This study employed a developmental research design, structured into three sequential phases of design, development and evaluation.

The initial phase of the project began with an in-depth literature review and curriculum analysis to identify the educational needs related to PLC and IoT applications. Based on these findings, a prototype training kit was developed, featuring the integration of a conveyor system and a tower light to simulate real-world industrial PLC operations. To support IoT functionalities, six types of sensors which are temperature, humidity, soil moisture, water quality, ultrasonic and smoke were installed (Figure 1). An ESP32 microcontroller was programmed to interface with these sensors, enabling real-time data collection and processing. In addition, an IoT-based monitoring dashboard was developed using the Blynk platform, providing wireless and real-time visualization of sensor data on a mobile device.

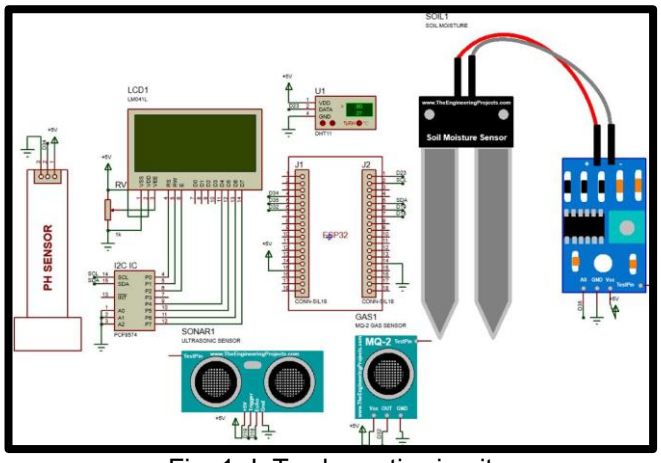

Fig. 1. IoT schematic circuit

In the automation section, the circuit includes connections between the PLC and key components such as the conveyor and tower light. The PLC is programmed to control the motor that drives the conveyor, while the tower light provides a visual indication of the system's operational status. Inputs to the PLC are also connected to switches and an obstacle detector, namely the proximity sensor, which functions to detect the presence of objects on the conveyor. The entire circuit in Proteus was designed with attention to logical connections and appropriate voltage requirements. Simulations were carried out to ensure that each component functioned as intended before physical implementation on an actual circuit board. This design not only illustrates the relationships between components but also plays a crucial

role in testing and validating the system's operation virtually before the actual prototype is built. Once the schematic circuit design of the educational kit was confirmed to function properly through simulation in the Proteus software, the next step was to develop the printed circuit board (PCB) layout (Figures 2 and 3). This process is essential to produce a neat, compact, and easy-to-assemble and maintain board design.

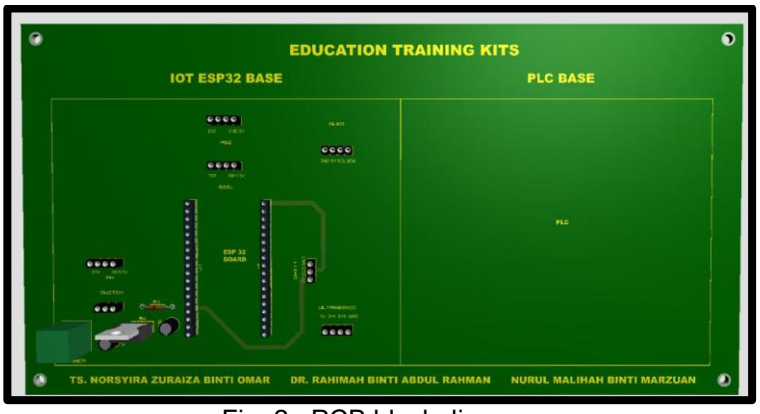

Fig. 2. PCB block diagram

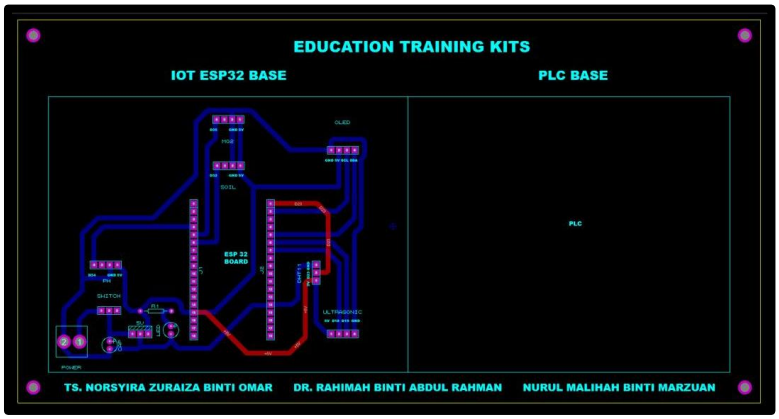

Fig. 3. PCB layout

The kit was evaluated for its technical operation by testing the functionality, integration and real-time performance of the PLC and IoT components including sensors, automation responses and wireless data transmission. The prototype was pilot tested with students from two courses, Final Year Project and PLC. The evaluation involved quantitative methods with data collected using structured usability questionnaires that focused on students' understanding, ease of use and the perceived educational value of the kit. All data collected were analysed descriptively to assess the kit's effectiveness and to inform design improvements for broader educational implementation.

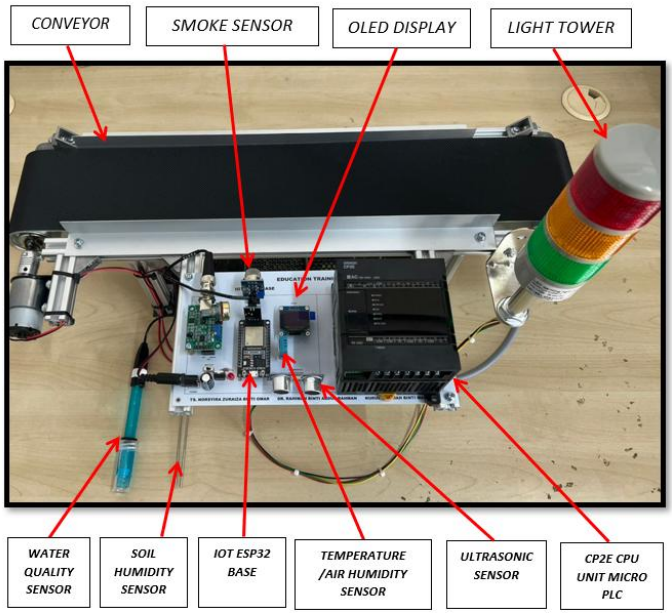

Fig. 4. Complete design of the educational kit

Figure 4 illustrates the complete design of the educational kit, which is ready to be used as a teaching aid for related topics. The kit integrates a basic automation system, including a conveyor and tower light, along with six types of IoT sensors and real-time communication via the Blynk application. The operation of this educational kit begins with connecting the kit to a stable DC power supply, such as a 12V adapter. Proper connection to both the printed circuit board (PCB) and the ESP32 microcontroller is essential to prevent damage to the components. The kit features two primary modes of operation, with PLC mode and IoT mode as shown in the flow chart in Figure 5 below. In PLC mode, the system operates the conveyor and tower light using programmed ladder logic. In IoT mode, the ESP32 microcontroller is used to read data from six types of sensors (temperature, ultrasonic (distance), water quality, smoke, air humidity, and soil moisture) and transmit this data in real time via Wi-Fi to a smartphone using the Blynk application. These modes can be used independently or simultaneously, depending on the instructional objectives.

For the PLC module, students are required to develop ladder diagrams using CX-Programmer software. Input signals from connected sensors are routed to the digital input terminals of the PLC, while the output terminals are linked to relays that control the motorized conveyor and tower light based on the programmed logic. Meanwhile, the IoT module involves the ESP32 microcontroller programmed via the Arduino IDE to interface with the sensors. The collected sensor data is transmitted wirelessly to the Blynk application and can also be viewed on an integrated OLED display (Figure 6). This setup allows real-time monitoring of environmental conditions through both mobile and onboard interfaces. Finally, the Blynk application displays the sensor readings in Figure 4 in both digital and graphical formats, enabling students to interact with the system and observe live data representations thereby enhancing their learning experience in automation and IoT applications.

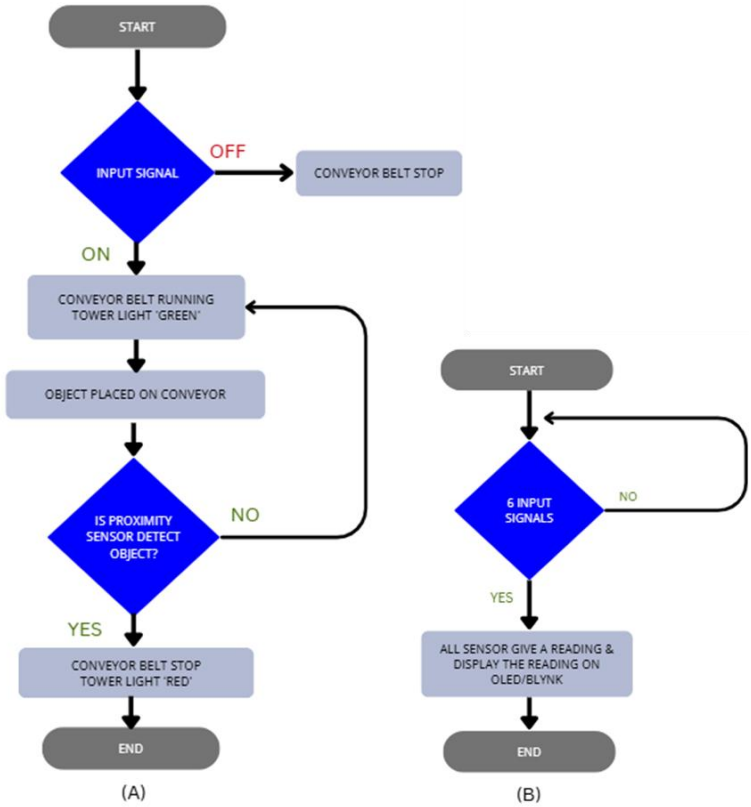

Fig. 5. Flow Chart (A) PLC Part; (B) IOT Part

3. Results and Discussion

This section presents the outcomes and the evaluation through simulation and practical testing. The results are discussed based on the technical performance of both the PLC and IoT components, focusing on the functionality, integration, and real-time monitoring capabilities. Additionally, user feedback from pilot testing with students is analyzed to assess usability, learning impact, and areas for further refinement.

Table 2. Sensor reading range specification

No.	Sensor Type	Parameter Measured	Typical Model	Measurement Range	Unit	Notes
1	Soil Moisture Sensor	Soil water content	Capacitive / YL-69	0 (dry) – 1023 (wet)	Analog value	Output is analog; requires calibration to convert to % moisture
2	Humidity Sensor	Relative humidity	DHT11 / DHT22	DHT11: 20–90% DHT22: 0–100%	%RH	Accuracy ±5% (DHT11), ±2% (DHT22); works with digital I/O
3	Ultrasonic Sensor	Distance / Water Level	HC-SR04	2 cm – 400 cm	cm	Accuracy ±0.3 cm; used for measuring tank or soil surface distance
4	MQ2 Gas Sensor	Gas concentration (LPG, Smoke, Methane)	MQ-2	200 – 10,000 ppm	ppm	Analog output; needs calibration for specific gases

5	pH Sensor	Acidity / Alkalinity	Analog pH sensor (e.g., SEN0161)	pH 0 – 14	pH units	Accuracy ±0.1 – 0.3 pH; analog output; needs buffer calibration
6	Temperature Sensor	Ambient temperature	DHT11 / DHT22	DHT11: 0–50°C DHT22: -40–80°C	°C	Accuracy ±2°C (DHT11), ±0.5°C (DHT22)

The Blynk application, shown in Figure 6, visualizes sensor data in both digital and graphical formats, allowing students to interact with live data streams. This interactive setup enhances students' understanding of automation systems, data acquisition, and IoT integration by bridging theoretical concepts with practical applications. As a result, it serves as a comprehensive learning platform that strengthens competencies in programmable logic control, sensor interfacing, and real-time IoT communication.

Fig. 6. OLED and Blynk Application Display

Students were allowed to modify the PLC program or ESP32 code to test various operational scenarios and logic configurations. Observations were made on how these changes affected the automation system and the data display on the Blynk application. The development of the educational kit has had a comprehensive impact on various stakeholders within the TVET education ecosystem, including institutions, educators, students, and the overall education system. From the institutional perspective, this project enhances the image and reputation of the institution as a leader in technical education innovation while supporting the goal of offering industry-relevant programs. This aligns with the objectives of the National TVET Policy, which emphasizes strengthening strategic collaboration between TVET institutions and industries to produce a highly skilled workforce. The project also serves as a catalyst for integrating technology into teaching and learning, particularly in the areas of automation and the Internet of Things (IoT).

For educators, the educational kit empowers teaching approaches by incorporating practical, industry-based technologies, while also creating opportunities for research and the development of innovative teaching aids. For students, it provides direct exposure to technical skills and industrial equipment, thereby enhancing employability, self-confidence, and competitiveness in the job market. The incorporation of project-based learning also fosters the development of soft skills such as problem-solving, teamwork, and communication. From a broader educational perspective, this project contributes to the transformation of TVET education towards a more responsive, digital, and Industry 4.0-aligned system. It supports the aspirations of the National TVET Policy by expanding access to quality education, improving learning facilities, and strengthening the development of relevant and adaptive curricula. In addition, this initiative aligns with several Sustainable Development Goals (SDGs), including SDG 4: Quality Education, and SDG 8: Decent Work and Economic Growth, by providing comprehensive and high-impact skills training. Overall, the educational kit represents a holistic educational innovation that supports national policy goals and strengthens the TVET ecosystem towards a more sustainable and competitive future.

A survey study was conducted involving 52 fourth-semester students to evaluate the effectiveness of using the educational kit in the teaching and learning (T&L) process. The questionnaire consisted of 15 items covering aspects such as technical understanding, kit design, the effectiveness of practical T&L, as well as interest and confidence in the fields of automation and IoT. A 5-point Likert scale was used: 5 (Strongly Agree), 4 (Agree), 3 (Neutral), 2 (Disagree), and 1 (Strongly Disagree). In addition, open-ended subjective questions were included to gather users' opinions and perspectives.

Table 2. Educational kit user feedback

NO	ITEM	Feedback Score Percentage (%)		
	Scale	3	4	5
1	*Saya memahami fungsi asas sensor selepas menggunakan kit ini.*	9.6	7.7	82.7
2	*Saya dapat melihat hubungan antara sensor dan sistem automasi sebenar.*	5.8	13.5	80.8
3	*Penggunaan PLC dalam kit ini membantu saya memahami logik kendalian industri.*	9.6	17.3	71.2
4	*Saya dapat mengenal pasti jenis sensor yang sesuai untuk aplikasi tertentu.*	9.6	17.3	73.1
5	*Integrasi IoT membantu saya memahami konsep pemantauan jarak jauh.*	7.7	23.1	69.2
6	*Reka bentuk kit ini menarik dan mesra pengguna.*	7.7	11.5	80.8
7	*Aktiviti praktikal yang dijalankan menggunakan kit ini memudahkan pembelajaran.*	7.7	13.5	78.8
8	*Saya dapat mengendalikan kit ini dengan bimbingan yang minimum.*	19.2	21.2	59.6
9	*Edukit ini membantu saya menjana idea untuk projek akhir tahun (FYP).*	11.5	13.5	75
10	*Tenaga pengajar memberi panduan yang jelas semasa sesi praktikal.*	7.7	9.6	82.7
11	*Latihan menggunakan kit ini lebih menarik berbanding pembelajaran teori semata-mata.*	5.8	13.5	80.8
12	*Saya lebih yakin dengan kemahiran teknikal saya selepas sesi latihan menggunakan kit ini.*	7.7	15.4	76.9
13	*Kit ini memberi saya gambaran jelas tentang keperluan industri 4.0.*	9.6	13.5	76.9
14	*Saya lebih berminat untuk mendalami bidang automasi dan IoT selepas menggunakan kit ini.*	7.7	19.2	73.1
15	*Edukit ini meningkatkan keyakinan saya untuk bekerja dalam bidang kejuruteraan elektrik/elektronik.*	9.6	11.5	78.8

Findings from the survey revealed that the effectiveness of the educational kit can be summarized into four main dimensions:

1. Understanding of Basic Concepts and Technological Applications

Items related to sensor functionality and its application in real-world automation systems (Items 1 and 2) recorded the highest agreement at scale 5, with 82.7% and 80.8% respectively. This suggests that the kit effectively enhances students' conceptual understanding. The use of PLCs and appropriate sensor selection (Items 3 and 4) also showed strong results, with over 70% rating them at scale 5. However, nearly 27% of responses fell within scale 3 and 4, indicating a need to reinforce students' grasp of industrial applications further. In terms of IoT fundamentals and relevance to Industry 4.0 (Items 5 and 13), more than 69% rated at scale 5, yet the presence of 30.8% in the neutral and agree categories suggests that additional exposure and context around these technologies could further enhance comprehension.

2. Kit Design and Usability

Students generally responded positively to the design of the kit, with 80.8% strongly agreeing that the kit is user-friendly (Item 6). However, only 59.6% felt confident operating the kit independently with minimal guidance (Item 8), highlighting the potential need for improvements in user manuals, interface design, or hands-on training support.

3. Impact on the Learning Process

The Educational Kit also had a significant positive impact on the teaching and learning process. Most students expressed satisfaction with the practical activities provided (Item 7 – 78.8%) and the overall teaching approach (Item 10 – 82.7%). Furthermore, 80.8% agreed that learning through this kit was more engaging compared to conventional theory-based instruction (Item 11). Notably, 75% of respondents acknowledged that the Educational Kit helped spark ideas for their Final Year Project (Item 9), reflecting its ability to promote creative and applied thinking.

4. Enhancement of Interest and Confidence

The Educational Kit contributed to increase student confidence in technical skills (Item 12 – 76.9%) and heightened interest in the fields of automation and IoT (Item 14 – 73.1%). Importantly, 78.8% of respondents reported that they felt more prepared and confident to work in the electrical or electronics field after using the kit (Item 15), demonstrating the Educational Kit's effectiveness as a tool for career readiness and motivation in the TVET context.

4. Conclusion

The development and implementation of the educational kit marks a significant advancement in bridging the gap between theoretical learning and practical application within the TVET context. By integrating core automation components such as PLC-controlled conveyor systems and tower lights with IoT-enabled sensor technologies, the kit provides students with an immersive, hands-on learning experience reflective of real industrial environments. The kit’s dual-mode operation, encompassing both PLC programming and real-time IoT monitoring, enables students to grasp the interdisciplinary nature of modern smart systems.

Evaluation results from pilot testing indicate a strong positive response from students in terms of usability, conceptual understanding, and increased confidence in technical skills. Furthermore, the educational kit aligns with national TVET policies and the broader goals of Industry 4.0 and Sustainable Development Goals (SDGs), especially in promoting quality education and decent work opportunities. It not only enhances student readiness for the workforce but also empowers educators with a flexible, impactful teaching tool.

For future enhancements, improvements could include the addition of wireless communication modules and the expansion of the monitoring dashboard to cater to larger-scale projects. These upgrades would further increase the kit’s relevance and scalability in more advanced educational and industrial settings. In essence, this educational kit serves as a scalable and sustainable educational innovation that supports the transformation of technical education. It fosters a learning ecosystem that is practical, industry-relevant, and capable of cultivating a generation of skilled, innovative, and future-ready graduates.

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DESIGN OF IOT GARBAGE MONITORING WITH WEIGHT SENSING

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Abstract

Efficient management of urban waste has always been a challenging task, requiring continuous efforts from ground-level personnel to empty garbage bins as they reach capacity. The unpredictable nature of garbage accumulation, varying widely in timing and volume, complicates this process. The "IoT Garbage Monitoring with Weight Sensing" project represents a significant innovation aimed at enhancing efficiency in waste management. This system monitors the fill-level of garbage bins and transmits real-time data via a web interface. Utilizing ultrasonic sensors mounted on the bins, it accurately measures and compares garbage levels against predefined thresholds. Additionally, weight sensors beneath the bins provide precise data on the amount of collected waste. This combined sensing approach enables authorities to monitor both fill levels and accumulated weights remotely. When a bin reaches its capacity, the system triggers alerts, facilitating timely waste collection by notifying disposal vehicles. The hardware components include an AVR family microcontroller, an LCD screen for local display, a Wi-Fi modem for data transmission, and a buzzer to signal alerts.
Keywords: Wi-Fi modem; Load cell; Ultrasonic sensor.

1. Introduction

The Internet of Things (IoT) refers to a network of interconnected physical objects (Jamil et al., 2022) capable of interacting and sharing data autonomously, without requiring human intervention. It is formally recognized as an "Information Society Infrastructure," enabling the collection of data from various entities such as humans, animals, vehicles, and household appliances. By equipping these objects with electronic hardware like sensors, software, and networking equipment, any physical entity with an IP address can be integrated into the IoT ecosystem for data transmission over networks. Unlike traditional Internet usage, IoT extends connectivity to everyday objects embedded with circuits, allowing them to interact and communicate via existing Internet infrastructure.

Since its inception, the scope of IoT has expanded significantly (Kumar & Rana, 2024), currently encompassing over 12 billion connected devices, with projections indicating this number could reach 50 billion by 2020. IoT has proven beneficial for both manufacturers and consumers alike. Manufacturers gain valuable insights into product usage and performance in real-world scenarios, enabling them to offer value-added services that enhance product lifecycles. Meanwhile, consumers benefit from the ability to integrate and control multiple devices, providing a more personalized and enhanced user experience.

IoT-enabled garbage monitoring utilizing weight sensing employs an ATmega microcontroller (Islam et al., 2020) with an LCD display, rechargeable battery, and solar panel powered by a 12V supply. The system integrates two types of sensors: a weight cell sensor and ultrasonic sensor, which measure weight and garbage levels respectively. Ultrasonic sensors monitor various levels of garbage in bins, triggering weight sensors to transmit data when thresholds are reached. The microcontroller processes this data and transmits it to a Wi-Fi module for communication. A mobile handset connected to the Wi-Fi router receives and displays garbage bin information in a web browser using an HTML interface.

In the current system, municipal staff collect garbage from empty bins daily. However, in public places, bins often overflow due to increasing waste accumulation. This overflow leads to garbage spillage and unpleasant odors, contributing to air pollution and potential health risks. Locating bins can be challenging, particularly for new drivers, prompting the introduction of GPS technology to aid in bin location and maintenance. Drawbacks of the existing system include heavy reliance on human resources (Hassan & Yusof, 2025), manual operation, high operational costs, odour emission causing health concerns, and the overall unhygienic appearance of the city.

The proposed system emphasizes efficient waste collection (Pathak & Shelar, 2021) by automating the process, thereby saving time. It continuously monitors the status of bins and sends notifications to designated authorities via an Android application. The advantages of this system include: i) Real-time monitoring of dustbins; ii) Intelligent service management; iii) Enhanced environmental quality; iv) Cost-effectiveness and urban improvement.

2. Methodology

This project proposes a real-time smart garbage monitoring system that is both simple and efficient. The system is designed to continuously track the status of garbage bins using a microcontroller-based approach. The key components of the system are as follows:

- ATmega328 Microcontroller:
  Serves as the central processing unit, managing all sensor inputs and coordinating data flow in the system.
- Ultrasonic Sensors:
  Four ultrasonic sensors are used, each assigned to a garbage bin to measure the fill level by detecting the distance from the sensor to the waste surface.
- Weight Sensor Module:
  A load cell-based weight sensor is integrated to measure the weight of the garbage in each bin, providing an additional metric for monitoring bin status.
- LCD Display:
  A display screen is included to show real-time data on garbage levels and weights locally.
- Wi-Fi Module:
  Enables wireless transmission of collected data to a designated website or IoT platform, allowing remote monitoring and data logging.

The ATmega328 Controller is an open-source board based on the Arduino cc ATmega328 microchip controller. It is equipped with sets of digital and analog input/output (I/O) pins that can be interfaced with various boards (shields) for expansion and other circuits. The board features 14 digital pins and six analog pins and is programmable via a Type B USB cable using the Arduino IDE (Integrated Development Environment). It can be powered either by a USB cable or an external 9-volt battery, accepting voltages between 7 and 20 volts. It is like the Arduino Nano and Leonardo. Distributed under a Creative Commons Attribution Share-Alike 2.5 license, the hardware reference design is available on the Arduino website. The ATmega328 comes pre-programmed with a bootloader that enables new code to be uploaded without needing an external hardware programmer.

A load cell is defined as a "weight measuring system needed for electronic scales that display weights." However, a load cell is not limited to weight measurement in electronic scales. It is a passive transducer or sensor that converts force into electrical signals and is also known as a "load transducer." The most predominant load cells are those based on strain gauges. The widespread adoption of strain gauge-based load cells is due to their small size compared to

other types, long operating life due to the lack of moving parts or other types, long operating life due to the lack of repetition of moving parts or other friction-causing components, and ease of production because of the small number of components.

The Weight Sensor Module is based on the HX711, a 24-bit analog-to-digital precision converter designed to interface directly with a bridge sensor for weight scale and industrial control applications. The HX711 not only offers simplicity compared to other chips, but it also features high integration, rapid response, and immunity to interference. This chip lowers the costs of electronic scales while simultaneously improving performance and reliability.

The ESP8266 Wi-Fi Module is a self-contained System-on-Chip (SoC) with a built-in TCP/IP protocol stack that can provide connectivity to a Wi-Fi network for microcontrollers. The ESP8266 can either host an application or offload all Wi-Fi networking functions from another device's processor. This low-cost module enables manufacturers to make microcontroller-based devices wirelessly networkable. The ESP8266 operates in the 2.4GHz range and utilizes a 32-bit RISC CPU running at 80MHz. It is based on TCP/IP (Transmission Control Protocol) and is a critical component for IoT operations. The ESP8266 features 64KB of ROM boot memory, 64KB of instruction RAM, and 96KB of data RAM. It performs IoT operations by sending data from an energy meter to a website accessible via an IP address. The module's TX and RX pins connect to the Arduino microcontroller's pins 7 and 8.

The Ultrasonic Sensor HC-SR04 uses sonar to measure the distance to an object. This provides excellent non-contact range detection with high precision and reliable readings, making it an easy-to-use kit. The sensor includes an ultrasonic transmitter and receiver. By measuring the time between the signal being transmitted and received, the sensor can accurately determine the distance to an object. The term LCD stands for Liquid Crystal Display. It is a type of electronic display module used in a wide range of applications, including cell phones, calculators, computers, television sets, and more. These displays are often chosen over light-emitting diodes and seven-segment displays in multi-segment configurations due to their advantages.

The main benefits of using an LCD module include its low cost, ease of programming, ability to display custom characters, special symbols, and even animations. A typical 16x2 LCD has two registers: the data register and the command register. The RS (Register Select) pin is used to switch between these registers. When the RS is set to '0,' it is in command mode; when set to '1,' it is in data mode. The solar panel is rated at 6V and 5W, which can recharge a 3.7V battery. A flowchart (Figure 2) illustrating the operational sequence of the proposed system to ensure accurate results.

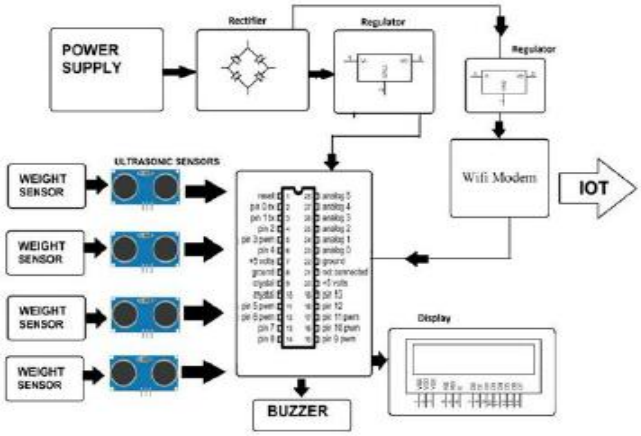

Fig. 1. Block diagram

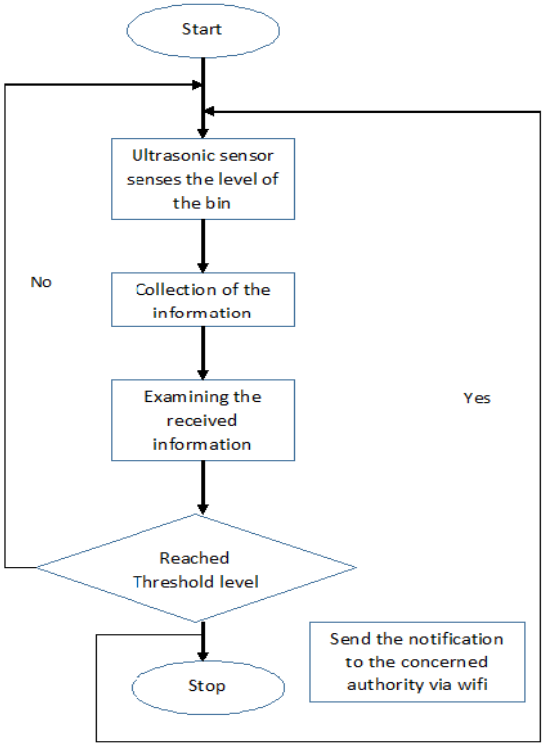

Fig. 2. Flowchart

At system start-up, the Wi-Fi module is initialized (Raj & Paul, 2020) and automatically connects to a pre-programmed SSID and password, which must be set by the user according to their router or mobile hotspot credentials. Once the connection is established, the system performs an initial scan to measure and record the height of all garbage bins.

After recording the bin heights, the system enters the active monitoring phase. During this phase, it continuously checks the garbage fill level and weight. To ensure data accuracy and reliability, the Wi-Fi connection is re-established before each monitoring cycle. This allows the system to upload the latest data to the designated website in real time. All collected data is accessible online, enabling relevant personnel—such as municipal officers—to monitor the garbage levels remotely from any location. For alert functionality, the system includes a buzzer and an LED indicator. When any garbage bin reaches its maximum capacity, the buzzer is triggered and the LED turns on. The buzzer continues to sound until the bin is emptied or the garbage level drops below the threshold.

3. Results and Discussion

The system testing involved analyzing four main garbage bin conditions: empty, half-filled, full, and heavy. Each condition was validated using a combination of ultrasonic sensors (Verma et al., 2020) and weight measurement. For the 'empty' condition, the system accurately detected 0% garbage fill, as verified by the baseline readings of the ultrasonic sensor (Verma et al., 2020). In the 'half-filled' state, garbage bins triggered alerts after reaching approximately 50% fill capacity, confirmed through both sensor values and visual inspection. When bins reached 90% capacity, the system initiated full-alert triggers. The sensors provided consistent readings, and the buzzer system was successfully activated in all tests. The 'heavy' bin scenario involved loads exceeding the predefined weight threshold (Alaa et al., 2023). This activated the weight-sensing module, which accurately measured overloads and triggered additional alerts (Alaa et al., 2023). In all test cases, real-time data was successfully transmitted to the online platform, allowing for remote status monitoring. These outcomes support the system's reliability and validate its potential for practical waste management deployment.

The system determines the garbage bin status using a combination of IR level sensors and a weight sensor. The conditions for various bin statuses are defined as follows:

a. Empty Bin: 0% fill level (triggered by the first IR sensor)
b. Half-Filled Bin: 50% fill level (triggered by the first and second IR sensors)
c. Full Bin: 90% fill level (all three sensors activated)
d. Heavy Bin: Threshold weight exceeded (triggered by weight sensor)

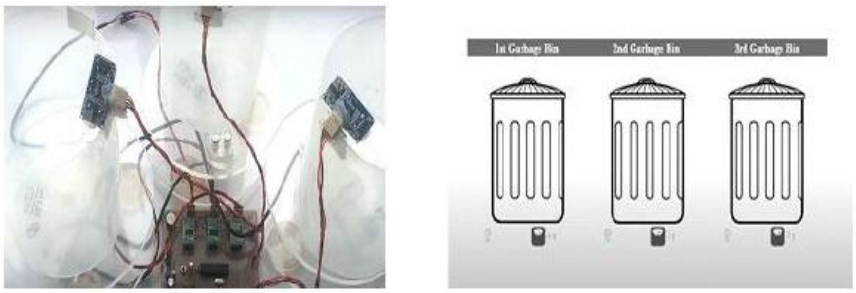

Fig.3. Empty dustbin

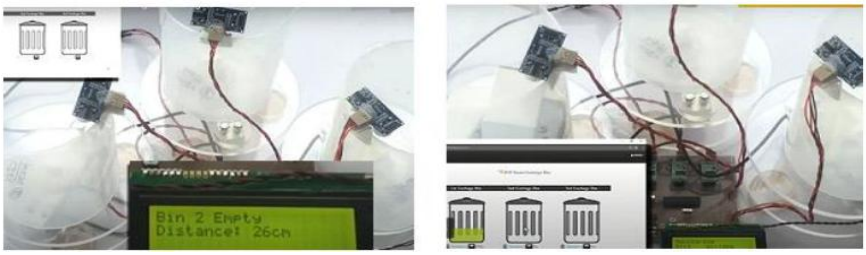

Fig.4. Half-filled dustbin (50%)

Fig. 5. Full dustbin (90%)

Fig. 6. Heavy dustbin

4. Conclusion

This project implements a smart garbage monitoring system using ultrasonic sensors, a weight sensor, a microcontroller, and Wi-Fi connectivity. The system ensures that each dustbin is monitored in real-time, triggering alerts when the garbage level reaches its threshold. This enables timely cleaning of bins and prevents overflow. If a dustbin is not emptied within a predefined time, the system logs the incident and forwards the record to higher authorities. This feature promotes accountability and facilitates appropriate action against responsible contractors. Additionally, it helps detect false service claims and minimizes the possibility of corruption in the waste management process. By optimizing the garbage collection schedule based on actual bin status, the system reduces the frequency of unnecessary collection trips. This results in significant cost savings on fuel and manpower while promoting a cleaner and more sustainable environment. Ultimately, this smart waste management solution enhances operational efficiency and contributes to improved urban cleanliness and hygiene.

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REAL-TIME FAMILY TRACKING USING GPS TECHNOLOGY

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Abstract

This project presents a real-time family tracking application utilizing GPS technology, enabling users to monitor the location of their family members from anywhere. The app aims to enhance safety by providing timely updates on the whereabouts of children and loved ones, addressing growing concerns in society using the Android system. Key features include accessing data location, ensuring users are aware of tracking, and maintaining a reliable connection for accurate readings. This application serves as a valuable tool for families, fostering peace of mind and connectivity even when apart.
Keywords: Real-time tracking; GPS technology; Mobile application.

1. Introduction

The world is currently undergoing significant advancements in technology, particularly in mobile development, which has shown immense growth. Today, smartphones have become integral to daily life, influencing nearly every aspect of our existence. These devices perform a multitude of functions, including sending emails, playing games, browsing the internet for information, and accessing social networking sites such as Facebook, YouTube, and Google.

The global mobile application market is anticipated to grow at a remarkably high rate, primarily driven by the expanding smartphone market. One area of interest for many individuals in the realm of mobile technology is real-time smartphone location tracking. This trend presents opportunities for developers and programmers to pursue their interests. The emphasis is on mobile applications that utilize the Global Positioning System (GPS). GPS, which stands for "Global Positioning System," is a satellite navigation system used to determine the precise location of an object on the ground. Originally developed for military use by the United States in the 1960s, GPS technology has since expanded into civilian applications over the following decades. Today, GPS receivers are integrated into a wide range of commercial products, including automobiles, smartphones, fitness watches, and Geographic Information System (GIS) devices.

The primary purpose of this project is to enable users to view GPS map locations in real-time, like the functionality offered by the "Waze" application. The location will be updated as soon as the user changes their position. This project is specifically aimed at families, with the goal of addressing social issues among teenagers. For parents concerned about their child's safety, the utilization of this service appears attractive, as they can check that their children are 'where they are supposed to be' (Simpson B, 2014).

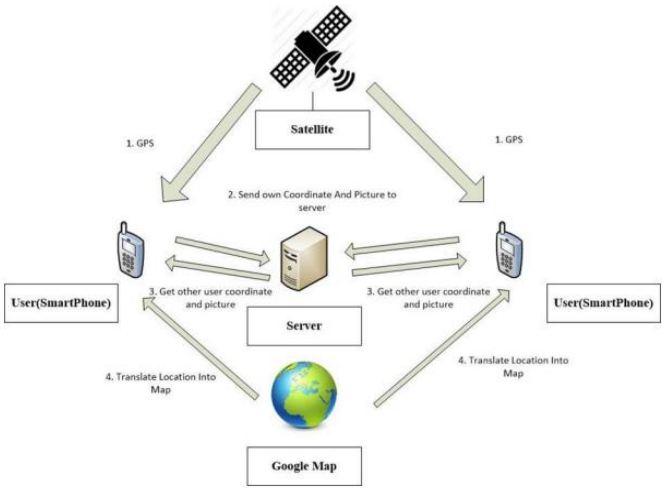

Fig. 1. System overview

Figure 1 illustrates how this system operates. The proposed project focuses on real-time family tracking through a GPS application. This application allows users to track their family members anywhere, providing peace of mind regarding the whereabouts of children or loved ones. The primary purpose of this app is to enhance safety and reduce the prevalence of concerning social phenomena in our society.

The techniques to be implemented include accessing location data, ensuring users are aware when they are being tracked, testing the application, and collecting relevant data. One of the challenges to be addressed is retrieving information at regular intervals to ensure accurate location readings. It is also essential to maintain a reliable connection between users to facilitate effective tracking. The importance of this application lies in its ability to keep loved ones safe and connected, even from a distance. To achieve this, I plan to utilize Firebase as a backend solution for real-time data synchronization and storage.

This project explores location-based applications that utilize mapping technologies, such as Glympse, GeoZilla, and Find My Friend. Each of these applications offers unique functionalities tailored to different user needs. Glympse focuses on real-time location sharing to reduce uncertainty in service deliveries, while GeoZilla caters to both family and business users by providing location tracking and safety alerts. Find My Friend specializes in GPS tracking for outdoor activities, allowing users to locate and communicate with friends in real-time.

Mobile phone tracking relies on technologies like GPS and radio signal multilateration to determine the position of a device. GPS, in particular, is widely used due to its accuracy, although it has limitations, such as high battery consumption and reduced effectiveness indoors. The applications discussed in this project utilize GPS and other location-based services (LBS) to provide users with various features, including real-time tracking, notifications, and map-based information.

The project also delves into the Android operating system, which is the foundation for developing these applications. Android offers a comprehensive software environment for mobile devices, including an application framework, an integrated browser, and support for hardware components like GPS and cameras. The development of Android apps is facilitated by Android Studio, an integrated development environment (IDE) that streamlines the coding, testing, and deployment processes.

Google Maps, a key tool in location-based applications, revolutionized online mapping with its introduction of continuous client-server interaction and extensive APIs for developers. This

has enabled the creation of sophisticated mapping applications that integrate seamlessly with Android and other mobile platforms, making it easier for developers to build powerful, location-aware applications. Based on the literature review of existing papers and journals, the technology involved in this project is still relatively new and requires a combination of different technologies to ensure its success. Google Maps plays a crucial role in this project by providing the necessary mapping capabilities, as developing a custom map would be impractical. The integration of GPS for obtaining coordinate locations with Google Maps for displaying tracking points creates an effective and efficient solution for this project.

2. Methodology

The life cycle model is a fundamental concept in systems engineering (SE). It outlines a series of stages that a system goes through, with each stage being governed by management decisions that determine when the system is ready to move from one stage to the next. For this project, the Incremental Model Life Cycle was chosen as the development approach. This model involves designing, implementing, and testing the software in increments, adding features step by step until the product is complete. It combines aspects of the traditional waterfall model with the iterative approach of prototyping, making it suitable for introducing a new system gradually and reducing the risks associated with large-scale changes. The methodology focuses on planning, requirements analysis, design, implementation, and development.

This phase involves detailed planning before proceeding to subsequent stages. During this stage, consultations with support personnel are necessary to ensure the project is on the right track. The appropriate software for the project's development is identified and set up to meet the project objectives. For this project, Android Studio was installed and configured on a Windows 7 virtual machine, with the Android SDK integrated into the environment. Proper preparation during this phase is crucial for the successful continuation of the project.

In the requirements phase, it is essential to identify and understand all the necessary requirements for developing the project. This phase involves a thorough analysis of the system's functional requirements and how they will be achieved in a step-by-step manner. The requirements phase is critical in the incremental model of software development, as it lays the foundation for the entire project. For this project, the primary requirements include the Android Studio software, which must run on a Windows-based system with a minimum of 2GB of RAM. Additionally, the Android SDK, emulator system images, and caches require at least 1GB of space. Insufficient resources can lead to slower system performance during development.

Through research and a review of previous studies, the limitations of this project have been identified. Based on these studies, new requirements for the application to be developed have emerged. This involves addressing the weaknesses of existing applications and proposing enhancements to improve them. A thorough analysis of the project's scope and functions is essential to clearly define the system requirements. This phase also involves identifying the contributions of the existing system and determining how the new system can be developed to meet future needs.

In this phase, the project requirements are translated into code. This includes developing the interface, login system, tracking features, and user details. Writing the code for location and image sharing, which involves generating coordinates and transmitting them to the server, is a particularly challenging aspect. Once the coding is complete, the system is evaluated to identify any bugs or errors. If issues are found, the system may undergo a reconstruction process to resolve them.

After the code is completed, the interface design and coding are integrated to form a new mobile application. Once the software has been thoroughly tested and no major issues are detected, it is ready for production, where it can be used by customers.
After the software version is released for production, a maintenance team is typically responsible for addressing any post-production issues. If a problem is identified, the development team is notified. Depending on the severity of the issue, a hotfix may be quickly implemented and deployed. For less critical issues, they may be addressed in the next software version update.

3. Results and Discussion

In this stage, the installation and setup of system requirements necessary for the project's development are completed. The hardware is set up and tested to ensure it meets the project's compatibility and performance needs. The configuration and deployment of the real-time family tracking app are implemented in Android Studio using the Java language. The app is connected to Firebase for database storage. This process involves both software and hardware configurations, ensuring that all components align with the system design and meet the project's expectations.

3.1 Family Tracking real-time (Parent)

a) Children Registration

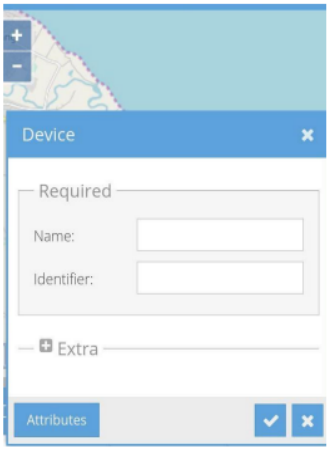

Fig. 2. Device form

Figure 2 illustrates the device form registration. The menu consists of two mandatory fields: one for entering the child's name and another for entering the unique identifier from the Family Tracking app (Children). After completing the form, users can tap the tick symbol to submit or the cross symbol to cancel.

b) Map

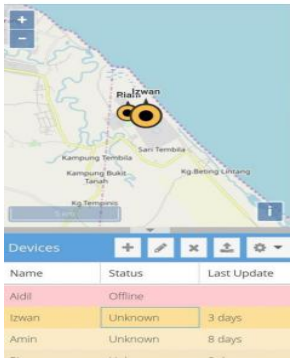

Fig. 3. Real-time location

Figure 3 displays the real-time locations of the children along with a list of their names. To locate a specific child, simply tap on their name in the list.

3.2 Family Tracking real-time (Children)

a) Interface

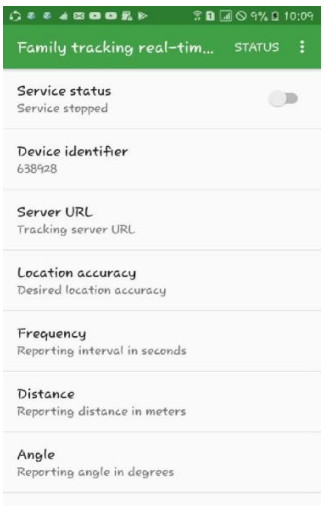

Fig. 4. Family tracking application interface

Figure 4 shows the real-time interface of the Family Tracking application(children). It displays information such as service status, device identifier, URL server, location accuracy, frequency, distance, and angle. The toggle function enables your phone to connect to GPS.

b) Number of Identifier

Fig. 5. Unique identifier number

Figure 5 shows the unique identifier number. The identifier is used to replace the phone number and is exclusive to a single device. This technique is to prevent children from cheating.

The application is tested using both black box and white box testing methods. Black box testing focuses on the application's functionality without knowing the internal structure, while white box testing involves analyzing the system's internal structure.

4. Conclusion

This project demonstrates the feasibility of a real-time family tracking system using GPS and Firebase. It successfully meets its objectives to monitor children remotely and contributes to mitigating social issues. Future improvements may include machine learning integration for predictive movement analysis and cross-platform compatibility.

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KEBERKESANAN PENGGUNAAN PERISIAN *LIVEWIRE* DALAM MENINGKATKAN PEMAHAMAN PELAJAR TERHADAP TOPIK PEMASA

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Abstrak

Kajian ini bertujuan untuk menilai keberkesanan penggunaan perisian simulasi *Livewire* dalam meningkatkan pemahaman pelajar terhadap topik pemasa 555 dalam kursus Electronic Circuits (DEE30043). Pemasa 555 merupakan komponen penting dalam litar elektronik yang sering digunakan dalam konfigurasi *astable* dan *monostable*, namun pelajar menghadapi kesukaran untuk memahami operasi dalaman dan fungsinya. Reka bentuk kuasi-eksperimen digunakan, melibatkan 30 orang pelajar semester 3 Sesi 2 2024/2025 yang mengambil kursus DEE30043 di Jabatan Kejuruteraan Elektrik di Politeknik Seberang Perai. Data dikumpulkan melalui ujian pra dan pasca serta soal selidik persepsi pelajar. Dapatan menunjukkan peningkatan yang signifikan dalam skor pemahaman selepas menggunakan *Livewire*, dengan purata markah meningkat daripada 52.3% kepada 78.6% ($p < .05$). Sebanyak 93% pelajar bersetuju bahawa *Livewire* membantu mereka memahami topik pemasa, dan 88% menyatakan minat terhadap subjek turut meningkat. Kajian mencadangkan bahawa perisian simulasi seperti *Livewire* berpotensi menjadi alat bantu pengajaran yang berkesan, terutamanya bagi topik yang kompleks dan abstrak.
Kata kunci: *Livewire*; Pemasa 555; Pemahaman pelajar.

1. Pengenalan

Perkembangan teknologi maklumat dan komunikasi (ICT) telah mendorong perubahan dalam pendekatan pengajaran dan pembelajaran, khususnya dalam bidang kejuruteraan. Kaedah tradisional seperti ceramah dan latihan berasaskan perkakasan sebenar sering kali tidak mencukupi untuk menerangkan konsep yang bersifat abstrak dan kompleks (Rahman & Ahmad, 2020). Dalam kursus Litar Elektronik (DEE30043), topik berkaitan pemasa 555 sering dikenal pasti sebagai antara topik yang mencabar untuk difahami oleh pelajar kerana memerlukan kefahaman mendalam terhadap operasi dalaman, konfigurasi *astable* dan *monostable*, serta aplikasinya dalam litar sebenar.

Kajian oleh Rahman dan Ahmad (2020) mendapati bahawa kaedah ceramah secara pasif menyebabkan pelajar sukar untuk mengaplikasikan teori pemasa 555 ke dalam situasi dunia sebenar. Manakala Yusof et al. (2021) pula menunjukkan bahawa pelajar yang hanya terdedah kepada latihan makmal tanpa visualisasi digital menunjukkan pencapaian rendah dari aspek pemahaman konsep. Omar et al. (2023) pula menegaskan bahawa penggunaan simulasi elektronik seperti *Livewire* dapat membantu pelajar membina pemahaman konseptual secara lebih interaktif dan visual, sekali gus meningkatkan tahap penguasaan topik-topik seperti pemasa 555.

Kajian oleh Dewi et al. (2024) mendapati peningkatan signifikan dalam kemahiran psikomotor pelajar selepas menggunakan *Livewire* dalam pembelajaran litar digital dan analog, manakala kajian Azis & Rahmat (2020) pula melaporkan bahawa walaupun *Livewire* digunakan secara meluas, penyelidikan yang menilai keberkesanan spesifik terhadap kefahaman pelajar mengenai pemasa 555 masih terhad. Ini menunjukkan wujudnya jurang dalam penyelidikan, khususnya dari aspek perbandingan prestasi pelajar sebelum dan selepas penggunaan

perisian tersebut, serta persepsi pelajar terhadap pengalaman pembelajaran menggunakan simulasi.

Tambahan lagi, kajian Nordin et al. (2021) mengesyorkan agar pendekatan simulasi diintegrasikan secara sistematik dalam kurikulum kejuruteraan, namun masih belum ada bukti kukuh yang menunjukkan bagaimana ia memberi impak khusus terhadap topik-topik tertentu seperti pemasa 555. Ketiadaan data empirikal yang menyokong keberkesanan *Livewire* dalam konteks ini menimbulkan keperluan untuk satu penyelidikan berstruktur yang dapat mengisi jurang pengetahuan tersebut.

Jurang utama yang dikenal pasti ialah kekurangan penyelidikan empirik yang menilai keberkesanan penggunaan *Livewire* dalam konteks pembelajaran pemasa 555 secara spesifik. Kebanyakan pendekatan pengajaran masih bergantung kepada latihan praktikal berasaskan perkakasan sebenar yang melibatkan kos tinggi, risiko keselamatan dan keperluan masa yang panjang untuk persediaan. Selain itu, kajian berkaitan persepsi pelajar terhadap simulasi *Livewire* juga masih terhad, terutama dari aspek keupayaan simulasi untuk menjelaskan fenomena perubahan voltan, masa tindak balas dan operasi dalaman IC 555. Tambahan pula, belum ada kajian tempatan yang membandingkan prestasi pelajar antara kaedah tradisional dan kaedah simulasi *Livewire* secara sistematik dalam topik pemasa 555. Ketiadaan data kuantitatif yang kukuh menimbulkan persoalan tentang keberkesanan sebenar penggunaan perisian ini dalam meningkatkan pencapaian pelajar.

Sehubungan itu, satu kajian berstruktur dan berdasarkan bukti perlu dijalankan untuk menilai tahap kefahaman pelajar sebelum dan selepas intervensi menggunakan *Livewire*, serta mengkaji persepsi mereka terhadap keberkesanan perisian ini dalam konteks pembelajaran pemasa 555. Dapatan kajian ini akan memberikan sumbangan penting kepada penambahbaikan kaedah pengajaran sedia ada dalam kursus Litar Elektronik dan menyokong penggunaan teknologi pendidikan dalam TVET. Kajian ini menetapkan tiga objektif iaitu menilai tahap kefahaman pelajar terhadap topik pemasa 555 sebelum dan selepas menggunakan perisian *Livewire*,mengenal pasti persepsi pelajar terhadap keberkesanan penggunaan *Livewire* dalam pembelajaran topik pemasa 555 dan menganalisis perbezaan pencapaian pelajar antara kaedah tradisional dan kaedah menggunakan simulasi *Livewire*.

2. Metodologi

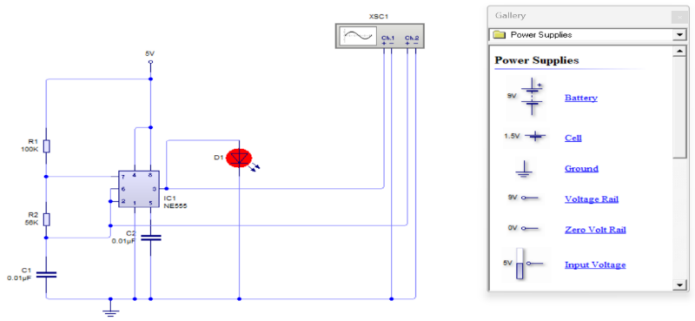
Kajian ini menggunakan reka bentuk kuasi-eksperimen dengan pendekatan pra-ujian dan pasca-ujian kumpulan tunggal (*one-group pretest-post-test design*). Pendekatan ini dipilih bagi menilai perubahan tahap pemahaman pelajar terhadap topik pemasa 555 sebelum dan selepas penggunaan perisian simulasi *Livewire* dalam sesi pengajaran dan pembelajaran. Reka bentuk ini dianggap sesuai untuk menilai keberkesanan sesuatu intervensi apabila pelaksanaan kumpulan kawalan tidak dapat dilakukan disebabkan oleh batasan tertentu dalam konteks pelaksanaan kajian. Soal selidik juga diberikan kepada pelajar untuk menilai tahap

Responden kajian terdiri daripada 30 orang pelajar semester 3 Diploma Kejuruteraan Elektrik dan Elektronik dari Politeknik Seberang Perai yang mengikuti kursus Electronic Circuits (DEE30043). Pemilihan sampel dibuat secara pensampelan bertujuan kerana semua pelajar tersebut terlibat secara langsung dengan topik pemasa 555 dalam kurikulum mereka. Sampel ini dianggap mencukupi bagi kajian awal yang memfokuskan kepada penilaian keberkesanan intervensi pendidikan.

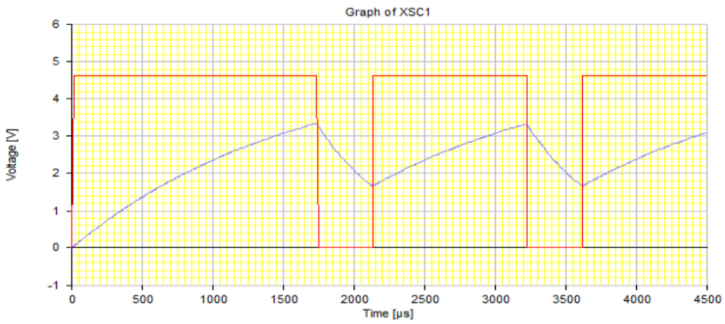
Kajian ini menggunakan dua instrumen iaitu soalan ujian yang berbentuk objektif dan soal selidik.Soalan objektif direka untuk menilai pemahaman pelajar mengenai konfigurasi *astable* dan *monostable* bagi pemasa 555. Litar pemasa *Livewire* ditunjukkan pada Rajah 1 dan juga keluaran pada Rajah 2 yang pelajar boleh lihat semasa simulasi.Skor ujian dikira dalam

bentuk peratus bagi membandingkan prestasi sebelum dan selepas menggunakan perisian *Livewire*. Kajian ini menggunakan skala Likert 5 mata (1 = Sangat Tidak Setuju hingga 5 = Sangat Setuju) kerana ia adalah pendekatan yang lazim digunakan dalam kajian pendidikan di Malaysia dan telah terbukti mudah difahami oleh responden. Selain itu, skala ini menyediakan kestabilan statistik yang baik serta kesesuaian untuk mengukur persepsi dan sikap pelajar dalam konteks pengajaran atas talian dan penggunaan perisian simulasi (Malaysian Journal of Learning and Instruction, 2023). Sebanyak 10 item disusun mengikut tiga dimensi iaitu: Pemahaman Konsep, Minat terhadap Subjek, dan Keberkesanan Penggunaan Perisian *Livewire*. Soal selidik ini bertujuan untuk mendapatkan maklum balas persepsi pelajar terhadap keberkesanan penggunaan perisian simulasi dalam meningkatkan pemahaman mereka. Borang soal selidik telah diedarkan kepada responden secara dalam talian menggunakan aplikasi Google Form. Pemilihan kaedah ini adalah bersesuaian dengan keperluan kajian kerana ia memudahkan proses pengumpulan data maklum balas, mengurangkan keperluan penggunaan kertas, serta mempercepat dan mempertingkat keberkesanan proses pengumpulan data.

Pelajar diberikan taklimat awal mengenai objektif kajian dan dikehendaki menjawab ujian pra bagi menilai tahap pemahaman awal mereka. Seterusnya, sesi pengajaran dijalankan di makmal komputer menggunakan perisian *Livewire* sebagai alat bantu simulasi. Selepas tamat sesi pengajaran, pelajar melengkapkan ujian pasca dan seterusnya menjawab soal selidik persepsi. Keseluruhan proses dilaksanakan dalam tempoh satu minggu kuliah.



Rajah 1. Litar pemasa *Livewire*



Rajah 2. Keluaran simulasi *livewire*

Data kuantitatif daripada ujian pra dan pasca dianalisis menggunakan ujian t-berpasangan bagi menentukan sama ada terdapat perbezaan yang signifikan dalam skor pelajar sebelum dan selepas intervensi. Nilai $p < .05$ ditetapkan sebagai aras signifikan. Data soal selidik pula dianalisis secara deskriptif menggunakan perisian *Statistical Packages for Social Sciences* (SPSS) for Windows versi 29.0 yang melibatkan nilai skor min. Skor min telah diterjermahkan untuk menentukan tahap tinggi, sederhana dan rendah seperti di Jadual 1 merujuk kepada Megat et al. (2007) bagi menilai persepsi pelajar terhadap keberkesanan penggunaan *Livewire*.

Jadual 1. Tafsiran skor min

Julat min	Tahap Persepsi
1.00-2.33	Rendah
2.34-3.66	Sederhana
3.67-5.00	Tinggi

Satu kajian rintis telah dijalankan ke atas 15 orang pelajar yang mendaftar kursus DEE30043-Electronic Circuits bagi menilai kefahaman, kesesuaian dan kebolehpercayaan instrumen soal selidik sebelum digunakan dalam kajian sebenar. Nilai pekali kebolehpercayaan telah ditentukan menggunakan pekali **Cronbach's Alpha**. Menurut Sekaran dan Bougie (2019), nilai Cronbach's Alpha yang melebihi 0.70 menunjukkan tahap kebolehpercayaan yang boleh diterima. Dalam kajian ini, nilai yang diperoleh ialah **0.82,** yang menunjukkan bahawa instrumen ini mempunyai kebolehpercayaan yang baik dan sesuai digunakan untuk kajian sebenar.

3. Dapatan dan Perbincangan

Jadual 2 menunjukkan skor purata dan sisihan piawai bagi ujian pra dan ujian pasca. Dapatan menunjukkan bahawa skor purata bagi ujian pra adalah sebanyak 52.3% dengan sisihan piawai 10.2, manakala skor purata bagi ujian pasca meningkat kepada 78.6% dengan sisihan piawai 8.7. Ini menunjukkan terdapat peningkatan sebanyak 26.3 mata dalam skor purata selepas pelajar mengikuti sesi pengajaran menggunakan perisian simulasi *Livewire*.

Jadual 2. Perbandingan skor purata ujian pra dan pasca

Jenis Ujian	Min (%)	Sisihan Piawai
Ujian Pra	52.3	10.2
Ujian Pasca	78.6	8.7
Perbezaan	26.3	

Bagi menentukan sama ada perbezaan skor tersebut adalah signifikan secara statistik, satu ujian t-berpasangan (paired sample t-test) telah dijalankan. Keputusan analisis menunjukkan bahawa terdapat perbezaan yang signifikan antara skor ujian pra dan ujian pasca dengan nilai $t(29) = -9.87$, dan nilai $p < 0.05$. Keputusan ini menunjukkan bahawa peningkatan skor selepas intervensi adalah signifikan pada aras kebolehpercayaan 95%. Oleh itu, boleh disimpulkan bahawa penggunaan perisian simulasi *Livewire* telah memberikan kesan yang positif terhadap peningkatan pemahaman pelajar dalam topik pemasa 555.

Untuk maklumbalas soal selidik selepas menggunakan simulasi *Livewire* pulak, hasil didapati semua memberi perspektif yang positif terhadap penggunaan Simulasi *Livewire*. Jadual 3 memaparkan skor min bahagian A iaitu pemahaman konsep. Dalam aspek pemahaman konsep, skor purata min keseluruhan adalah 4.3, dengan item tertinggi "Visualisasi litar melalui simulasi memudahkan pemahaman saya" (min = 4.6). Hasil ini selari dengan dapatan Makhrus et al. (2021) yang membuktikan bahawa eksperimen maya menggunakan *Livewire* dapat meningkatkan pemahaman konsep elektronik asas secara signifikan.

Jadual 3. Skor min bahagian A bagi pemahaman konsep

Item	Pernyataan	Min	Tahap
1	Saya memahami fungsi asas pemasa 555.	4.3	Tinggi
2	Saya dapat membezakan antara mod *astable* dan *monostable*.	4.1	Tinggi
3	*Livewire* membantu saya memahami konsep dengan lebih baik.	4.5	Tinggi
4	Visualisasi litar melalui simulasi memudahkan pemahaman saya.	4.6	Tinggi
5	Saya berasa yakin membina litar pemasa menggunakan 555.	4.2	Tinggi
6	Saya dapat mengaplikasikan pemasa 555 dalam projek sebenar.	4.0	Tinggi
	Purata Min	4.3	Tinggi

Bagi minat terhadap subjek yang ditunjukkan dalam Jadual 4, purata min 4.4 membuktikan bahawa penggunaan simulasi menjadikan pembelajaran lebih interaktif dan menarik. Omar et al. (2023) turut mendapati bahawa integrasi perisian simulasi dalam pengajaran meningkatkan motivasi pelajar serta mengurangkan beban kognitif, yang seterusnya meningkatkan penglibatan mereka dalam pembelajaran.

Jadual 4. Skor min bahagian B bagi minat terhadap subjek

Item	Pernyataan	Min	Tahap
1	Saya lebih berminat untuk mempelajari topik pemasa selepas sesi ini.	4.4	Tinggi
2	Sesi pembelajaran menjadi lebih menarik dengan *Livewire*.	4.3	Tinggi
	Purata Min	4.4	Tinggi

Sementara itu, Jadual 5 pula menunjukkan hasil dapatan bagi keberkesanan penggunaan *Livewire*, purata min 4.1 mengesahkan bahawa pelajar menyetujui *Livewire* sebagai alat bantu pengajaran yang relevan. Dapatan ini seiring dengan kajian Arafah et al. (2020) yang menunjukkan bahawa pembelajaran berasaskan inkuiri yang dibantu simulasi *Livewire* adalah sahih, berkesan, dan diterima baik oleh pelajar. Tambahan pula, Miftah et al. (2024) membuktikan bahawa penggunaan *Livewire* dalam pengajaran asas elektronik dapat meningkatkan kreativiti pelajar pada tahap sederhana hingga tinggi. Persepsi positif terhadap penggunaan simulasi juga turut dilaporkan oleh Saris dan Md Sapari (2022) yang mendapati pelajar di universiti Malaysia lebih cenderung memberi maklum balas positif terhadap pembelajaran yang memanfaatkan teknologi gamifikasi dan simulasi.

Jadual 5. Skor min bahagian C bagi keberkesan terhadap *Livewire*

Item	Pernyataan	Min	Tahap
1	Saya ingin menggunakan *Livewire* dalam topik lain juga.	4.0	Tinggi
2	*Livewire* adalah alat bantu pengajaran yang berkesan	4.2	Tinggi
	Purata Min	4.1	Tinggi

4. Kesimpulan

Secara kesimpulannya, kajian ini dijalankan bagi menilai keberkesanan penggunaan perisian simulasi *Livewire* dalam meningkatkan pemahaman pelajar terhadap topik pemasa 555 dalam kursus Electronic Circuits (DEE30043). Berdasarkan analisis yang dijalankan, hasil dapatan menunjukkan peningkatan yang signifikan dalam skor pemahaman pelajar selepas intervensi, di samping persepsi positif terhadap penggunaan *Livewire* sebagai alat bantu pengajaran dan pembelajaran.Penggunaan simulasi elektronik seperti *Livewire* bukan sahaja membantu pelajar memahami konsep yang kompleks melalui pendekatan visual dan interaktif, malah turut meningkatkan minat dan motivasi pelajar terhadap subjek. Oleh itu, pendekatan berasaskan teknologi ini wajar dijadikan sebahagian daripada kaedah pengajaran dalam kursus-kursus kejuruteraan elektrik di peringkat politeknik dan institusi pengajian tinggi yang lain. Penggunaan simulasi jugak membantu memberi kefahaman pelajar terhadap kursus dengan mudah disebabkan boleh mengubah nilai-nilai komponen yang dikehendaki. Berdasarkan hasil kajian, beberapa cadangan dikemukakan bagi penambahbaikan kajian akan datang dan pelaksanaan kaedah pengajaran berasaskan simulasi iaitu pelaksanaan kajian menggunakan reka bentuk eksperimen sebenar dengan kumpulan kawalan bagi meningkatkan keabsahan dalaman kajian.Kajian juga boleh ditambahbaik dengan membuat penambahan saiz sampel daripada pelbagai institusi bagi meningkatkan kesahan dapatan. Kajian juga boleh dibuat dengan mengembangkan keberkesanan *Livewire* dalam topik-topik lain dalam kursus elektronik seperti penguat operasional (OP-AMP) atau transistor serta integrasi *Livewire* dengan pendekatan pembelajaran berasaskan projek (PBL) untuk memperkukuh aplikasi pengetahuan pelajar dalam situasi dunia sebenar. Implikasi daripada kajian ini, dapat disimpulkan bahawa kajian ini penting kepada pendidik dan penggubal kurikulum dalam bidang kejuruteraan. Penggunaan perisian simulasi seperti *Livewire* dapat dijadikan sebagai satu strategi pengajaran yang efektif dalam meningkatkan pemahaman

konsep teknikal yang kompleks. Selain itu, kajian ini juga menunjukkan keperluan untuk memanfaatkan teknologi pendidikan secara lebih meluas dalam pengajaran dan pembelajaran di politeknik dan institusi teknikal.

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FAKTOR-FAKTOR YANG MEMPENGARUHI PERSEPSI PELAJAR TERHADAP AMALI KEJURUTERAAN ELEKTRIK SECARA JARAK JAUH: SATU KAJIAN KES DI POLITEKNIK SEBERANG PERAI

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Abstrak

Kajian ini bertujuan mengenal pasti faktor-faktor yang mempengaruhi persepsi pelajar terhadap pelaksanaan amali Kejuruteraan Elektrik secara jarak jauh di Politeknik Seberang Perai (PSP). Populasi kajian terdiri daripada 470 pelajar Diploma Kejuruteraan Elektrik, manakala sampel seramai 125 pelajar semester 2 sesi II 2024/2025 yang mengikuti kursus *Semiconductor Device* dipilih menggunakan persampelan rawak berstrata. Instrumen kajian ialah soal selidik berstruktur merangkumi faktor kemudahan infrastruktur teknologi, tahap kefahaman, keberkesanan pengajaran pensyarah, motivasi dan minat pelajar. Nilai Alpha Cronbach diperoleh sebanyak 0.91, menunjukkan kebolehpercayaan instrumen sangat tinggi. Analisis deskriptif mendapati skor min keseluruhan persepsi pelajar ialah 4.21 (positif), dengan skor min tertinggi bagi keberkesanan bahan pengajaran dan sokongan pensyarah (4.45) dan terendah bagi ketersediaan peralatan amali di rumah (3.85). Dapatan menunjukkan kemudahan teknologi dan kualiti modul memberi pengaruh signifikan terhadap persepsi pelajar. Kajian mencadangkan penambahbaikan reka bentuk modul amali digital dan pengukuhan sokongan pembelajaran bagi meningkatkan keberkesanan amali secara jarak jauh.

Kata kunci: Pembelajaran jarak jauh; Amali; Pengajaran dan pembelajaran.

1. Pengenalan

Perkembangan teknologi maklumat dan komunikasi telah memberi impak besar kepada bidang pendidikan, khususnya dalam pelaksanaan pembelajaran jarak jauh (PJJ) (Almahasees, et.al , 2021). Situasi pandemik COVID-19 yang melanda dunia telah mempercepatkan lagi adaptasi terhadap kaedah pengajaran secara dalam talian, termasuk kursus yang bersifat amali seperti Kejuruteraan Elektrik (Dhawan, 2020). Walau bagaimanapun, pelaksanaan amali secara jarak jauh menimbulkan pelbagai cabaran dari segi keberkesanan pembelajaran, tahap kefahaman pelajar serta kesediaan infrastruktur dan teknologi (Chaka, 2020).

Di Politeknik Seberang Perai (PSP), kursus amali merupakan komponen penting dalam pembelajaran bagi pelajar Kejuruteraan Elektrik. Justeru, pendekatan jarak jauh yang dilaksanakan memerlukan penilaian rapi terhadap keberkesanannya dari sudut pandangan pelajar. Persepsi pelajar memainkan peranan penting dalam menentukan keberkesanan dan penerimaan terhadap pendekatan ini (Singh & Thurman, 2019).

Oleh itu, kajian ini dijalankan untuk mengenal pasti faktor-faktor yang mempengaruhi persepsi pelajar terhadap amali Kejuruteraan Elektrik secara jarak jauh. Antara faktor yang dijangka memberi kesan ialah kemudahan peralatan dan akses internet, kaedah penyampaian pengajaran, sokongan pensyarah, serta motivasi pelajar (Adnan & Anwar, 2020). Kajian ini dapat memberikan gambaran jelas terhadap pelaksanaan pengajaran dan pembelajaran secara jarak jauh bagi komponen amali, serta mencadangkan penambahbaikan bagi meningkatkan keberkesanan pengajaran dan pembelajaran secara jarak jauh.

Hasil daripada kajian ini dijangka dapat memberi panduan kepada institusi pengajian tinggi dalam merancang pendekatan pengajaran yang lebih sesuai, berkesan dan mesra pelajar, khususnya dalam konteks pendidikan teknikal secara dalam talian.

Berikut merupakan objektif bagi kajian ini:

a) Mengenal pasti tahap persepsi pelajar semester II yang mengikuti Kursus *Semiconductor Devices* terhadap pelaksanaan amali Kejuruteraan Elektrik secara jarak jauh di Politeknik Seberang Perai (PSP).
b) Mengenal pasti faktor-faktor yang mempengaruhi persepsi pelajar terhadap keberkesanan amali secara jarak jauh, seperti kemudahan teknologi, sokongan pensyarah dan minat pelajar.
c) Menganalisis hubungan antara faktor-faktor yang dikenalpasti dengan persepsi pelajar terhadap pembelajaran amali secara jarak jauh

Pelaksanaan pembelajaran jarak jauh (PJJ) telah menjadi satu pendekatan utama dalam sistem pendidikan moden, terutamanya semasa pandemik COVID-19. Beberapa kajian lepas telah meneliti keberkesanan dan cabaran yang dihadapi oleh pelajar dalam mengikuti pembelajaran secara dalam talian, termasuk bagi subjek yang berasaskan amali.

Menurut Dhawan (2020), pembelajaran jarak jauh (PJJ) menyediakan peluang fleksibel kepada pelajar, namun kurangnya interaksi fizikal dan praktikal boleh menjejaskan keberkesanan dalam pembelajaran berasaskan kemahiran. Ini disokong oleh Adnan dan Anwar (2020) yang mendapati bahawa pelajar kurang yakin dengan penguasaan kemahiran teknikal apabila kelas amali dijalankan secara dalam talian.

Chaka (2020) menekankan bahawa faktor infrastruktur seperti akses kepada peralatan, kestabilan internet, dan perisian yang sesuai merupakan antara penyumbang utama kepada keberkesanan pembelajaran amali secara jarak jauh. Kajian oleh Singh dan Thurman (2019) turut menunjukkan bahawa keberkesanan pengajaran banyak dipengaruhi oleh strategi penyampaian yang digunakan oleh pensyarah, termasuk penggunaan video, simulasi dan demonstrasi interaktif.

Di samping itu, Almahasees, et.al (2021) menegaskan bahawa persepsi pelajar terhadap pembelajaran dalam talian dipengaruhi oleh motivasi dalaman, tahap literasi teknologi, dan sokongan yang diterima sepanjang proses pembelajaran. Ini menunjukkan bahawa faktor-faktor bukan teknikal seperti sikap, minat, dan pengalaman pelajar juga memainkan peranan yang besar.

Walaupun banyak kajian telah dijalankan berkaitan pembelajaran jarak jauh (PJJ), namun terdapat kekurangan kajian spesifik yang meneliti pelaksanaan amali Kejuruteraan Elektrik secara jarak jauh dalam konteks politeknik di Malaysia, terutamanya dari sudut persepsi pelajar. Justeru, kajian ini bertujuan untuk mengisi jurang tersebut dengan meneliti secara lebih mendalam faktor-faktor yang mempengaruhi persepsi pelajar di Politeknik Seberang Perai terhadap pelaksanaan amali secara jarak jauh.

Kajian selepas pandemik turut menunjukkan peralihan fokus daripada sekadar kesinambungan pembelajaran kepada keberkesanan jangka panjang (PJJ). Menurut Abdullah dan Rahman (2022), pelajar institusi TVET di Malaysia mula menyesuaikan diri dengan penggunaan teknologi digital, namun keberkesanan amali masih dipengaruhi oleh ketersediaan peralatan di rumah serta kemahiran pensyarah dalam mengadaptasi pengajaran. Sementara itu, kajian oleh Lee, et.al. (2023) mendapati bahawa selepas pandemik, motivasi pelajar meningkat apabila kaedah pembelajaran jarak jauh (PJJ) digabungkan dengan sesi praktikal bersemuka secara berkala.

Dalam konteks amali TVET secara dalam talian, kajian oleh Noor Azman et al. (2023) menekankan bahawa pembelajaran berasaskan simulasi dapat mengurangkan jurang kemahiran praktikal, terutamanya dalam kursus Kejuruteraan Elektrik. Simulasi interaktif membolehkan pelajar mempraktikkan prosedur kerja dalam persekitaran maya sebelum berhadapan dengan peralatan sebenar. Ini selari dengan dapatan Hamid dan Fauzi (2024) yang melaporkan bahawa penggunaan perisian simulasi seperti *Multisim* dan *Proteus* meningkatkan tahap kefahaman konsep litar elektrik sehingga 18% berbanding kaedah kuliah semata-mata.

Dapatan daripada kajian-kajian terkini ini mengukuhkan hujah bahawa gabungan kaedah simulasi, sokongan teknologi, dan bimbingan pensyarah yang berterusan dapat meningkatkan keberkesanan pelaksanaan amali secara jarak jauh bagi kursus berasaskan kemahiran.

2. Metodologi

Kajian ini menggunakan pendekatan kuantitatif dengan kaedah kajian tinjauan (survey) bagi mengenal pasti faktor-faktor yang mempengaruhi persepsi pelajar terhadap amali Kejuruteraan Elektrik secara jarak jauh. Kajian ini dilaksanakan dalam bentuk kajian kes di Politeknik Seberang Perai (PSP).

Reka bentuk kajian ini adalah berbentuk deskriptif dan inferensi, yang bertujuan untuk mendapatkan data secara langsung daripada pelajar melalui soal selidik yang dibangunkan khusus berdasarkan objektif kajian. Data yang dikumpul dianalisis untuk mengenal pasti hubungan antara pemboleh ubah bebas (faktor-faktor pengaruh) dengan pemboleh ubah bersandar (persepsi pelajar).

Populasi kajian terdiri daripada pelajar Kejuruteraan Elektrik di Politeknik Seberang Perai (PSP) semester 2 sesi II 2024/2025 yang terdiri daripada tiga program pengajian iaitu Diploma Kejuruteraan Elektrik dan Elektronik (DEE), Diploma Kejuruteraan Elektronik (Komunikasi) (DEP) dan Diploma Kejuruteraan Elektronik (Komputer) (DTK) yang telah mengikuti kursus amali secara jarak jauh bagi kursus Semiconductor Devices. Sampel dipilih menggunakan kaedah pensampelan bertujuan (purposive sampling). Seramai 125 pelajar terlibat sebagai responden kajian, ianya menepati jadual penentuan sampel Krejcie dan Morgan (1970).

Instrumen kajian ialah borang soal selidik yang dibahagikan kepada tiga bahagian utama:

Bahagian A: Maklumat demografi pelajar
Bahagian B: Tahap persepsi pelajar terhadap pelaksanaan amali jarak jauh
Bahagian C: Faktor-faktor yang mempengaruhi persepsi seperti kemudahan teknologi, keberkesanan pengajaran, motivasi, dan sokongan pensyarah

Soal selidik menggunakan skala Likert 5 mata (1 = Sangat Tidak Setuju hingga 5 = Sangat Setuju).

Soal selidik diedarkan secara dalam talian menggunakan platform *Google Form* bagi memudahkan capaian responden dan menjimatkan masa. Maklumat berkaitan kajian turut dijelaskan di bahagian awal borang soal selidik sebagai langkah persetujuan bermaklumat. Untuk menentukan instrumen kajian mempunyai nilai kesahan dan kebolehpercayaan yang baik, satu kajian rintis telah dijalankan kepada 30 pelajar yang mempunyai ciri serta situasi yang sama dengan populasi sebenar dan dapatan analisis kajian rintis menunjukkan indeks kebolehpercayaan Alpha Cronbach ialah 0.91. Dapatan ini menunjukkan instrumen berada dalam keadaan sangat baik dan efektif dengan tahap konsisten yang tinggi sekaligus boleh digunakan dalam penyelidikan sebenar (Bond & Fox 2003).

Data yang dikumpul dianalisis menggunakan perisian SPSS versi 29. Analisis yang dijalankan termasuk:

a. Statistik deskriptif untuk frekuensi, peratusan dan min
b. Analisis korelasi untuk melihat hubungan antara pemboleh ubah
c. Analisis regresi bagi menentukan pengaruh setiap faktor terhadap persepsi pelajar

3. Dapatan dan Perbincangan

Seramai 125 responden dari tiga program yang terdapat di Jabatan Kejuruteraan Elektrik, Politeknik Seberang Perai telah mengambil bahagian dan berkongsi maklum balas mereka mengenai pelaksanaan amali secara jarak jauh. Daripada jumlah tersebut, 88% merupakan pelajar lelaki dan 12% pelajar perempuan. Analisis deskriptif menunjukkan bahawa secara keseluruhannya, persepsi pelajar terhadap amali Kejuruteraan Elektrik secara jarak jauh berada pada tahap sederhana. Jadual 1 menunjukkan nilai min dan tahap bagi item persepsi pelajar terhadap amali jarak jauh.

Pelajar memberi respon yang paling tinggi bagi item faham apa yang diajar dalam amali jarak jauh walaupun masih ditahap sederhana. Manakala item yang berada di tahap paling rendah pula adalah amali jarak jauh sama berkesan seperti fizikal iaitu dengan nilai skor min 2.65. Dapatan ini menunjukkan bahawa walaupun kaedah penyampaian yang interaktif memberi kesan positif, pelajar masih merasakan keberkesanan amali dalam talian tidak setara dengan amali fizikal.

Jadual 1. Nilai min dan tahap bagi item persepsi pelajar terhadap amali jarak jauh

Item Persepsi	Min	Tahap
Saya faham apa yang diajar dalam amali jarak jauh	3.42	Sederhana
Amali membantu penguasaan kemahiran teknikal	3.18	Sederhana
Minat terhadap amali jarak jauh	3.05	Sederhana
Amali jarak jauh sama berkesan seperti fizikal	2.65	Rendah
Skor Min Keseluruhan	3.22	Sederhana

Merujuk kepada Jadual 2, didapati pelajar berpendapat pelaksanaan amali jarak jauh dari aspek kemudahan teknologi memberikan impak yang sangat ketara di mana item bagi tiada masalah teknikal menunjukkan nilai skor min 2.88 yang membawa nilai tahap rendah. Selain itu, pelajar juga berpendapat item bagi peralatan mencukupi hanya tahap sederhana dengan nilai skor min 3.10 dan internet stabil juga berapa pada tahap yang sama dengan nilai skor min 3.05.

Jadual 2. Nilai min dan tahap bagi item kemudahan teknologi

Item Persepsi	Min	Tahap
Peralatan Mencukupi	3.10	Sederhana
Internet Stabil	3.05	Sederhana
Tiada masalah teknikal	2.88	Rendah
Skor Min Keseluruhan	3,01	Sederhana

Jadual 3 menunjukkan faktor penyampaian pensyarah mencatatkan skor min keseluruhan tertinggi dalam kajian ini (min = 3.74, tahap tinggi), di mana ia memainkan peranan besar dalam membentuk persepsi positif pelajar terhadap amali jarak jauh. Nilai min tertinggi dicatatkan oleh item *mudah hubungi pensyarah* (min = 3.78, tahap tinggi), menandakan bahawa komunikasi yang lancar meningkatkan kefahaman dan keyakinan pelajar. Nilai min terendah dalam faktor ini ialah *arahan jelas* (min = 3.68, tahap sederhana), menunjukkan masih terdapat ruang untuk penambahbaikan dalam penyampaian arahan semasa kelas amali.

Jadual 3. Nilai min dan tahap bagi item kemudahan teknologi

Item Persepsi	Min	Tahap
Penggunaan bahan bantu (video/ simulasi)	3.75	Tinggi
Mudah hubungi pensyarah	3.78	Tinggi
Arahan jelas	3.68	Sederhana
Skor Min Keseluruhan	3.74	Tinggi

Skor min keseluruhan bagi faktor motivasi ialah 3.25 pada tahap sederhana. Jadual 4 menunjukkan nilai min bagi setiap item. Nilai min tertinggi ialah ulangkaji selepas kelas (min = 3.68, tahap sederhana), manakala nilai terendah ialah fokus semasa kelas (min = 2.95, tahap rendah). Pelajar cenderung untuk melakukan ulang kaji selepas sesi amali, namun ramai yang mudah hilang tumpuan kerana suasana rumah tidak seperti di makmal. Faktor ini memberi kesan kepada keberkesanan pembelajaran jarak jauh, walaupun semangat belajar pelajar berada pada tahap sederhana dengan nilai skor min 3.12.

Jadual 4. Nilai min dan tahap bagi item kemudahan teknologi

Item Persepsi	Min	Tahap
Semangat belajar	3.12	Sederhana
Fokus semasa kelas	2.95	Rendah
Ulang kaji selepas kelas	3.68	Sederhana
Skor Min Keseluruhan	3.25	Sederhana

Merujuk Jadual 5, dapatan ini mengesahkan bahawa penyampaian pensyarah adalah faktor paling kuat mempengaruhi persepsi pelajar, diikuti kemudahan teknologi dan motivasi pelajar.

Jadual 5. Analisis korelasi

Pembolehubah	r	Nilai-p	Keputusan
Kemudahan Teknologi vs Persepsi	0.43	<0.01	Signifikan Sederhana
Penyampaian Pensyarah vs Persepsi	0.61	<0.01	Signifikan Kuat
Motivasi vs Persepsi	0.39	<0.05	Signifikan Sederhana

Keputusan kajian menunjukkan bahawa persepsi pelajar terhadap amali jarak jauh berada pada tahap sederhana, menandakan pelajar masih belum sepenuhnya bersedia menerima amali secara jarak jauh sebagai alternatif setara kepada amali fizikal. Faktor penyampaian pensyarah merupakan faktor paling dominan yang memberi kesan terhadap persepsi positif. Ini selari dengan kajian Dhawan (2020) dan Singh & Thurman (2019) yang menyatakan bahawa strategi pengajaran dan bahan bantu memainkan peranan besar dalam keberkesanan pembelajaran dalam talian. Dapatan ini menunjukkan bahawa pelajar secara umum berpuas hati dengan pendekatan penyampaian pensyarah, terutamanya dalam menyediakan bahan bantu seperti video atau simulasi yang membantu proses pemahaman amali. Hal ini selari dengan kajian Singh dan Thurman (2019) yang menyatakan penggunaan kaedah pengajaran berasaskan teknologi seperti video interaktif dapat meningkatkan kefahaman pelajar dalam pembelajaran berasaskan kemahiran.

Kajian tempatan oleh Zainal dan Rahman (2023) mengenai amali TVET dalam talian turut mendapati bahawa arahan yang terlalu ringkas atau bergantung kepada teks tanpa demonstrasi langsung boleh menjejaskan kefahaman pelajar. Oleh itu, strategi penyampaian yang menggabungkan video langkah demi langkah, sesi soal jawab langsung, dan nota visual disyorkan bagi meningkatkan keberkesanan penyampaian. Sebaliknya, kekangan peralatan dan masalah teknikal terus menjadi isu utama seperti dilaporkan oleh Adnan & Anwar (2020). Ini menunjukkan perlunya sokongan institusi dari segi penyediaan kit amali mini, akses ke makmal maya atau perisian simulasi.

Motivasi pelajar pula berada di tahap sederhana. Ini konsisten dengan kajian Chaka (2020**)** yang menegaskan bahawa suasana persekitaran dan kurangnya interaksi rakan sebaya turut memberi kesan terhadap tumpuan dan minat pelajar.

Selain itu, kajian selepas pandemik oleh Rahman et al. (2022) mengenai amali berasaskan simulasi bagi kursus TVET mendapati bahawa walaupun simulasi dapat mengekalkan minat pelajar, ia tidak sepenuhnya menggantikan pengalaman amali di makmal. Justeru, pendekatan hibrid yang menggabungkan simulasi interaktif dengan sesi amali fizikal yang dijadualkan secara berkala boleh menjadi strategi yang lebih berkesan untuk mengekalkan motivasi dan fokus pelajar.

4. Kesimpulan

Kajian ini bertujuan untuk mengenal pasti persepsi pelajar terhadap pelaksanaan amali Kejuruteraan Elektrik secara jarak jauh serta meneliti faktor-faktor yang mempengaruhinya. Berdasarkan hasil soal selidik terhadap 125 pelajar di Politeknik Seberang Perai, didapati bahawa tahap persepsi pelajar berada pada tahap sederhana, dengan beberapa kekangan utama yang memberi kesan terhadap pengalaman pembelajaran mereka. Faktor penyampaian pensyarah dikenal pasti sebagai pengaruh paling besar terhadap persepsi pelajar, diikuti oleh faktor kemudahan teknologi dan motivasi pelajar. Walaupun pensyarah berusaha menggunakan pendekatan interaktif, pelajar masih menghadapi kekangan seperti sambungan internet yang lemah, kekurangan peralatan di rumah, serta kesukaran memberi tumpuan semasa kelas berlangsung dari rumah. Kajian ini menyimpulkan bahawa walaupun amali secara jarak jauh memberi alternatif pembelajaran ketika krisis seperti pandemik, ia tidak dapat sepenuhnya menggantikan pengalaman pembelajaran secara fizikal terutamanya bagi kursus teknikal yang memerlukan kemahiran tangan.

Kajian ini mendapati bahawa pelaksanaan amali secara jarak jauh bagi kursus teknikal dan vokasional (TVET) menghadapi cabaran, terutamanya dalam penguasaan kemahiran teknikal oleh pelajar. Implikasi daripada penemuan ini adalah penting bagi pelbagai pihak. Dari sudut pengajaran dan pembelajaran, pensyarah perlu menyesuaikan kaedah amali dengan strategi yang lebih interaktif seperti simulasi dan video demonstrasi, serta berperanan aktif sebagai fasilitator digital untuk memberi sokongan berterusan kepada pelajar. Bagi pihak institusi, pelaburan dalam peralatan seperti kit praktikal di rumah dan infrastruktur digital yang canggih adalah perlu untuk menggantikan pengalaman fizikal di makmal. Selain itu, pembangunan polisi atau garis panduan khusus bagi pelaksanaan amali TVET secara jarak jauh amat diperlukan untuk memastikan keberkesanan dan kualiti pembelajaran. Untuk kajian akan datang, dicadangkan agar kajian bandingan antara amali fizikal dan jarak jauh dilaksanakan. Penggunaan kaedah kualitatif seperti temubual mendalam juga disarankan bagi mendapatkan pemahaman yang lebih jelas tentang cabaran sebenar. Akhir sekali, sampel kajian perlu diperluaskan ke lebih banyak institusi untuk meningkatkan kebolehpercayaan dan generalisasi dapatan.

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ECO LUMINOUS PAVEMENT

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Abstrak

Eco Luminous Pavement adalah satu idea inovasi untuk menambahkan elemen pencahayaan pada blok laluan pejalan kaki sedia ada di pasaran bagi menambahkan lagi kelainan dan nilai estetika pada blok pejalan kaki tersebut. Apabila waktu malam blok laluan pejalan kaki ini akan bercahaya dengan sendirinya menggunakan konsep '*glow in the dark'* dengan penambahan bahan luminous dalam penghasilan produk ini. Bahan yang digunakan untuk menghasilkan blok laluan pejalan kaki ialah serbuk bercahaya iaitu *luminescent powder*, batu bercahaya (*luminescent stone*), hancurkan batu, sabut kelapa dan simen. Produk ini menggunakan penambahan bahan kitar semula dalam nisbah simen iaitu sabut kelapa bagi mengurangkan kos penghasilan produk disamping menambahkan konsep hijau ke dalam produk. Produk ini mempunyai nilai pasaran yang tersendiri kerana menggunakan konsep *glow in the dark,* keunikan gabungan elemen pencahayaan dan mesra alam serta ketahanan produk ini lebih kuat berbanding blok sedia. Produk ini dihasilkan dalam bentuk sarang lebah (*honeycomb*). Pengujian yang terlibat dalam penghasilan produk ini adalah pengujian berat produk, ujian mampatan dan ujian visual. Kajian soal selidik juga diedarkan kepada responden yang terdiri daripada Pihak Berkuasa Tempatan, kontraktor, pembekal bahan binaan dan pengguna kawasan riadah yang difokuskan. Soal selidik diedarkan melalui medium *google form* yang terbahagi kepada dua (2) soal selidik iaitu kajian sebelum reka bentuk produk dan kajian selepas reka bentuk produk. Penggantian 20% sabut kelapa dalam penghasilan blok pejalan kaki ini juga dapat meningkatkan daya mampatan blok pejalan kaki iaitu 15.8 MPa lebih tinggi berbanding blok pejalan kaki sedia ada dipasaran iaitu 11.6 MPa.
Kata kunci: Luminous; Kitar semula; Sabut kelapa.

1. Pengenalan

Tujuan produk ini adalah untuk menghasilkan blok pejalan kaki bercahaya yang dapat menarik perhatian pengguna terutamanya pada waktu malam kerana ia dapat bercahaya dengan sendirinya. Selain itu, blok ini dapat mengelakkan pencemaran alam sekitar dengan menggunakan penambahan bahan sisa buangan yang dikitar semula iaitu sabut kelapa. Produk ini juga dapat menghasilkan blok laluan pejalan kaki yang menarik dan mempunyai nilai estetika yang tersendiri. Pernyataan masalah bagi produk ini adalah blok pejalan kaki sedia ada di pasaran tidak dapat bercahaya dengan sendirinya pada waktu malam. Jika tiada lampu jalan di kawasan tersebut ianya akan menyukarkan penggunaan untuk melihat blok pejalan kaki pada waktu malam. Sabut kelapa yang tidak digunakan hanya dibuang atau dibakar dan isu ini boleh menyebabkan pencemaran alam sekitar. Terdapat dua (2) objektif dalam menghasilkan produk ini, pertama adalah untuk menghasilkan blok laluan pejalan kaki yang bercahaya "*glow in the dark"* pada waktu malam. Objektif kedua adalah untuk menghasilkan blok laluan pejalan kaki yang menggunakan bahan kitar semula iaitu sabut kelapa. Produk ini memberikan kepentingan kepada empat (4) pihak iaitu Pihak Berkuasa Tempatan, kontraktor, pembekal bahan binaan dan pengguna kawasan riadah.

Satu kajian yang dihasilkan oleh Deepika et,al (2002) iaitu *A Study of Materials For Luminescent Concrete Pavement* menggunakan penambahan bahan *Luminescent Powder (LP)* dan *Reflective Powder (RP)* dalam blok pejalan kaki konkrit. Menurut kajian ini terdapat

hipotesis menyatakan bahawa dengan penambahan LP dan RP dalam konkrit dapat mengurangkan kuasa pada waktu malam. Berdasarkan kajian yang telah Deepika et,al (2002) jalankan menunjukkan bahawa penggunaan kuasa elektrik lampu jalan mewakili sekitar 20% hingga 30% daripada penggunaan kuasa lampu awam manakala kadar penggunaan kuasa adalah di bawah 65%. Bahan bercahaya adalah sejenis *photoluminescent* yang boleh menyimpan tenaga apabila ia disinari oleh cahaya dan terus memancarkan cahaya. Salutan bercahaya ini dibuat dengan menggabungkan warna-warna yang cerah, bahan pembentukan filem dan bahan tambahan yang sesuai dengan keadaan laluan pejalan kaki tersebut (Bailin Shah et.al, 2022). Wentong Wang et.al, (2021) menyatakan komposit berasaskan konkrit bercahaya sendiri digunakan dalam pembangunan dan bahan binaan untuk mengurangkan penggunaan kuasa, berfungsi pada kebolehlihatannya pada waktu malam.

Simen bercahaya mendapatkan tenaga cahaya berasaskan matahari pada waktu siang dan menukarkannya kepada cahaya pada waktu malam. Simen bersinar juga dipanggil simen nyah cas ringan atau *Glow in obscurity concrete (GID)* (Mousheen et.al, 2022). Bahan yang digunakan dalam konkrit ini ialah simen, batu aggregate, air dan resin glowing luminous stone yang digunakan untuk denai, batu dan simen terazo. *Glowing Concrete* dihasilkan dengan menggunakan *resin glowing luminous stone* untuk menggantikan jumlah agregat kasar yang sama dalam nisbah yang berbeza dan juga membantu menghasilkan semula cahaya pada waktu malam tanpa menggunakan tenaga elektrik

Projek jalan yang dicat menggunakan teknologi *glow in the dark* pertama di negara ini adalah di Jalan Sungai Lalang (B19) di Hulu Langat. Ahli Parlimen Hulu Langat, Mohd Sany Hamzan berkata, projek perintis dilaksanakan Jabatan Kerja Raya (JKR) Daerah Hulu Langat itu membolehkan pemanduan menjadi lebih selamat dengan bantuan pantulan cahaya pada pembahagi jalan. Cat jalan bernyala dalam gelap ini adalah cubaan projek rintis daripada pihak (JKR) Daerah Hulu Langat dalam membawa inovasi dalam kejuruteraan jalan. Reka cipta ini diilhamkan bagi membantu pemanduan yang lebih selamat di jalan raya pada waktu malam. Dengan mengekalkan ciri pemantulan cahaya kuning dengan penggunaan *High Intensity Prismatic Sheet,* kaedah pencahayaan ditambah baik dengan ciri pendarfluor atau lebih dikenali sebagai teknologi *glow in the dark* yang mengandungi elemen fosforus pigmen bagi mengeluarkan cahaya yang boleh dilihat selepas diberi tenaga. Sumber tenaga adalah sama ada daripada cahaya matahari atau lampu kenderaan yang diserap, sebelum bercahaya semula atau dapat dilihat pada waktu malam.

2. Metodologi

Instrumen kajian yang digunakan bagi produk ini adalah soal selidik. Soalan soal selidik diedarkan melalui aplikasi *google form* kepada responden. Populasi yang dipilih adalah dikalangan Pihak Berkuasa Tempatan, kontraktor, pembekal bahan binaan dan pengguna kawasan riadah dari kawasan kulim. Bagi Pihak Berkuasa Tempatan iaitu Majlis Perbandaran Kulim populasi responden hanya berfokus kepada Jabatan Pernacangan dan Landskap sahaja. Responden yang digunakan dalam kajian ini adalah seramai 37 orang yang terdiri daripada 20 peratus (%) Pihak Berkuasa Tempatan, 23 peratus (%) kontraktor, 53 peratus (%) pengguna kawasan riadah dan 3 peratus (%) pembekal bahan binaan.

Dapatan diatas menunjukkan bahawa responden bersetuju bahawa blok pejalan kaki sedia ada dipasaran tidak menarik pada waktu malam dimana responden bersetuju dengan penambahan bahan luminous supaya blok tersebut dapat bercahaya dengan sendirinya pada waktu malam. Selain daripada itu responden bersetuju bahawa sabut kelapa sesuai digunakan sebagai bahan tambahan dalam penghasilan blok ini disamping dapat mengurangkan pencemaran.

Jadual 1. Analisa reka bentuk blok pejalan kaki sedia ada

Bil	Soalan	Sangat Setuju (%)	Setuju (%)	Neutral (%)	Tidak Setuju (%)	Sangat Tidak Setuju (%)
1	Blok pejalan kaki sedia ada tidak menarik perhatian pada waktu malam	18.9	59.5	18.9	2.7	0
2	Blok pejalan kaki sedia ada mudah dilihat di waktu malam tanpa lampu?	2.7	35.1	10.8	32.4	18.9
3	Penambahan bahan luminous dalam blok pejalan kaki boleh menyebabkan ia bercahaya pada waktu malam	32.4	54.1	5.4	8.1	0
4	Sabut kelapa boleh digunakan sebagai bahan tambahan dalam blok pejalan kaki	13.5	56.8	18.9	8.1	2.7
5	Penambahan sabut kelapa dalam blok pejalan kaki dapat mengurangkan pencemaran	21.6	51.4	16.2	8.1	2.7

Hasil dapatan daripada soal selidik ini menunjukkan bahawa responden berpuas hati dan bersetuju dengan penambahan bahan luminous ke atas blok pejalan kaki yang menyebabkan blok pejalan kaki ini menarik pada waktu malam kerana ianya boleh bercahaya dengan sendirinya dan dapat dilihat pada waktu malam tanpa bantuan lampu. Responden juga bersetuju bahawa dengan penambahan sabut kelapa dalam pembuatan blok pejalan kaki ini dapat mengurangkan berat blok pejalan kaki serta dapat meningkatkan kekuatan mampatannya.

Jadual 2. Analisa kajian selepas reka bentuk produk

Bil	Soalan	Sangat Setuju (%)	Setuju (%)	Neutral (%)	Tidak Setuju (%)	Sangat Tidak Setuju (%)
1	Blok pejalan kaki luminous ini menarik perhatian pada waktu malam	70.4	29.6	0	0	0
2	Blok pejalan luminous mudah dilihat di waktu malam tanpa lampu?	51.9	33.3	14.8	0	0
3	Penambahan bahan luminous dalam blok pejalan kaki boleh menyebabkan ia bercahaya pada waktu malam	59.3	33.3	7.4	0	0
4	Penambahan sabut kelapa dalam blok pejalan kaki dapat mengurangkan berat blok pejalan kaki	22.2	48.1	11.1	18.5	0
5	Penambahan sabut kelapa dalam blok pejalan kaki dapat menguatkan kekuatan mampatan	55.6	40.7	3.7	0	0

3. Dapatan dan Perbincangan

Terdapat tiga kaedah pengujian yang dijalankan dalam penghasilan produk ini iaitu pengujian berat konktit, ujian mampatan dan pengujian visual. Saiz sampel yang digunakan untuk eksperimen ini adalah 15cm x 15cm x 15cm iaitu saiz bagi pengujian kiub.

Hasil daripada analisa berat nisbah bancuhan konkrit, berat konkrit campuran sabut kelapa pada 28 hari paling tinggi iaitu 7.6 kilogram dan berat konkrit yang paling ringan ialah konkrit campuran sekam padi iaitu 6.8 kilogram pada 28 hari. Hasil pengujian menunjukkan bahawa campuran blok pejalan kaki dan sekam padi adalah paling ringan berbanding blok pejalan kaki (1:2:3) dan campuran blok pejalan kaki dan sabut kelapa.

Jadual 3. Analisa berat

Bil	Jenis Blok Pejalan Kaki	Keputusan Berat Bata (kg) (sebelum direndam)	Keputusan Berat Bata (kg) (7 hari)	Keputusan Berat Bata (kg) (14 hari)	Keputusan Berat Bata (kg) (28 hari)
1	Blok pejalan kaki (1:2:3)	8.0	7.4	7.2	7.3
2	Blok pejalan kaki + Sekam Padi	7.2	6.8	6.5	6.8
3	Blok pejalan kaki + Sabut Kelapa	7.8	7.6	7.4	7.6

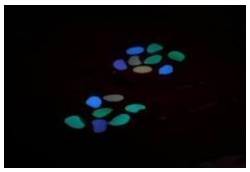
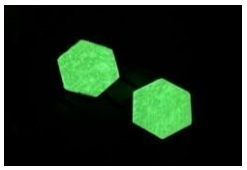
Hasil daripada ujian kekuatan mampatan didapati campuran blok pejalan kaki campuran sabut kelapa lebih kuat berbanding dengan blok pejalan kaki (1:2:3) dan campuran blok pejalan kaki dan sekam padi. Keputusan ujian bagi campuran sabut kelapa ialah 15.8 MPa manakala blok pejalan kaki (1:2:3) adalah 11.6 MPa dan bagi campuran sekam padi ialah 3 MPa. Walaupun pengujian berat menunjukkan blok pejalan kaki campuran sekam padi adalah paling ringan namun kekuatan ujian mampatan bagi blok pejalan kaki campuran sabut kelapa adalah paling tinggi.

Jadual 4. Analisa ujian mampatan

Bil	Jenis Blok Pejalan Kaki	Keputusan Ujian Mampatan (MPa) (7 hari)	Keputusan Ujian Mampatan (MPa) (14 hari)	Keputusan Ujian Mampatan (MPa) (28 hari)
1	Blok pejalan kaki (1:2:3)	11.2	8.4	11.6
2	Blok pejalan kaki campuran sekam padi	4.6	4.4	3.7
3	Blok pejalan kaki campuran sabut kelapa	12.9	13.6	15.8

Satu pengujian visual dilakukan untuk menguji sama ada bahan blok pejalan kaki ini mampu bercahaya dengan sendirinya pada waktu malam atau tempat yang gelap. Jadual 4.5 menunjukkan hasil keputusan Analisa visual. Didapati sampel yang menggunakan *Luminescent paint* lebih terang berbanding *Luminescent stone* dan *Luminescent Powder.*

Jadual 5. Analisa visual

Bil	Jenis Blok Pejalan Kaki	Gambar
1	Blok pejalan kaki dan *luminescent powder*	
2	Blok pejalan kaki dan *luminescent stone*	
3	Blok pejalan kaki dan *luminescent paint*	

4. Kesimpulan

Objektif pertama adalah untuk menghasilkan blok laluan pejalan kaki yang bercahaya '*glow in the dark*' pada waktu malam. Objektif pertama ini tercapai dengan penggunaan *luminuous powder*, *luminuous stone* dan *luminous paint dan* produk dilihat bercahaya dengan hasil ujian mendapati *luminuous stone* dan *luminuous paint* memberikan pencahayaan yang lebih terang berbanding *luminuous powder*. Objektif kedua adalah untuk menghasilkan blok laluan pejalan kaki yang menggunakan bahan kitar semula iaitu sabut kelapa atau sekam padi. Objektif kedua tercapai dengan menggantikan 20% sabut kelapa dalam penggunaan simen. Daripada penggantian 20% sabut kelapa dalam penghasilan blok pejalan kaki ini juga dapat meningkatkan daya mampatan blok pejalan kaki iaitu 15.8 MPa lebih tinggi berbanding blok pejalan kaki sedia ada dipasaran iaitu 11.6 MPa. Sepanjang proses penghasilan produk dan ujian yang telah dijalankan, didapati bahawa masih terdapat beberapa ruang untuk penambahbaikan untuk meningkatkan produktiviti dan kualiti produk. Beberapa cadangan untuk penambahbaikan produk yang dibuat untuk menyelesaikan masalah yang timbul dan pada masa yang sama menghasilkan produk berkualiti yang lebih baik pada masa akan datang. Terdapat beberapa langkah yang disyorkan yang boleh diambil untuk melaksanakan cadangan iaitu dengan mengkaji cara yang sesuai agar blok luminous ini tahan terhadap cuaca, mengekalkan kecerahan dan estetika pada jangka waktu yang lama. Selain itu, mempelbagaikan penggunaan bahan luminous dan juga bahan kitar semula bukan hanya pada blok konkrit.

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KAJIAN KEBERKESANAN PENGGUNAAN PERENGKOH PAIP ERGONOMIK

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Abstrak

Perengkuh paip dan spanar merupakan peralatan yang digunakan secara meluas di seluruh dunia dalam kerja-kerja perpaipan. Namun begitu, kebanyakan peralatan ini masih kurang menitikberatkan aspek keselamatan dan kesihatan dari sudut ergonomik, sedangkan faktor ini amat penting kerana boleh memberi kesan langsung terhadap postur badan serta keselesaan pengguna. Oleh itu, penghasilan Perengkuh Paip Ergonomik (PPE) ini bertujuan untuk membuat perbandingan dari segi tempoh masa penggunaan antara spanar konvensional dengan PPE, selain menilai tahap keberkesanan PPE dalam meningkatkan kecekapan dan keselamatan kerja-kerja perpaipan. Antara kelebihan PPE ini adalah meningkatkan keberkesanan kerja, meminimumkan masa yang diperlukan untuk menyelesaikan tugas, meningkatkan kebolehkerjaan, serta menjamin keselamatan dan keselesaan pengguna sepanjang tempoh penggunaan. Kajian ini menggunakan instrumen soal selidik yang melibatkan 50 orang responden terdiri daripada tukang paip berpengalaman dan juga orang awam. Hasil kajian mendapati bahawa PPE yang direka bentuk dengan saiz yang lebih kecil, ringan, mudah dikendalikan dan bersifat mesra pengguna dapat memberi impak positif terhadap prestasi kerja. Dapatan turut menunjukkan bahawa masa penggunaan PPE adalah jauh lebih singkat, iaitu 21.61 saat berbanding spanar boleh laras konvensional yang mencatatkan masa 107.66 saat. Dari aspek tahap keberkesanan pula, skor min sebanyak 4.69 diperoleh, sekali gus membuktikan bahawa PPE ini berupaya membantu kerja-kerja perpaipan dengan lebih efisien. Selain itu, ia juga mudah digunakan di pelbagai sudut dan posisi, dapat mengurangkan risiko kecederaan, memendekkan tempoh masa bekerja serta tidak memerlukan penggunaan tenaga kerja yang ramai. Secara keseluruhannya, inovasi PPE ini berpotensi besar dalam meningkatkan produktiviti serta menjaga aspek keselamatan dan kesihatan pengguna, selaras dengan keperluan ergonomik semasa.
Kata kunci: Perengkuh paip; Ergonomik; Keberkesanan kerja perpaipan.

1. Pengenalan

Kebanyakan rumah, bangunan atau di tandas-tandas awam mempunyai sinki yang menggunakan paip boleh lentur (*flexible hose*). Paip seperti ini tidak memerlukan pemotongan dan pengukuran paip kerana ia adalah paip yang boleh dilentur. Paip seperti ini biasanya digunakan untuk membuat penyambungan di tempat yang sempit dan mempunyai ruang yang amat terhad. Rajah 1 menunjukkan paip boleh lentur. Di antara ciri-ciri paip boleh lentur adalah seperti berikut i) Mempunyai saiz nat yang menepati piawaian standard ii)Bersifat fleksibel dan mudah dilentur mengikut keperluan iii) Memudahkan proses pemasangan, terutamanya di ruang sempit iv) Tidak memerlukan proses pemotongan semasa pemasangan.

Rajah 1. Paip boleh lentur

Pemasangan paip boleh lentur pada ruang yang sempit dan terhad memerlukan alatan tangan perpaipan yang khas. Contoh-contoh alatan tangan yang digunakan untuk pemasangan paip adalah seperti Rajah 2.

Rajah 2. a) Spanar boleh laras b) Perengkuh paip c) Spanar gabung

PPE ini telah direka bentuk oleh penyelidik dengan tujuan untuk memudahkan pengguna yang terlibat dalam aktiviti pemasangan atau penyelenggaraan sistem perpaipan. Alat ini sesuai digunakan khususnya dalam kerja-kerja perpaipan di kawasan kediaman atau bangunan, terutamanya pada sambungan paip boleh lentur seperti di bahagian sinki atau ruang sempit yang sukar dicapai. Selain itu, penggunaan PPE ini juga berpotensi untuk mengurangkan tempoh masa yang diperlukan dalam penyempurnaan tugasan berkaitan perpaipan. Secara umumnya, ergonomik merujuk kepada cabang ilmu yang mengaplikasikan pengetahuan tentang tingkah laku manusia, had keupayaan serta ciri-ciri fisiologi untuk tujuan mereka bentuk peralatan, sistem, tugas atau ruang kerja supaya lebih selamat, efisien, selesa dan mesra pengguna.

Menurut Chapanis (1985), terdapat dua matlamat utama dalam prinsip ergonomik. Pertama adalah untuk meningkatkan keberkesanan, kecekapan serta keselamatan ketika melakukan sesuatu tugas, termasuk mengurangkan ralat dan meningkatkan produktiviti. Matlamat kedua pula adalah untuk memenuhi keperluan manusia dari aspek keselamatan, keselesaan, mengurangkan keletihan, mengawal tekanan, serta meningkatkan tahap kepuasan bekerja dan kualiti hidup individu. Secara amnya, golongan tukang paip sering berdepan dengan kesukaran apabila berlaku kebocoran pada paip boleh lentur (*flexible hose*) yang dipasang di bahagian sinki dan memerlukan penyelenggaraan. Antara cabaran utama adalah ruang penyambungan yang sempit, sekali gus menyukarkan proses baik pulih. Situasi ini bukan sahaja meningkatkan risiko kecederaan kepada pekerja, malah turut memanjangkan tempoh pembaikan kerana mereka perlu bekerja dalam posisi tidak ergonomik seperti meniarap, merangkak atau berbaring. Selain itu, penggunaan spanar konvensional yang bersaiz besar menyukarkan operasi penyelenggaraan, khususnya di ruang kerja yang terhad dan sukar dicapai. Sehubungan itu, kajian ini turut memperkenalkan pembangunan PPE yang direka bentuk lebih mesra pengguna, praktikal dan sesuai digunakan di kawasan sempit. Di samping itu, kajian ini juga bertujuan untuk membuat perbandingan dari segi tempoh masa penggunaan antara spanar konvensional dengan PPE, selain menilai tahap keberkesanan PPE dalam meningkatkan kecekapan dan keselamatan kerja-kerja perpaipan.

2. Metodologi Kajian

Kajian ini menggunakan gabungan kaedah persampelan berkelompok dan persampelan rawak mudah bagi mendapatkan data yang bersifat menyeluruh dan mewakili populasi sasaran. Melalui kaedah persampelan berkelompok, responden terdiri daripada kumpulan tukang paip yang berpengalaman dalam kerja-kerja perpaipan. Pemilihan secara berkelompok ini membolehkan penyelidik memfokuskan kepada golongan pengguna yang mempunyai kepakaran teknikal serta pengalaman praktikal dalam penggunaan peralatan paip. Sementara itu, kaedah persampelan rawak mudah diaplikasikan bagi memilih responden dalam kalangan orang awam, di mana setiap individu mempunyai peluang yang sama untuk dipilih tanpa mengira latar belakang. Kaedah ini memastikan keterwakilan pandangan daripada pengguna biasa yang juga terlibat dalam penggunaan produk berkaitan perpaipan di kediaman atau premis mereka. Kedua-dua kategori responden ini dipilih kerana mereka merupakan pengguna utama peralatan perpaipan, sama ada secara profesional mahupun untuk kegunaan

harian. Sebanyak 50 set soal selidik diedarkan kepada responden yang telah menjalankan ujian ke atas prototaip PPE. Pendekatan ini membolehkan penyelidik memperoleh data empirikal yang holistik serta menilai tahap keberkesanan dan kebolehgunaan PPE daripada perspektif pengguna berbeza latar belakang.

Soal selidik dalam kajian ini dibangunkan selaras dengan objektif kajian. Antara aspek yang diterapkan dalam item soal selidik termasuk tempoh masa pengendalian PPE serta tahap keberkesanan produk tersebut. Bagi mengukur tahap persetujuan responden terhadap setiap item, skala Likert telah digunakan. Instrumen soal selidik ini dibahagikan kepada dua bahagian. Bahagian A mengandungi empat item soalan yang bertujuan untuk mengumpul maklumat demografi responden seperti jantina, umur, bangsa dan jenis pekerjaan. Sementara itu, Bahagian B terdiri daripada lima item soalan yang memfokuskan kepada penilaian tahap keberkesanan penggunaan PPE berdasarkan pengalaman responden. Jadual 1 memperincikan bilangan item soal selidik mengikut setiap bahagian. Bagi Bahagian B, responden diminta untuk menyatakan tahap persetujuan mereka terhadap pernyataan yang diberikan menggunakan skala Likert. Susun atur dan definisi bagi setiap tahap dalam skala Likert ditunjukkan dalam Jadual 2. Manakala Jadual 3 menunjukkan tahap skor min.

Jadual 1. Jumlah item mengikut bahagian

Bahagian	Item	Jumlah Item
A	Demografi	4
B	Keberkesanan Produk	5

Jadual 2. Skala Likert

Skala	Aras Persetujuan	Tahap
1	Sangat Tidak Setuju	Tidak Setuju
2	Tidak Setuju	
3	Kurang Setuju	Kurang setuju
4	Setuju	Setuju
5	Sangat setuju	

(Sumber: Adaptasi Piaw, C. W, 2006)

Jadual 3. Tahap skor min

Tahap	Skor Min
Rendah	1.00 - 2.33
Sederhana	2.34 - 3.66
Tinggi	3.67 - 5.00

(Sumber: Adaptasi Chua, Y. P, 2014)

3. Dapatan dan Perbincangan

Data yang diperoleh, dianalisis dengan menggunakan skor min. Huraian analisis data dibahagikan kepada dua bahagian utama iaitu:

3.1 Demografi

Profil demografi responden meliputi maklumat berkaitan jantina, umur, bangsa dan jenis pekerjaan. Data demografi yang dikumpulkan dianalisis bagi memperoleh taburan kekerapan dan peratusan, tanpa melibatkan analisis mendalam yang lain. Seramai 50 orang responden terlibat dalam kajian ini.

Jadual 4. Responden berdasarkan jantina

Bil	Jantina	Kekerapan	Peratus
1	Lelaki	45	90
2	Perempuan	5	10
	Jumlah	50	100

Seperti yang ditunjukkan dalam Jadual 4, seramai 45 orang responden adalah lelaki, mewakili 90% daripada keseluruhan sampel. Manakala, responden perempuan pula adalah seramai 5 orang, iaitu bersamaan dengan 10% daripada jumlah keseluruhan responden.

3.2 Umur

Jadual 5 memperincikan taburan responden mengikut kategori umur. Umur responden telah diklasifikasikan kepada tiga kumpulan utama. Hasil kajian menunjukkan bahawa majoriti responden, iaitu seramai 38 orang (76%), berada dalam lingkungan umur 21 hingga 30 tahun. Seterusnya, seramai 8 orang responden (16%) berada dalam kategori umur 31 hingga 40 tahun. Manakala 4 orang responden atau 8% terdiri daripada kumpulan umur 41 hingga 50 tahun.

Jadual 5. Responden berdasarkan umur

Bil	Umur	Kekerapan	Peratus
1	21 – 30 Tahun	38	76
2	31 – 40 Tahun	8	16
3	41 – 50 Tahun	4	8
	Jumlah	50	100

3.3 Bangsa

Jadual 6 menunjukkan taburan responden mengikut kategori bangsa. Hasil kajian mendapati majoriti responden adalah daripada kaum Melayu, iaitu seramai 84% daripada keseluruhan sampel. Sementara itu, responden berbangsa Cina mewakili 10%, manakala responden berbangsa India adalah sebanyak 6%.

Jadual 6. Responden berdasarkan bangsa

Bil	Bangsa	Kekerapan	Peratus
1	Melayu	42	84
2	Cina	5	10
3	India	3	6
	Jumlah	50	100

3.4 Jenis Pekerjaan

Jadual 7 menunjukkan bahawa majoriti responden adalah terdiri daripada pelajar, iaitu sebanyak 44% daripada keseluruhan responden. Selain itu, terdapat juga pelatih industri dari Institut Kemahiran Mara (IKM) dan kontraktor binaan, masing-masing mewakili 8%. Responden lain terdiri daripada juruteknik Mydin (8%), pelatih industri dari Politeknik (6%), pekerja kedai perkakasan (6%), juruteknik IPG (4%), operator (4%) serta tukang paip di IPG sebanyak 4%. Manakala selebihnya, iaitu masing-masing mewakili 2%, terdiri daripada nelayan, pembantu pegawai teknikal, anggota polis dan individu yang bekerja sendiri.

Jadual 7. Responden berdasarkan jenis pekerjaan

Bil	Pekerjaan	Kekerapan	Peratus
1	Juruteknik (IPG)	2	4.0
2	Juruteknik Mydin	4	8.0
3	Nelayan	1	2.0
4	Operator	2	4.0
5	Pelajar	22	44.0
6	Pelatih Industri (IKM)	4	8.0
7	Pelatih Industri (Politeknik)	3	6.0
8	Pem. Pegawai Teknik	1	2.0
9	Kontraktor Binaan	4	8.0
10	Polis	1	2.0

11	Pekerja kedai *hardware*	3	6.0
12	Tukang Paip (IPG)	2	4.0
13	Sendiri	1	2.0
	Jumlah	50	100.0

3.5 Tempoh Masa Penggunaan Spanar Boleh Laras dan Perengkuh Paip Ergonomik

Objektif pertama kajian adalah untuk membandingkan tempoh masa yang diambil bagi melaksanakan kerja-kerja perpaipan, terutamanya kerja yang melibatkan kawasan atau ruang yang sempit. Hal ini kerana penggunaan perengkuh paip dan spanar biasa sering kali menyukarkan kerja di kawasan berhalangan, sekali gus menyebabkan tempoh masa untuk menyiapkan kerja perpaipan menjadi lebih panjang. Berdasarkan ujian masa yang telah dijalankan ke atas penggunaan PPE dan spanar biasa dalam kerja-kerja perpaipan, hasilnya jelas menunjukkan bahawa PPE memerlukan masa yang lebih singkat berbanding spanar biasa. Jadual 8 memaparkan perbezaan tempoh masa antara PPE dan spanar boleh laras. Dapatan ini membuktikan bahawa PPE lebih praktikal dan mudah digunakan berbanding alatan sedia ada, khususnya untuk kerja perpaipan di ruang sempit atau sukar diakses.

Jadual 8. Keputusan ujian masa di antara spanar dan perengkuh paip ergonomik (PPE)

Peralatan	Perengkuh Paip Ergonomik	Spanar Boleh Laras
Masa yang diambil membuka paip boleh lentur *flexible hose* di sinki	21.61 saat	107.66 saat

3.6 Tahap Keberkesanan Perengkuh Paip Ergonomik

Objektif kedua kajian adalah untuk mengenal pasti tahap keberkesanan penggunaan perengkuh paip ergonomik dalam kerja-kerja perpaipan. Reka bentuk perengkuh paip yang ditambah baik dengan ciri-ciri ergonomik dapat membantu pengguna menjalankan kerja perpaipan dengan lebih mudah, terutamanya di kawasan yang sempit. Selain itu, penggunaan perengkuh ini juga berupaya mengurangkan risiko kecederaan dalam kalangan pengguna. Di samping itu, penggunaan tenaga fizikal dapat diminimumkan kerana perengkuh paip ergonomik direka untuk memendekkan masa membuka atau mengetatkan bolt dan nat, sekali gus meningkatkan kecekapan kerja. Jadual 9 memaparkan keseluruhan skor min yang diperoleh hasil daripada analisis kajian ini. Sebanyak lima item telah dibangunkan bagi menilai tahap keberkesanan penggunaan PPE. Penilaian dilakukan berdasarkan maklum balas responden terhadap item-item tersebut untuk menentukan nilai skor min masing-masing. Berdasarkan keputusan analisis, tahap keberkesanan penggunaan perengkuh paip ergonomik ditentukan menerusi kategori tahap kecenderungan min.

Jadual 9. Kadar skor min bagi keberkesanan penggunaan perengkuh paip ergonomik

Bil.	Item	Skor min	Tahap
1	Produk PPE ini memudahkan pelaksanaan kerja-kerja perpaipan	4.80	Tinggi
2	Produk ini mudah digunakan di pelbagai sudut atau posisi kerja	4.66	Tinggi
3	Produk ini mudah digunakan di kawasan kerja yang sempit dan terhad	4.80	Tinggi
4	Alat perengkuh paip ergonomik ini membantu mengurangkan risiko kecederaan semasa menjalankan kerja di kawasan sempit	4.58	Tinggi
5	Penggunaan perengkuh paip ergonomik ini dapat memendekkan masa kerja perpaipan	4.60	Tinggi
	Nilai Purata Skor Min		4.69

Secara keseluruhannya, dapatan kajian menunjukkan purata skor min bagi tahap keberkesanan penggunaan PPE adalah 4.69, yang berada dalam kategori tahap tinggi. Keupayaan produk ini untuk berfungsi dengan efektif dalam pelbagai posisi menjadikannya

lebih fleksibel dan sesuai digunakan di lokasi kerja yang berbeza. Selain itu, dalam situasi ruang kerja yang sempit dan terhad, produk ini turut menunjukkan prestasi cemerlang dengan skor min sebanyak 4.80. Dari sudut keselamatan, hasil kajian mendapati penggunaan perengkuh paip ergonomik berpotensi mengurangkan risiko kecederaan ketika menjalankan kerja di kawasan yang terhad, dengan nilai min direkodkan sebanyak 4.58. Secara tidak langsung, ini membuktikan bahawa produk ini bukan sahaja dapat meningkatkan kecekapan kerja, malah memberi penekanan terhadap aspek keselamatan pengguna, khususnya dalam persekitaran kerja yang mencabar. Di samping itu, antara kelebihan utama perengkuh paip ergonomik ini adalah keupayaannya memendekkan tempoh masa kerja perpaipan, sebagaimana ditunjukkan oleh skor min 4.60. Keupayaan ini membantu pengguna melaksanakan tugasan dengan lebih cepat dan efisien, sekali gus meningkatkan tahap produktiviti kerja secara keseluruhan.

4. Kesimpulan

Perbincangan keputusan kajian ini dibuat selari dengan objektif yang telah ditetapkan. Objektif pertama adalah untuk membandingkan tempoh masa penggunaan PPE dengan spanar boleh laras dalam kerja-kerja pemasangan atau penggantian paip boleh lentur (*flexible hose*). Ujian masa telah dijalankan bagi memenuhi objektif tersebut. Hasil ujian menunjukkan penggunaan spanar memerlukan purata masa sebanyak 107.66 saat untuk menyiapkan tugas tersebut. Sebaliknya, apabila menggunakan PPE, masa yang diambil adalah jauh lebih singkat iaitu hanya sekitar 21.61 saat. Ini jelas membuktikan bahawa PPE dapat membantu mempercepatkan kerja perpaipan berbanding penggunaan spanar biasa. Bagi objektif kedua, kajian ini menilai tahap keberkesanan penggunaan PPE dalam kerja-kerja perpaipan yang melibatkan paip boleh lentur. Hasil soal selidik mendapati rata-rata responden bersetuju bahawa PPE memudahkan kerja mereka, khususnya di kawasan yang sempit atau sukar diakses. Nilai skor min yang dicatatkan adalah 4.80, menunjukkan tahap keberkesanan yang tinggi. Dapatan ini menunjukkan bahawa PPE berpotensi menyelesaikan masalah keterbatasan ruang serta meningkatkan kecekapan kerja di lapangan. Secara keseluruhan, kajian ini menunjukkan bahawa penggunaan Perengkuh Paip Ergonomik bukan sahaja dapat mempercepatkan kerja, malah turut meningkatkan aspek keselamatan dan kemudahan pengguna. Dengan kelebihan tersebut, PPE amat disarankan untuk digunakan dalam sektor perpaipan, terutamanya bagi kerja-kerja yang melibatkan ruang kerja yang terhad atau memerlukan kedudukan badan yang tidak selesa.

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THE INFLUENCE OF PRICE AND SERVICE QUALITY ON CONSUMER PURCHASE DECISIONS AT GERAI HANIA ONLINE STORE IN MEDAN CITY

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Abstract

This research aims to analyse the influence of price and service quality on consumer purchasing decisions at the Gerai Hania online store in Medan. The study employs a quantitative approach, utilising a multiple linear regression analysis method. Data were collected through questionnaires distributed to 90 consumers who had made purchases at the store. The variables studied include price and service quality as independent variables and purchasing decision as the dependent variable. The results indicate that both price and service quality have a significant positive impact on purchasing decisions, acting both partially and simultaneously. The coefficient of determination (R^2) demonstrates that the two independent variables can explain 86.7% of the variation in purchasing decisions. Among these factors, service quality is the most significant factor influencing purchasing decisions, as indicated by the highest standardised coefficient (Beta). These findings underscore the importance of competitive pricing and high-quality service in enhancing consumer interest and satisfaction in online retail settings. This study offers valuable insights for online business owners seeking to enhance customer acquisition and retention strategies through targeted pricing and service enhancements.
Keywords: Price; Service quality; Purchasing decision.

1. Introduction

The rapid development of information and communication technology in recent years has brought about fundamental changes in consumer behaviour patterns, including in the city of Medan. This digital transformation has driven a shift from conventional transactions to online transactions, enabling consumers to purchase products or services without the need for physical presence in stores. Various e-commerce platforms and online shops have emerged, offering convenience, time efficiency, and practicality in the shopping process. Gerai Hania is one of the businesses that has taken advantage of this opportunity. This online store, specialising in women's and children's clothing, is located on Jl. Alfalah No.13 B, Suka Maju Subdistrict, Medan Johor District, Medan City, North Sumatra 20146. Established in early 2020 by a young couple who recognised the growing trend of online shopping during the COVID-19 pandemic, Gerai Hania initially marketed its products through a personal Instagram account with a limited collection. However, due to positive market responses, the store gradually expanded its marketing channels to TikTok and Shopee, actively using these platforms to promote content and facilitate sales transactions. In addition to its online presence, Gerai Hania also offers offline purchasing services at the same location, providing an alternative for customers who prefer to view the products in person.

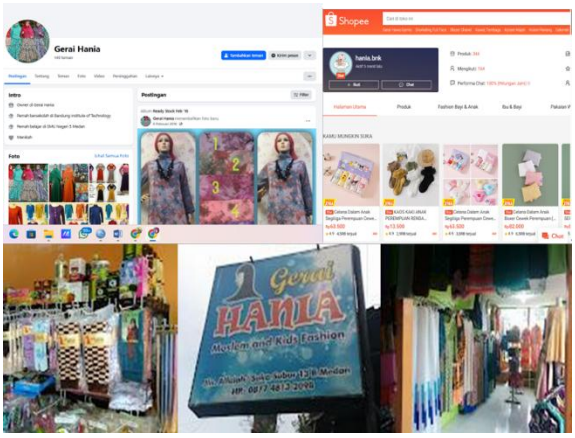

Fig. 1. Overview of Gerai Hania's offline and online storefront

The products offered by Gerai Hania include a variety of women's and children's clothing, such as dresses, blouses, long dresses (*gamis*), sleepwear, and daily kids' outfits. All products are carefully selected in accordance with current fashion trends, while maintaining affordable prices for the middle-income consumer segment. A competitive pricing strategy is one of Gerai Hania's key advantages, supported by efforts to provide comfortable and prompt service, both in communication and product delivery.

However, as the business has grown, Gerai Hania has encountered several challenges, particularly in maintaining the quality of its customer service. Based on initial observations and internal sales data, it was found that monthly transaction volumes fluctuate and do not always correspond with the number of visits to the store's online pages. This indicates a gap between initial consumer interest and final purchasing decisions. Some customers have also provided feedback regarding slow response times and incomplete product information. With increasing competition in the online fashion industry, enhancing customer service has become crucial for maintaining the store's reputation and fostering customer loyalty.

In the context of online stores, consumer purchasing decisions represent a critical stage influenced by various factors. The purchase decision process involves a series of steps, starting from need recognition, information search, evaluation of alternatives, purchase decision, and post-purchase behaviour. Throughout this process, consumers consider the available information about the product, pricing, reviews from other customers, transaction security, and their previous shopping experiences. (Devi & Fadli, 2023; Zahira & Salamah, 2022).

Previous studies have shown that online purchasing decisions are influenced strongly by competitive pricing and high-quality service. A survey by Zubaidah and Latief (Devi & Fadli, 2023) revealed that factors such as discount promotions, free shipping, price, and product quality significantly affect consumer purchasing decisions on Shopee. Meanwhile, research conducted by Ghoni and Soliha (Dika Juliantari & Prawitasari, 2025) as well as Hermansyah et al. found that brand image, customer reviews, service quality, and price have a significant influence on purchase decisions (Hardianawati et al., 2024).
In this context, competitive and transparent pricing not only reflects the value of the product but also represents consumer trust in the store (Kotler & Keller, 2021). A study by Ulfah, Fadilah, and Fadli emphasises that prices aligned with consumers' perceived value can significantly drive purchasing decisions (Devi & Fadli, 2023; Fadilah et al., 2023; Ulfah, 2023). Meanwhile, service quality which includes response speed, clarity of product information, delivery reliability, transaction security, and friendly communication has been proven to contribute to customer satisfaction and loyalty directly. Research conducted by Marbun, Antoni, and Faradila demonstrates that excellent service can encourage repeat purchases

and strengthen consumer loyalty (Faradila et al., 2024; Marbun, 2022; Nufal & Kuswinarno, 2024).

As the store continues to grow, Gerai Hania has established a substantial customer base in Medan and its surrounding areas. Daily visits to the store's accounts and consumer interactions have increased significantly, especially during promotional events or seasonal discounts. The business has also created employment opportunities for additional staff, such as social media administrators, packaging teams, and customer service personnel. In navigating the rapidly evolving online market, Gerai Hania must gain a deep understanding of how price and service quality influence consumer purchasing decisions. An accurate understanding of the factors influencing purchase decisions will serve as a foundation for formulating more effective and relevant marketing strategies, thereby enhancing competitive advantage in the increasingly intense online fashion industry. Theoretically, the relationship between the variables Price (X1), Service Quality (X2), and Purchase Decision (Y) can be illustrated through a conceptual framework:

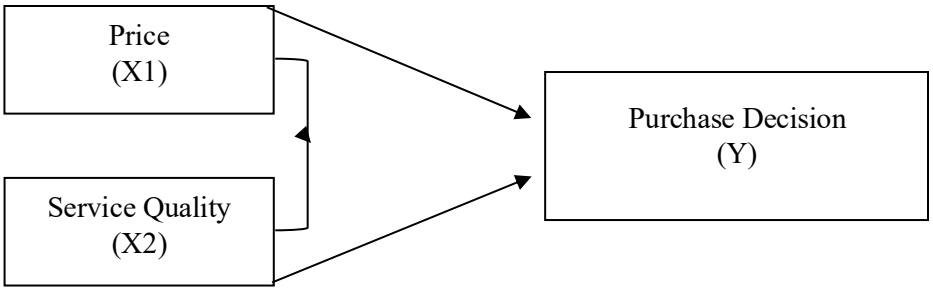

Fig. 2. Theoretical Framework

Based on the aforementioned explanation, the research hypotheses are formulated as follows:

H^1: Price has a positive and significant effect on consumer purchase decisions at the Gerai Hania online store in Medan City.

H^2: Service quality has a positive and significant effect on consumer purchase decisions at the Gerai Hania online store in Medan City.

H^3: Price and service quality simultaneously have a positive and significant effect on consumer purchase decisions at the Gerai Hania online store in Medan City.

Thus, this study is expected to provide both theoretical and practical contributions, as well as serve as a reference for Gerai Hania in formulating data-driven marketing strategies to enhance competitive advantage and customer satisfaction.

2. Methodology

This study involved customers of Gerai Hania Online Store, located at Jl. Alfalah No.13 B, Suka Maju Subdistrict, Medan Johor District, Medan City, North Sumatra, 20146. Gerai Hania specializes in selling women's and children's clothing through various digital platforms, including Instagram, TikTok, and Shopee, as well as operating a physical storefront. The study's target population included all customers who made purchases between November 2024 and March 2025, during which the store averaged 173 transactions per month. Using Slovin's formula and a 10% margin of error, the study determined a sample size of 90 respondents. Participants were selected based on the criterion that they had completed at least two purchases. This sampling method ensured the inclusion of informed and experienced customers, thereby improving the validity of the findings related to the impact of pricing and service quality on purchasing decisions.

The research was conducted from March to June 2025. The initial stages included the submission of the research title and the preparation of the proposal, followed by data collection through online questionnaires and data analysis using SPSS Version 22. The questionnaires were distributed digitally to Gerai Hania customers who met the participation criteria. Before data collection, participants were informed about the purpose of the study and their consent was obtained voluntarily. The collected data were then coded, classified, and processed for statistical testing in accordance with the research objectives. Throughout the research process, ethical considerations such as confidentiality and data privacy were maintained to protect respondent identities.

The primary data in this study were obtained through an online questionnaire distributed via Google Forms: https://forms.gle/NYj4Dwh3w1Ft3c358. Secondary data were collected from relevant literature, including scholarly journals, books, articles, and supporting documentation. The questionnaire was structured to include 15 statement items distributed across three main variables: Price (X1), Service Quality (X2), and Purchase Decision (Y). Each item was measured using a 5-point Likert scale with response options ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). This instrument was developed and refined based on existing literature and adapted to the research context of online consumers in Medan.

The operational definitions and indicators for each variable are as follows:

a. Price (X1) refers to the consumer's perception of the affordability, fairness, and attractiveness of product pricing. This variable was measured using 5 items related to:
    1. Price affordability
    2. Satisfaction with price relative to quality
    3. Price attractiveness compared to competitors.
    4. Influence of promotions or discounts
    5. Price transparency
b. Service Quality (X2), Defined as the perceived quality of service provided during the online shopping experience, including interaction and platform usability. Measured with 5 items covering:
    1. Product conformity with description
    2. Admin responsiveness
    3. Transaction safety and trust
    4. Friendliness of service
    5. Interface appearance and ease of navigation of the online store

c. Purchase Decision (Y), Refers to the customer's final decision to buy a product based on evaluation of product, price, and service quality. Measured with 5 items focusing on:
    1. Product suitability with consumer needs
    2. Information seeking before purchase.
    3. Comparison with other stores
    4. Consideration of price and quality
    5. Purchase satisfaction and repurchase intention.

Before full-scale data collection, the questionnaire was reviewed to ensure clarity of statements and consistency with research objectives. A pilot test was also conducted to assess internal reliability and refine wording where necessary. The data collected through questionnaires were analysed using SPSS version 22. A series of analytical procedures was applied to ensure that the data were valid, reliable, and met the classical assumptions necessary for conducting multiple linear regression analysis. The steps are as follows:

1. Validity Test: The purpose of this test is to ensure that each item in the questionnaire accurately measures the intended construct. The validity was assessed using the Corrected Item-Total Correlation, where a correlation coefficient greater than 0.30 indicates that the item is valid.

2. Reliability Test: This test measures the internal consistency of questionnaire items using Cronbach's Alpha. A value of α ≥ 0.70 indicates that the instrument is reliable.
3. Classical Assumption Tests: Prior to regression analysis, the dataset was tested for the following classical assumptions:
    a. Normality Test: Assesses whether the residuals are normally distributed, evaluated through Kolmogorov–Smirnov and Q–Q Plot analysis.
    b. Multicollinearity Test: Detects the presence of high correlation among independent variables. The model is considered free from multicollinearity if Tolerance > 0.10 and VIF < 10.
    c. Heteroscedasticity Test: Detects unequal variances of residuals. The absence of heteroscedasticity is confirmed if the scatterplot of residuals appears randomly distributed without a discernible pattern.
4. Coefficient of Determination (R^2): This test examines the proportion of variation in the dependent variable (Purchase Decision) explained by the independent variables (Price and Service Quality).
5. Partial Test (t-test): This test is used to determine the individual influence of each independent variable on the dependent variable. It shows whether Price and Service Quality have a statistically significant impact when considered separately.
6. Simultaneous Test (F-test): This test evaluates whether Price and Service Quality together have a statistically significant effect on the Purchase Decision.
7. Multiple Linear Regression Analysis: This analysis is used to assess both the simultaneous and partial effects of Price (X_1) and Service Quality (X_2) on Purchase Decision (Y). It determines how each independent variable influences the dependent variable while controlling for the other. The regression produces coefficient values that indicate the direction and strength of the relationship, as well as the coefficient of determination (R^2), which reflects the proportion of variance in the purchase decision explained by both variables. This method also supports hypothesis testing through t-tests (partial) and F-tests (simultaneous), allowing for a comprehensive evaluation of the model's predictive power.

Hypothesis testing was conducted at a significance level of α = 0.05 (5%)

a) If p-value ≤ 0.05, the alternative hypothesis (Ha) is accepted, indicating a statistically significant effect.
b) If p-value > 0.05, the null hypothesis (Ho) is accepted, indicating no statistically significant effect.

Additionally, for the t-test, significance is also confirmed if the t-statistic is equal to or greater than the t-table value. This analytical approach ensures that the findings are statistically valid and capable of accurately explaining the influence of Price and Service Quality on consumer Purchase Decisions at Gerai Hania Online Store in Medan.

3. Results and Discussion

This study conducted a descriptive analysis to understand the demographic background and purchasing preferences of consumers at Gerai Hania, an online store based in Medan, Indonesia. Data was collected through questionnaires distributed to 90 respondents, selected using the Slovin formula to ensure an accurate representation of the population. The population consisted of all customers who made purchases at Gerai Hania, which recorded an average of 173 transactions per month between November 2024 and March 2025. Since the exact number of unique customers was unknown and the population was relatively large, probability-based sampling was not feasible. The information gathered includes variables such as gender, age, education level, purchase frequency, source of information, preferred payment method, and the primary factors influencing purchasing decisions. All 90 questionnaires were fully completed and deemed valid for analysis, resulting in a 100%

response rate. Accordingly, both descriptive and inferential analyses were conducted based on this dataset, providing a representative insight into the characteristics and behaviour of Gerai Hania's consumer base.

Table 1. Respondent characteristics

No	Respondent Characteristic	Category	Frequency (n)	Percentage (%)
1	Age	< 20 years	10	11.10%
		20 – 25 years	64	71.10%
		26 – 30 years	5	5.60%
		31 – 35 years	6	6.70%
		> 35 years	5	5.60%
2	Gender	Male	33	36.70%
		Female	57	63.30%
3	Last Education Level	Senior High School (SMA/SMK)	57	63.30%
		Diploma	6	6.70%
		Undergraduate/Graduate/Postgraduate (S1/S2/S3)	27	30.00%
4	Purchase Frequency	Once	31	34.40%
		2–3 times	37	41.10%
		More than 3 times	22	24.40%
5	Source of Information	Instagram	27	30.00%
		TikTok	21	23.30%
		Friends/Family	42	46.70%
6	Payment Method	Cash on Delivery (COD)	45	50.00%
		E-wallet	22	24.40%
		Credit/Debit Card	7	7.80%
		Bank Transfer	16	17.80%
7	Main Factor Influencing Purchase	Service Quality	34	37.80%
		Product Price	19	21.10%
		Recommendations from Others	12	13.30%
		Combination (price, quality, promo, service)	25	27.80%

Based on Table 1, the respondent characteristics in this study reflect the demographic profile and purchasing behaviour of consumers at the Gerai Hania Online Store. These characteristics include age, gender, level of education, purchase frequency, source of information, payment method, and the main factors influencing purchase decisions. A detailed explanation of each characteristic is presented below:

a. Age Distribution
   The majority of respondents (71.10%) were aged between 20 and 25 years, indicating that Gerai Hania's customer base is dominated by young adults. Meanwhile, 11.10% were under 20 years old, and smaller proportions were found in the 26–30 (5.60%), 31–35 (6.70%), and over 35 years (5.60%) age groups. This suggests that the store primarily appeals to consumers in early adulthood, a group typically active in online shopping and responsive to digital marketing.
b. Gender
   Female respondents constituted a higher proportion (63.30%) compared to males (36.70%). This aligns with existing consumer behaviour studies, which show that

women tend to dominate in online retail, particularly in fashion, beauty, and lifestyle-related products.

c. Educational Background
   Most respondents (63.30%) completed senior high school (SMA/SMK), followed by 30.00% who held undergraduate or postgraduate degrees (S1/S2/S3), and 6.70% with diploma-level education. This reflects a consumer group with relatively broad educational backgrounds, with a significant portion being early stage working professionals or students.
d. Purchase Frequency
   In terms of purchase frequency, 41.10% of respondents had purchased 2–3 times from the store, while 34.40% had only purchased once, and 24.40% had made more than three purchases. This indicates a relatively high level of repeat purchases, which may suggest customer satisfaction or effective promotional strategies.
e. Source of Information
   When asked how they discovered the store, 46.70% cited recommendations from friends or family, 30.00% through Instagram, and 23.30% via TikTok. These findings highlight the role of word-of-mouth and social media, particularly Instagram, as primary marketing channels for attracting customers.
f. Payment Methods
   Cash on Delivery (COD) was the most preferred payment method (50.00%), followed by e-wallets (24.40%), bank transfers (17.80%), and credit/debit cards (7.80%). The dominance of COD suggests that trust and convenience remain important factors in online transactions for this market segment.
g. Main Factors Influencing Purchase Decisions
   Regarding the main factors influencing purchase decisions, 37.80% of respondents prioritised service quality, followed by price (21.10%), recommendations from others (13.30%), and a combination of factors (27.80%), including price, quality, promotions, and service. This implies that service excellence plays a crucial role in consumer decision-making, along with a balanced value proposition.

Overall, the respondent profile indicates that Gerai Hania's primary customers are young, digitally connected, and value-driven consumers who are sensitive to both service quality and peer influence. These insights are valuable for targeting and refining marketing strategies, as well as improving customer retention efforts. To evaluate the accuracy of each measurement item in representing its respective construct, a validity test was conducted using the Pearson product-moment correlation technique. This method assesses the degree to which each questionnaire item correlates with the total score of its variable, thereby determining whether the item is capable of validly measuring what it is intended to measure.

The test was performed at a significance level of $\alpha = 0.05$, with 90 respondents included in the analysis. Based on the degrees of freedom ($df = N - 2 = 88$), the critical R-value (r-table) was determined to be 0.2071. Any item with a correlation coefficient greater than 0.2071 and a p-value less than 0.05 is considered statistically valid. The validity test was applied to three key variables: Price (X_1), Service Quality (X_2), and Purchase Decision (Y), each of which was measured using five questionnaire items. The results of the validity test for each variable are detailed below:

Price (X_1) was measured through five indicators designed to capture consumer perceptions of pricing strategies, fairness, and value. The results of the validity test are presented in Table 2.

Table 2. Validity test results for price (X_1)

Item	Correlation Coefficient (r)	r-table	Decision
1	0.792	0.2071	Valid
2	0.869	0.2071	Valid
3	0.841	0.2071	Valid
4	0.796	0.2071	Valid
5	0.809	0.2071	Valid

As shown above, the correlation coefficients for all five items range from 0.792 to 0.869, which are significantly higher than the r-table value. This indicates a strong and consistent correlation between each item and the total score of the Price variable. Consequently, all items are considered valid and accurately reflect the construct they are intended to measure. Service Quality (X_2), The Service Quality variable was also assessed using five indicators that measured dimensions such as responsiveness, reliability, and customer satisfaction. The validity results are presented in Table 3.

Table 3. Validity test results for service quality (X_2)

Item	Correlation Coefficient (r)	r-table	Decision
1	0.834	0.2071	Valid
2	0.828	0.2071	Valid
3	0.784	0.2071	Valid
4	0.839	0.2071	Valid
5	0.836	0.2071	Valid

All items demonstrate correlation coefficients above the threshold, ranging from 0.784 to 0.839, with statistically significant p-values ($p < 0.05$). This confirms that each item effectively measures the Service Quality construct, making them all suitable for inclusion in further analysis. Purchase Decision (Y), To assess Purchase Decision, five indicators were used to capture the factors influencing consumers' decision-making processes, including intention, behaviour, and satisfaction. The results are provided in Table 4.

Table 4. Validity test results for purchase decision (Y)

Item	Correlation Coefficient (r)	r-table	Decision
1	0.828	0.2071	Valid
2	0.847	0.2071	Valid
3	0.769	0.2071	Valid
4	0.822	0.2071	Valid
5	0.83	0.2071	Valid

The correlation coefficients for this variable range from 0.769 to 0.847, which clearly exceeds the critical value. All p-values are also below 0.05, affirming that these items validly measure the intended construct. To evaluate the internal consistency of the research instrument, a reliability test was conducted using Cronbach's Alpha coefficient. This statistical measure is commonly employed to determine the extent to which items within a construct yield consistent results. A Cronbach's Alpha value of 0.70 or higher is generally accepted to indicate a high level of reliability, suggesting that the items collectively measure the same underlying construct with adequate consistency.

The reliability test in this study was performed on three key variables: Price (X_1), Service Quality (X_2), and Purchase Decision (Y). Each variable was measured using five questionnaire items. The results of the analysis are presented in Table 5.

Table 5. Reliability test results of research variables

Variable	Number of Items	Cronbach's Alpha	Decision
Price (X_1)	0.88	5	Reliable
Service Quality (X_2)	0.882	5	Reliable
Purchase Decision (Y)	0.877	5	Reliable

The results indicate that the Price variable obtained Cronbach's Alpha of 0.880, confirming strong internal consistency among the five items used to measure consumer perceptions related to pricing. The Service Quality variable showed a Cronbach's Alpha of 0.882, suggesting a high degree of reliability in the measurement of service-related factors such as responsiveness, accuracy, and customer satisfaction. The Purchase Decision variable achieved a Cronbach's Alpha of 0.877, indicating that the instrument used to assess consumer purchase behaviour is also highly reliable.

These findings demonstrate that all measurement instruments used in this study possess an acceptable level of reliability. Therefore, the items are considered suitable for further statistical analysis, including regression modelling and hypothesis testing, which depend on the internal consistency of the variables involved. To assess whether the data used in this study follow a normal distribution, a normality test was conducted using two approaches: the Shapiro–Wilk test, which is suitable for small to medium sample sizes, and a visual assessment using the Q–Q Plot. The assumption of normality is an essential prerequisite for conducting parametric tests, such as multiple linear regression.

Table 6. Normality test results

Variable	Kolmogorov–Smirnov Sig.	Shapiro–Wilk Sig.	Conclusion
Price (X_1)	0.009	0.200*	Normal
Service Quality (X_2)	0.004	0.057	Normal
Purchase Decision (Y)	0.002	0.094	Normal

The Shapiro–Wilk test results for all three variables show p-values greater than 0.05, indicating that the data are normally distributed and do not significantly deviate from the expected distribution. Even though the Kolmogorov–Smirnov test indicates lower p-values, the Shapiro–Wilk test is prioritised due to its higher sensitivity in small samples (N = 90). In addition to the statistical test, a Normal Q–Q Plot was examined to provide visual confirmation of normality. As shown in Fig. 2, the data points are closely aligned along the diagonal line, further supporting the conclusion that the residuals are normally distributed.

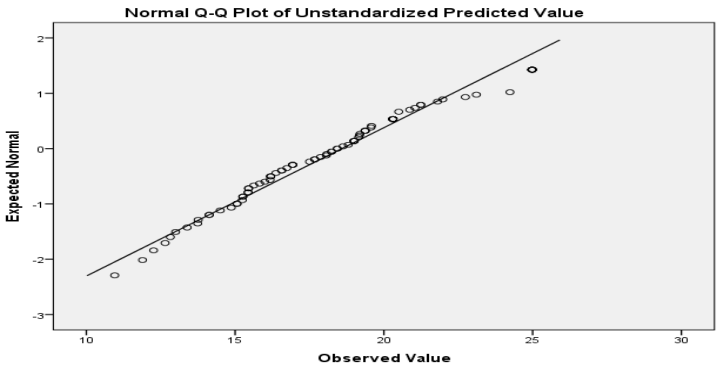

Fig.3. Normal Q–Q plot of unstandardized predicted values

The combination of statistical results and visual inspection confirms that the normality assumption has been satisfied, and thus the dataset is appropriate for further parametric analyses such as regression.

To identify multicollinearity between independent variables, the analysis used the Variance Inflation Factor (VIF) and Tolerance. The test results are summarised in Table 7.

Table 7. Multicollinearity T-test results

Variable	Tolerance	VIF	Conclusion
Price (X_1)	0.22	4.537	No multicollinearity
Service Quality (X_2)	0.22	4.537	No multicollinearity

Both variables show VIF values below 10 and Tolerance above 0.10, indicating no multicollinearity. Thus, the independent variables can be reliably used in the regression model. Heteroscedasticity was tested using a scatterplot of unstandardized residuals versus predicted values. As shown in Figure 4, the residuals are randomly dispersed without forming a specific pattern. This indicates that the assumption of homoscedasticity is met, and no heteroscedasticity is present in the model.

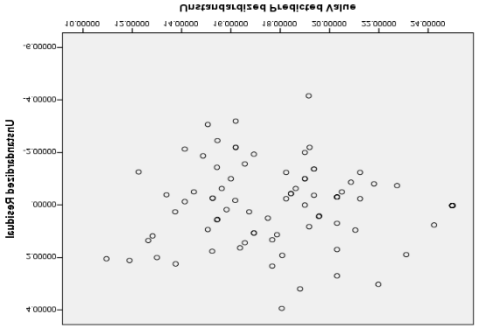

Fig.4. Scatterplot of unstandardized residuals

As shown in the scatterplot, the distribution of residuals appears to be randomly scattered around the horizontal axis, with no discernible pattern such as a funnel shape, curve, or systematic clustering. This indicates that the variance of the residuals remains relatively constant across all levels of the predicted values. Based on this visual inspection, it can be concluded that heteroscedasticity is not present in the model. Therefore, the assumption of homoscedasticity is satisfied, and the regression analysis can proceed without bias related to unequal variance of residuals. A multiple linear regression was conducted to evaluate the effect of Price (X_1) and Service Quality (X_2) on Purchase Decision (Y). The results are shown in the table below:

a) Model Summary

Table 8. Model Summary

No	Type of correlation	Correlation value
1	R	0.931
2	R^2	0.867
3	Adj R^2	0.864

The correlation coefficient (R) of 0.931 indicates a very strong positive relationship between the variables. The coefficient of determination (R^2) of 0.867 means that 86.7% of the variation in Purchase Decision can be explained by Price and Service Quality. The Adjusted R^2 value of 0.864 confirms the model's consistency, making it suitable for interpretation and further analysis.

b) Simultaneous Test (F-Test)

To test the simultaneous effect of Price (X_1) and Service Quality (X_2) on Purchase Decision (Y), an F-test was conducted through ANOVA analysis. The results are presented below:

Table 13. F-test results

	Model	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1237.665	2	618.833	283.176	0
	Residual	190.123	87	2.185		
	Total	1427.789	89			

a. Dependent Variable: Y_Total
b. Predictors: (Constant), X2_Total, X1_Total

At a significance level of α = 0.05, with $df_1 = 2$ and $df_2 = 87$, the F-table value is approximately 3.10. Since the computed F-value (283.176) is far greater than the F-table value and the p-value = 0.000 < 0.05, it can be concluded that the regression model is statistically significant. This indicates that both Price and Service Quality have a significant effect on the Purchase Decision simultaneously.

c) Partial Test (t-Test)

Table 14. T-test results

Variable	Coef. (B)	t-value	Sig.	t-table (df = 63)	Interpretation
Constant	1.773	1.843	0.070	1.987	Not significant
X_1 (Price)	0.327	4.606	0.000	1.987	Significant positive effect
X_2 (Service Quality)	0.265	3.555	0.001	1.987	Significant positive effect

At a significance level of α = 0.05 with df = 87, the critical t-table value is 1.987. Both independent variables meet the criteria for statistical significance, as their t-values exceed the t-table value and their p-values are less than 0.05. This confirms that both Price and Service Quality have a significant and positive influence on Purchase Decision, with Price (X_1) exerting a slightly stronger effect.

d) Regression Equation

Based on the multiple linear regression analysis, the regression equation that models the relationship between the independent variables—Price (X_1) and Service Quality (X_2)—and the dependent variable Purchase Decision (Y) is expressed as follows:

$$Y= 1.602+0.370X1+0.565X2+e \quad (1)$$

Where:
Y = Purchase Decision
X_1 = Price
X_2 = Service Quality
E = Error Term (at α = 0.05)

The results of the multiple linear regression analysis yielded the equation $Y = 1.602 + 0.370X_1 + 0.565X_2 + e$, indicating that when both Price (X_1) and Service Quality (X_2) are zero, the baseline level of Purchase Decision (Y) is 1.602. The coefficient for Price (0.370) suggests that each one-unit increase in price contributes to a 0.370-unit increase in purchase decision, while the coefficient for Service Quality (0.565) implies a 0.565-unit increase in purchase decision for every one-unit improvement in service quality, assuming other variables remain constant. Both variables have p-values of 0.000, which are below the 0.05 significance threshold, confirming that Price and Service Quality each have a statistically significant and positive influence on consumer purchase decisions at Gerai Hania Online Store.

The findings from the multiple linear regression analysis demonstrate that both Price (X_1) and Service Quality (X_2) significantly influence Purchase Decision (Y) among consumers of the

Gerai Hania online store. The regression model is statistically valid, as indicated by the ANOVA significance value of 0.000 ($p < 0.05$), and shows high explanatory power with an R^2 value of 0.867, indicating that 86.7% of the variation in purchase decisions can be explained by the two independent variables, while the remaining 13.3% is attributed to other factors not included in the model.

Partially, Price (X_1) has a positive and significant effect on purchase decisions, with a regression coefficient of 0.370 and a significance value of 0.000. This suggests that competitive pricing plays an important role in influencing consumer decisions, particularly in online markets where price comparisons are easily accessible. This result is consistent with the studies by Mita Soraya and Yoestini, as well as Zenada et al., which found that consumers tend to choose products that offer a balance between price and quality(Mita Soraya & Yoestini, 2024; Zenada et al., 2024). However, contrasting findings from Arisa and Wiranto and Amron (2024) indicate that in certain contexts, factors such as brand trust, product reviews, or promotional programs may have a stronger influence than price alone(Arisa, 2024; Wiranto & Amron, 2024).

Similarly, Service Quality (X_2) shows a significant positive influence on Purchase Decision, with a regression coefficient of 0.565 and a significance value of 0.000. This finding implies that improvements in service quality, such as responsive communication, accurate product information, delivery reliability, and effective return policies, can enhance customer satisfaction and increase the likelihood of purchase. These results are supported by the findings of Prihandoyo et al. and Muhtad, who emphasised that service excellence contributes significantly to purchase behaviour, particularly in the online shopping environment (Muhtadi, 2024; Prihandoyo et al., 2025). However, some studies, such as those by Humairoh and Riski, Sirait and Arjuna found that service quality did not significantly affect purchase decisions in some cases, as customers prioritised free shipping, discounts, or peer reviews over service interactions (Humairoh & Riski, 2024; Sirait & Arjuna, 2025).

Simultaneously, the combined effect of Price and Service Quality is confirmed through the F-test, with an F-value of 283.176 and a significance value of 0.000, demonstrating that these two variables together have a statistically significant impact on Purchase Decision. The high R^2 value supports the assertion that both price strategies and service performance are essential components in influencing consumer behaviour. These findings align with the research of Widianti and Langga, who stated that the synergy between pricing and service factors contributes to customer loyalty and repeat purchases(Langga, 2024; Widianti, 2024). However, alternative perspectives from Adinitasya and Sulastri argue that in some settings, brand awareness, product quality, and consumer trust may have greater simultaneous influence than price and service (Adinitasya & Sulastri, 2024).

Taken together, the findings confirm that price and service quality both play critical roles in shaping purchase decisions in the context of online retail. However, the extent of their influence may vary depending on consumer characteristics, product types, and market dynamics. It is therefore essential for online businesses to not only offer competitive prices and superior service but also to consider other strategic elements such as branding, user experience, and promotional effectiveness.

4. Conclusion

This study aimed to investigate the effect of Price and Service Quality on consumer Purchase Decisions in the context of an online retail store, Gerai Hania in Medan. Based on multiple linear regression analysis, the findings reveal that both Price and Service Quality have a significant and positive influence on purchase decisions, either partially or simultaneously. The R Square value of 0.867 indicates that these two variables can explain 86.7% of the variance in purchase decisions. The t-test results confirmed that Price (Sig. = 0.000) and Service Quality (Sig. = 0.000) are individually significant predictors, while the F-test result (Sig. = 0.000) supports their combined effect. These results contribute to the growing body of knowledge on consumer behaviour in digital commerce by reaffirming that competitive pricing and excellent service delivery are critical drivers of purchasing intent and decision-making. Practically, this suggests that online retailers should adopt a balanced strategy by ensuring both affordability and quality service to build trust, enhance customer satisfaction, and increase sales conversion. Future research is encouraged to include other influencing variables such as brand trust, promotional strategies, customer reviews, and user experience to provide a more comprehensive understanding of consumer decision-making. It is also recommended that longitudinal or comparative studies be conducted across different product categories or regions to validate and enrich these findings.

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ADAPTING TO THE DIGITAL SHIFT: E-INVOICING AND TAX REFORM IN MALAYSIA

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Abstract

Malaysia stands on the edge of a major digital transformation in tax administration, with the scheduled implementation of mandatory electronic invoicing (E-invoicing) set to begin in August 2024. Positioned as a cornerstone of the nation's broader digitalization efforts, e-invoicing is expected to reshape business transaction processes by promoting greater transparency, operational efficiency, and improved tax compliance. However, the transition poses significant challenges, particularly for small and medium-sized enterprises (SMEs), which often lack the necessary infrastructure and readiness in implementing e-invoicing. This study examines the various aspects of e-invoicing adoption in Malaysia, highlighting its potential benefits, regulatory challenges, and implementation obstacles. Drawing from extensive literature, the research highlights major concerns such as limited digital capabilities, integration difficulties with existing systems, and rising cybersecurity risks. Despite clear advantages including cost savings, improved data accuracy, and environmental benefits measures the success of this initiative depends heavily on well-structured policies, resilient digital infrastructure, and the integration of technologies like blockchain, artificial intelligence, and cloud computing. The study underscores the importance of targeted support, clear regulatory guidance, and capacity in the building programs to ensure inclusive and effective adoption across all business segments.
Keywords: Digital readiness; E-invoicing; Tax reform.

1. Introduction

Digitalization has significantly enhanced the ability of tax administrations to collect, process, and monitor tax information in real time. Among the most impactful innovations is E-invoicing, which streamlines the exchange of billing data between businesses and tax authorities. Many African tax administrations have embraced digital tools like e-invoicing to boost revenue collection, improve administrative performance, and provide better-quality services to individuals and businesses in promoting a more growth-friendly tax system (African Tax Administration Forum [ATAF], 2021a). E-invoicing also offers operational benefits to businesses by improving the efficiency and accuracy of recordkeeping (PwC, 2021). For tax authorities, it enables timely validation of taxpayer records and cross-verification with trading partners, helping to reduce tax evasion and strengthen compliance (OECD, 2020; IMF, 2020).

Several Asian economies, including South Korea, Indonesia, and India, have implemented phased e-invoicing requirements with differing levels of integration. These initiatives are frequently backed by advanced digital infrastructure and clear regulations. Instead of simplifying business-to-business (B2B) and business-to-government (B2G) transactions, the evolution has given tax authorities the authority to carry out risk-based audits, lessen administrative requirements, and make conducting business easier.

Considering these global trends, Malaysia is ready to start its own e-invoicing journey. The Inland Revenue Board of Malaysia (IRBM) oversees the required implementation, which has been since August 2024. The program is a crucial part of the nation's larger MyDigital strategy, which aims to improve tax efficiency, fortify digital governance, and harmonize with international best practices. In a time when fiscal leakage and shadow economy activities

continue to be major concerns, e-invoicing in Malaysia is intended to foster transparency, operational efficiency, and improved tax compliance.

However, the Malaysian context presents a unique set of challenges. Small and medium-sized firms (SMEs) make up more than 97% of all businesses in the country, yet they frequently lack the resources and technological know-how needed to adhere to e-invoicing laws. Issues, including lack of knowledge, incompatibility with older systems, and cybersecurity vulnerabilities, make the adoption of e-invoicing more challenging. As it moves closer to full implementation, Malaysia will need strong regulatory frameworks, technical infrastructure, public-private cooperation, and supportive mechanisms like financial incentives, capacity-building, and transitional assistance programs (Ernst & Young, 2023; MDEC, 2022).
The objective of this study is to investigate and assess the use of electronic invoicing in the Malaysian business environment, with a particular emphasis on small and medium-sized businesses (SMEs). This study aims to assess the advantages and challenges in adopting E-invoicing, look at how prepared SMEs are for digital and regulatory changes, and suggest tactical ways to get past possible implementation challenges. The goal of this study is to yield insightful information that encourages the widespread use of e-invoicing.

Efforts by the government to improve tax compliance, decrease fraud, and encourage digital transformation in financial reporting have propelled the global adoption of e-invoicing between 2021 and 2025. E-invoicing platforms are now crucial in modernizing tax administration, increasing productivity, and facilitating real-time data verification. E-invoicing systems have been put in place in a number of nations to increase administrative effectiveness, lower fraud, and improve tax compliance. In order to prevent VAT fraud and expedite tax reporting, Italy implemented the Sistema di Inters Cambio (SdI) in 2019, requiring e-invoicing for both B2B and B2G transactions (OECD, 2022). In 2024, France plans to implement a nationwide electronic invoicing system with the goal of lowering administrative costs and enhancing fiscal transparency (European Commission, 2024). Furthermore, to improve GST compliance and enable real-time invoice tracking, India implemented a tiered method in 2020 that required e-invoicing depending on turnover thresholds (EY, 2023). In the effort to strengthen fiscal management and digital trade documentation, Brazil, an early adopter since the 2000s, extended its Nota Fiscal Eletrônica (NF-e) system between 2021 and 2023 (OECD, 2022; PwC, 2021). Besides that, to facilitate real-time B2B transaction monitoring, South Korea is working with the National Tax Service (NTS) to build an e-tax invoicing system between 2021 and 2025 (World Bank, 2021). To increase tax efficiency and facilitate real-time transaction monitoring, Malaysia's 2023 Budget mandated e-invoicing starting in August 2024 (LHDNM, 2023; Budget 2023).

As the need for efficiency, transparency, and digitalization in tax administration grows, Malaysia has implemented a complete E-invoicing Framework, intending to revolutionize the country's tax system. The goals of the Twelfth Malaysia Plan (12MP), which place a strong emphasis on speeding up digital transformation throughout the public sector, are in line with this strategy (Economic Planning Unit, 2021). Malaysia's larger commitment to implementing Fourth Industrial Revolution (IR4.0) technology, enhancing tax compliance, and reducing the shadow economy includes the use of e-invoicing (Ministry of Finance Malaysia, 2023). The Malaysian Inland Revenue Board (IRBM) created the MyInvois system, which makes it easier to validate and submit invoices in real time. The objectives of this system are to improve audit trails, lessen tax fraud potential, and expedite reporting procedures (IRBM, 2023). E-invoicing is essential to Malaysia's digital governance goal, as stated in the national fiscal policies for 2021–2025.

Policy / Source	Period	Initiative / Focus	Main Objectives	Source
Budget 2023 (MOF)	2022 – 2024	Official announcement of mandatory e-invoicing starting August 2024	Tax reform, improve compliance, digitize reporting	Ministry of Finance Malaysia. (2022)
LHDNM e-invoicing Guideline	2023 – 2024	Technical guide on e-invoicing structure and MyInvois system	Standardized e-documents for B2B, B2C, B2G transactions	Inland Revenue Board of Malaysia. (2023)
12th Malaysia Plan (RMK-12)	2021 – 2025	National development strategy; digitalisation of the public sector and tax admin	Modernize tax infrastructure, empower digital SMEs	Economic Planning Unit. (2021a)
Malaysia Digital Economy Blueprint (MyDIGITAL)	2021 – 2025	Digital-first public sector, cloud adoption, real-time services	Enable smart governance and cloud-ready tax systems	Economic Planning Unit. (2021b)
LHDNM e-invoicing Roadmap & FAQs	2024	Detailed phased implementation by taxpayer category	Ensure readiness and clarity for mandatory implementation	Inland Revenue Board of Malaysia. (2024)

Fig. 1. Malaysia's e-invoicing framework

The implementation of e-invoicing in Malaysia, pioneered by LHDN via the MyInvois system, is consistent with the country's larger digital transformation strategy delineated in the Twelfth Malaysia Plan (12MP). Key national policies between 2021 and 2025 that seek to improve compliance, simplify tax administration, and digitize financial reporting are the driving forces behind this project. The formal Budget 2023 requirement for the implementation of e-invoicing beginning in August 2024, the release of comprehensive technical instructions and roadmaps by LHDN, and the strategic frameworks offered by RMK-12 and the Malaysia Digital Economy Blueprint (MyDIGITAL) are some of the crucial initiatives. A complete framework for Malaysia's transition to a digital tax environment is formed by several projects, which collectively place an emphasis on smart governance, digital SME empowerment, real-time services, and standardized e-documentation across B2B, B2C, and B2G transactions.

Malaysia's implementation of e-invoicing is supported by a consistent set of national and regional policy frameworks aimed at speeding digital transformation, boosting tax transparency, and improving administrative efficiency. The 12th Malaysia Plan (2021–2025) provides foundational support by prioritising the modernisation of tax administration through the development of digital infrastructure, sound governance practices, and the empowerment of small and medium enterprises (Economic Planning Unit, 2021). Complementing this, Budgets 2023 and 2024 serve as critical policy instruments that formalise e-invoicing implementation through legislative mandates and fiscal incentives, thereby reinforcing the nation’s broader agenda of tax reform and digitalisation (Ministry of Finance Malaysia, 2023). The Malaysia Digital Economy Blueprint (MyDIGITAL) further positions e-invoicing as a pivotal component in building a secure, trustworthy, and interoperable digital government ecosystem (Economic Planning Unit, 2021b). At the operational level, the LHDNM E-invoicing Guidelines (2023–2024) outline the technical specifications and phased rollout plans necessary to facilitate a structured nationwide implementation (Inland Revenue Board of Malaysia [LHDNM], 2023). Regionally, Malaysia’s strategy aligns with the ASEAN Digital Integration Framework and the OECD’s BEPS 2.0 initiative, both of which advocate for standardised digital tax practices and cross-border interoperability (ASEAN, 2021; OECD, 2022). Collectively, these strategic policy instruments reflect a systematic and future-oriented

approach to digitalising public financial management while promoting compliance, efficiency, and global competitiveness.

NO.	POLICY	RELATION TO E-INVOICING	CHARACTERISTICS																					
			Digital-First Approach – Strong push for digital public services and business transformation.	Governance & Integrity – Enhances transparency and efficiency in revenue collection.	SME Empowerment – Promotes SME digitalisation and automation.	Sustainable Growth – Encourages paperless operations and green technology.	Sustainable Growth – Encourages paperless operations and green technology.	Inclusivity – Ensures fair tax enforcement through digital compliance.	Mandatory Implementation Plan – Phased e-invoice rollout starting August 2024, based on annual turnover.	Tax System Transparency – Seeks to improve auditability and traceability of business transactions.	Combat Shadow Economy – Targets unreported income through real-time validation of e-invoices.	Digital Transformation in Tax – Invests in infrastructure to support e-taxation systems.	Public Sector Digitalisation – Accelerates e-government initiatives like MyInvois.	Cybersecurity & Trust – Emphasizes secure data exchange and protection in digital transactions.	Infrastructure-Driven – Supports cloud, 5G and integration for scalable systems.	Citizen-Centric – Focuses on service delivery efficiency and user experience.	Validation Model – All invoices must be validated via LHDNM before issuance.	Two Submission Options – Via MyInvois Portal (manual) or API integration (automated).	B2B, B2C, B2G Coverage – Applies across all transaction types.	Real-Time Reporting – Enables near-instant tax compliance tracking.	Regional Interoperability – Harmonization of digital transaction systems.	Tax Framework Alignment – Encourages unified e-invoicing structures among ASEAN countries.	International Tax Reform – Linked with OECD's BEPS 2.0 for fair taxation of digital economy.	Future-Proofing Tax Policy – Prepares Malaysia for global e-invoicing & digital VAT requirements.
1	**12th Malaysia Plan (RMK12)** Policy Focus: National Development Strategy (2021–2025)	Supports e-invoicing as a tool to modernize tax administration, reduce leakages, and improve fiscal management.	/	/	/	/	/	/																
2	**Budget 2023 & Budget 2024** Policy Focus: Fiscal Reform & Tax Administration Modernization	Serves as the triggering policy that mandates e-invoicing across Malaysia, with legal backing and timelines.							/	/	/	/												
3	**Malaysia Digital Economy Blueprint (MyDIGITAL)** Policy Focus: Digitalization of Government & Economy	E-invoicing aligns with MyDIGITAL's goal to create a trusted, efficient, and tech-enabled government system.											/	/	/	/								
4	**LHDNM E-Invoicing Guidelines (2023–2024)** Policy Focus: Technical & Operational Framework for E-	Provides the blueprint and mechanism for e-invoicing execution in Malaysia.															/	/	/	/				
5	**ASEAN Digital Integration Framework & BEPS 2.0** Policy Focus: Cross-Border Digital Tax Cooperation	Positions Malaysia as part of regional and global efforts to digitalize taxation and promote fair cross-border e-trade.																			/	/	/	/

Fig. 2. Characteristics of government policies in facilitating e-invoicing adoption in Malaysia

Malaysia's adoption of e-invoicing from 2021 to 2025 has benefited the public and private sectors significantly and is consistent with the country's larger vision for digital transformation. Enhancing tax compliance and transparency through real-time invoice validation and reporting to tax authorities is one of the biggest benefits. This improves audit trails and reduces fraudulent activities (Ministry of Finance Malaysia, 2022). The Inland Revenue Board of Malaysia (LHDNM) can reduce the tax gap and encourage more accountability in the fiscal ecosystem with the help of this capability.

E-invoicing promotes process automation and cost reduction from an operational standpoint. Business transactions are streamlined by the digitization of invoicing procedures, which decreases human error, administrative overheads, and manual entry (Inland Revenue Board of Malaysia, 2023). Businesses have reported up to 80% cost savings by doing away with paper-based invoicing procedures, including printing, storage, and postal costs, according to recent industry data (Billentis, 2020; Avalara, 2025).

Adopting standardized formats for business-to-business (B2B), business-to-consumer (B2C), and business-to-government (B2G) transactions also makes it easier for different platforms and sectors to integrate seamlessly and promotes industry-wide interoperability (Inland Revenue Board of Malaysia, 2024). Faster payment cycles, better working capital management, and increased cash flow efficiency are all benefits of interoperability, especially for SMEs (Economic Planning Unit, 2021a).

By enabling a cloud-ready, digital-first public sector, e-invoicing also plays a critical role in furthering the objectives of the Malaysia Digital Economy Blueprint (MyDIGITAL), which includes better administrative transparency and public service delivery (Economic Planning Unit, 2021b). The move to paperless operations greatly lowers carbon emissions and advances worldwide Environmental, Social, and Governance (ESG) goals from the perspective of environmental sustainability (Carbon Trust, 2022; Pagero, 2025).

Additional operational advantages include improved invoicing accuracy, where automation has resulted in a 37% decrease in invoice disputes, strengthening vendor relationships, and requiring less reconciliation work (Aberdeen Group, 2021). Additionally, by offering real-time financial information, integration with business systems enhances forecasting, data analysis,

and strategic decision-making (Digitalist Magazine, 2023). According to Kolleno (2025) and the OECD (2021), e-invoicing facilitates digital audit capabilities and real-time tax inspections, ensuring regulatory compliance with both local and international standards, including those suggested by the OECD. As more nations enact laws requiring digital reporting, this compliance readiness is very important. Finally, e-invoicing systems' scalability makes them ideal for small and medium-sized businesses (SMEs), allowing for expansion without corresponding increases in administrative burden (Gartner, 2024). Additionally, automated audit trails and secure digital records strengthen data integrity, lower the risk of fraud, and increase responsibility (HSBC Business Go, 2023; Kiizen, 2024). When combined, these advantages demonstrate how e-invoicing may revolutionize Malaysia's financial environment and increase its competitiveness in the global digital economy.

Beginning in August 2024 for companies with yearly revenues over RM100 million, Malaysia has implemented a phased mandate for mandatory electronic invoicing, or e-invoicing, through the MyInvois system. By January 2026, smaller businesses will follow suit (IRBM, 2023b). This phased implementation is in line with Malaysia's overarching objectives for digital transformation, which include improving economic formalization, operational transparency, and tax compliance (EPU, 2021). The shift is fraught with difficulties, though, especially for small and medium-sized businesses (SMEs), which must overcome organizational, financial, legal, and technical obstacles. According to analysts, complete support will be necessary to enable inclusive and successful adoption, even in the face of continued mitigation tactics such as exemptions, training initiatives, and financial incentives (KPMG, 2023; Tricor, 2024).

Since the Inland Revenue Board (IRBM) uses a structured e-invoicing format based on XML or JSON standards, Malaysian SMEs frequently use antiquated accounting systems that are incompatible with it (IRBM, 2023a). Real-time data validation, system upgrades, and large API investments are necessary for integration with the MyInvois system. For businesses that have not yet digitized, the IRBM's need for 55 invoice fields, of which 37 are mandatory, presents a hurdle (Deloitte, 2023). Frequent data formatting problems, duplicate errors, and rejected invoices because of unfilled fields have been reported by early adopters. Cybersecurity concerns are also quite real, and stakeholders stress the importance of strong encryption and data control (PwC Malaysia, 2024), as lack of the ability to properly handle system updates or secure sensitive financial data, SMEs with inadequate IT infrastructure are excessively impacted.

Adoption becomes even more challenging due to the changing compliance framework. Implementation dates and requirements have changed after the publication of IRBM's E-Invoice Guideline Version 4.1 (and later 4.2), particularly for SMEs. Businesses having RM25 million to RM100 million in sales as of 2024 are needed to comply by January 2025, while those with RM500,000 or less only have to comply by January 2026 (IRBM, 2023b). New regulations pertaining to self-billed and aggregated invoices, which vary between B2B and B2C transactions, must also be understood by taxpayers. Concern over the "fear of non-compliance due to complexity and ambiguity," particularly during the transitioning phase, has been voiced by numerous SMEs (SME Corp Malaysia, 2023). Lacks in knowledge and comprehension still exist across industries, despite the government's provision of short-term respite through "soft launch" grace periods and allowances for monthly consolidated billing (Bernama, 2024).

One additional significant obstacle is the cost of compliance. Financial hardship results from the need for many SMEs to retrain employees, pay consultants or software suppliers, and purchase new digital tools (World Bank, 2022). Larger companies might be able to afford these expenses, but small and medium-sized businesses find it difficult to put digital investments ahead of fundamental functions. The Malaysian government implemented accelerated capital allowances for ICT-related purchases under Budget 2024 in order to lessen this burden (MOF, 2023). Concurrently, the Malaysia Digital Economy Corporation (MDEC) collaborated with

software providers to provide SMEs with free or inexpensive e-invoicing services. However, there are still remaining concerns over the long-term sustainability and dependability of these technologies, which contribute to their uneven adoption (Tricor, 2024). Even if incentives reduce the cost of entry, many companies say that unanticipated costs like vendor lock-in, system outages, or training delays still prevent full implementation.

Problems with people and organizations exacerbate technical and financial difficulties. There are misconceptions regarding the e-invoicing procedure because a sizable percentage of Malaysian SMEs lack internal IT and finance skills (KPMG, 2023). Many businesses make the mistake of confusing structured e-invoices with PDF invoices, which causes mistakes and delays. Due to the large variations in digital literacy among employees and small business owners, resistance to change is also common. According to a recent KPMG poll, 78% of SMEs said they were "less than halfway ready" for the changeover (KPMG, 2023). The challenges of scale for larger firms include realigning procedures, retraining entire accounting teams, and modernizing enterprise resource planning (ERP) systems. In addition to technology improvements, these human elements point to a greater need for extensive, focused training programs.

The IRBM and Ministry of Finance have implemented a number of support mechanisms, such as extended deadlines, training roadshows, and subsidized instruments, to solve these issues. More than 1,000 officers from all around Malaysia have been mobilized by the "Jelajah Mega e-Invois 2025" program to interact with SMEs directly and spread awareness (Bernama, 2024). Beyond that, the MyInvois software and webpage were created to assist microbusinesses in sending out free electronic invoices. Despite these attempts, analysts stress that a patient and well-coordinated strategy is one that gives companies the time and room to adjust without facing excessive penalties, which is essential to Malaysia's success. Despite the implementation phase is still complicated and developing, Malaysia is well-positioned to establish a more transparent, effective, and technologically enabled tax system with sustained support.

2. Methodology

Government records, official websites (such IRBM and SME Corp Malaysia), and academic databases, including ScienceDirect, Emerald Insight, and Google Scholar, are the sources of secondary data used in this study. Understanding the idea of e-invoicing, recognizing the difficulties SMEs confront, and analyzing its effects on SMEs, tax authorities, and other stakeholders are the goals. To find important topics about the advantages, challenges, and implications of implementing e-invoicing, content analysis was employed. Thematic analysis aided in highlighting research gaps, comparing results from various studies, and coming to logical conclusions. This method offers information on how SMEs adjust to electronic invoicing and offers tactics to facilitate a more seamless transition for all parties.

3. Results and Discussion

Malaysia's e-invoicing initiative is an essential step in improving transparency, supporting tax administration, and encouraging company adoption of digital technologies in accordance with the Twelfth Malaysia Plan and MyDIGITAL Blueprint. LHDNM's MyInvois technology facilitates real-time invoice validation and integration with existing systems to reduce fraud and improve tax compliance (Inland Revenue Board of Malaysia [IRBM], 2023a). Despite the clear benefits, such as reduced administrative costs, improved auditability, and environmental sustainability, many expectations remain unfulfilled, especially among SMEs. Technical challenges that hinder adoption include cybersecurity flaws, data integration issues, and obsolete accounting software (PwC Malaysia, 2024; KPMG, 2023). Moreover, regulatory ambiguity, which includes continuously updated rules and varying compliance levels based on turnover, makes the transition more challenging and time-consuming for SMEs (IRBM, 2023b; SME Corp Malaysia,

2023). Despite government support, including training roadshows and subsidized tools, SMEs continue to face resource limitations and digital literacy issues.

Adoption is further complicated by organizational and financial constraints. Many SMEs still find it difficult to pay for staff training, consultancy, and system improvements, despite the Budget 2024's introduction of expedited capital allowances and software incentives (Ministry of Finance Malaysia, 2023). Additionally, due to their lack of digital literacy and resistance to change, SME owners and employees often confuse organized e-invoicing for simple PDF forms (KPMG, 2023). Surveys indicate that approximately 78% of SMEs are not fully prepared for the August 2024 requirement, highlighting the critical need for targeted capacity-building programs (KPMG, 2023).

Category	Benefits	Challenges
Tax Compliance	Real-time validation improves audit trails & reduces fraud (IRBM, 2023a)	Regulatory ambiguity and frequently updated guidelines confuse SMEs (IRBM, 2023b; SME Corp Malaysia, 2023)
Operational Efficiency	Automates invoicing process, reduces manual errors and admin workload (Billentis, 2020; Kolleno, 2025)	Integration issues with legacy systems, API investment burdens (PwC Malaysia, 2024; Deloitte, 2023)
Financial Impact	Reduces costs (up to 80%) by eliminating paper-based invoices (Avalara, 2025)	High initial costs for software upgrades, training, and consultation (MOF, 2023; World Bank, 2022)
Environmental Sustainability	Supports ESG goals by reducing paper usage and emissions (Carbon Trust, 2022)	Lack of awareness of the sustainability link among SMEs
Cash Flow & Payment	Faster invoice cycles lead to better cash flow and working capital management (Economic Planning Unit, 2021a)	Payment cycle benefits are not visible to businesses without full integration.
Digital Transformation	Enhances adoption of cloud systems, blockchain, ERP integration (Digitalist Magazine, 2023)	Low digital literacy, resistance to change among SME owners & staff (KPMG, 2023)
Scalability	Ideal for SMEs scaling up operations with limited admin overhead (Gartner, 2024)	SMEs lack IT teams; misconceptions (e.g., confusing PDF with structured XML invoice)
Cybersecurity	Enables secure storage, traceability, and reduces invoice tampering (HSBC, 2023; Kiizen, 2024)	Rising cybersecurity concerns and lack of internal IT safeguards (PwC Malaysia, 2024)
Regulatory Alignment	Helps align Malaysia with global standards (OECD, 2022; EY, 2023)	Overlap between business models (B2B/B2C/B2G) leads to confusion in invoice categorisation
Government Support	Grants, MyInvois portal, Jelajah Mega roadshows & capital allowance support (Bernama, 2024; MOF, 2023)	Concerns over long-term sustainability and reliability of free software tools (Tricor, 2024)

Fig. 3. E-invoicing implementation in Malaysia: Adoption benefits vs challenges

4. Conclusion

In the country's journey towards digital tax reform, Malaysia's audacious decision to make e-invoicing mandatory is a turning point. The initiative's success depends on its capacity to bridge the digital readiness gap, especially among SMEs, even though it offers more transparency, operational efficiency, and worldwide regulatory harmonization. Fragmented adoption, unclear regulations, and insufficient digital capacity continue to be major obstacles despite robust policy support, obvious benefits, and established technological infrastructure.

Malaysia must provide inclusive, scalable solutions, boost public-private cooperation, and step up capacity-building initiatives to fully adapt to this digital revolution. E-invoicing can only become a revolutionary tool that changes Malaysia's fiscal landscape and equips its business ecosystem for a digital-first future by implementing coherent policies, rather than merely being a compliance mandate.

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APPLICATION OF SALES BUDGET IN ESTIMATING SALES AT DUDUKIN COFFEESHOP

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Abstract

This study aims to develop a sales budget at Dudukin Coffeeshop using the Trend Moment, Least Square, and Semi Average forecasting methods. Effective sales planning is very important to maximize revenue and manage product availability, especially for their flagship product, Sanger. The data used in this research is Sanger sales data from January to December 2024. This research uses a quantitative descriptive approach with analysis techniques in the form of sales forecasting using the three methods, as well as calculating the Standard Forecasting Error (SKF) to assess the accuracy of each method. The results of the Standard Forecasting Error (SKF) analysis show that the Semi Average method has an SKF value of 86.14, followed by the Trend Moment method with an SKF value of 95.21 and the Least Square method with an SKF value of 98.99. From the calculation of the Standard Forecasting Error (SKF), the most appropriate method to use is the Semi Average method because it has the lowest Standard Forecasting Error (SKF) value. Thus, the Semi Average method is considered the most accurate and is used to prepare a sales budget for the January-March 2025 period, with estimated revenue of Rp31,140,000 and total sales of 2,076 cups. This budget is expected to assist management in making strategic decisions related to menu development, promotion, pricing, and resource allocation.
Keywords: Budget; Forecast; Sales.

1. Introduction

In 2024, the Indonesian economy faces a series of complex challenges caused by global pressure, is increasing inflation, and as well a slowdown Power buy society. Medan City, which is one of the centers growth economy and culture in North Sumatra, also felt the impact from crisis this, especially in the micro, small and medium enterprises (MSMEs). One of the most affected sectors is industry culinary, especially the business coffee shops (coffeeshop). The coffee shop business is a small and medium-sized enterprise group that is currently growing rapidly and attracting the attention of the government and business owners in Indonesia. According to the Ministry of Industry of the Republic of Indonesia, as stated on kemenperin.go.id, several considerations have been taken into account to establish regulations and implement development programs, aiming to make small and medium industries efficient and effective in the future. One of these considerations is the role of coffee shops (Adiningrum et al., 2022). The previous coffee shop become favourite place for young and professional circles for gather, work, and socialize, now face decline drastic in amount visitors and daily transactions. Situation This the more exacerbated by the increase price material standard, such as coffee beans, milk, and sugar, which cause operational costs to swell. One way to maintain the survival of a business is by effectively managing the management functions across all aspects of business activities so that good and maximum results can be obtained in accordance with the business plan.

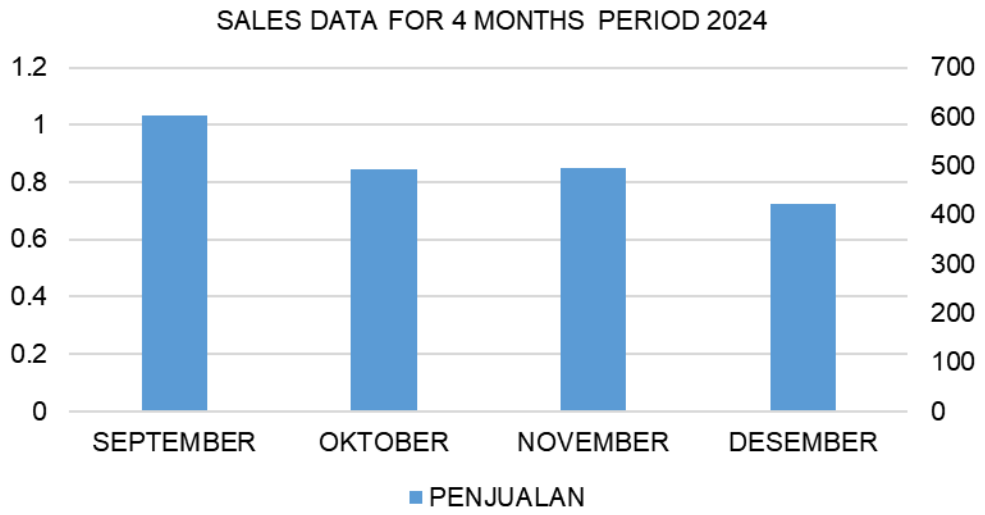

Fig. 1 Sales data at Dudukin Coffeeshop in 2024

On the other hand, society now chooses to prioritize expenditure on needs, so that power buyers of non-essential products, such as specialty coffee, are experiencing a significant decline. Impact from the crisis is very noticeable, visible from the adjustment budget sales made by the perpetrator's business coffee shop in Medan. Many perpetrators' efforts that must be made revise sales targets annually, reduce budget promotion, and do massive efficiency to persist. Declining turnover sales, which were originally not predictable, forcing management to compile repeat projection revenue and design more strategies adaptive to the unfavourable market situation stability.

In running an activity business, every company needs to do thorough planning to reach the goals that have been set. One of the form plans is compilation budget sales. The company was established with the primary goal of maximizing profits so that the company's survival can grow sustainably. In order to achieve optimal profits, the company needs to increase the volume of sales. On that basis, a sales budget is used as a planning and control tool for the company's activities. In preparing the sales budget, the company must determine the volume and selling price of the products to be sold in the specified time period, thus sales forecasting is essential in the preparation of the sales budget (Dwijayanti & Lasmini, 2024). One form of planning is the preparation of a sales budget. Without a budget, managing a company's operations can become difficult, especially in terms of sales planning. Sales are the main source of the company's revenue, and the success or failure of a business often depends on how sales management can improve sales performance (Risty et al., 2024).

The budget is a planning of the company's operational activities that are interconnected and plays an important role as a work guideline tool so that every company activity can be directed towards achieving the desired goals (Septianti & Dahtiah, 2021). Document This own role is important in project income companies as well as become base in compile budget other like budget production, budget costs, and cash budget. Sales Budget is an estimate of the company's sales over a certain period based on various factors, including market trends, economic conditions, competition, and marketing strategies. Preparing a more accurate sales budget helps businesses allocate resources optimally, avoid waste, and improve efficiency and profitability (Akbar et al., 2024). Sales forecasting is the expected level of company sales based on a chosen marketing plan and an assumed marketing environment (Kotler & Keller, 1959). This means that sales forecasts are not only based on past data but also take into account marketing strategies and the current market situation.

Coffee Shop Sit down is a business operating in the field of food and beverages, especially serving coffee with draft shop contemporary hangout. One of its mainstays is Sanger drink,

which is quite in demand by customers. However, in Operational, Coffeeshop Sit down Not yet apply system budget sales based on data and systematic calculations. This can impact on less optimal planning income and control cost operations. Without existence budget proper sales, coffeeshop This will difficulty in plan purchase material standard, set timetable staff, and manage cash flow. budget designed sales with Good No only functioning as tool control, but also as a guide strategy for Coffee Shop Sit down.

For compile budget accurate sales, required method forecasting proper sales. Forecasting methods are generally used to determine the sales budget, but it is also possible that these methods can be used to determine the production budget, as the production budget is very important within a company to ensure that the finished goods inventory is adequate (Darwis & Yusiana, 2016). In research this, writers use three method forecasting, namely method Trend Moment, Least Square, and Semi Average. The Trend Moment Method is a time series model prediction method that seeks a trend line based on certain mathematical and statistical calculations to find a straight-line function that replaces the broken line formed from the company's historical data, which is then projected to predict future outcomes (Fitriani & Rakhma Devi, 2022). While the Least Square Method is A methods that can used in matter predict a price with using data from the past for made into guidelines in the future come. This method have superiority that is one of them can do prediction against data that is fluctuating or ebb and flow (fluctuating) (Ghulam et al., 2022). And the Semi Average Method is a half average trend method that determines that for known function Y = a + bx, all historical data shared into two groups with the amount of each member is the same. Third method This chosen Because capable describe trend sale based on historical data as well as easily implemented by the perpetrator business micro small medium (MSMEs).

Forecasting methods are broadly divided into two: qualitative forecasting methods and quantitative forecasting methods. The quantitative method focuses on numerical calculations based on past statistical data. This quantitative method has several estimation techniques, namely the free hand method, semi average method, moment method, least square method, and parabolic method (Hazmi et al., 2023). While the qualitative method focuses on opinions or experiences of informants based on interim sales data (Syamsul et al., 2022). By using these forecasting methods, it is hoped that Coffeeshop Dudukin can develop a more measurable and accurate sales budget, thereby supporting better decision-making in the future.

2. Methodology

Study This use types of secondary data in the form of notes on report sales at Coffeeshop Sit down and research This use approach quantitative descriptive purposeful to describe How implementation budget sale done at Coffeeshop Sit down as well as How budget the used for estimate sales. The quantitative research approach can be defined as a research method based on positivism philosophy, which can be used to study a certain population or sample, collect data using research instruments, analyze quantitative/statistical data, with the aim of testing the stated hypothesis (Prayogi & Kurniawan, 2024). Approach quantitative chosen Because study This involves numerical data and analysis statistics simple in evaluating accuracy planning sales. Research This using quantitative data in the form of sales data Sanger products in the period January 2024 to December 2024. Data sources used in study This namely internal data obtained from notes sales at Coffeeshop Sit down.

This study uses technique analysis in the form of forecasting sales with the method forecasting Trend Moment, Least Square, and Semi Average, as well as count Standard Error Forecasting (SKP) to evaluate the accuracy of each method. Data analysis was performed in a number of stage as following:

i. Sales Data Processing: Sales data arranged in tables and graphs for easily understood trends as well as fluctuations that occur every month.
ii. Forecasting Sales: Sales data 2024 used for count projection sale January 2025 with use three Methods: Trend Moment, Least Square, Semi Average.
iii. Compilation Budget Sales: Results from forecasting will be made into base in compile budget sale For January 2025.
iv. Comparison of Results: Results from third method forecasting compared to see which method gives more stable and realistic results.

3. Results and Discussion

This research uses data collection techniques in the form of observation. The Observation Method is a data collection technique conducted through observation, accompanied by notes on the conditions or behaviors of the target objects (Hasibuan et al., 2023). In this research, observation is conducted by directly examining the sales records owned by Dudukin Coffeeshop, as well as documentation in the form of recording historical data on Sanger product sales for the year 2024. Following is sales data Sanger products from January to December 2024:

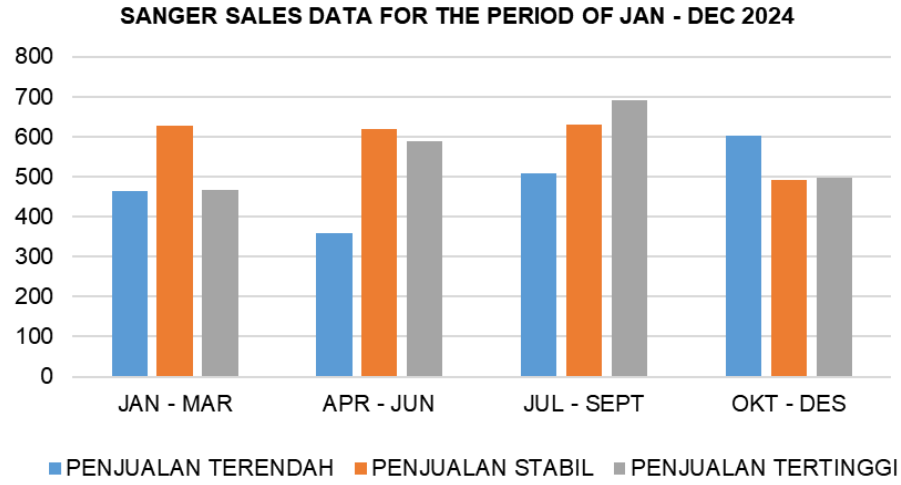

Fig. 2 Sanger product sales data

Trend Moment, also known as the Secular Trend, is a time-series forecasting method that adjusts a trend line using a set of past data and then projects it forward to forecast the future, for short- or long-term forecasting (Amrullah et al., 2020). In another sense, the Trend Moment method is a simple and effective way to calculate sales forecasts, making it time-efficient to implement in a company (Fakhta Tri Nasution & Ridho Lubis, 2022). Steps for calculating the Trend Moment method:

i. Determine the value of Y is from results sale with period the time that has passed determined
ii. Determine the value of the X parameter is from 0 and sorted in accordance with Y value
iii. Determine the value of XY is with multiply X value and Y value
iv. Determine the value of X2 is with squaring X value

Determine Forecasting Sale using the Trend Moment Method:

$$Y = a + b\,X \quad (1)$$

$$\sum Y = na + b\sum X \quad (2)$$

$$\sum XY = a\sum X + b\sum X2 \quad (3)$$

Then input its value into the equality formula above so that the result:

$$6{,}546 = 12\ a + 66\ b \quad (4)$$
$$36{,}846 = 66\ a + 506\ b \quad (5)$$

Next, to find the a/b value using the elimination method, first multiply equation 1 by 11 and equation 2 by 2 so that the value of a in the second equation matches the b value, which is 5.90, and is equal to 513.05. Furthermore, the values of a and b are applied to the Trend Moment method for sales from January 2024 to December 2024 (refers to Table 1).

$$Y = a + b\ X \quad (6)$$
$$Y = 513.05 + 5.90\ (X) \quad (7)$$

Table 1. X, Y, XY, XY2 values and estimates the trend moment method

No	Month	X	Y	XY	X2	TM
1	January – 24	0	464	0	0	574.4
2	February – 24	1	628	628	1	568.51
3	March – 24	2	466	932	4	562.62
4	April – 24	3	360	1080	9	556.73
5	May – 24	4	620	2480	16	550.84
6	June – 24	5	588	2940	25	544.95
7	July – 24	6	509	3054	36	539.06
8	August – 24	7	630	4410	49	533.17
9	September - 24	8	691	5528	64	527.28
10	October – 24	9	602	5418	81	521.39
11	November - 24	10	492	4920	100	515.5
12	December - 24	11	496	5456	121	509.61

The Least Squares method is a technique for predicting a price using past data to guide future predictions (Ghulam et al., 2022). The least-squares method determines the best-fitting linear regression line by minimizing squared errors. Least Squares Method Calculation steps:

i. Determine the value of Y from the results of sales within a specific period based on the elapsed time.
ii. Determine the value of X for the period data, since the period is 12 months (even number), the X values start from -11, -9, -7, -5, -3, -1, 1, 3, 5, 7, 9, 11.
iii. Calculate the value of XY by multiplying the X value by the Y value.
iv. Calculate the value of X^2 by squaring the X value.

After the values of a and b are known, the result is substituted into equation (6), so the equality method least square method becomes Y = 545.5 + 2.95 (X).

Table 2. X, Y, XY, XY2 values and estimates least square method

NO	MONTH	X	Y	XY	X2	LS
1	January – 24	-11	464	-5104	121	513.05
2	February - 24	-9	628	-5652	81	518.95
3	March – 24	-7	466	-3262	49	524.85
4	April – 24	-5	360	-1800	25	530.75
5	May – 24	-3	620	-1860	9	536.65
6	June – 24	-1	588	-588	1	542.55
7	July – 24	1	509	509	1	548.45
8	August – 24	3	630	1890	9	554.35
9	September-24	5	691	3455	25	560.25
10	October – 24	7	602	4214	49	566.15
11	November - 24	9	492	4428	81	572.05
12	December - 24	11	496	5456	121	577.95

The Semi-Average Method involves dividing data into two parts, then calculating the average of each part to serve as a base trend line. Semi-Average Method Calculation Steps:

1. Divide the data into two groups, each containing an even number of data points.
2. Determine the base period
3. Assign a period number x = 0 to the base period.
4. Calculate the semi-total, which is the total sales for each group.
5. Find the semi-average for each group by dividing the semi-total appropriately.

Table 3. Three mark calculation in estimation semi average method

No	Month	Sale	Group	X	Semi Total	Semi Average	Year Trends
1	January - 24	464		-5			
2	February - 24	628		-3			
3	March – 24	466	I	-1	3.126	521.00	521 + 8.16 (X)
4	April – 24	360		1			
5	May – 24	620		3			
6	June – 24	588		5			
7	July – 24	509		7			
8	August - 24	630		9			
9	September – 24	691		11			
10	October - 24	602	II	13	3.420	570.00	570 +8.16 (X)
11	November – 24	492		15			
12	December - 24	496		17			

Based on previous calculations using the trend method, least squares, and semi-average, the company can select the most appropriate method for compiling the sales forecast budget. To determine which method is best to apply in the company, these methods—trend, least squares, and semi-average—are then evaluated using the Standard Error of Forecasting (SKF). SKF is one of the key criteria for comparing sales forecast results. The smallest SKF value indicates that the forecast closely approximates the actual situation. Formula standard error forecasting:

$$(SKF) = \sqrt{\Sigma} (X-Y)\ 2/n \quad (8)$$

Where Y represents actual sales (realization), X is the sales forecast, and n is the number of periods analyzed. The calculation of SKF = 95.21 sales at Dudukin Coffeeshop using the trend moment method is as follows:

Table 4. SKF sales table use method trend moment

No	Month	Sales (Y)	Sales Forecast (X)	X - Y	(X - Y) 2
1	January – 24	628	574.4	-53.60	2,872.96
2	February – 24	466	568.51	102.51	10,508.30
3	March – 24	360	562.62	202.62	41,054.86
4	April – 24	620	556.73	-63.27	4,003.09
5	May – 24	588	550.84	-37.16	1,380.87
6	June – 24	509	544.95	35.95	1,292.40
7	July – 24	630	539.06	-90.94	8,270.08
8	August – 24	691	533.17	-157.83	24,910.31
9	September – 24	602	527.28	-74.72	5,583.08
10	October – 24	492	521.39	29.39	863.77
11	November – 24	496	515.5	19.50	380.25
12	December - 24	422	509.61	87.61	7,675.51
		6,504			108,795.49

Calculation of SKF sales at Dudukin Coffee Shop using the least squares method as follows:

Table 5. SKF sales using the least square method

No	Month	Sale (Y)	Sales Forecast (X)	X - Y	(X-Y) 2
1	January – 24	628	513.05	-114.95	13,213.50
2	February - 24	466	518.95	52.95	2,803.70
3	March - 24	360	524.85	164.85	27,175.52
4	April - 24	620	530.75	-89.25	7,965.56
5	May - 24	588	536.65	-51.35	2,636.82
6	June - 24	509	542.55	33.55	1,125.60
7	July - 24	630	548.45	-81.55	6,650.40
8	August - 24	691	554.35	-136.65	18,673.22
9	September -24	602	560.25	-41.75	1,743.06
10	October - 24	492	566.15	74.15	5,498.22
11	November - 24	496	572.05	76.05	5,783.60
12	December - 24	422	577.95	155.95	24,320.40
		6,504			117,589.63

$$SKF = \sqrt{\Sigma (X-Y)2\ n} = \sqrt{117,589,\ 63:12} = 98.99$$

Calculation of SKF sales at Dudukin Coffeeshop using the semi-average method as follows:

Table 6. SKF sales use semi average method

No	Month	Sale (Y)	Sales Forecast (X)	X - Y	(X - Y) 2
1	January - 24	628	480.15	-147.85	7,924.76
2	February - 24	466	496.49	30.49	3,125.53
3	March - 24	360	512.83	152.83	30,966.41
4	April - 24	620	529.17	-90.83	5,746.81
5	May - 24	588	545.51	-42.49	1,578.93
6	June - 24	509	561.85	52.85	1,899.96
7	July - 24	630	627.19	-2.81	255.54
8	August - 24	691	643.53	-47.47	7,492.19
9	September - 24	602	659.87	57.87	- 4,324.05
10	October - 24	492	676.21	184.21	5,413.93
11	November - 24	496	692.55	196.55	3,832.73
12	December - 24	422	708.89	286.89	25,134.43
		6,504			89,047.18

$$SKF = \sqrt{\Sigma (X-Y)2\ n} = \sqrt{89.047,18:12} = 86.14$$

As for the results from SKF using third method is presented in form table as following:

Table. 7 SKF comparison of trend moment, least square and semi average methods

No	Method	SKF
1	Trend Moment	95.21
2	Least Square	98.99
3	Semi Average	86.14

From the comparison of the sizes of the SKF values shown in the table above, we can see that among the methods used, the trend method has an SKF of 95.21, the least squares method has an SKF of 98.99, and the semi-average method has an SKF of 86.14. Therefore, one can conclude that the semi-average method is preferable because it has a higher SKF value compared to the trend method and the semi-average method. After calculating forecasted sales and the forecast standard error (SKF), Coffeeshop Dudukin can use the semi-average method as its sales budget for the upcoming year. Based on the semi-average

method, the budgeted sales for Sanger products from January to March 2025 can be estimated, with the highest expected demand leading to an anticipated income of Rp. 31,140,000 and total sales of 2,076 cups.

4. Conclusion

Based on the results of the study on the implementation of sales budgeting at Coffeeshop Sit Down using forecasting methods such as Trend Moment, Least Square, and Semi Average, it can be concluded that Coffeeshop Sit Down has not yet developed a system to compile sales budgets based on historical data and trend analysis. Therefore, sales planning remains simple and unstructured. Based on forecasting results from Sanger's 2024 sales data, the following results were obtained:

i. 1. Trend Moment Method estimates sales from January to March 2025 at 1,491 cups.
ii. 2. Least Square Method estimates sales from January to March 2025 at 1,767 cups.
iii. 3. Semi Average Method estimates sales from January to March 2025 at 2,076 cups.

Among these methods, the Semi Average Method provides the highest and most descriptive sales forecast, showing a strong mathematical approach to identifying sales trends. Therefore, this method is most appropriate for compiling the sales budget for Sanger products from January to March 2025. The estimated sales budget for this period is 2,076 cups, which corresponds to a revenue of Rp. 31,140,000 (assuming a selling price of Rp. 15,000 per cup).

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THE INFLUENCE OF ONLINE MEDIA AND MARKETPLACE ON PRODUCT SALES AT CV ALKENA STORE

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Abstract

This study analyses the influence of online media and marketplaces on product sales at CV Alkena Store. Online media includes digital platforms such as Facebook and Instagram, while marketplaces include Shopee, Bukalapak, and Tokopedia. The research question in this article is: Do online media and marketplaces have a positive and significant impact on product sales at CV Alkena Store? The purpose of this article is to determine the extent to which online media and market trends influence product sales growth at CV Alkena Store. This study aims to analyze the influence of online media and marketplaces on product sales at CV Alkena Store. By utilizing advances in digital technology and increased internet access, CV Alkena Store carries out marketing strategies through online media and marketplace platforms to increase sales. This study found that online media and marketplaces can increase product visibility, expand customer reach, and increase customer trust through review and rating systems. In addition, this study also found that the use of online media and marketplaces can help companies increase product sales more effectively and efficiently. However, some challenges need to be overcome, such as tight competition on marketplace platforms and high online marketing costs. Therefore, this study can provide insight for companies on how to utilize online media and marketplaces to increase product sales and overcome existing challenges. Thus, this study can help companies improve their marketing and product sales performance in the digital era. This study can also contribute to the development of digital marketing theory and online marketing strategies, as well as provide recommendations for other companies that want to increase product sales through online media and marketplaces. In addition, this study can also help raise awareness of the importance of utilizing digital technology. The quantitative method with the Slovin formula is used to determine the sample with a significance value of 10%. The number of respondents/samples is 98 customers from a population of 4,000. The results show a significant correlation between online media and marketplaces with sales, with a contribution of 71.7%.
Keywords: Social Media; Marketplace; Sales.

1. Introduction

The development of digital technology has changed the way companies market their products. CV Alkena Store, as a company engaged in the retail sector, carries out marketing strategies through online media and marketplaces to increase sales. Online media and marketplace platforms have become two major forces in modern marketing strategies. The growth of increasingly digitally connected consumers and the ability to make purchases online has made digital marketing one of the key elements in today's company marketing strategies. According to Anugrah (2023) online media or social media is a digital marketing tool that can reach all groups and is easily accessible. Online media refers to digital platforms that allow users to access and interact with content online via the internet. With online media, users can access news, entertainment, education, and other information quickly and easily.

According to Lestari & Patrikha (2022) Market place can be said to be a collection of many shops that sell. Marketplace offers various features that support the buying and selling process, such as product catalogues, secure payment systems, product reviews and ratings, and logistics services. According to Hidayah (2023) Marketplace is a platform that provides a place and means for sellers to gather. Then offer products or goods, which can be services, to be sold to potential consumers or customers. According to Sopali (2022), marketplace is a site whose main service is social networking services, including Shopee, Bukalapak, Tokopedia, and others. According to Lestari & Patrikha (2022) Marketplace can be said to be a collection of many shops that sell. Marketplace offers various features that support the buying and selling process, such as product catalogs, secure payment systems, product reviews and ratings, and logistics services.

According to Sumayati & Yatimatun (2021), the definition of sales is the purchase of something (goods or services) from one party to another party by getting money in return from that party. Sales are a source of company income; the greater the sales, the greater the income the company receives. According to Ana et al. (2021), sales is a science that can provide its own influence for sellers, to invite potential consumers to be interested in buying products. It can be concluded that sales is the process of giving something to other people/buyers with the aim of obtaining money as compensation or payment. The phenomenon of online media in this study was when Alkena Store started operating as an online store and utilizing social media platforms such as Facebook and Instagram. In 2020, the use of online media in Indonesia increased rapidly. As a result of the report Datareport (2020), 160 million people in Indonesia, or 59% of the total population, use social media, and 175.4 million people use the internet which is equivalent to 64% of the total population in 2020. So, the owner took advantage of the opportunity to sell on online media.

The marketplace phenomenon in this study was when the owner of CV Alkena Store saw the great development in the use of marketplaces in Indonesia, and realized this great potential and then decided to expand their marketing strategy by selling their goods on various marketplace platforms. As a result of the report from Databoks (2020), Shopee led as the largest site visitor, reaching 96.5 million. By using online media and marketplaces, he can increase the visibility of his products and take advantage of the promotional features provided by the marketplace platform, thereby expanding customer reach and increasing customer trust through the review and rating system in the marketplace.

Marketplace is an online platform that connects sellers and buyers to conduct transactions for buying and selling products or services. Marketplace platforms, such as Shopee, provide access to millions of potential consumers worldwide. Companies can leverage existing marketplace infrastructure to market their products without having to build their own sales platform. Features such as advanced product search, customer reviews, and product recommendations allow companies to increase product visibility and influence consumer purchasing decisions. Although online media marketing and marketplace presence offer many opportunities for CV Alkena Store, some challenges need to be overcome. These challenges include intense competition on marketplace platforms, potentially high online marketing costs, and difficulties in building brand awareness and consumer trust online. This phenomenon is an important background for further research on how online media and marketplaces can influence product sales at CV Alkena Store.

2. Methodology

2.1 Basic Research Framework

According to Sugiyono & Hadi (2021), the research method is basically a scientific way to obtain data with certain goals and uses. Based on this, there are four keywords that need to be considered, namely the scientific method, data, goals, and uses. The scientific method

means that research activities are based on rational, empirical, and systematic scientific characteristics. Based on this explanation, it can be concluded that the research method is a scientific method used to obtain data in accordance with research studies with certain goals and uses.

2.2 Research Identification

According to Abubakar (2021), these variables consist of two types, namely independent variables and dependent variables:

i. Independent variables, these variables are often called stimulus variables, predictors, or antecedents. Often also referred to as free variables. Independent variables are variables that cause changes or the emergence of dependent variables (bound).
ii. The independent variables (free) in this study are online media (X1) and marketplace (X2).
iii. Dependent Variable, this variable is often called the output variable, the criteria, and the constant. It is also often referred to as the bound variable. The bound variable is a variable that is influenced or that is the result, because of the existence of the independent variable.

The Dependent Variable (bound) in this study is Product Sales (Y).

2.3 Operational Definition of Research Variables

The operational definition of research variables can be seen in the following table.:

Tabel 1. Operational Definition and Indicators of Research Variables

Variable	Definition	Indicator	Measurement Scale
Online Media (X1)	Online media or social media is a digital marketing tool that can reach all groups and is easily accessible.	1. Interesting and Entertaining Content 2. Consumer and Seller Interaction 3. Consumer Interaction 4. with Consumers Ease of Searching Product Information 5. Ease of Communication of Information to the Public 6. Level of Trust in Online Media	Likert
Marketplace (X2)	Marketplace is a platform that provides a place and means for sellers to gather. Then offer products or goods, which can be services, to be sold to potential consumers or customers.	1. Facilitate transactions 2. Bring together sellers and buyers 3. Provide infrastructure	Likert

Variable	Definition	Indicator	Measurement Scale
Product Sales (Y)	Sales is one of the functions in marketing, where the goal is for the company to make a profit so that the company's operational activities continue to run.	1.Achieving sales volume 2. Gaining profit 3.Supporting company growth	Likert

2.4 Population

According to Abubakar (2021) population is all data sources or research subjects or sources from which data will be obtained. The population in this study is all customers of CV Alkena Store who have purchased products through online media and marketplaces in the last 3 months.

2.5 Sample

According to Abubakar (2021) explains that a sample is part of the research population or a representative of the population being studied. Then, research using a population or sample, also greatly depends on the ability of the researcher himself, for example from the ability of the researcher's manpower, funds, and time. The population to be taken is active customers with CV Alkena Store in the last 3 months, the number of customers is 4,000. Determining the number of samples (respondents) the author uses the formula from Slovin, namely as follows:

$$n = \frac{N}{1+Ne^2} \quad (1)$$

Where :
N = Sample
N = total population
E = Estimated error rate with a significance level (10%) based on this formula, the following sample numbers are obtained:

$$n = \frac{4000}{1 + 4000(0.1)^2}$$

$$n = 97.5 \; rounded \; up \; to \; 98$$

In this study, the percentage of sampling error rate of 10% as the error limit in sampling, so based on the formula, the number of calculations from the population of 4,000 customers, the sample in this study amounted to 97.5 respondents which was rounded up to 98 respondents. According to (Hikmawati., 2020) explains that research data sources consist of:

a. Primary Data Sources

Primary data sources require data or information from the first source, usually we call it respondents. The primary data taken by researchers is from questionnaires to obtain their perceptions and experiences using online media and marketplaces and their impact on product sales.

b. Secondary Data Sources

Secondary data sources use materials that are not from the first source as a means of obtaining data or information to answer the problems being studied. In addition to primary data, the data sources used by researchers are secondary data sources, secondary data is obtained through various sources, namely books, the internet, and other research journals related to the topic being researched by the author.

The data collection technique in this study is by using a questionnaire. According to (Hikmawati., 2020:83) a questionnaire is a data collection technique carried out by giving a set of questions or written to respondents to be answered. The type of data source in this study is primary data. Analysis of research measuring instruments is a method used by a researcher to determine the extent to which a variable affects another variable. The purpose of the data analysis method is to interpret and draw conclusions from several collected data. Data processing uses a computer program, namely SPSS version 25.00. SPSS is a computer program that functions to help process statistical data correctly and quickly.

3. Results and Discussion

In the analysis of research data, researchers will present data obtained from online shop customer responses. In this study, a pre-test was conducted on a random customer respondent who had shopped in online media and marketplaces as many as 30 people. After that, the questionnaire was distributed to CV Alkena Store customers, with a total of 98 respondents, to obtain the original results. In the questionnaire, there are 24 statements, of which 12 are about online media, 6 are about marketplaces, and 6 are about product sales. There are 5 choices in the questionnaire, namely strongly agree, agree, less agree, disagree and strongly disagree.

Table 2. Online Media Validity Test Results (X1)

Statement To -	r	Test Results
1	0,757	Valid
2	0,913	Valid
3	0,787	Valid
4	0,756	Valid
5	0,754	Valid
6	0,639	Valid
7	0,889	Valid
8	0,73	Valid
9	0,808	Valid
10	0,827	Valid
11	0,838	Valid
12	0,685	Valid

Based on the table above, the online media variable is declared valid.

Table 3. Marketplace Validity Test Results (X2)

Statement To -	r	Test Results
1	0,606	Valid
2	0,863	Valid
3	0,856	Valid
4	0,856	Valid
5	0,78	Valid
6	0,859	Valid

According to the table above, it is evident that the marketplace variable value is declared valid.

Table 4. Sales Validity Test Results (Y)

Statement To -	r	Test Results
1	0,864	Valid
2	0,892	Valid
3	0,835	Valid
4	0,828	Valid
5	0,840	Valid
6	0,859	Valid

Based on the table above, the Sales variable is declared valid.

Table 5. Online Media Reliability Test Results (X1)

Cronbach's Alpha	N of Items
0.943	12

Based on the table above, it can be seen that the value of the online media variable is indicated as reliable.

Table 6. Marketplace Reliability Test Results (X2)

Cronbach's Alpha	N of Items
0.892	6

Based on the table above, it is evident that the marketplace variable value is considered reliable.

Table 7. Sales Reliability Test Results (Y)

Cronbach's Alpha	N of Items
0.924	6

Based on the table above, it is evident that the sales variable is considered reliable.

According to Ibrahim et al., (2018) the data normality test is to determine whether the data population is normally distributed or not. If the data is normally distributed, then a parametric statistical test can be used. Meanwhile, if the data are not normally distributed, a nonparametric statistical test is used. According to Ibrahim et al., (2018)"The linearity test is a test that will ensure whether the data we have is in accordance with the linear line or not. The linearity test is used to confirm whether the linear nature between two variables identified in theory is in accordance with the existing research results or not. According to Hidayah (2021) the classical assumption test is a test carried out to determine whether there are classical assumption problems in the Ordinary Leas Square (OLS) linear regression model. According to Hidayah (2021), to obtain an efficient and unbiased examination value, also known as BLUE (Best Linear Unbiased Estimator) from a multiple linear regression equation, the classical assumption test consists of: normality test, multicollinearity test, and heteroscedasticity test.

According to Sukardi as cited in Gunawan (2023), correlation refers to a study involving the collection of data to ascertain whether a relationship exists, as well as the strength of that relationship, between two or more variables. It is important to note that correlation does not establish causation; rather, it merely indicates the presence or absence of a relationship between the examined variables. Additionally, Indriastuti (2019) states that the coefficient of determination is significant as it represents the proportion of influence that the independent variable exerts on the dependent variable. In other words, the value of the coefficient of determination, or R-squared, is useful for predicting and quantifying the contribution of variable X to variable Y, expressed as a percentage.

Indriastuti (2019) states that this regression analysis aims to assess how strongly variables affect the dependent variable (Y). To examine the impact of each independent variable, specifically online media (X1) and marketplace (X2), on product sales (Y), a simple linear regression is applied. According to Yahya (2023), a hypothesis is a statement or assumption proposed by researchers as a temporary answer to research questions. A hypothesis helps test the truth of a proposed theory, generate new ideas for developing existing theories, and broaden understanding of the phenomena being studied. Additionally, the hypothesis is used to examine the influence of independent variables on dependent variables.

Table 8. Partial Test Results (T-Test)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	9.081	.415		21.864	.001
	Media online	.305	.009	.946	35.476	.001
	Marketplace	.031	.015	.054	2.029	.045

$$Y = 9.081 + 0.305 (X1) + 0.031(X2)$$

The online media variable is 35,476 with a significance level of 0.001 because the calculated t value (35,476) is greater than the t table (1.66) and the resulting sig value of 0.001 is less than 0.05. Therefore, the HO is rejected, and the HI is accepted. Online media has a partial and significant effect on sales. The marketplace variable is 2,029 with a significance level of 0.045 because the calculated t value (2,029) is greater than the t table (1.66), and the resulting sig value of 0.045 is less than 0.05. Therefore, the HO is rejected, and the HI is accepted. The marketplace has a significant impact on sales.

Table 9. Simultaneous Test Results (F-Test)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	172.694	2	86.347	883.704	.001[b]
	Residual	9.283	95	.098		
	Total	181.977	97			

From the test results, the calculated F value was 883.704 with a significance of 0.001. Therefore, the significance value is less than 0.05 (0.001 < 0.05), so the hypothesis that "Online Media and Marketplace jointly influence product sales at CV Alkena Store" is accepted.

Based on the regression coefficient, the t statistic for the online media variable is 35,476, while the t table value is 1.66, so 35,476 > 1.66. Additionally, with a significance value of 0.001 (which is less than 0.05) and the t table value, H1 is accepted and H0 is rejected. Rejecting H0 indicates that online media has a positive and significant effect on product sales at CV Alkena Store. This suggests that CV Alkena Store's online media plays an important role in efforts to boost employee productivity. Similarly, the t statistic for the marketplace variable is 2.029, compared to the t table value of 1.66, so 2.029 > 1.66. With a significance value of 0.045 (less than 0.05) and the t table value, H1 is accepted and H0 is rejected. Rejecting H0 shows that the marketplace has a positive and significant impact on product sales at CV Alkena Store. This indicates that the marketplace is crucial in efforts to increase product sales. From the test results, the calculated F value is 883,704, with a significance level of 0.001. Since this value is smaller than 0.05 (0.001 <0.05), it can be concluded that online media and marketplaces jointly influence product sales at CV Alkena Store.

4. Conclusion

Based on the study results, the researcher concludes that: Partially, online media has a significant effect on product sales at CV Alkena Store. Partially, the marketplace also significantly impacts product sales at CV Alkena Store. Additionally, both online media and the marketplace together have a significant effect on product sales at CV Alkena Store. According to the determination coefficient test, the R square value was 71.7%, while the remaining 28.3% was influenced by other factors not included in the model. There is a significant positive correlation between online media and sales, with an r value of 0.536 indicating a strong and positive relationship. Likewise, the marketplace shows a significant positive correlation with sales, with an r value of 0.288 indicating a weak but significant relationship.

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THE EFFECT OF PRICE AND PRODUCT QUALITY ON PURCHASE DECISION AT CAFE MIE AND YOU LUBUK PAKAM

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Abstract

In a competitive business world, price and product quality are two important factors that influence purchasing decisions. This research was conducted to determine the influence of price and product quality on consumer purchase decisions at Cafe Mie and You. This study uses a quantitative approach with a survey method, where data is obtained through the distribution of questionnaires to Cafe Mie and its consumers, totalling 79 respondents. The analysis technique used is multiple linear regression to test the influence of independent variables (price and product quality) on dependent variables (purchase decisions). The results of this study show that both price and product quality have a positive and significant effect on consumer purchase decisions, both partially and simultaneously. These findings suggest that competitive pricing strategies and improved product quality can be important factors in driving purchasing decisions.
Keywords: Price; Product quality; Purchase decision.

2. Introduction

The level of competition in Indonesia is very tight, as the company is always trying to increase market share and reach new customers. Marketing is a comprehensive, integrated and planned activity, carried out by an organization or institution in an effort to be able to accommodate market demand by creating products with selling value, determining prices, communicating, delivering, and exchanging valuable offers for consumers, clients, partners, and the general public (Indrasari, 2019).

Price is one of the elements of a marketing mix strategy. Because price is considered to be one of the determining factors for the company's sustainability, a price strategy is not the only way to overcome various problems in running a company (Haque, 2020). Price is often associated with product quality; price itself is an element of the marketing mix that earns revenue or also the easiest element in the scope of marketing to be adjusted, channels and even product features (Cahyono et al., 2020), The price has a positive effect on the purchase decision on the Shopee marketplace in Mojokerto has been proven. Shows on Shopee marketplace prices with quality according to consumer needs, and provide many discounts and promotions (Ilmiyah & Krishernawan, 2020).

Price is the amount of money (plus some products if possible) required to obtain a certain number of combinations and products and services (Gunarsih et al., 2021). Product quality refers to the extent to which a product can meet or exceed consumer expectations. Product quality includes characteristics such as durability, aesthetic appearance, ease of use, reliability, and the suitability of the product with the promised specifications.(Eka Murti Hartono & Sumantri Indra Wicaksana, 2023), Product quality is a totality that includes the characteristics and properties of the product or service that affect the level of consumer trust

in the product or service and how long that trust can last (Chaerunnisa et al., 2023). Product Quality is the quality that includes efforts to meet or exceed customer expectations that include products, services, people, processes, and the environment (Scott, 2021).

Decision-making as a form of consumer behaviour is a form of psychological process that occurs in a human being. This means that even though it is not visible, decisions can be inferred from observable behaviours that decisions have been made, so that it can be concluded that a psychological "decision-making" event has occurred. The consumer's mind has been described as a black box, which shows the interaction of stimuli, consumer characteristics, decision-making processes, and consumer responses (Tri Nuryani et al., 2022). A quality product can definitely meet and satisfy the needs of a person who uses the product. Purchasing decisions are a process in which consumers get to know the problem, seek information about a particular product or brand, and evaluate how well each of these alternatives can solve the problem, which then leads to a purchase decision (Hafidh Fauzi, 2021), Purchase discretion is the behaviour that consumers engage in seeking, evaluating, and spending on a product or service that is expected to satisfy their needs (Wicaksono et al., 2023).

Table 1. Caffe Mie and You sales data in 2023

Month	Sum
March	157.850.430
April	211.693.003
May	197.674.734
June	109.386.857
July	80.534.680
August	94.650.786
September	100.912.635
December	97.642.400

Based on the sales data in Table 1 above, the sales of Caffe Mie and You are erratic or stable, sometimes increasing and sometimes decreasing from month to month. Sales from March to May remain steady, but sales from June to December experience a sharp decline. Caffe Mie and You need to consider this to understand consumer or public preferences when visiting. Therefore, the author explores whether the pricing of products at Caffe Mie and You aligns with their quality and whether the quality, especially taste, influences customers' interest in purchasing.

3. Methodology

This research method is quantitative. Quantitative methods rely on objective measurements and statistical analysis of sample data collected through various instruments such as questionnaires, servers, tests, or other research tools to verify or test the hypotheses proposed in the study. Quantitative research is a research method based on the philosophy of positivism, used to research a specific population or sample, collect data using research instruments, and analyze quantitative or statistical data, with the aim of testing the hypothesis that has been formulated (Melpiana & Sudarajat, 2022). The data collection technique used is a questionnaire, by providing a set of questions and written statements to respondents to provide responses according to the information needed (Novi Rudiyanti et al., 2025). A sample is a part of the population that is the source of data in the study, where the population is part of the number of characteristics possessed by the population. If the population is large and it is not possible to study everything in the population, for example, due to limited funds, energy, and time, then the study can use samples taken from the population (Asia et al., 2023).

Then, to obtain high-quality research data, classical assumption testing is also carried out, consisting of a normality test, a Mult consistency test, and a heteroscedasticity test. To answer the research questions, this study also uses hypothesis testing, specifically a T-test. This T

test will show how much influence independent variables have on dependent variables. The Partial Test (t-test) aims to determine the influence of each independent variable on the bound variable. The decision-making criterion in this test according to (Ghozali, 2016) is that if the p value < 0.05, then Ha is accepted. Conversely, if the p value is ≥ 0.05 then Ha is rejected (Selvia et al., 2022).

4. Results and Discussion

Table 2. Age Characteristics of Respondents

Customer's Age	Sum	Presentation
16-19	33	41,7%
20-24	38	48,1%
25-30	8	10,2%
Total	79	100%

From Table 2 above, respondents who bought were 16-19 years old, accounting for 33 of the total respondents. Respondents who bought were aged 20-24 years old, as 38 people out of the total respondents. Respondents who bought were aged 25-30 years old as 8 people out of the total respondents. Thus, the dominant age groups among respondents who made purchases were 20-24 and 16-17 years old.

Table 3. Kolmogorov-Smirnov Test Sample Test Results

Normal Parameters, b	Mean	,0000000
	Std. Deviation	3,18521046
Most Extreme Differences	Absolute	,082
	Positive	,082
	Negative	-,082
Test Statistic		,082
Asymp. Sig. (2-tailed)		,200c, d

In Table 3 above, it can be seen that the results of the Kolmogorov-Smirnov normality tester prove that the value of the significant level produced is greater than 0.05, which is 0.200, so it can be concluded that the statistical tester of normality is classified as a normal distribution.

Table 4. Linearity Test Results

			Sum of Squares	Df	Mean Square	F	Sig.
Purchase Decision * Price	Between Groups	(Combined)	1322,397	16	82,650	7,477	,000
		Linearity	1133,642	1	1133,642	102,558	,000
		Deviation from Linearity	188,755	15	12,584	1,138	,343
		Within Groups	685,324	62	11,054		
		Total	2007,722	78			

Based on Table 4 above, the linearity coefficient is 0.343 > 0.05, indicating that Price has a linear relationship with the Purchase Decision.

Table 5. Correlation test results

		Price	Product Quality	Purchase Decision
Price	Pearson Correlation	1	,689**	,751**
	Sig. (2-tailed)		,000	,000
	N	79	79	79
Product Quality	Pearson Correlation	,689**	1	,665**

	Sig. (2-tailed)	,000		,000
	N	79	79	79
	Pearson Correlation	,751**	,665**	1
Purchase Decision	Sig. (2-tailed)	,000	,000	
	N	79	79	79

Based on Table 5 above, the significant value (2-Tailed) is 0.000, which is less than 0.05, indicating a relationship. Therefore, it can be concluded that Price has a moderate relationship with the Purchase Decision. Similarly, the significance value (2-Tailed) for Product Quality is 0.000, which is also less than 0.05, indicating a relationship. Hence, it can be concluded that Product Quality has a moderate relationship with the purchase decision.

Table 5 Determination Coefficient Test Results

Type	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,778a	,606	,595	3,227

Based on the table above, it can be concluded that the variables Price and Product Quality account for 60.6% of the Purchase Decision variable.

Table 6. Multiple Linear Regression Test Results

Type		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2,540	2,623		,968	,336
	Price	,535	,095	,558	5,621	,000
	Product Quality	,330	,117	,280	2,819	,006

In the table above, it is known that in the unstandardized coefficients of part B, a multiple linear regression equation is obtained, namely with the following formula:
Purchase Decision = 2.540 + 0.535 Price + 0.330 Product Quality. Based on the above equation, it can be described as follows:

a. Constant = 2.540 indicates the value of the constant. If the value of the free variable X1, i.e., Price, and the value of X2, Product Quality, are both 0, then customer loyalty will increase by 2.540.
b. The coefficient X1b1 = 0.535 shows that the Price variable (X1) has a positive effect on the Purchase Decision of 0.535. This means that for every 1-unit increase in Price (X1), the Price to the Purchase Decision will increase by 0.535.
c. The coefficient X2b2 = 0.330 indicates that the Product Quality (X2) variable has a positive impact on the Purchase Decision, with an effect size of 0.330. This means that for every 1-unit increase in Product Quality (X2), the likelihood of the Purchase Decision increases by 0.330.

Based on Table 6, the t-value for the price variable is 5.621 with a significance level of 0.000. Since the p-value is below 0.05, the null hypothesis is rejected. The results of the t-test confirm that price has a statistically significant effect on product quality. This supports the research hypothesis and aligns with the existing literature on price as a purchasing decision.

Based on the normality test, the results of the research conducted by the researcher indicate that the Kolmogorov-Smirnov values for Price and product quality are 0.200, indicating that the data are normally distributed (p-value> 0.05). Based on the linearity test, Price shows a linear relationship (p-value = 0.343 > 0.05), and Product Quality shows a linear relationship (p-value = 0.040 < 0.05). Based on the correlation test carried out, the correlation value between Price is 0.000 and product quality is 0.000, which means that Price and product quality have a moderate correlation relationship in the purchase decision. The results of the determination coefficient test indicated that the R Square value was 0.606, indicating that the

variables Price (X1) and Product Quality (X2) accounted for 60.6% of the variance in Purchase Decision (Y).

Based on the results of the multiple linear regression test carried out, it showed that the value of the constant was 2.540, which showed a positive influence on the independent variables (X1 and X2). Meanwhile, the value of the regression coefficient of the price of the variable X1 is 0.535, which means that if the variable X1 increases by 1 unit, then Y will increase by 0.535 or as much as 53.5%. The value of the coefficient of the Product Quality regression of the variable X2 is as large. 0.330 This means that if the variable X2 increases by 1 unit, then Y will increase by 0.330 or 33%.

4. Conclusion

Based on the research results, the study concluded that Price (X1) and Product Quality (X2) influence the purchase decision (Y) at Caffe Mie and You Lubuk Pakam. Both price and product quality significantly affect consumer purchasing decisions at these cafes. The t-test results confirmed that each variable, individually and collectively, has a positive and significant impact on purchase decisions. Therefore, it can be concluded that a strong pricing strategy and high product quality are essential for influencing consumer choices at the cafe.

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THE INFLUENCE OF PRODUCT QUALITY, SERVICE QUALITY ON CUSTOMER LOYALTY AT ODDETE RESTO

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Abstract

This study aims to examine the influence of product quality and service quality on customer loyalty at Oddete Resto, Medan. The method used is quantitative. The number of respondents is 97 customers of Oddete Resto, Medan. The basis for the selection of this sample is the non-probability sampling method using accidental sampling techniques. The magnitude of the influence of product quality and service quality on customer loyalty can be seen from the results of the determination test percentage between product quality (X1) and service quality (X2) to customer loyalty (Y) is 94%. This proves that product quality and service quality influence customer loyalty by 94% and the rest is influenced by other factors that are not examined.
Keywords: Product quality; Service quality; Customer loyalty.

1. Introduction

Intense business competition, characterized by many companies producing similar products, can lead to a decrease in sales volume. To survive and succeed, companies must engage in marketing that builds a strong company image. Customer loyalty is essential for business continuity, and it is significantly influenced by product quality and service quality. Good products and services can increase customer satisfaction and loyalty, while failures in these areas can lead to a decrease in loyalty. Customer loyalty is defined as a deep-seated commitment to consistently repurchase or re-subscribe to a product or service in the future, despite situational influences or marketing efforts from competitors that might cause behavioural changes. Product quality is considered one of the main factors in a company's competitiveness and is defined by the physical condition, function, and nature of a product that aims to meet and satisfy consumer needs. Service quality, on the other hand, is the company's ability to meet customer expectations, and it is perceived as good when the service received aligns with what was expected.

Customer loyalty is a deep-seated customer commitment to re-subscribe or repurchase selected products or services consistently in the future, even though situational influences and marketing efforts have the potential to cause behavioural changes (Gultom et al., 2020). The research conducted by Christopher dan Lauren (Sasongko, 2021) loyalty is the availability of customers to continue to subscribe to a company in the long term, by buying and using its goods and services repeatedly, and voluntarily recommending the company's products to others. Product quality is one of the main things that is considered in the company. Quality is one of the important policies in increasing the competitiveness of the main product to provide satisfaction to consumers that exceeds or is at least equal to the quality of competitors' products (Santoso, 2019). The research conducted by (Othman et al., 2022), Product quality is the physical condition, function, and nature of a product, either goods or services, based on

the expected level of quality, such as durability, reliability, accuracy, ease of operation, product repair and other product attributes with the aim of meeting and satisfying consumer or customer needs.

Service quality is the company's expertise to meet customer expectations, and also if the service received or that has been experienced is as expected, so that the quality is perceived as good and can satisfy customers (Cesariana et al., 2022). Oddete Resto Cafe Vegan Vegetarian, inaugurated on May 1, 2019, is known for its healthy vegan-vegetarian menu and cozy atmosphere. However, interviews with customers revealed issues such as prices not matching the quality of the food and drinks, excessive use of MSG, long waiting times, and menu-recording errors. This dissatisfaction could lead loyal customers to seek alternatives. Therefore, this study aims to investigate the influence of product quality and service quality on customer loyalty at Oddete Resto.

The vegan-vegetarian cafe serves food and drinks without animal products, using ingredients such as vegetables, fruit, grains, and legumes. Since its inauguration, Oddete Resto Cafe Vegan Vegetarian has succeeded in providing a good experience through the dishes and atmosphere offered.Based on the issues circulating about the phenomenon that occurred, the author conducted interviews with several customers at Oddete Resto, Medan. From the results of interviews conducted by the author at Oddete Resto Cafe Vegan Vegetarian, Medan that the price given is not in accordance with the expectations of the food or drink received, for example, the taste quality of food and drinks is normal, but too much MSG is given. And the service provided to customers is also not appropriate, for example, a very long waiting time, and an error in recording the customer's menu. This phenomenon can make customers feel dissatisfied and cause loyal customers to look for other substitutes.Based on the background above, the author is interested in finding out "Is there an influence of product quality, service quality on customer loyalty at Oddete Resto, Medan?".

2. Methodology

According to Waruwu (2023), research methods are procedures and schemes used in research. Researchers conducted research using quantitative research methods. According to Priadana, M.S. & Sunarsi S.Pd., M.M., CHt (2021), the quantitative research type is a systematic investigation of a phenomenon by collecting data that can be measured using statistics, mathematics, or computing. This research was conducted at Oddete Resto Cafe Vegan Vegetarian, located at Jl. Bakaran Batu No.19 AA, Sei Rengas Permata, Kec. Medan Area, Medan City. The research period started in March 2024 and ended in June 2024.

According to Sugiyono (Ulfa, 2021), states that basically a research variable is something in the form of anything that is determined by the researcher to study so that information about it is obtained, then conclusions are drawn. In this study, there are three variables used, namely two independent variables and one closed variable. Researchers use two independent variables (free), namely Product Quality (X1) and Service Quality (X2), and the dependent variable (bound) is Customer Loyalty (Y).

According to (Suriani et al., 2023), population is the entire object or subject of research that has certain characteristics to be studied and conclusions drawn. In this study, the population used by researchers is all customers who have made purchases at Oddete Resto Cafe Vegan Vegetarian, Medan. Because the population is too large to be taken entirely in the study, the researchers used the Accidental Sampling technique, which is a form of sampling based on chance. Where, anyone who happens to meet the researcher and is considered suitable as a data source, will become a research sample. In calculating the number of samples using nonprobability sampling techniques with an accidental sampling approach, researchers used the Lameshow formula as follows:

$$n = \frac{(1.96)^2 x 0.5 x 0.5}{(0.1)^2} = 96.04 \quad (1)$$

Table 1. Definition operational

No.	Variabel	Definisi	Indikator	Skala Pengukuran
1.	Product Quality (X1)	"Quality is an overall evaluation process to consumers for the improvement of the performance of a product" Mowen (Arianto & Difa, 2020).	1. Performance 2. Features 3. Reliability 4. Conformance 5. Durability 6. Serviceability 7. Aesthetics 8. Perceived quality	Likert
2.	Service Quality (X2)	"Service quality is a form of assessment of the level of service provided by the bank to customers in accordance with their expectations." Harahap & Amanah (Meilani & Sugiarti, 2022).	1. Tangible 2. Reliability 3. Responsiveness 4. Assurance 5. Empathy	Likert
3.	Customer Loyalty (Y)	"Customer loyalty is a customer's commitment to a brand, store or supplier based on a very positive attitude and is reflected in consistent main purchases." Tjiptono (Putra, 2021)	1. Repeat Purchases 2. Habitual Consumption of the Brand 3. Great Love for the Brand 4. Fixation on the Brand 5. Belief that a Certain Brand is the Best 6. Recommendation of the Brand to Others.	Likert

In accordance with the results of the calculation, the results of the minimum sample size required in the study was 96.04 respondents, and the authors increased it to 97 respondents. The data collection methods in this study are:
a) Interview: Data collection techniques carried out through face-to-face and direct questioning and answers between researchers and sources.
b) Observation: Observation data collection methods not only measure the attitudes of respondents but can also be used to record various phenomena that occur. Observation data-collection techniques are suitable for research aimed at studying human behavior, work processes, and natural phenomena.
c) Questionnaire/questionnaire: Data collection methods are carried out by giving a set of questions or written statements to respondents to answer.

In this study using a Likert scale as a measuring tool in a survey. The Likert scale is a technique commonly used in questionnaires to measure respondents' attitudes, opinions, or perceptions of something.

Table 2. Likert scale score

Positive Statement	Score	Negative Statement	Score
Strongly Agree (SA)	5	Strongly Agree (SA)	5
Agree (A)	4	Agree (A)	4
Neutral (N)	3	Neutral (N)	3
Disagree (D)	2	Disagree (D)	2
Strongly Disagree (SD)	1	Strongly Disagree (SD)	1

3. Results and Discussion

Based on the results of the research conducted on 97 respondents through the distribution of questionnaires to Oddete Resto, Medan customers. The total number of respondents used was 97, categorized by gender as shown in the following table:

Table 3. Description of respondent characteristics by gender

Gender	Total (Person)	Percentage
Male	48	49.5%
Female	49	50.5%
Total	97	100%

Based on the table, it is evident that out of the 97 respondents, they can be divided into two categories based on gender. There are 48 males, which accounts for 49.5% of the total, and 49 females, representing 50.5%. This indicates that most of the research participants are female**.** According to (Prasetyo et al., 2019) validity testing is carried out by correlating the scores of each question item using product moment correlation techniques. To find out whether a question item is considered valid, the value of the validity coefficient will be seen compared to the cut off value. The interpretation of the validity coefficient is considered valid if the validity coefficient is> 0.30 so that the items are considered valid, otherwise if the validity coefficient is less than 0.30 (<0.30) then the items are invalid. According to (Duli, 2019, p. 106), reliability is a test tool to determine the extent to which the measurement results remain consistent when measuring two or more times against the same symptoms using the same measuring instrument. The level of reliability of a research construct/variable can be seen from the Cronbach Alpha (α) statistical results. A variable is said to be reliable if it provides a Cronbach alpha value> 0.60. The more the alpha value approaches 1, the more reliable the data reliability value is.

From the calculations using SPSS 26, as seen in the Pearson correlation column between the product quality, service quality and customer loyalty variables, it is considered valid if the corrected item is more than 0.3. Based on the results of the reliability testing conducted in this study, each indicator that has passed the validity test will be processed using Cronbach Alpha. A statement will be considered reliable if the Cronbach Alpha value is > 0.6. Questionnaires were distributed for a pre-test to 30 respondents outside the sample, namely Oddete Resto, Medan. The analysis was carried out to determine the validity of each question using SPSS 26, where the validity and reliability results for product quality, service quality and customer loyalty can be observed in the details below. Based on the Table 4, it is known that there are 16 statement items in the product quality (X1) and service quality variable (X2) that are considered valid because the corrected item values are > 0.3, it is known that there are 15 statement items in the customer loyalty variable (Y) that are considered valid because the corrected items values are > 0.30.

Table 4. Result of Validity and Reliability Test Product Quality, Service Quality and Customer Loyalty

No.	Corr. Items	Cronb. Alpha	No.	Corr. Items	Cronb. Alpha	No.	Corr. Items	Cronb. Alpha
X1	0.363	0.821	X1	0.875	0.886	Y1	0.582	0.831
X2	0.383		X2	0.513		Y2	0.555	
X3	0.573		X3	0.415		Y3	0.432	
X4	0.433		X4	0.424		Y4	0.603	
X5	0.613		X5	0.727		Y5	0.488	
X6	0.710		X6	0.609		Y6	0.600	
X7	0.391		X7	0.809		Y7	0.538	
X8	0.554		X8	0.782		Y8	0.401	

X9	0.375	X9	0.718	Y9	0.557
X10	0.396	X10	0.394	Y10	0.475
X11	0.702	X11	0.380	Y11	0.692
X12	0.498	X12	0.654	Y12	0.736
X13	0.763	X13	0.520	Y13	0.771
X14	0.725	X14	0.697	Y14	0.366
X15	0.391	X15	0.691	Y15	0.363
X16	0.602	X16	0.640		

It can be concluded that the questionnaire statement items in the product quality variable are considered reliable because 0.821>0.60; it can be concluded that the questionnaire statement items in the service quality variable are considered reliable because 0.886>0.60; and it can be concluded that the questionnaire statement items in the customer loyalty variable are considered reliable because 0.831>0.60. According to Widarjono (Duli, 2019), the normality test aims to determine whether the residual values are normally distributed or not. This test can be conducted using a histogram test, normal P-Plot test, Chi-Square test, Skewness and Kurtosis, or Kolmogorov-Smirnov test. Before we proceed with the actual analysis, the research data must undergo a test for the normality of its distribution. Good data is characterized by a normal distribution. The basis for decision-making in the normality test is as follows: if the significance value is greater than α = 0.05, then the data is considered normally distributed. Conversely, if the significance value is less than α = 0.05, then the data is not normally distributed.

Table 5. Result of Normality Test

One-Sample Kolmogorov-Smirnov Test		
N		97
Normal Parameters[a,b]	Mean	.0000000
	Std. Deviation	.97243826
Most Extreme Differences	Absolute	.067
	Positive	.067
	Negative	-.054
Test Statistic		.067
Asymp. Sig. (2-tailed)		.200[c,d]

Based on the results of the normality test, it is observed that the significance value is 0.200>0.05. Therefore, it can be concluded that the residual values follow a normal distribution. According to (Kambono & Marpaung, 2020), the multicollinearity test aims to test the correlation between independent variables in regression. A good regression model should be free from such correlation. Multicollinearity can be seen from the Variance Inflation Factor (VIF) and Tolerance values, where VIF < 10.00 and Tolerance > 0.10 indicate the absence of multicollinearity.

Table 6. Result of Multicollinearity Test

Model		Collinearity Statistics	
		Tolerance	VIF
1	Product Quality	.208	4.801
	Service Quality	.208	4.801

The table above shows that the tolerance and VIF values for product quality and service quality meet the tolerance criteria (0.208> 0.10) and VIF criteria (4.801 < 10.00), so the regression model is free from multicollinearity and suitable for use. According to Widarjono (Duli, 2019,

p. 122), the heteroscedasticity test assesses whether the residual variances differ across observations. The decision-making basis for the Heteroscedasticity test is: If the significance >α=0.05, no heteroscedasticity occurs; if <α=0.05, heteroscedasticity occurs. A good regression model should be free from heteroscedasticity.

Table 7. Result of Heteroscedasticity Test

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.590	.695		2.286	.024
	Product Quality	-.009	.028	-.070	-.311	.756
	Service Quality	-.008	.030	-.059	-.262	.794

The table above shows the significance value of product quality 0.756>0.05 and service quality 0.794 > 0.05, so the regression model is free from heteroscedasticity and is suitable for use.

3.1 Result of Correlation Coefficient Test

According to (Qomusuddin & Siti, 2021), correlation analysis is the analysis of the relationship between two or more variables, specifically between independent variables and dependent variables.

Table 8. Result of Correlation Coefficient Test

		Product Quality	Service Quality	Customer Loyalty
Product Quality	Pearson Correlation	1	.890**	.932**
	Sig. (2-tailed)		.000	.000
	N	97	97	97
Service Quality	Pearson Correlation	.890**	1	.942**
	Sig. (2-tailed)	.000		.000
	N	97	97	97
Customer Loyalty	Pearson Correlation	.932**	.942**	1
	Sig. (2-tailed)	.000	.000	
	N	97	97	97

The results show a Pearson correlation between product quality (X1) and customer loyalty (Y) of 0.932, and between service quality (X2) and customer loyalty (Y) of 0.942. The two asterisks signify a strong relationship, and the positive correlation value indicates that improving product and service quality increases customer loyalty. The coefficient of determination is data to determine how much the percentage of the direct influence of the independent variable is getting closer to the dependent variable or it can be said that the use of the model is justified, according to Sugiyono (Julhendri Sinaga et al., 2020).

Table 9. Result of Coefficient Determination Test

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.970[a]	.940	.939	.983

a. Predictors: (Constant), Service Quality, Product Quality
b. Dependent Variable: Customer Loyalty

Based on the table above, it shows the R Square value of 0.940, meaning that product quality (X1) and service quality (X2) affect customer loyalty (Y) by 94% at Oddete Resto, Medan. According to (Qomusuddin & Siti, 2021, p. 82), multiple linear regression analyses the effect of two or more independent variables (X) on the dependent variable (Y). The multiple linear regression model is described by the following equation:

$$Y = a + \beta 1.X1 + \beta 2\,.X2 \quad (2)$$

Table 10. Result of Multiple Linear Regression Test

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	9.935	1.113		8.930	.000
	Product Quality	.377	.045	.464	8.390	.000
	Service Quality	.457	.047	.533	9.628	.000

The regression test results show that Constant (α) = 9,935. This indicates that if product quality (X1) and service quality (X2) = 0, customer loyalty increases by 9,935. The coefficient X1b1 = 0,377 means that every increase of 1 unit of product quality increases loyalty by 0,377. The service quality coefficient X2b2 = 0,457 means that a 1-unit increase in service quality increases customer loyalty by 0,457. Simultaneous Test (F Test) tests whether the independent variables together have a significant effect on the dependent variable (Mardiatmoko, 2020). With the decision: If the sig value is <0.05 or F count> F table, then there is an effect of variable X simultaneously on variable Y. If the sig value is> 0.05 or F count < F table, then there is no effect of variable X simultaneously on variable Y.

F table = F (k; n-k) F table = F (4; 95)

F table = F (4; 97-2) Thus, the F table value is 2,47

Table 11. Result of Hypothesis (F-Test)

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1422.703	2	711.352	736.575	.000[b]
	Residual	90.781	94	.966		
	Total	1513.485	96			

The test results show the significance of the effect of X1 and X2 on Y of 0.000 <0.05 and F count 736.575> 2.47, so that X1 and X2 simultaneously affect Y. According to (Mardiatmoko, 2020) Partial Test (T test) is used to determine whether the independent variable regression model partially has a significant effect on the dependent variable. With the decision: If the sig value <0.05 or t count> t table then there is an influence of variable X on variable Y. If the sig value is> 0.05 or t count < t table then there is no influence of variable X on variable Y.

t table = t (α/2 ; n-k-1) t table = t (0,025 ;94)

t table = t (0,05/2 ; 97-2-1) Thus the t table value is 1.986.

Table 12. Result of Hypothesis (t-Test)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	9.935	1.113		8.930	.000
	Product Quality	.377	.045	.464	8.390	.000
	Service Quality	.457	.047	.533	9.628	.000

The table above shows significant probabilities for X1, X2, and Y (0.000 < 0.05), and the t-counts for product quality (X1) (8.390) and service quality (X2) (9.628) exceed the t-table (1.986). So, product quality (X1) and service quality (X2) affect customer loyalty (Y).

4. Conclusion

Based on the findings, it is concluded that both product and service quality have a significant, positive effect on customer loyalty at Oddete Resto. The study found that 94% of customer loyalty is influenced by these two factors, highlighting their critical importance for the restaurant's business continuity.

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THE INFLUENCE OF PRODUCT QUALITY AND CUSTOMER EXPERIENCE ON PURCHASE DECISIONS AT SENORITACOFFEE.21 MEDAN

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Abstract

Coffee shops have evolved from simple beverage providers into modern, comfortable spaces with fast internet and workspaces that support productivity and creativity. This quantitative study, using an associative strategy at Cafe Senorita Coffee.21 Medan found that product quality and customer experience significantly affect purchase decisions. The correlation value (r) of 0.493 indicates a strong relationship between the variables and purchasing decisions. The R-squared value of 0.228 shows a partial effect of 22.8%. Both the t-test and F-test confirmed a significant influence: the t-test showed a significant probability for product quality and customer experience, and the F-test indicated a simultaneous significant effect with a value of 0.000.
Keywords: Product quality; Customer experience; Purchase decision.

1. Introduction

Coffee shops have become a symbol of modern society's lifestyle shift. In the digital era, they've transformed beyond places to drink coffee, now offering high-quality beverages, a relaxed atmosphere, and modern facilities like fast internet and workspaces. This evolution meets not only the need for caffeine but also social and environmental needs that support creativity and productivity. Coffee shops have evolved from a simple roadside shop to a more sophisticated space offering quality coffee, a relaxed atmosphere, and modern amenities. These places not only satisfy customers' caffeine needs but also provide a supportive social environment in which to work or relax. A customer's decision to buy from a coffee shop often depends on factors such as the quality of the coffee, the comfort of the space, and the level of customer service. Ultimately, customers choose places that align with their lifestyle and provide a satisfying experience. According to Tjiptono (2019), a purchase decision is the final stage of a process where consumers recognize a problem, seek information, and evaluate alternatives.

According to Tjiptono(2019), a purchasing decision is a process in which consumers recognize their problems, seek information about certain products or brands and evaluate how well each alternative can solve their problems, which then leads to a purchasing decision, while according to Arfah(2022) purchasing decisions area thought process in which an individual evaluates various options and makes a choice on a product from among many choices. Anggraini et al. (2022) state that product quality can be measured by its longevity can last a long time so that we can trust our products. From a marketing perspective, we can see that a quality measure encompasses perceptions of a buyer's quality and the quality of the product, while Darma (2021) suggests that overall product quality has characteristics and a nature that affect its ability to satisfy consumers. The better the quality of our products, the newer variants we make so that consumers are interested in our products. Customer experience is a response given by customers based on personal experience which is the result of an interaction either directly or indirectly, while Hidayat (2021) argues that a good customer

experience can meet customer needs and create trust in customer memory so that it can form feelings of pleasure, attachment, and strong emotional feelings towards the company.

Cafe Senorita Coffee.21, located in Medan since 2019, is a popular vegetarian cafe known for its unique combination of Western flavors and sustainable values. Despite its popularity, the cafe faces problems, including customer complaints about product quality (e.g., coffee that is too sweet or food that is too bland) and a poor customer experience due to long waiting times. These issues can cause customers to consider other cafes with a better taste and service experience. The sales data from 2023 also show fluctuating sales, reinforcing the need to investigate factors influencing consumer purchase decisions.

*Cafe*Senoritacoffee.21 has succeeded in creating a unique experience for consumers and is also one of the most popular coffee shops in Medan. This is evident from the number of sales that occurred throughout 2023. However, even though it is quite popular, this is not far from several problems that occurred when Cafe Senoritacoffee.21 was in production. Based on information obtained by the author from the cafe employees, there were complaints from customers regarding the quality of the coffee products served, being too sweet, and the food served being too bland. Several customers who have bought at the Senorita coffee.21 cafe also complained about the less than satisfactory taste of the coffee. In addition, the customer experience is getting worse because the waiting time for food is too long. These problems cause customers to consider continuing to buy at the Senorita coffee. 21 cafe or choosing another cafe that offers a better taste and service experience.

Table 1. Senoritacoffee.21 sales data 2023

Month	Amount
January	Rp43,013,750
February	Rp32,863,400
March	Rp33,353,750
April	Rp33,532,750
May	Rp39,752,860
June	Rp36,813,000
July	Rp32,537,000
August	Rp27,745,500
September	Rp34,220,899
October	Rp33,603,000
November	Rp34,695,500
December	Rp34,442,500

From the data above, the sales of Cafe Senoritacoffee.21 experienced an increase and a decrease in sales. Cafe Senoritacoffe.21 is very comfortable for a place to relax and comfortable to gather with friends and family or just enjoy a cup of coffee while enjoying a comfortable place.

2. Methodology

According to Janna & Herianto (2021), quantitative data is a research method based on a positivistic approach, research data in the form of numbers that will be measured using statistics as a calculation test tool, related to the problem being studied to produce a conclusion. Positivist philosophy is used in certain populations or samples. The strategy used in this research is to use an associative research strategy. According to Sugiyono (2019) associative research is a research problem formulation that is intended to ask about the relationship between two or more variables. In this study, an associative research strategy was used to identify the extent of the influence of variable X (independent variable) consists

of product quality (X1), and *customer experience*(X2), against variable Y, namely the purchasing decision (dependent variable), either partially or simultaneously.

3. Results and Discussion

According to Maryati (2022), the normality test is carried out to test whether the residual variables are normally distributed in a regression model. A good regression model has residual variables that are normally distributed. The normality test in this study used the one Kolmogorov-Smirnov test, using the SPSS 25 program. The data is declared normally distributed if the significance is greater than 0.05.

Table 2. Normality Test Results

N		X1	X2	Y
		100	100	100
Normal Parametersa,b	Mean	43.00	69.33	45.15
	Std. Deviation	4,623	8,019	3,644
Most Extreme Differences	Absolute	,093	,103	,108
	Positive	,067	,092	,092
	Negative	-,093	-,103	-,108
Test Statistics		,093	,103	,108
Asymp. Sig. (2-tailed)		,031c	,010c	,006c

From table 2, it can be seen that the significance value (Asymp. Sig . 2-tailed) of Kolmogorov-Smirnov is (X1) 0.31,, X2, 0.10 and Y, 0.06. Where the value is greater than 0.05, it is concluded that the residual value is normally distributed. According to Maharani et al. (2023), multicollinearity testing aims to test whether the regression model finds a correlation between independent variables.

Table 3. Multicollinearity Test

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	27,707	3,171		8,736	,000		
	X1	,183	,096	,232	1,909	,059	,527	1,899
	X2	,138	,055	,304	2,496	,014	,527	1,899

In the table above, the correlation value for the tolerance value variable (X1) Product quality is 0.527> 0.10 and the VIF value of Product quality is 1.899 <10.00, (X2) Customer Experience has a tolerance value of 0.527> 0.10 and a VIF value of 1.899 <10.00. It can be concluded that this regression model is free from multicollinearity symptoms and is suitable for use. Heteroscedasticity means the variance of disturbance variables is not constant. The heteroscedasticity test is used to test whether the variance of the residuals differs across observations.

Table 4. Heteroscedasticity Test

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	5,029	1,815		2,770	,007
	X1	-,089	,055	-,222	-1,612	,110
	X2	,019	,032	,084	,612	,542

In the table above, it can be seen that the correlation value for the significant value variable (X1) Product quality is 0.110 > 0.05, and (X2) Customer Experience has a significant value of 0.542 > 0.05. It can be concluded that this regression model is free from heteroscedasticity

symptoms and is suitable for use. The direction is expressed in the form of positive and negative relationships, while the strength or weakness of the relationship is expressed in the magnitude of the correlation coefficient (Purnama, 2023).

Table 5. Correlation Coefficient Test

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,493a	,243	,228	3,203

From the results above, it can be concluded that the variables product quality (X1), customer experience (X2), and purchasing decisions (Y) are related, as the values show positive correlations. The correlation value (r) is 0.493, which means that product quality and customer experience have a strong relationship to purchasing decisions. Determination analysis (R2) is used to measure how well the model is able to explain the variation of the dependent variable. The determination coefficient value is 0 or 1. A small R2 value means that the ability of the dependent variables is very limited. A value close to 1 means that the independent variables provide almost all the information needed to predict the variation of the dependent variable (Pranatawijaya et al., 2019).

Table 6. Coefficient of Determination Test

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,493a	,243	,228	3,203

From the table above, the magnitude of the influence of product quality and customer experience on purchasing decisions is 22.8%. Multiple linear regression is used to find the influence of two or more independent variables (X) on the dependent variable (Y). According to [11], multiple linear regression analyzes the effect of two or more independent variables (X) on the dependent variable (Y)

Table 7. Multiple Linear Regression Test

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations		
		B	Std. Error	Beta			Zero order	Partial	Part
1	(Constant)	27,707	3,171		8,736	,000			
	X1	,183	,096	,232	1,909	,059	,441	,190	,169
	X2	,138	,055	,304	2,496	,014	,464	,246	,220

In the table above, it is known that in the Unstandardized Coefficients section B, the multiple linear regression equation is obtained using the following formula:

Purchase decision = 27.707 + 0.183 Product quality + 0.138 customer experience

Based on the equation above, it can be explained as follows:
a) Constant (α) = 27.707 shows the constant value. If the value of the independent variable X1, namely product quality, and the value of the variable X2, namely customer experience, are 0, then customer loyalty will increase by 27.707.
b) Coefficient X1b1 = 0.183 shows that the product quality variable (X1) has a positive effect on purchasing decisions by 0.183. This means that for every 1 unit increase in product quality (X1), the product quality on purchasing decisions will increase by 0.183.
c) The coefficient X2b2 = 0.138 shows that the customer experience variable (X2) has a positive effect on purchasing decisions by 0.138. This means that for every 1 unit increase in

customer experience (X2), the customer experience on purchasing decisions will increase by 0.138.

Basis for decision making:

a) If the sig value < 0.05, or t count > t table, then there is an influence of variable X on variable Y.

b) If the sig value > 0.05 or t count < t table, then there is no influence of variable X on variable Y.

Table 8. T-test

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	27,707	3,171		8,736	,000
	Product Quality	,183	,096	,232	1,999	,059
	Customer Experience	,138	,055	,304	2,496	,014

Based on the results of the table above, it can be seen that the significant probability figure for the Product quality variable (X1) is 0.005 < 0.05 and the customer experience variable (X2) is 0.000 < 0.05, the calculated t value for the product quality variable (X1) is 1.999 > 1.98552 t table, the calculated t value for the customer experience variable (X2) is 2.496 > 1.98552 t table so it can be concluded that there is an influence between variable X1 on variable Y and X2 has an influence on variable Y. The Simultaneous Test (F Test) tests whether the independent variables together have a significant effect on the dependent variable (Tua & Andariyani, 2022). Basis for decision making:

a) If the sig value < 0.05, or F count > F table, then there is a simultaneous influence of variable X on variable Y.

b) If the sig value > 0.05 or F count < F table then there is no simultaneous influence of variable X on variable Y.

Where the F table value is 2.47.

Table 9. F Test

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	319,874	2	159,937	15,594	,000b
	Residual	994,876	97	10,256		
	Total	1314,750	99			

Based on the test results above, it is known that the significance value for the influence of X1 and X2 simultaneously on Y is 0.000 < 0.05, and the calculated F value is 15.594 > F table 2.47, so it can be concluded that there is a simultaneous influence of X1 and X2 on Y.

From the analysis carried out, the following research results were obtained by the researcher:

1. The results of the correlation coefficient test can be concluded that the variables of product quality (X1), customer experience (X2), and purchasing decisions (Y) are related because the values show positive results. The correlation value (r) is 0.493 which means that product quality and customer experience have a strong relationship to purchasing decisions.
2. The results of the determination coefficient test show that the R Square value is 0.228, which means that the partial influence of the product quality variables (X1) and customer experience (X2) on the purchasing decision variable (Y) is 22.8%.Senorita coffee 21.
3. Test results (T)seen that the number significant probability of product quality variable (X1) 1.999 > 1.98552 t table, calculated t value of customer experience variable (X2) 2.496 > 1.98552 t table so it can be concluded that there is an influence of variable X1 on variable Y, and X2 has an influence on variable Y.

4. Test results (F)It is known that the significance value for the influence of X1 and X2 simultaneously on Y is 0.000 < 0.05 and the calculated F value is 15.594 > F table 2.47, so it can be concluded that there is a simultaneous influence of X1 and X2 on Y.

4. Conclusion

Based on the analysis, the research concludes that product quality (X1) and customer experience (X2) influence purchasing decisions (Y) at Cafe Senorita Coffee.21 Medan. Relationship between Product Quality and Customer Experience with Purchasing Decisions:

i. The results of the correlation coefficient test show that there is a positive relationship between product quality and customer experience with purchasing decisions, with a correlation value (r) of 0.493. This means that both variables have a fairly strong relationship with purchasing decisions at Cafe Senorita Coffee.21 Medan.
ii. Partial Influence of Product Quality and Customer Experience on Purchasing Decisions : Based on the R Square value of 0.228, it is known that product quality and customer experience partially influence purchasing decisions by 22.8%. This shows that most of the variability in purchasing decisions can be explained by product quality and customer experience.
iii. The Simultaneous Influence of Product Quality and Customer Experience on Purchasing Decisions: The F test results show a significance value of 0.000, which is smaller than 0.05, and the calculated F value is 15.594, which is greater than the F table of 2.47. This indicates that there is a significant influence of product quality and customer experience simultaneously on purchasing decisions. In other words, product quality and customer experience simultaneously influence consumer purchasing decisions at Cafe Senorita Coffee.21 Medan.

This conclusion confirms that both product quality and customer experience play an important role in influencing consumer purchasing decisions at Cafe Senorita Coffee.21 Medan, both partially and simultaneously. This study provides valuable insights for cafe management to continue improving product quality and customer experience, to encourage better customer purchasing decisions.

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THE INFLUENCE OF SERVICE QUALITY AND PRODUCT QUALITY REGARDING PURCHASING DECISIONS AT VEGETARIAN THANKSGIVING MEDAN VEGETARIAN

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Abstract

Product quality is defined as the standard of goods and products offered to consumers to fulfill their needs and desires. Service quality refers to the actions and activities of businesses to ensure customer satisfaction. This study was conducted to determine if service quality and product quality collectively influence purchasing decisions at Syukur Vegetarian Restaurant in Medan. Using a quantitative method, data was collected from 96 customers through a non-probability sampling method. The determination test showed that the influence of service quality (X1) and product quality (X2) on purchasing decisions (Y) is 49.1%. This indicates that these two factors have a significant influence on purchasing decisions, with the remaining influence coming from other factors not examined in this study.
Keywords: Service quality; Product quality; Buying decision.

1. Introduction

The food service industry is experiencing rapid growth, from small cafes to large-scale restaurants. For a business to succeed in a competitive market, it must offer high-quality products with competitive value and efficient service. It is important for businesses to understand consumer behavior and purchasing decisions, especially in the restaurant sector. A purchasing decision is a process in which an individual chooses from various alternatives, representing the first step in the decision-making process. According to Tjiptono, a purchasing decision is part of consumer behavior, which involves the acquisition and identification of products and services.

Service quality is defined as the level of excellence expected and controlled to meet customer desires. It can also be seen as a system that provides what the public needs, whether organized by the government or private companies. Product quality is a primary concern for producers. It shows the level of a brand's or product's expertise in performing its role and meeting expectations. According to Kothler & Amstrong in (Marbun et al., 2022) Purchasing decisions are problem solving by individuals by choosing behavioural alternatives and are considered the most appropriate action in purchasing by taking the first step of the decision making process.

Meanwhile, according to Tjiptono in (Cahya et al., 2021)states that purchasing decisions are part of consumer behavior. Consumer behavior is an action that is directly related to the acquisition and identification of products and services, including the decision-making process before and after the action.According to Tjiptono in(Sari & Suprajang, 2020)states that "Service quality is the level of excellence expected and control over that level of excellence to meet customer desires." Tourism service quality is an attraction that includes the uniqueness of the spatial layout (landscape) and beauty.

According to Fandy in (Saefullah, 2022) Service quality is a system that provides something that the public needs, organized by the government or private companies; organizations that

provide something to the public or do something for the government; businesses whose work is doing something for customers but not producing goods; certain skills or assistance that someone can offer; and the condition or position of being a servant or helper. According to Tjiptono & Chandra in (Putri et al., 2021) explains that product quality is something that is offered to consumers which can be in the form of goods or services to meet the needs and desires of customers which can then be used or felt by customers.

Meanwhile, according to Assauri in (Cesariana et al., 2022) Product quality is the main important thing that needs attention from producers/industry. Quality is the main equipment to achieve product position. Quality shows the level of expertise of a brand or product in performing its role and expectations. Product quality can be seen from the size of how long the product lasts, so that it can be trusted by consumers. Syukur Vegetarian Restaurant, established in 2013 in Medan, is known for its vegetarian dishes made from plants, vegetables, and nuts. Although the restaurant is popular, interviews with customers in April revealed some shortcomings.

Customers complained about long waiting times during peak hours and that the food was not properly cooked, affecting its taste and texture. This has led to an interest in researching the influence of service quality and product quality on purchasing decisions at the restaurant. Although Syukur restaurant is famous and serves quality and healthy vegetarian food, there are still some shortcomings in both the quality and product quality.Some customers complain about the food ordering system as well as the taste of the food itself. During peak hours, customers experienced long waiting times and in some cases the food was not properly cooked, affecting the taste and texture. This information was obtained by researchers through interviews conducted in early April.

2. Methodology

According to Hoy & Adam in the book (Hasibuan et al., 2022) Quantitative research is a systematic scientific study of the parts and phenomena and their relationships. According to (Balaka, 2022) Quantitative Research Method is a research method that uses data, namely numbers that are emphasized on objective measurement of results accompanied by statistical analysis/numbers used in statistical analysis from an objective scale to measure units of analysis called variables.

3. Results and Discussion

Normality test is conducted to determine whether the data taken from the population is normally distributed or not. Normality testing in this study uses Kolmogorov-Smirnov. Data are considered normally distributed if the p-value is > 0.05.

Table 1. Results Normality Test

		Unstandardized Residual
N		96
Normal Parametersa,b	Mean	.0000000
	Std. Deviation	2.80370655
Most Extreme Differences	Absolute	.074
	Positive	.074
	Negative	-.072
Test Statistics		.074
Asymp. Sig. (2-tailed)		.200c,d

Based on the normality test results, the p-value is 0.062 > 0.05, indicating that the residuals are normally distributed.

The Heteroscedasticity Test is carried out to determine whether the data taken from the population shows symptoms of heteroscedasticity or not. According to Suharjo in (Puspa et al., 2021)The heteroscedasticity test is to determine whether in the regression model there is inequality of variance from the residual of one observation to another.

Table 2. Heteroscedasticity Test Results

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.054	2,914		1,391	.168
	Quality of Service	.034	.055	.082	.613	.541
	Product Quality	-.066	.058	-.153	-1.144	.255

In the table above, it can be seen that the correlation value for the significant value variable of service quality0.541 > 0.05 and product quality has a significant value of 0.255 > 0.05. It can be concluded that this regression model is free from heteroscedasticity symptoms and is suitable for use. According to Nugraha in (Fariz Hidayatullah, 2024) the assumption that must be met in regression analysis is the absence of a relationship between independent variables, which is then referred to as multicollinearity. Multicollinearity testing is carried out with a value *Variance Inflation Factor (*VIF) > 10, whereas if the tolerance value > 0.10 and the VIF value < 10 then it is stated that there is no multicollinearity.

Table 3. Multicollinearity Test Results

Model		Collinearity Statistics	
		Tolerance	VIF
1	Quality of Service	.595	1,681
	Product Quality	.595	1,681

In the table above, it can be seen that the correlation value for the service quality tolerance value variable is 0.595> 0.10, and the service quality VIF value is 1.681 <10.00. Product quality has a tolerance value of 0.595> 0.10 and a VIF value of 1.681 <10.00. It can be concluded that this regression model is free from multicollinearity symptoms and is suitable for use. In the context of mathematics, the abilities to solve problems and to communicate mathematically are two skills that are fundamentally linked and cannot be separated in either learning or everyday application.

Table 4. Correlation Coefficient Test Results

		Quality of Service	Product Quality	Buying decision
Quality of Service	Pearson Correlation	1	.636**	.648**
	Sig. (2-tailed)		.000	.000
	N	96	96	96
Product Quality	Pearson Correlation	.636**	1	.618**
	Sig. (2-tailed)	.000		.000
	N	96	96	96
Buying decision	Pearson Correlation	.648**	.618**	1
	Sig. (2-tailed)	.000	.000	
	N	96	96	96

Based on the SPSS “Correlations” output table above, the Pearson correlation between the product quality variable (X1) and customer trust (Y) is 0.000, and the Pearson correlation between the social media marketing variable (X2) and customer trust (Y) is 0.000. The two

asterisks indicate that there is a strong relationship between the product quality variable (X1) and customer trust (Y) and the social media marketing variable (X2) and customer trust (Y). A positive correlation value means that if product quality and social media marketing increase, customer trust will also increase. The coefficient of determination is a value that shows the extent of the contribution of influence given by the independent variable to the dependent variable.

Table 5. Results of the Test of the Determination Coefficient of X1 Against Y

Mode	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.648 a	.420	.414	3.008

Based on the table above, the R Square value is 0.414, this means that the partial influence of the service quality variable (X1) on the Purchasing Decision variable (Y) is 42% at Syukur Vegetarian, Medan.

Table 6. Results of the X2 Determination Coefficient Test Against Y

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.618a	.381	.375	3.107

Based on the table above, the R Square value is 0.618. This means that the influence of the product quality variable (X2) on the Purchasing Decision variable (Y) is 38.1% at Syukur Vegetarian, Medan.

Table 7. Results of the Test of the Determination Coefficient of X1 and X2 Against Y

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.701a	.491	.480	2,834

Based on the table above, the R Square value is 0.491. This means that the influence of the product quality variable (X2) on the Purchasing Decision variable (Y) is 49.1% at Syukur Vegetarian, Medan. Multiple linear regression functions to find the influence of two or more independent variables (X) on the dependent variable (Y).

Table 8. Multiple Linear Regression Test Results

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	17,310	4,870		3,554	.001
	Product Quality	.347	.097	.344	3,591	.001
	Quality of Service	.412	.092	.429	4.471	.000

In the table above, it is known that in the Unstandardized Coefficients section B, the multiple linear regression equation is obtained using the following formula:
Customer loyalty = 17,310 + 0.347 service quality + 0.412 customer satisfaction
Based on the equation above, it can be explained as follows:

a) The constant (α) = 17.310 shows the constant value, if the value of the independent variable X1, namely service quality and the value of the variable X2, namely customer satisfaction, is 0, then customer loyalty will increase by 17.310.
b) The coefficient X1b1 = 0.412 shows that the service quality variable (X1) has a positive effect on customer loyalty of 0.412. This means that for every 1 unit increase in service quality (X1), the service quality on customer loyalty will increase by 0.412.

c) The coefficient X2b2 = 0.347 shows that the customer satisfaction variable (X2) has a positive effect on customer loyalty of 0.347. This means that for every 1 unit increase in customer satisfaction (X2), customer satisfaction with customer loyalty will increase by 0.437.

In (Novian et al., 2023) the basis for decision making in a joint test (f-test), if the sig value (significance) < 0.05 then the independent or free variables simultaneously influence the dependent or dependent variables, whereas if the sig value (significance) > 0.05 then the independent or free variables simultaneously do not influence the dependent or free variables. Basis for decision making:

a) If the sig value < 0.05, or F count > F table, then there is a simultaneous influence of variable X on variable Y.
b) If the sig value > 0.05 or F count < F table then there is no simultaneous influence of variable X on variable Y.

F table = F(k;nk)
F table = F(4;96-2)
F table = F (4 ; 94)
Where the F table value is 2.47

Table 9. F Test Results

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	719,716	2	359,858	44,815	.000b
	Residual	746,773	93	8,030		
	Total	1466.490	95			

Based on the test results above, it is known that the significance value for the influence of X1 and X2 simultaneously on Y is 0.000 < 0.05 and the calculated F value is 44.815 > F table 2.47, so it can be concluded that there is a simultaneous influence of X1 and X2 on Y. In (Novian et al., 2023)The basis for decision making in a partial test (t-test), if the sig value (significance) < probability 0.05 then there is an influence between the independent variable and the dependent variable, while if the sig value (significance) > probability 0.05 then there is no influence between the independent variable and the dependent variable. Can be done with the following formula:

Basis for decision making:

a) If the sig value < 0.05, or t count > t table, then there is an influence of variable X on variable Y.
b) If the sig value > 0.05 or t count < t table then there is no influence of variable X on variable Y.

t table = t (α/2 ; nk-1)
t table = t (0.05/2 ; 96-2-1)
t table = t (0.025 ;93)
Where the t table value is 1.98580.

Table 10. T-Test Results

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	17,310	4,870		3,554	.001
	Product Quality	.347	.097	.344	3,591	.001
	Quality of Service	.412	.092	.429	4.471	.000

Based on the results of the table above, the significant probability figures for the service quality variable (X1) are 0.000 <0.05. The product quality variable (X2) is 0.001 <0.05. The customer satisfaction variable is 0.000 <0.05, the calculated t value for the service quality variable (X1) is 4.471> 1.98580 t table, the calculated t value for the customer satisfaction variable (X2) is 3.591> 1.98580 t table so it can be concluded that there is an influence between the X1 variable on the Y variable and X2 has an influence on the Y variable. From the analysis carried out, the following research results were obtained by the researcher:

a) Based on the results of the normality test, the significance value is known.0.062 > 0.05then it can be concluded that the residual values are normally distributed.
b) The results of the multicollinearity test show that the correlation value for the service quality tolerance value variable is 0.966 > 0.10 and the service quality VIF value is 1.035 < 10.00, customer satisfaction has a tolerance value of 0.966 > 0.10 and a VIF value of 1.035 < 10.00. It can be concluded that this regression model is free from multicollinearity symptoms and is suitable for use.
c) The results of the multicollinearity test show that the correlation value for the service quality tolerance value variable is 0.595 > 0.10 and the service quality VIF value is 1.681 < 10.00, customer satisfaction has a tolerance value of 0.595 > 0.10 and a VIF value of 1.681 < 10.00. It can be concluded that this regression model is free from multicollinearity symptoms and is suitable for use.
d) The results of the heteroscedasticity test show that the correlation value for the significant value variable of service quality is 0.541 > 0.05 and customer satisfaction has a significant value of 0.255 > 0.05. It can be concluded that this regression model is free from heteroscedasticity symptoms and is suitable for use.
e) Service quality variable (X1) and product quality (X2) influences purchasing decisions (Y) has a positive relationship and Pearson correlation between the service quality variable (X1) and purchasing decisions (Y) of 0.000, and the Pearson correlation value between the product quality variable (X2) and purchasing decisions (Y) of 0.030.
f) The results of the determination coefficient test show that the R Square value is0.414, this means that the influence of the service quality variable (X1) simultaneously on the purchasing decision variable (Y) is 42% at Syukur Vegetarian, Medan.
g) The results of the determination coefficient test show that the R Square value is 0.618, which means that the influence of the product quality variable (X2) simultaneously on the purchasing decision variable (Y) is 38.1% at Syukur Vegetarian, Medan.
h) The results of the determination coefficient test show that the R Square value is 0.923, which means that the influence of the service quality variables (X1) and product quality (X2) simultaneously on the Purchase Decision variable (Y) is 49.1% at Syukur Vegetarian, Medan.
i) The results of the F test show that the significance value for the influence of X1 and X2 simultaneously on Y is 0.000 < 0.05 and the calculated F value is 44.815 > F table 2.47, so it can be concluded that there is a simultaneous influence of X1 and X2 on Y.

4. Conclusion

Based on the research finding, the author concludes that:

a) The percentage between service quality (X1) and purchasing decisions (Y) is 42%. This proves that service quality influences purchasing decisions by 42% and the remaining is influenced by other factors not examined in this study.
b) The percentage between product quality (X2) and purchasing decisions (Y) is 38.1%. This proves that customer satisfaction affects customer loyalty by 38.1% and the remaining is influenced by other factors not examined in this study.
c) The percentage between service quality (X1) and product quality (X2) on purchasing decisions (Y) is 49.1%. This proves that service quality and product quality influence purchasing decisions by 49.1% and the remaining is influenced by other factors not examined in this study.

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THE INFLUENCE OF PRODUCT QUALITY, SERVICE QUALITY, AND PURCHASING DECISIONS AT CAFE LIMA SATU

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Abstract

This study aims to determine the extent to which product and service quality influence purchasing decisions at Cafe Lima Satu. The method employed in this study is an associative quantitative approach, used to measure relationships between variables. The study involved 71 respondents selected using accidental sampling, a technique in which participants are chosen based on availability and willingness to respond. The results showed that Product Quality and Service Quality together explained 93.4% of the variance in Purchasing Decisions, as indicated by the coefficient of determination. This indicates that these two factors influence most customer purchasing decisions at the cafe. The remaining 6.6% is attributed to other factors not captured in the model, such as price, promotion, location, or individual customer characteristics. This study confirms that factors such as taste quality, product presentation, and the comfort and service provided by employees significantly influence customer purchasing decisions. Thus, management should continue to maintain and enhance product and service quality to sustain and attract consumer interest. The findings also demonstrate that the model employed in this study is both strong and relevant.
Keywords: Product quality; Service quality; Purchasing decisions.

1. Introduction

As urban lifestyles become increasingly fast-paced busier, consumers tend to prefer food options that are convenient and readily accessible. The demand for high-quality food products is rising, pushing businesses to offer superior products at competitive prices. In a competitive market, consumers benefit from a wider range of choices as businesses strive to deliver high quality offerings that attract and retain customers. One noTable player in the vegetarian café industry is Cafe Lima Satu, which specializes in plant-based food and beverages. The café presents a unique concept, catering to health-conscious individuals who prioritize vegetarian or vegan diets. However, beyond the provision of high-quality food, two key factors significantly influence customer purchase decisions in the food and beverage industry: product quality and service quality.

Product quality includes taste, menu variety, and the use of high-quality ingredients in vegetarian meals. Meanwhile, service quality encompasses aspects such as customer service, speed of service, and the availability of menu information. While these factors are essential, there is limited research on how they impact purchasing decisions at Cafe Lima Satu. Given the importance of these elements, this study aims to analyze the influence of product quality and service quality on consumer purchase decisions at Cafe Lima Satu. Understanding these relationships enables businesses to enhance their offerings and develop a competitive advantage in the increasingly dynamic café industry. According to Tjiptono, (Maulidya et al., 2021) product quality is everything that a producer can offer for the attention, demand, search, purchase, use and consumption of the market as a fulfilment or desire of the market concerned.

According to Arianto, (Putra et al., 2023) “Service quality can be defined as focusing on meeting needs and requirements, as well as on timeliness to meet customer expectations”. Customer or consumer expectations must be met as they are the key conditions for service quality to be considered good. Purchasing decisions are problem-solving activities in which individuals select the most appropriate course of action from two or more alternatives. According to the Firmansyah decision-making process (as cited in Octavia et al., 2023) these decisions involve a series of stages before arriving at the final choice. It can be concluded that purchasing decisions are one of the stages of consumer behaviour that underlie consumers making purchasing decisions before post-purchase behaviour and how individuals, groups and organizations choose, buy, use and how goods or services satisfy their needs and wants.

Therefore, it is important for Cafe Lima Satu to pay attention to product quality and service quality to improve customer purchasing decisions and retain existing customers.
According to the information obtained from a customer identified as “G” stated that the service at Cafe Five was perceived as less friendly, making customers feel uncomforTable when making purchases.” Meanwhile, a customer identified as “Y” stated that Cafe Lima Satu guarantees a 100% vegetarian composition, which is very helpful for individuals who adhere to vegetarianism.

2. Methodology

The research method used in this study is quantitative methods. According to Sugiyono, as cited in (Abyan & Rohana, 2022) the quantitative approach is a research method based on the philosophy of positivism. It involves studying specific populations or samples often using random sampling techniques with data collected through research instruments and analyzed statistically. This study aims to test a previously established hypothesis. To achieve this, the author employs an associative quantitative research method, which is used to examine the relationship between two or more variables through statistical analysis.

Table 1. Definition Operational

Variable	Definition	Indicator	Measurement Scale
Product Quality (X1)	According to Nasution (2005), the definition of product quality is the alignment between products, synergized teams, processes and work and the company environment which ultimately exceeds customer expectations.	• Performance • Reliability • Design • Durability and robustness • Perceived quality • Additional features	Likert
Service Quality (X2)	The definition of service quality can be interpreted as an effort to fulfill the needs and desires of consumers and the accuracy of their delivery in balancing consumer expectations. Quoted from (Anim & Putu, 2020).	• Physical evidence • Reliability • Guarantee • Empathy • Responsive day	Likert
Purchasing decision (Y)	The definition of a purchasing decision is a decision process taken by consumers in assessing a product they want to buy. Quoted from (Barus et al., 2021).	• Problem recognition • Information search • Evaluation of alternatives • Purchase decision • Post-purchase behavior	Likert

According to Sudaryono (Ana, 2022), a population is defined as the generalization area consisting of objects or subjects that possess certain qualities and characteristics determined for research, from which conclusions can be drawn. In this study, the population comprised all customers who made purchases at Café Lima Satu, although the exact number was unknown. When a population is too large to study in its entirety due to time, resource, or cost constraints, researchers may use a sample drawn from the population. In this study, the researchers employed the Accidental Sampling technique, a non-probability sampling method in which respondents are selected based on chance, that is, anyone who happens to meet the researcher and is deemed suiTable as a data source is included as a sample.

The following are commonly used research data collection techniques: tests, interviews, observations, questionnaires, surveys, and document analysis. According to Sujarweni (2018: 120), (Nafis et al., 2021) a questionnaire is a method of collecting data by providing respondents with written questions or statements to which they respond. In this study, a closed questionnaire was employed. In this type of questionnaire, answer choices are predetermined, and respondents are required only to select the option that best represents their response. In this study, the researcher used Likert scale as the measuring tool. The Likert scale is a technique commonly used in questionnaires to measure respondents' attitudes, opinions, or perceptions of something.

Table 2. Score Likert

Description	Symbol	Score
Strongly Agree	SA	5
Agree	A	4
Neutral	N	3
Disagree	D	2
Strongly Disagree	SD	1

3.0 Results and Discussion

The number of respondents in this study was 71 people, categorized by gender as shown in the following Table. Based on Table 3, it can be concluded that 71 respondents are namely male 29 people (40.85%) and female 42 people (59.15%). This showed that most of the respondents are female respondents.

Table 3. Description of characteristics of research subjects based on gender

No.	Gender	Tota (Person)	Percentage
1.	Male	29	40,85%
2.	Female	42	59,15%
	Total	71	100%

According to Sugiyono, (Sugiono et al., 2020), validity can be interpreted as the level of accuracy of the measuring instrument in measuring the intended concept. According to Widiyanto, (Hakim et al., 2021) validity refers to the extent to which a questionnaire accurately measures the variables under study. A valid instrument ensures that the data collected are appropriate for measuring the intended constructs. There are two commonly used methods for testing validity. The first is the Pearson correlation, and the second is the correlated item–total correlation.

Table 4. Result of validity and Reliability

No. X1	Corr. Items	Cronb. Alpha	No. X2	Corr. Items	Des	Cronb. Alpha	No. Y	Corr. Items	Cornb. Alpha
X1	0,679		X1	0,676	Valid		Y1	0,66	
X2	0,557		X2	0,768	Valid		Y2	0,765	

X3	0,654		X3	0,657	Valid		Y3	0,554	
X4	0,688	Reliable	X4	0,677	Valid	Reliable	Y4	0,735	Reliable
X5	0,558	0,804	X5	0,676	Valid	0,860	Y5	0,656	0,864
X6	0,553		X6	0,653	Valid		Y6	0,653	
X7	0,503		X7	0,68	Valid		Y7	0,688	
X8	0,612		X8	0,696	Valid		Y8	0,59	
X9	0,626		X9	0,644	Valid		Y9	0,745	
X10	0,634		X10	0,632	Valid		Y10	0,737	
X11	1		X11	1	Valid		Y11	1	

Table 4 shows each variable-product quality (X1), service quality (X2), and purchasing decisions (Y)-consists of 10 valid question items with a corrected correlation value of more than 0.3. The three variables meet the reliability criteria with a Cronbach's Alpha value of more than 0.60, especially product quality with a value of 0.804. Thus, the variables of service quality and purchasing decisions are also declared reliable.

According to Ghozali, (Hutapea & Ghozali, 2022) the normality test is carried out to test whether in a regression model, an independent variable and the dependent variable or both have a normal or abnormal distribution. If the distribution results show that the data is normal or close to normal, then the regression model can be considered good. To determine whether the data are normally distributed in SPSS, the Kolmogorov-Smirnov Test can be used. Kolmogorov Smirnov tests with the provisions the significant value> 5% or 0.05% then the data has a normal distribution. If the significant value <0.05% or 5%, then the data has an abnormal distribution.

Table 5. Result of Normality Test

One-Sample Kolmogorov-Smirnov Test		
		Unstandardized Residual
N		71
Normal Parameters[a,b]	Mean	0,0000000
	Std. Deviation	0,82731114
Most Extreme Differences	Absolute	0,099
	Positive	0,082
	Negative	-0,099
Test Statistic		0,099
Asymp. Sig. (2-tailed)		.083[c]

Based on the results of the normality test using the Kolmogorov- Smirnov test on SPSS 25 (Table 5). The significance value (Asymp.Sig) is 0.083> 0.05, it can be concluded that the residual value is normally distributed and can be carried out for further research. According to Duli (2019: 120), the multicollinearity test aims to see whether there is a high correlation between the independent variables in a multiple linear regression model. Multicollinearity occurs when there is a strong relationship between two or more independent variables in the regression model. This symptom can be detected by checking the Variance Inflation Factor (VIF) and Tolerance. If the VIF value is less than 10 and the Tolerance value is greater than 0.1, it can be concluded that there is no multicollinearity in the model.

Table 6. Result of Multicollinearity Test

Model		Collinearity Statistics	
		Tolerance	VIF
1	Product Quality	.182	5.499
	Service Quality	.182	5.499

Based on the test results in the Table above, the tolerance value of product quality and service quality is 0.182 ≥ 0.10 and the VIF value is 5.499 ≤ 10. Therefore, it can be concluded Multicollinearity is not present. According to Ghozali, (Akbar et al., 2023) Heteroscedasticity

can be tested using the Glejser approach in SPSS. If the significance probability value is greater than the confidence level > 0.05, it can be concluded that there is no heteroscedasticity. Vice versa, if the significance probability value is less than the confidence level, namely <0.05, it can be concluded that heteroscedasticity is present in the modal (Ghozali, as cited in Chandra et al., 2023).

Table 7. Result of Heteroscedasticity Test

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	-0,135	0,714		-0,189	0,850
	Product Quality	0,06	0,044	0,381	1,363	0,177
	Service Quality	-0,04	0,045	-0,246	-0,881	0,381

Table 7 shows that the product quality sig value is 0.177 > 0.05 and the service quality sig value is 0.381 > 0.05, indicating that there is no heteroscedasticity. According to Sugiyono (2019) and Chandra et al. (2023), the correlation coefficient is a measure of the strength of the relationship between two or more variables. The product-moment correlation coefficient is a correlation technique used to find relationships and prove the hypothesis of a relationship between two variables when the data from the two variables are the same.

Table 8. Result of Correlation Coefficient Test

		Product Quality	Service Quality	Purchase Decision
Product Quality	Pearson Correlation	1	.905**	.964**
	Sig. (2-tailed)		0,000	0,000
	N	71	71	71
Service Quality	Pearson Correlation	.905**	1	.902**
	Sig. (2-tailed)	0,000		0,000
	N	71	71	71
Purchase Decision	Pearson Correlation	.964**	.902**	1
	Sig. (2-tailed)	0,000	0,000	
	N	71	71	71

Based on the Table above, the correlation of Product Quality (X1) is 0.964> 0.5 - <1, the correlation of Service Quality (X2) is 0.902> 0.5 - <1, which indicates that both variables have a strong positive correlation. According to Ghozali (2018: 97), (Rahardjo & Yulianto, 2022) the coefficient of determination (R^2) measures the extent to which a model can explain the variations in the dependent variable. The coefficient of determination (R square or R squared) symbolized by "R^2" shows the magnitude of the contribution of the influence given by the independent variable (X) to the dependent variable (Y). The coefficient of determination or R square is useful for predicting and seeing how much influence the X variables contribute simultaneously (together) to the Y variable.

Table 9. Result of Coefficient Determination

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.966[a]	0,934	0,932	0,839

Based on Table 9, the coefficient of determination (R^2) of the R-squared value is 0.934, indicating that the effect of the independent variable (X) on the dependent variable (Y) is 93.4%. A Multiple Linear Regression is a statistical model that examines the relationship

between a dependent variable and two or more independent variables (also called predictors). In multiple linear analysis, the dependent variable is influenced by more than one independent variable (Arikunto, Rismawati, 2022).

Table 10. Result of Multiple Linear Regression Test

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	T	Sig.
1	(Constant)	5,227	1,112		4,701	0,000
	Product Quality	0,774	0,069	0,817	11,190	0,000
	Service Quality	0,156	0,070	0,163	2,226	0,029

$$Y = 5{,}227 + 0{,}774\ X1 + 0{,}156\ X2 + e \quad (1)$$

Purchasing decisions are influenced by product and service quality. Product quality has a greater impact (0.774) than service quality (0.156). This means that improving product quality is more significant in driving purchases, but service quality still plays a role. Ghozali, (Lestari & Ardini, 2023) states that the t test is used to test the extent to which the independent variable partially affects the dependent variable.

Table 11. Result of Hypothesis (T-Test)

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	5,227	1,112		4,701	0,000
	Product Quality	0,774	0,069	0,817	11,190	0,000
	Service Quality	0,156	0,070	0,163	2,226	0,029

Table 11 shows that the significance probability of the Product Quality variable (X1) is 0.000 < 0.05, indicating that it has a significant partial effect on purchasing decisions (Y). Meanwhile, the significance value for the significance of the Service Quality variable (X2) is 0.029 <0.05, indicating that it also partially affects purchasing decisions (Y)

The F test, or Fisher's test, is a statistical method used to test hypotheses on the variability of two or more groups of data. According to Sugiyono, (Santosa, 2020) the F test is examined by using the following formula:

$$F = \frac{R^2/k}{(1-R^2)/(n-k-1)} \quad (2)$$

Table 12. Result of Hypothesis (F-Test)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	678,962	2	339,481	481,824	.000[b]
	Residual	47,911	68	0,705		
	Total	726,873	70			

Table 12 shows that the significance figure is 0.000 < 0.05, indicating that the variables Product Quality (X1) and Service Quality (X2) simultaneously affect Purchasing Decisions (Y).

4.0 Conclusion

The conclusion of this study is that product quality and service quality have a positive and significant influence on purchasing decisions at Café Lima Satu, both individually and simultaneously. Enhancing product quality to meet customer expectations and improving service quality are likely to encourage increased purchasing decisions. These findings demonstrate that both factors play a crucial role in attracting and retaining customers.

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THE EFFECT OF CUSTOMER VALUE, SERVICE QUALITY ON CUSTOMER LOYALTY AT STRAWBERRY VEGGIE

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Abstract

This study aims to analyze the Influence of Customer Value and Service Quality on Strawberry Veggie Customer Loyalty. This study uses quantitative methods which can be defined as a research approach based on the philosophy of positivism. In this approach research is conducted on a specific sample often selected using random sampling techniques. Customer value indicators include quality values, emotional values, and social values. The indicators of service quality are reliability, responsiveness, certainty, empathy, and real. Customer loyalty indicators include speaking positively on a brand; recommend it to others and continue to make repeat purchases. Sampling is done using Purposive Sampling with a sample of 97 respondents. The results of the normality test of this study are 0.119 greater than the standard significance 0.05. The results of the coefficient test indicate that there is a relationship between Customer Value and Service Quality on Customer Loyalty, namely 92.9%.The linear regression results show a significance value of 0.000 (< 0.05), indicating that the Customer Value variable (X1) and the Service Quality variable (X2) collectively have a significant effect on Customer Loyalty (Y). The F-test results show a significance value of 0.000 < 0.05, demonstrating that the Customer Value variable (X1) and Service Quality variable (X2) simultaneously have a significant effect on Customer Loyalty (Y).
Keywords: Customer value; Service quality; Customer loyalty.

1. Introduction

Food is a basic human need, and restaurants play an important role in providing it. In response to growing demand, many restaurants now offer vegetarian options, including dishes that use vegeTables as meat substitutes. One example is Strawberry Veggie, which provides a wide variety of vegetarian meals. This restaurant, along with several others in Medan, caters specifically to the needs of vegetarian consumers. According to Kotler, (Brama Kumbara, 2021) customer value is the set of benefits expected by customers from a particular product or service, while total customer cost is the set of expected costs that customers expect to incur in evaluating, obtaining, using and disposing of a product or service

Service quality is the expected level of excellence and control over that level of excellence to meet customer desires. Of course, the embodiment of the service must also be presented as best as possible which is closely related to quality assurance or the good quality presented according to (Kasinem 2020). According to Sambodo Rio Sasongko (2021), customer loyalty is a deeply held commitment to repurchase or continue supporting a preferred product or service in the future, even when situational factors or marketing efforts might encourage switching. In the context of food consumption, many customers make purchases, although some may not always choose the available menu options, as menus often change daily.

Strawberry Veggie Cemara Asri is a restaurant that provides vegetarian food. Established in 2017, it is located at Jalan Strawberry Medan Estate, Percut Sei Tuan District, Deli Serdang Regency, North Sumatra. By improving the quality of service, the restaurant aims to attract more customers and encourage repeat visits. However, some customers have complained

about delays in food service. Based on this issue, this study aims to examine the influence of customer value and service quality on customer loyalty at Strawberry Veggie.

2. Methodology

According to Sugiyono (Andini and Lestari, 2021), quantitative research methods can be defined as research approaches based on the philosophy of positivism. These methods are used to study specific populations or samples, typically selected using random sampling techniques. Data are collected using research instruments and analyzed quantitatively/statistically, with the aim of testing predetermined hypotheses. Whitney (Kartina, 2021) stated that “the descriptive method is the search for facts with the correct interpretation.” Therefore, the descriptive method involves examining facts from the object of study and emphasizes data collection in the form of words or statements. In this study, a descriptive research strategy was employed to determine the extent of the influence of the independent variables Customer Value (X1) and Service Quality (X2) on the dependent variable, Customer Loyalty (Y), both partially and simultaneously.

According to Sugiyono (Purwanto, 2019), research variables are anything the researcher determines to be studied, enabling the collection of information and the drawing of conclusions. In this study, the variables consist of independent and dependent (bound) variables. According to Sugiyono, independent variables are variables that affect or cause the emergence of dependent variables (Kusmiyati Kusmiyati & Nera Marinda Machdar, 2023). The independent variables in this study are Customer Value (X1) and Service Quality (X2). According to Sugiyono, dependent variables are those influenced or determined by independent variables (Kusmiyati Kusmiyati & Nera Marinda Machdar, 2023). In this study, the dependent variable is Customer Loyalty (Y). According to Arikunto,(Syahidin, Syafii, and Sirojuzilam 2022) The operational definition of the variables are as follows:

a. Customer Value can be defined as the ratio between how much the customer earns and how much the customer gives, the customer benefits and incurs costs. According to Sheth, (Brama Kumbara, 2021) customer value is divided into three important components; quality value, social value, emotional value.
b. Service Quality: Service quality is a form of effort to meet the needs and desires of consumers and the accuracy of its delivery in balancing consumer expectations. Tjipto, (Lestari and Iskandar 2021) defines service quality as a form of effort in realizing the needs, desires of buyers, and the accuracy of product delivery in order to keep up with buyers' expectations. There are five indicators of service quality; reliability, responsiveness, assurance, empathy, physical evidence
c. Customer Loyalty: Purchase decisions refer to consumers’ judgments in deciding to buy products or services by considering and evaluating alternatives among various options. According to Bastian (as cited in Ayuningtyas, Santoso, and Winahyu, 2023), customer loyalty indicators include: speaking positively about the product or service, recommending it to others, and making repeat purchases.

Sugiyono,(Yuzairi and Aguss, 2022) defined population as a general domain like objects or subjects with certain qualities and characteristics that are determined by researchers to be investigated and concluded. The population in this study consists of Strawberry veggie customers although the exact number is unknown. According to the researchers, the restaurant receives an average of approximately 30 visitors per day. Sugiyono (Haribowo et al., 2022) defines Purposive Sampling as: "A technique for determining samples with certain considerations”. The sample in this study was selected using the purposive sampling technique because not all potential respondents met the criteria established by the researcher. This technique involves selecting samples based on specific considerations or criteria that must be fulfilled, which are as follows:

a. Consumers must be at least 18 years old ensuring that they can understand the content of the questionnaire.
b. Consumers must have seen and understood Strawberry veggie products.
c. Consumers must have purchased Strawberry veggie products at least once per month
.

Data in this study were collected through the distribution of questionnaires, a method in which respondents complete structured questions. The questions were designed to address the research objectives. The researcher distributed the questionnaires from April 20, 2024, to June 20, 2024, between 11:00 AM and 3:00 PM WIB. A total of 97 respondents successfully completed the questionnaire, in accordance with the predetermined sample size. According to Sugiyono (as cited in Idris, Sugiarto, and M. Saleh, 2019), the Likert scale is used to measure individuals' or groups' attitudes, opinions, and perceptions regarding social phenomena. In this study, the questionnaire employed a Likert scale to collect data.

Table 1. Statement for answers

No.	Statement	Score
1.	Strongly Agree	5
2.	Agree	4
3.	Neutral	3
4.	Disagree	2
5.	Strongly Disagree	1

3. Results and Discussion

Rahmawan and Hidayat (2020) mentioned that "the normality test is a test with the aim of testing whether in the regression model, the disruptive or residual variable has a normal distribution". In this study, the researcher has tested the normality of the data using the Kolmogorov-Smirnov test. The data is normally distributed, if the significance > 0.05.

Table 2 Normality Test Results

		Unstandardized Residual
N		97
Normal Parameters[a,b]	Mean	.0000000
	Std. Deviation	1,98194948
Most Extreme Differences	Absolute	.081
	Positive	.064
	Negative	-.081
Test Statistic		.081
Asymp. Sig. (2-tailed)		.119[c,d]

Based on the results of the normality test using the Kolmogorov–Smirnov test, the significance value was 0.119 (> 0.05), indicating that the residuals are normally distributed. Ghozali, (Rahmawan and Hidayat, 2020) stated that the Linearity Test aims to determine whether two variables have a significant linear relationship. The researcher uses SPSS 22 to conduct a Test for Linearity with a significance of 0.05, with the stipulation that if the Sig. deviation from linearity value > 0.05, then there is a linear relationship between the free variable and the bound variable. On the other hand, if the value of Sig. deviation from linearity < 0.05, then there is no linear relationship between the independent variable and the bound variable.

Table 3. Customer Value Linearity Test Results (X1)

			Sum of Squares	df	Mean Square	F	Sig.
Customer Loyalty* Customer value*	Between Groups	(Combined)	5081.546	31	163.921	44.967	.000
		Linearity	4794.912	1	4794.912	1315.347	.000
		Deviation from Linearity	286.635	30	9.554	2.621	.001
	Within Groups		236.948	65	3.645		
	Total		5318.495	96			

Based on Table 3, the Sig. The value deviation from linearity is 0.001 < 0.05, indicating that there is no linear relationship between the free variable (X1) and the bound variable (Y).

Table 4. Service Quality Linearity Test Results (X2)

			Sum of Squares	df	Mean Square	F	Sig.
Customer Loyalty * Service Quality	Between Groups	(Combined)	5005.614	30	166.854	35.197	.000
		Linearity	4831.621	1	4831.621	1019.196	.000
		Deviation from Linearity	173.993	29	6.000	1.266	.213
	Within Groups		312.881	66	4.741		
	Total		5318.495	96			

Based on Table 4, the value of Sig. deviation from linearity is 0.213, which is greater than 0.05. Therefore, there is a linear relationship between the free variable (X2) and the bound variable (Y). According to Ghozali, (Rahmawan and Hidayat 2020) "multicollinearity testing aims to test whether the regression model finds correlation between independent variables". Researcher uses SPSS 22 to determine the results of the multicollinearity test with the condition of decision-making if the tolerance value is ≥ 0.10 and VIF is ≤ 10, then multicollinearity does not occur.

Table 5. Multicollinearity Test Results

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	2.574	.811		3.175	.002		
	Customer Value	.392	.075	.453	5.231	.000	.101	9.947
	Service Quality	.462	.076	.523	6.043	.000	.101	9.947

Based on the test results of Table 5, the tolerance value of customer value and service quality is 0.101 ≥ 0.10 and the VIF value is 9.947 ≤ 10 showing there is no multicollinearity. According to Ghozali (2018), “the heteroscedasticity test is used to examine whether there is a variance disparity in the residuals of one observation compared to another in a regression model.” In this study, the scatter plot method in SPSS 22 was used to assess heteroscedasticity. Suppose the scatter plot shows no clear pattern and the points are evenly distributed above and below zero on the y-axis. In that case, it indicates that heteroscedasticity is not present, as illustrated in the scatter plot below:

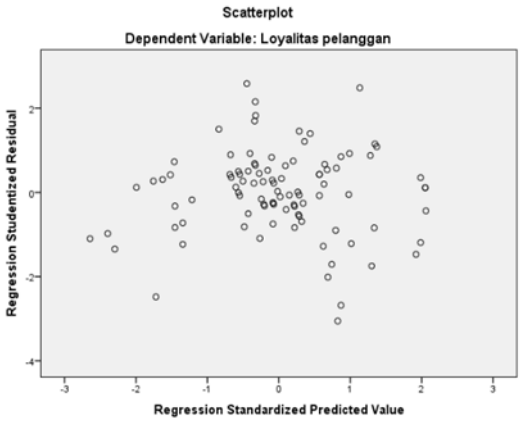

Fig. 1. Heteroscedasticity Test Results

Based on the test results, which meet the previously stated requirements, it can be concluded that heteroscedasticity is absent. To measure the degree of relationship between variable X and variable Y, the researcher calculates the correlation coefficient with the conditions and criteria According to (Lind, Douglas.A., Wathen 2019) the criteria for the strength of the relationship between two variables are as follows:

i. If the correlation value is -1, then the negative correlation is perfect.
ii. If the correlation value is <-1 - <-0.5, then there is a strong negative correlation.
iii. If the correlation value is -0.5, then there is a moderate negative correlation.
iv. If the correlation value is >-0.5 <0, then there is a weak negative correlation.
v. If the correlation value is 0, then there is no correlation.
vi. If the correlation value is >0 -<0.5, then there is a weak positive correlation value.
vii. If the correlation value is 0.5, then there is a moderate positive correlation value.
viii. If the correlation value is >0.5 - <1, then there is a strong positive correlation value.
ix. If the correlation value is 1, then there is a perfect positive correlation value

Table 6. Correlation Test Results

		Customer value	Quality of service	Customer loyalty
Customer value	Pearson Correlation	1	.948**	.950**
	Sig. (2-tailed)		.000	.000
	N	97	97	97
Service Quality	Pearson Correlation	.948**	1	.953**
	Sig. (2-tailed)	.000		.000
	N	97	97	97
Customer Loyalty	Pearson Correlation	.950**	.953**	1
	Sig. (2-tailed)	.000	.000	
	N	97	97	97

Based on the Table above, the correlation of Customer Value (X1) is 0.950 > 0.5 - <1, is the same as the correlation of Service Quality (X2) of 0.953 > 0.5 - <1, showing that both have a strong positive correlation value. According to Sugiyono (Indrawan and Kaniawati Dewi, 2020), the product moment correlation coefficient is a technique used to measure the relationship between two variables and to test the hypothesis regarding their correlation, provided that the data for both variables are of the same type. Researcher used SPSS 22 to determine the results of the determination coefficient test (R^2) with a determination coefficient value between 0 (zero) to 1 (one). A value close to 1 (one) means that the independent variable (X)

provides almost all the information needed to predict the variation of the dependent variable (Y).

Table 7. Determination Coefficient Test Results

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.964[a]	.929	.928	2.003

Based on Table 8, the value of the determination coefficient (R^2) is 0.929, which means that the influence of the independent variable (X) on the dependent variable (Y) is 92.9%. According to Anwar (2018), the t-test is used to assess the potential of each variable and to determine whether the independent variable (X) is individually related to the dependent variable (Y). Researcher uses SPSS 22 to determine the results of the T-test with the condition of decision-making if the significance < α 0.05. Customer Value Variable (X1) partially affects Customer Loyalty(Y) Service Quality Variable (X2) partially affects Customer Loyalty (Y)

Table 8. T Test Results

Type		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.574	.811		3.175	.002
	Customer Value	.392	.075	.453	5.231	.000
	Service Quality	.462	.076	.523	6.043	.000

T test from Table 9 shows that the probability number of significance of the Customer Value variable (X1) is 0.002 < 0.05 indicates that it is partially affecting Customer Loyalty (Y). Meanwhile, the probability of significance of the Service Quality variable (X2) is 0.000 < 0.05 means that it can partially affect Customer Loyalty (Y). (Anwar 2018)"The F test is used to determine the potentials of the whole of the independent variable (X) whether the two independent variables have a simultaneous effect on the bound variable (Y)". Researcher uses SPSS 22 to determine the results of the F test with the condition of decision-making if the significance of < α = 0.05 then the variables Customer Value (X1) and Service Quality (X2) simultaneously affect Customer Loyalty (Y).

Table 9. F Test Results

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4941.395	2	2470.697	615.873	.000[b]
	Residual	377.100	94	4.012		
	Total	5318.495	96			

The results of the F test from Table 10 the significance number is 0.000 < 0.05 demonstrate that the variables Customer Value (X1) and Service Quality (X2) simultaneously affect Customer Loyalty (Y). Based on the data analysis conducted by the researcher, the results are as follows:

a. The results of the linearity test indicated that if the significance value for deviation from linearity (Sig.) is greater than 0.05, there is a linear relationship between the independent variable and the dependent variable.*

b. The results of the linearity test showed that if the Sig. deviation from linearity value > 0.05, there is a linear relationship between the free variable and the bound variable.
c. The results of the correlation test showed that the correlation value of Customer Value (X1) and the correlation of Service Quality (X2) > 0.5 - <1, then both had a strong positive correlation value.
d. The results of the determination coefficient test showed that the value of the determination coefficient 〖(R〗^2) of the value of R square is 0.929 which means that the influence of the independent variable (X) on the dependent variable (Y) was 92.9%.
e. The results of the multiple linear test showed that the significance value of < 0.05 indicates that the variables Customer Value (X1) and Service Quality (X2) together had an effect on the Customer Loyalty variable (Y). A regression equation of Y=2.574+0.392X_1+0.462X_2+ε. That is, every time 1 unit of the Customer Value variable (X1) increases, the value of the Customer Loyalty variable (Y) will increase by 0.392 units. Each time 1 unit is added variable Quality of Service (X2), the value of the Customer Loyalty variable (Y) will increase by 0.462 units.
f. The results of the T test showed that the significance probability number is <0.05 thus the variables Customer Value (X1) and Service Quality (X2) partially affected Customer Loyalty (Y).
g. The results of the F test show that the significance number is <0.05 variables Customer Value (X1) and Service Quality (X2) simultaneously affect Customer Loyalty (Y).

4. Conclusion

Based on the test results and analysis, customer value, service quality, and customer loyalty collectively affect customer behavior at Strawberry Veggie. Furthermore, purchase decisions of Strawberry Veggie customers are influenced by service quality and customer loyalty to the tune of 92.9%, while the remaining 7.1% is affected by other factors not included in the model.

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THE EFFECT OF COMMUNICATION AND WORK DISCIPLINE ON EMPLOYEE PERFORMANCE AT PT. CIPTAMANDIRI AGUNG JAYA AT MAHA VIHARAMAITREYA MEDAN

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Abstract

The purpose of this study is to examine the influence of communication and discipline on employee performance at PT. Cipta Mandiri Agung Jaya, specifically in the Maha Vihara Maitreya environment. Communication is an essential medium in the workplace, while discipline refers to an individual's willingness to comply with and adhere to applicable regulations and norms. Primary data were collected through questionnaires distributed to 97 respondents. The analysis was conducted using the correlation coefficient with the help of SPSS 25. The results of the regression analysis are as follows: Employee Performance (Y) = 7.603 + 0.437X1 + 0.510X2, indicating that every one-unit increase in communication (X1) contributes to a 0.437 increase in employee performance, and every one-unit increase in discipline (X2) contributes to a 0.510 increase. The F-test results show a significance value of 0.000 (< 0.05), indicating that communication and discipline simultaneously have a significant effect on employee performance.
Keywords: Communication; Discipline; Employee performance.

1. Introduction

Communication and discipline are key factors that determine the progress or decline of a company. In organizations with employees who are responsible and highly disciplined, work is performed efficiently and reliably. Effective communication also plays a crucial role in preventing misunderstandings that could lead to losses for the company or organization. To ensure effectiveness, regulations enforcing employee discipline must be clearly established. For these rules to function properly, leaders must set a strong example, as they serve as guides for their subordinates. A leader who demonstrates discipline and provides proper direction can foster high levels of employee performance, ultimately benefiting the organization.

Employees play a critical role in the success of a company. Consistent and diligent employees help the organization achieve its vision and mission more efficiently. However, managing employees can be challenging, especially in large organizations, as each employee has unique thoughts, feelings, status, desires, and backgrounds. Improving communication, work discipline, and work supervision within a company is expected to enhance employee performance, leading to greater job satisfaction and commitment. This, in turn, contributes to the overall advancement of the company and the improvement of the quality of employees' work.

2. Methodology

Quantitative research is a form of research that uses numerical data collection and analytical techniques to test hypotheses, draw conclusions and understand the relationships between the variables being studied. According to scientific sources, quantitative research is generally considered to be an impartial and systematic scientific methodology for collecting measurable data, conducting statistical analysis and drawing conclusions from the resulting data analysis. Quantitative research is a research methodology that uses scientific techniques to collect numerical data, conduct statistical analysis, and draw conclusions based on the findings. The use of quantitative research methodology allows researchers to test hypotheses objectively, draw broader generalizations about the population, and provide strong empirical data to support their conclusions. Through the use of this methodology, scholars are able to understand the relationships between the variables being studied, resulting in a more methodical and reliable understanding of the phenomena being studied (Amruddin et al., 2022).

The indicators contained in quantitative research include:

a. Research variables are ideas, events, or characteristics whose values may fluctuate during a study. Variables can be further divided into dependent variables that are influenced or assessed in the study, and independent variables that influence or are used to predict other factors. For example, physical exercise is an independent variable, and mental health is a dependent variable in a study on the impact of physical exercise on mental health;
b. The research plan or technique used to collect and examine data to provide answers to research questions is known as research design. Depending on the purpose of the research and the type of data collected, the research design may be an experiment, survey, case study, or correlation study. The accuracy and reliability of the research findings will be ensured by an appropriate research design;
c. The methods and tools used to collect information from research participants are called data collection techniques. Some methods that are often used to collect data are surveys, observations, interviews, and secondary data collection. The reliability and validity of the data obtained will be guaranteed by using a methodology that is in accordance with the research objectives and population characteristics; and
d. The process of analyzing research findings and presenting them in an easy-to-understand format, such as Tables, graphs, or reports, is called the interpretation and presentation of results. In order for readers or stakeholders to understand and apply research findings, research results must be presented clearly and accurately (Sena Wahyu [2].

According to Sugiyono (2020), the formulation of problems in a study can be grouped into three forms: descriptive, comparative, and associative. The method that will be used by the author is a quantitative research method with an associative form. A questionnaire is a data collection technique that is carried out by giving a set of written questions or statements to respondents to answer where the Likert scale is used to measure the attitudes, opinions, and perceptions of a person or group of people on social phenomena (Marpaung et al., 2021).

3. Results and Discussion

3.1 Normality Test Results

For statistical analysis, data from each variable must be normally distributed. Before conducting hypothesis testing, a normality test is performed. In this study, the Kolmogorov–Smirnov test using SPSS 25 was employed to assess normality. Data are considered normally distributed if the significance value is greater than 0.05.* According to Ghozali at (Fenny Krisna Marpaung et al., 2021), the normality test aims to test whether in the regression model, the interfering variables or residuals have a normal distribution.

Table 1. Normality Test Results
Kolmogorov-Smirnov Normality Test Results

		Unstandardized Residual
N		96
Normal Parametersa,b	Mean	.0000000
	Std. Deviation	2.62844551
Most Extreme Differences	Absolute	.066
	Positive	.057
	Negative	-.066
Test Statistics		.066
Asymp. Sig. (2-tailed)		.200c,d

a. Test distribution is Normal.
b. Calculated from data.
c. Lilliefors Significance Correction.
d. This is a lower bound of the true significance.

Source: Data processed using SPSS 25 (2024)

From Table 1 the significance value for the variables Communication (X1), Discipline (X2) and Employee Performance (Y) is 0.200 and greater than 0.05, indicating that the data can be distributed normally.

3.2 Multicollinearity Test Results

According to Hidayatullah (2024), the assumption that must be met in regression analysis is the absence of a relationship between independent variables, which is then referred to as multicollinearity. Multicollinearity testing is carried out with a value Variance Inflation Factor (VIF) > 10, whereas if the tolerance value > 0.10 and the VIF value < 10 then it is stated that there is no multicollinearity.

Table 2. Results of Multicollinearity Test Coefficients

Model		Collinearity Statistics	
		Tolerance	VIF
1	COMMUNICATION	.970	1,031
	DISCIPLINE	.970	1,031

Based on the output results of the Table above, it can be seen that the regression model does not have a multicollinearity problem because the VIF value is less than 10 and/or the tolerance value is more than 0.01.

3.3 Heteroscedasticity Test Results

According to Suharjo in Puspa et al. (2021), the heteroscedasticity test is to determine whether in the regression model there is inequality of variance from the residual of one observation to another.

Table 3. Heteroscedasticity Test Results

Model	Unstandardized Coefficients		Standardized Coefficients		t	Sig.
	B	Std. Error	Beta			
1	(Constant)	8.146	3.262		2.498	.015
	X1	-.086	.057	-.170	-1,494	.139
	X2	-.045	.045	-.115	-1.009	.316

Based on Table 3, the regression model does not have a heteroscedasticity problem because the significance value of the Communication (X1) and Discipline (X2) variables is greater than 0.05.

3.4 Determination Test Results

The coefficient of determination (KD) functions to determine the magnitude of the contribution of the independent variable to the dependent variable.

Table 4. Results of Determination Coefficient Test

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.746a	.556	.546	2,657

The formula for testing the coefficient of determination (R2) is as follows.

KD = R2 X 100%
KD = (0.746)2 X 100%
KD = 56.304%

From the Table 4, it shows that the magnitude of the influence of Communication (X1) and Discipline (X2) on Employee Performance (Y) is 56.304%.

3.5 Multiple Linear Regression Test Results

Table 5. Multiple Linear Regression Results

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	7,603	3.468		2.192	.031
	COMMUNICATION	.437	.057	.542	7,724	.000
	DISCIPLINE	.510	.058	.615	8,765	.000

Y = a + b1X1 + b2X2
Y = 7.603 + 0.437X1 + 0.510X2

The explanation of the equation above is as follows:

i. If Communication and Discipline improve, Employee Performance will be 7,603.
ii. The Communication Coefficient (X1) is 0.437, which means that if communication improves or gets better, it can increase employee performance by 0.437.
iii. The regression coefficient of discipline (X2) is 0.510, which means that if discipline increases or adds one unit, it can increase employee performance by 0.447.

3.6 Partial Test Results (T-Test)

In Novian et al. (2023), the basis for decision making in a partial test (t-test) is if the sig value (significance) < probability 0.05 then there is an influence between the independent variable and the dependent variable, while if the sig value (significance) > probability 0.05 then there is no influence between the independent variable and the dependent variable.

Table 6. Partial Test (T Test)

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	7,603	3.468		2.192	.031
	COMMUNICATION	.437	.057	.542	7,724	.000
	DISCIPLINE	.510	.058	.615	8,765	.000

The provisions in the partial test (T test) are as follows: If the significance value is <0.05 then there is an influence of the independent variable on the dependent variable. If the significance value > 0.05 then there is no influence of the independent variable on the dependent variable. Based on the output Table 6 above, it can be seen that the significance value of the communication variable is 0.000, which means it is less than 0.05, so communication has an effect on employee performance and H01 is rejected. The significance value of the discipline variable is 0.000, which means it is less than 0.05, so discipline has an effect on customer satisfaction and H02 is rejected.

3.7 Simultaneous Test Results (F Test)

In Novian et al. (2023), the basis for decision making in a joint test (f-test) is if the sig value (significance) < 0.05 then the independent or free variables simultaneously influence the dependent or dependent variables, whereas if the sig value (significance) > 0.05 then the independent or free variables simultaneously do not influence the dependent or free variables.

Table 7. Simultaneous Test Results (F Test)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	821,629	2	410,815	58,211	.000b
	Residual	656,329	93	7,057		
	Total	1477.958	95			

The provisions in the simultaneous test (F test) are as follows: If the significance value < 0.05 then the hypothesis is accepted. If the significance value > 0.05 then the hypothesis is rejected. Based on Table 7, the significance value is 0.000<0.05 so it can be concluded that communication and discipline simultaneously have an influence on employee performance.

The results of data processing, obtained results, namely based on the validity test, for the variables of communication and discipline on employee performance, all statements are accepted/valid. Based on the results of the reliability test, the reliability coefficient of the instrument (cronbachalfa) of the communication variable is 0.711, the reliability coefficient of the instrument (cronbachalfa) of service quality is 0.771, and the reliability coefficient of the instrument (cronbachalfa) of customer satisfaction is 0.628. The value of the reliability coefficient of the instrument (cronbachalfa) of all variables is greater than 0.600, this proves that the questionnaire used is reliable or can be relied on. Based on the normality test used, it shows that the Kolmogorov Smirnov value for communication and discipline on employee performance is 0.200, which means that the data is normally distributed (greater than 0.05). Based on the multicollinearity test, this study shows that the VIF value is less than 10 and/or the tolerance value is more than 0.01, so it can suggest that the processed data regression model does not have multicollinearity problems.

The results of the heteroscedasticity test show that there is no heteroscedasticity problem because the significance value of each independent variable is greater than 0.05. Based on

the correlation coefficient test conducted, it shows that the correlation coefficient value between communication and discipline on employee performance is 0.746, which means that communication and discipline on employee performance have a strong correlation relationship. The results of the determination coefficient test value are 56.304%, which means that communication and discipline towards employee performance, product quality and service quality have an influence of 56.304% on employee performance. The results of the multiple linear regression test produced a regression model equation Y = 7.607 + 0.347 (X1) + 0.447 (X2), which means that every increase of 1 unit of communication can increase discipline by 0.347 times and an increase of 1 unit of communication will increase employee performance by 0.510 times. The partial test results (T test) show that the significance value of communication and discipline is less than 0.05, so it can be concluded that Ha1 and Ha2 are accepted. Likewise, the results of the simultaneous test (F test) are accepted. Likewise, the results of the simultaneous test (F test) show that communication and discipline have an influence on customer satisfaction simultaneously.

4. Conclusion

Based on the data analysis and discussion presented in the previous chapter, researchers can draw several conclusions. Employee discipline positively influences performance in achieving company goals at PT. Cipta Mandiri Agung Jaya, Maha Vihara Maitreya, Medan. This is supported by a strong positive correlation between discipline and employee performance, with a correlation coefficient of 0.746. Furthermore, the coefficient of determination indicates that discipline accounts for 97.4% of the variation in employee performance, while the remaining 2.6% is influenced by other factors not examined in this study.

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THE EFFECT OF PRODUCT QUALITY, SERVICE QUALITY ON PURCHASE DECISIONS AT BRADE SPRAYER

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Abstract

The purpose of this research is to find out whether there is an influence of product quality and service quality on purchasing decisions at the Brade Sprayer Shop. The research method is quantitative, with data collected via questionnaires and a Likert scale. The sample in this study was 30 respondents. Sampling uses an incidental technique, which is a sample determination based on chance. Data analysis uses simple regression tests and correlation coefficients and uses SPSS 25 for data processing. The research results show that there is a significant influence between product quality and service quality on purchasing decisions at the Brade Sprayer Shop
Keywords: Product quality; Service quality; Purchasing decisions.

1. Introduction

The development of agriculture in the 24th year has grown very rapidly where vegetables and fruits are so fresh and beautiful, with the quality of sprayer products it has made it easier for farmers to eliminate pests that inhibit the growth and productivity of the plant, Sprayer is a tool or equipment used by farmers in order to eradicate and control pests and plant diseases (Adolph, 2016). This sprayer has undergone various changes, the first is the backpack sprayer model, this model is still relatively manual to use it so that it produces relatively low spray pressure, especially when the operator is tired of moving the backpack sprayer pump lever (Jamaluddin et al., 2014). Until finally the sprayer creates the latest sprayer product quality that greatly helps farmers without having to spray manually, with the portable power sprayer it is very easy to use because this item has used a high-quality GP160 SD1 engine and has extraordinary reliability, so it is suitable for long-term use, besides this machine is very fuel efficient and oil consumption.

Purchasing decisions are decisions to evaluate different products/brands on the market to choose and then buy the product/brand (Citra, 2024) , Meanwhile, according to Tjiptono in Fatkhurrahman (n.d.), purchasing decisions are a division of consumer behavior. Consumer behavior is an action that is directly related to the acquisition and identification of products and services, including the decision-making process before and after the action. Brade Sprayer Store was established in 2018, which is a store that only provides agricultural aids in the form of sprayers with various types and models, namely, Hand Sprayer, Backpack Sprayer, Portable Power Sprayer, Foggers, Tractor Sprayer, Aerial Sprayer, Manual Knapsack Sprayer, Electric Knapsack Sprayer with various models and types can be adjusted to the needs of farmers. Even though the Brade Sprayer Store is quite well-known for the quality of its sprayer products among farmers, there are still some shortcomings in the quality of the

Brade Sprayer Store's products, which makes customers or buyers a little hesitant in planning to purchase the product.

In addition, there are customers who provide suggestions and criticisms about the quality of the product, which often results in failure in the sprayer head, causing it to jam and not be able to be used. The quality of service at the Brade Sprayer store is very good, in terms of communication, very friendly and polite, and the delivery service is on time. This information was obtained by researchers based on interviews conducted in early May.

2. Methodology

2.1 Understanding Purchasing Decisions

According to Indrasari (Artameviah, 2022) Purchasing decisions are a selection of two or more alternative choices, in other words, choices/alternatives must be available to a person when deciding. According to Kerin and Hartley (Erna, 2022), purchasing decision is a five-stage process that buyers go through in making choices about which products and services to purchase including problem recognition, information search, evaluation of alternatives, purchase decision, and post-purchase behavior. According to Firmansyah in Erna (2022) Explains that there are eight purchasing decision indicators as follows: Decision on product type In every decision regarding the purchase of a product, we must pay attention to which important needs come first and the amount of money we have according to our household income.

Decisions on Product Characteristics Consumers decide to buy a mobile phone product with a certain form (size, quality, pattern, etc.). Decisions about brands Consumers decide which brand to take. Companies must understand how consumers choose a brand. The five conditions below drive branding decisions. Products will be easily recognized if they use a brand or brand mark. The product is perceived to have the highest value for its price. Quality and standards are easy to maintain. Demand for general product classes is large enough to support regional, national and international chains. Mass development is critical to the success of the brand to support advertising and administrative overhead costs. There are economies of scale.

According to Sugiyono (Agustian et al., 2019), states that basically a research variable is something in the form of anything that is determined by the researcher to study so that information about it is obtained, then conclusions are drawn. In this study, there are three variables used, namely two independent variables and one closed variable. Researchers use two independent variables (free), namely Product Quality (X1) and Service Quality (X2), and the dependent variable (bound) is Customer Loyalty (Y). In this study using a Likert scale as a measuring tool in a survey. The Likert scale is a technique commonly used in questionnaires to measure respondents' attitudes, opinions, or perceptions of something.

Table 1. Likert Scale Score

Positive Statement	Mark	Negative Statement	Mark
Strongly Disagree (STS)	1	Strongly Disagree (STS)	1
Disagree (TS)	2	Disagree (TS)	2
Hesitant (Neutral)	3	Hesitant (Neutral)	3
Agree (S)	4	Agree (S)	4
Strongly Agree(SS)	5	Strongly Agree (SS)	5

Source: Sugiyono (Wahyuddin 2022)

The author used an associative quantitative research method in this study. The author wanted to understand the relationship between two or more variables using statistics. According to

Sugiyono (Nasution, 2022), an associative strategy is applied to examine the relationship between two variables, namely a causal relationship.

3. Results and Discussion

3.1 Result of Multicollinearity Test

According to Pangow et al. (2024), the multicollinearity test aims to test the correlation between independent variables in regression. A good regression model should be free from such correlation. Multicollinearity can be seen from the Variance Inflation Factor (VIF) and Tolerance values, where VIF < 10.00 and Tolerance > 0.10 indicate the absence of multicollinearity.

Table 2. Multicollinearity Test Results

Model		Collinearity Statistics	
		Tolerance	VIF
1	Quality of Service	.595	1,681
	Product Quality	.595	1,681

The table above shows that the tolerance and VIF values for product quality and service quality meet the tolerance criteria of 0.595>0.10 and VIF 1,681<10.00, so the regression model is free from multicollinearity and is suitable for use.

3.2 Results of Heterocesdasticity Test

According to Widarjono in Nafiudin et al. (2021), the heteroscedasticity test tests whether there is an inequality of residual variance between observations. The decision-making basis for the Heteroscedasticity test is: If the significance > α=0.05, no heteroscedasticity occurs; if < α=0.05, heteroscedasticity occurs. A good regression model should be free from heteroscedasticity.

Table 3. Results of the Heteroscedasticity Test

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.054	2.914		1.391	.168
	Kualitas Pelayanan	.034	.055	.082	.613	.541
	Kualitas Produk	-.066	.058	-.153	-1.144	.255

The table above shows the significance value of product quality 0.168>0.05 and service quality 0.541 > 0.05, so the regression model is free from heteroscedasticity and is suitable for use.

3.3 Results of Correlation Coefficient Test

According to Sugiyono in Marpaung et al. (2021), the correlation coefficient is a strong relationship number between two or more variables. The product-moment correlation coefficient is a correlation technique used to find relationships and prove the hypothesis of a relationship between two variables if the data from the two variables or are the same. In simple terms, correlation can be interpreted as a relationship.

Table 4. Correlation Coefficient Test Results

		Total_X2	Total_X1	Total_Y
Total_X2	Pearson Correlation	1	.700**	.593**
	Sig. (2-tailed)		.000	.001
	N	30	30	30
Total_X1	Pearson Correlation	.700**	1	.602**
	Sig. (2-tailed)	.000		.000
	N	30	30	30
Total_Y	Pearson Correlation	.593**	.602**	1
	Sig. (2-tailed)	.001	.000	
	N	30	30	30

Based on the SPSS "Correlations" output table above, it is known that the Pearson correlation value between the service quality variable (X1) and the purchasing decision (Y) is .001, and the Pearson correlation value between the product quality variable (X2) and the purchasing decision (Y) is 0.000. The two asterisks indicate that there is a strong relationship between the service quality variable (X1) and the purchasing decision (Y) and the product quality variable (X2) and the purchasing decision (Y). A positive correlation value means that if the service quality and product quality increase, the purchasing decision will also increase.

3.4 Result of Coefficient Determination

The coefficient of determination is a value that shows the extent of the contribution of influence given by the independent variable to the dependent variable. According to Ghozali in Ardista (2021), The determination coefficient test (Adjusted R^2) aims to measure the extent to which the calculation is able to explain the variation in the dependent variable.

Table 5. Results of Determination Coefficient Test

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.746a	.556	.546	2,657

The formula for testing the coefficient of determination (R2) is as follows.

$$KD = R2 \times 100\%$$
$$KD = (0.746)2 \times 100\%$$
$$KD = 56.304\%$$

From the calculation results above, it can be seen that the magnitude of the influence of Communication (X1) and Discipline (X2) on Employee Performance (Y) is 56.304%.

3.5 Multiple Linear Regression Test Results

According to Qomusuddin and Siti (2021), multiple linear regression analyzes the effect of two or more independent variables (X) on the dependent variable (Y). The following equation describes the multiple linear regression model:

Table 6. Multiple Linear Regression Test

		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	10,282	2,921		3,521	.002
	Total_X2	.271	.166	.335	1,635	.114
	Total_X1	.186	.104	.368	1,793	.084

The regression test results show that Constant (α) = 10,282. This indicates that if product quality (X1) and service quality (X2) = 0, customer loyalty increases by 10,282.
The coefficient X1b1 = 0,271 means that every increase of 1 unit of product quality increases loyalty by 0,271. The service quality coefficient X2b2 = 0,186 means that every increase of 1 unit of service quality increases customer loyalty by 0,186.

3.6 The Results of Hypothesis (F-Test)

Simultaneous Test (F Test) tests whether the independent variables together have a significant effect on the dependent variable (Mardiatmoko, 2020). With the decision: If the sig value is < 0.05 or F count > F table then there is an effect of variable X simultaneously on variable Y. If the sig value is > 0.05 or F count < F table then there is no effect of variable X simultaneously on variable Y

F table = F (k; n-k) F table = F (4; 95)
F table = F (4; 97-2) Where the F table value is 2,47

Table 7. Results of Hypothesis (F-Test)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	164.082	1	164.082	38.645	.000b
	Residual	118.885	28	4.246		
	Total	282.967	29			

The test results show the significance of the effect of X1 and X2 on Y of 0.000 <0.05 and F count 164.082> 2.47, so that X1 and X2 simultaneously affect Y

3.7 The Results of Hypothesis (T-Test)

According to (Mardiatmoko, 2020) Partial Test (T test) is used to determine whether the independent variable regression model partially has a significant effect on the dependent variable. With the decision: If the sig value <0.05 or t count> t table then there is an influence of variable X on variable Y. If the sig value is> 0.05 or t count < t table then there is no influence of variable X on variable Y.

t table = t (α/2 ; n-k-1) t table = t (0,025 ;94)
t table = t (0,05/2 ; 97-2-1) Where the t table value is 1.986.

Table 8. Results of Hypothesis (T-test)

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	10.282	2.921		3.521	.002
	Total_X1	.186	.104	.368	1.793	.084
	Total_X2	.271	.166	.335	1.635	.114

The table above shows significant probabilities for X1, X2, and Y (0.000 <0.05), and the t-counts of product quality (X1) (3.521) and service quality (X2) (1.635) exceed the t-table (1.986). So, product quality (X1) and service quality (X2) affect customer loyalty (Y).

4. Conclusion

Based on the results of the research conducted by the author, the author concludes that:The percentage between service quality (X1) and purchasing decision (Y) is 42%. This proves that service quality influences purchasing decision by 42% and the rest is influenced by other factors that are not studied. The percentage between product quality (X2) and purchasing decision (Y) is 38.1%. This proves that customer satisfaction influences customer loyalty by

38.1% and the rest is influenced by other factors that are not studied. The percentage between service quality (X1) and product quality (X2) and purchasing decision (Y) is 49.1%. This proves that service quality and product quality influence purchasing decision by 49.1% and the rest is influenced by other factors that are not studied.

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THE EFFECT OF SERVICE QUALITY AND PRODUCT QUALITY ON PURCHASE DECISIONS AT TAI WOK MEDAN VEGETARIAN

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Abstract

This study aims to analyze the influence of service quality and product quality on consumers' purchasing decisions at Tai Wok. In today's increasingly competitive business environment, both service and product quality are considered crucial factors that significantly affect consumer behavior when choosing a product or service. This study targets customers of Tai Wok who have purchased its products and directly experienced the quality of its goods and services.The sampling method used is non-probability sampling with an incidental sampling technique, where respondents were selected based on their availability and willingness to participate by filling out the questionnaire voluntarily. Primary data was collected through the distribution of questionnaires to 50 selected respondents. The data was then analyzed using an F-test (simultaneous test) with the help of SPSS version 26 software to determine the simultaneous effect of service quality and product quality on purchasing decisions. The results of the analysis indicate that service quality and product quality together have a significant influence on consumer purchasing decisions. However, there are also other external factors not examined in this study that may affect consumer choices. This research provides valuable insights for business owners and managers in developing effective marketing strategies, enhancing customer service quality, and improving product offerings to be more competitive in the market and better aligned with customer expectations and needs.
Keywords: Service Quality; Product Quality; Purchase Decision.

1. Introduction

In the modern era, business competition is becoming increasingly intense, particularly in the culinary industry. The culinary business is one of the many businesses that is growing rapidly even during a crisis. This is because food is a fundamental human need that must be fulfilled. The growth of the culinary industry is accompanied by an increasing number of restaurants offering similar foods, with many individuals competing to establish businesses in order to maximize their profits. With the continuous development of technology, it can be observed that while buying and selling transactions were previously conducted directly, people and businesses are increasingly shifting to virtual markets and becoming accustomed to conducting transactions, including sales, purchases, and product marketing, online. The industry, as one of the main sectors of the national economy, plays a strategic role in supporting economic sustainability and growth.

Service quality is the overall features and characteristics of a good or service that influence its ability to satisfy stated or implied needs (Khairani et al., 2019). Service quality is provided by a company to be able to meet the expectations of its consumers. Meanwhile, Fadhilah and Nainggolan (2024) state that service quality is the level of expected excellence and managing that level of excellence to meet customer expectations. Sari and Indra (2024) state that product quality is quality that involves efforts to meet or exceed customer expectations, which includes products, services, people, processes, and the environment. Product quality is also

a constantly changing condition (for example, what is considered high quality today may be worse in the future). Vol and Sandra (2024) state that product quality is known as the capabilities, features, and characteristics of a product or service that depend on its ability to satisfy customer needs. According to Irwan and Wibowo (2021), consumers make purchasing decisions after they identify problems, evaluate, and obtain information about a particular product. Marketers need to have a deeper understanding of the many factors that influence the consumer decision-making process if they are to be successful.

Price, brand image, promotion, and overall product quality are just a few of the factors that influence consumers' views on their purchasing decisions. According to Manoy et al. (2021), purchasing decisions are consumer behavior about how individuals, groups, and organizations select, buy, use goods, services, ideas, or experiences to satisfy their needs and wants. Tai Wok Vegetarian is a culinary business offering Japanese inspired cuisine that combines tradition and innovation in every dish. It provides customization fast food wok dishes, authentic vegetarian ramen, and a dining experience that evokes the atmosphere of Japan. Tai Wok, located near Pasarame at Jl. Asia Baru no. 61, Sei Rengas II, Medan Area District, Medan City, North Sumatra, features a plant-based concept inspired by Taiwanese street food. All menu items are uniquely prepared using a wok with a high-pressure method, which imparts a distinctive smoky aroma to the dishes. Based on this background, the author is interested in conducting a study entitled "The Influence of Service Quality and Product Quality on Purchasing Decisions at Tai Wok Vegetarian Medan."

2. Methodology

This research method is a quantitative method. Research used quantitative methods, namely concrete/empirical, objective, measurable, rational, and systematic. Quantitative methods are also called discovery methods, because with this method it can be discovered and developed as new science and technology with research data in the form of numbers and statistical analysis. According to Sugiyono in Fitria and Barseli (2021), quantitative research is a research method based on the philosophy of positivism. It is used to study a particular population or sample, with sampling techniques typically carried out randomly. Data collection is collected using research instruments, and data analysis is quantitative statistical, with the primary aim of testing the formulated hypothesis. The problem formulation used by the author is associative, which seeks to examine the relationship between two or more variables. This relationship is causal in nature, meaning it involves a cause-and-effect connection. In this study, the independent variables, which influence other variables, are denoted as X_1 and X_2, while the dependent variable, which is influenced, is denoted as Y.

3. Results and Discussion

3.1 Normality Test Results

Normality Test is conducted to determine whether the data taken from a population are normally distributed or not. The normality test in this study uses Kolmogorov-Smirnov. Data are considered normally distributed if the significance value is greater than 0.05. In this study, normality was assessed using the Kolmogorov-Smirnov (KS) nonparametric statistical test. The acceptance criteria are as follows: if the significance value (2-tailed) is ≥ 0.05, the data are considered normally distributed; conversely, if the significance value (2-tailed) is < 0.05, the data are considered not normally distributed (Quaris, 2021).

Table 1. Normality Test Results

One-Sample Kolmogorov-Smirnov Test		
		Unstandardized Residual
N		50
Normal Parametersa,b	Mean	.0000000
	Std. Deviation	1.21673769
Most Extreme Differences	Absolute	.089
	Positive	.046
	Negative	-.089
Test Statistics		.089
Asymp. Sig. (2-tailed)		.200c,d

Based on the results of the normality test, the significance value is 0.200 > 0.05, so it can be concluded that the residual value is normally distributed.

3.2 Linearity Test Results

The significance level is 0.05 and the degrees of freedom of the numerator are n-1 and the degrees of freedom of the denominator are n-1, so if the F count < F table is obtained, it means that the linear data is assisted by using SPSS for Windows Release Version 25 according to Maesarah et al. (2024).

Table 2. Results of Linearity Test of Service Quality

			Sum of Squares	df	Mean Square	F	Sig.
Y * X1	Between Groups	(Combined)	68,525	14	4.895	1,527	.152
		Linearity	34,758	1	34,758	10,843	.002
		Deviation from Linearity	33,766	13	2,597	.810	.646
	Within Groups		112.195	35	3.206		
	Total		180,720	49			

3.3 Heteroscedasticity Test Results

The Heteroscedasticity Test is carried out to determine whether or not the data taken from the population shows symptoms of heteroscedasticity. According to Ghozali in Dona (2023), Heteroscedasticity test is a classical assumption test included in the linear regression model. The purpose of the heteroscedasticity test is to determine whether there is a variance inequality among the residuals in the regression model. If the residuals have equal variance across observations, the data are said to exhibit homoscedasticity; if the variance differs, it is referred to as heteroscedasticity.

Table 3. Heteroscedasticity Test Results

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	2.173	1.244		1,747	.087
	X1	-.024	.035	-.103	-.676	.362
	X2	-.010	.019	-.077	-.507	.417

Table 3 showed that the correlation value for the service quality variable is significant, 362> 0.05, and product quality has a significant value.417> 0.05. This indicates that the regression model is free of heteroscedasticity and is suitable for use.

3.4 Multicollinearity Test Results

Multicollinearity tests are carried out to determine whether or not the data taken from the population shows symptoms of multicollinearity. Multicollinearity testing is carried out by looking at the Variance Inflation Factor (VIF) value between independent variables with the tolerance value. The commonly used limits to indicate the presence of multicollinearity are tolerance values < 0.10 and VIF values > 10, while if the tolerance value > 0.10 and VIF value < 10 then it is stated that there is no multicollinearity (Mardiatillah et al., 2021).

Table 4. Multicollinearity Test Results

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	17,994	1,916		9,393	.000		
	X1	.123	.054	.221	2.266	.028	.896	1.116
	X2	.207	.030	.673	6,897	.000	.896	1.116

Table 4 shows that there are no symptoms of multicollinearity, because each independent variable (service quality and product quality) has a VIF < 10 and a tolerance > 0.1.

3.5 Correlation Coefficient Test Results

According to Riadi in Ardista (2021), the Pearson product moment correlation is a parametric statistical test tool used to examine the relationship between two random, homogeneous, and normally distributed samples. In simple terms, correlation can be understood as a measure of the relationship between variables.

Table 5. Correlation Coefficient Test Results

		X1	X2	Y
X1	Pearson Correlation	1	.323*	.439**
	Sig. (2-tailed)		.022	.001
	N	50	50	50
X2	Pearson Correlation	.323*	1	.745**
	Sig. (2-tailed)	.022		.000
	N	50	50	50
Y	Pearson Correlation	.439**	.745**	1
	Sig. (2-tailed)	.001	.000	
	N	50	50	50

Based on the SPSS "Correlations" output table, it is known that the Pearson correlation value between the service quality variable (X1) and the purchasing decision (Y) is .001, and the Pearson correlation value between the product quality variable (X2) and the purchasing decision (Y) is 0.000. The two asterisks indicate that there is a strong relationship between the service quality variable (X1) and the purchasing decision (Y) and the product quality variable (X2) and the purchasing decision (Y). A positive correlation value means that if the service quality and product quality increase, the purchasing decision will also increase.

3.6 Results of Determination Coefficient Test

The coefficient of determination is a value that shows the extent of the contribution of influence given by the independent variable to the dependent variable. According to Ghozali in Ardista (2021), The determination coefficient test (Adjusted R^2) aims to measure the extent to which the calculation is able to explain the variation in the dependent variable.

Table 6. Results of the Determination Coefficient Test

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.774a	.599	.582	1.242

Based on the table above, the R Square value is 0.038, demonstrating that the partial influence of the service quality variable (X1) and product quality (X2) on the purchasing decision variable (Y) is 59% at Tai Wok Vegetarian Medan.

3.7 Multiple Linear Regression Test Results

Multiple linear regression is used to find the influence of two or more independent variables (X) on the dependent variable (Y). Multiple linear regression analysis is a linear relationship between two or more independent variables (X) on the dependent variable (Y).$X1$,$X2$,...Xp) with its dependent variable (Y). Usually the data used is on an interval or ratio scale (Maharadja et al., 2021).

Table 7. Multiple Linear Test Results

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	17,994	1,916		9,393	.000
	X1	.123	.054	.221	2.266	.028
	X2	.207	.030	.673	6,897	.000

Based on the table above, the multiple linear regression equation can be derived from the B values in the Unstandardized Coefficients section using the following formula:

Purchase decision = 17,994 + 0.123 service quality + 0.207 product quality

Based on the equation above, the interpretations are as follows:

a) The constant (α) = 17.994 shows the constant value, if the value of the independent variable X1, namely service quality and the value of variable X2, namely product quality, is 0, then the purchasing decision will increase by 17.994.
b) The coefficient X1b1 = 0.123 shows that the service quality variable (X1) has a positive effect on purchasing decisions by 0.123. This means that for every 1 unit increase in service quality (X1), the service quality on purchasing decisions will increase by 0.123.
c) The coefficient X2b2 = 0.207 shows that the product quality variable (X2) has a positive effect on purchasing decisions by 0.207. This means that for every 1 unit increase in product quality (X2), the product quality on purchasing decisions will increase by 0.207.

From the analysis conducted, the following research results were obtained:

a) Based on the results of the normality test, the significance value is 0.200 > 0.05, so it can be concluded that the residual value is normally distributed.
b) The results of the multicollinearity test shown that the correlation value for the service quality tolerance value variable is 1,000 > 0.10 and the service quality VIF value is 1,000 < 10.00, product quality has a tolerance value of 1,000 > 0.10 and the product quality VIF value is 1,000 < 10.00, indicating that this regression model is free from multicollinearity symptoms and is suitable to be used.
c) The results of the heteroscedasticity test showed that the correlation value for the significant value variable of service quality is 0..362> 0.05 and product quality has

a significant value of 0.471 > 0.05. Thus, this regression model is free from heteroscedasticity symptoms and is suitable to be used.

d) The results of the correlation coefficient test demonstrate that the variables of service quality (X1), product quality (X2), and purchasing decisions (Y) are related because the values show positive results. The correlation value (r) is 0.795 which means that service quality and product quality have a strong relationship to purchasing decisions.
e) The results of the determination coefficient test showed that the R Square value is 0.038, which means that the partial influence of the service quality variable (X1) on the purchasing decision variable (Y) is 3.8% at Tai Wok Vegetarian Medan.
f) The results of the determination coefficient test showed that the R Square value is 0.599, which means that the influence of the product quality variable (X2) simultaneously on the purchasing decision variable (Y) is 59% at Tai Wok Vegetarian Medan.
g) The results of the determination coefficient test show that the R Square value is 0.633, which means that the influence of the service quality variables (X1) and product quality (X2) simultaneously on the purchasing decision variable (Y) is 59% at Tai Wok Vegetarian Medan.
h) The results of the t-test show that the significant probability figure for the service quality variable (X1) is 0.005 < 0.05 and the product quality variable (X2) is 0.000 < 0.05, the calculated t value for the service quality variable (X1) is 2.226 > 1.98552 t table, the calculated t value for the product quality variable (X2) is 6.897 > 1.98552 t table so it can be concluded that there is an influence between variable X1 on variable Y and X2 has an influence on variable Y.
i) The results of the F test show that the significance value for the influence of X1 and

4. Conclusion

Based on the results of this study, it can be concluded that service quality has a positive and significant effect on purchasing decisions at Tai Wok Vegetarian Medan. This suggests that an improvement in service quality is likely to lead to an increase in purchasing decisions. Similarly, product quality also has a positive and significant influence on purchasing decisions at Tai Wok Vegetarian. This indicates that improving product quality is likely to result in higher purchasing decisions. Furthermore, service quality and product quality together have a simultaneous influence on purchasing decisions at Tai Wok Vegetarian Medan. The study found that the percentage of influence between service quality and product quality on purchasing decisions is 59%. This means that these two variables account for 59% of the variation in purchasing decisions, while other unexamined factors influence the remaining portion.

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THE INFLUENCE OF SERVICE QUALITY AND CUSTOMER TRUST ON CUSTOMER LOYALTY AMONG SHOPEE USERS IN MEDAN CITY

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Abstract

The purpose of this study is to examine and analyze the influence of Service Quality and Customer Trust on Customer Loyalty among Shopee Users in Medan City. This study employs a quantitative research method. The population of this study is unknown, so the author uses the Lemeshow formula to determine the sample size, which is 97 samples. The partial test results on Service Quality (X1) show that the t-count value (2.751) > t-table value (1.985) with a significance level of 0.007 < 0.05, Therefore, it can be concluded that there is a significant positive partial effect of Service Quality on Customer Loyalty on Shopee in Medan City. Meanwhile, for Customer Trust (X2), it shows the t-count value (3.717) > t-table (1.985) with a significant level of 0.000 < 0.05. Therefore, it can be concluded that there is a significant positive partial effect between Customer Trust and Customer Loyalty on Shopee in Medan City. The simultaneous test results show the F-count value (12.328) > F-table value (3.09) with a significance level of 0.000 < 0.05. Therefore, it can be concluded that there is a significant effect between Service Quality and Customer Trust simultaneously on Customer Loyalty.

Keywords: Service quality; Customer trust; Customer loyalty.

1. Introduction

Changes and developments in the field of technology have a significant impact on various sectors that follow the global economy, from an industrial economy to a service economy. One of the technological developments is online sales applications, which are currently popular, such as Shopee. With the increasing development of technology, the need for online stores has also increased.

A company will succeed if it is oriented towards consumer desires, aiming to satisfy consumers. Companies that want to grow and gain a competitive advantage must provide quality products or services and good customer service, which will lead to customer loyalty. Loyal customers will provide many benefits to the company, such as repeat purchases and recommendations to friends.

Service quality is a crucial factor that companies must consider to gain customer loyalty. Service quality is the key to a company's success, especially in the retail sector. The quality of service depends on the producer's ability to meet consumer expectations consistently. Satisfied consumers will create loyalty, drive word-of-mouth recommendations, and even improve the company's image in the eyes of consumers. Therefore, service quality must be the company's primary focus.

Customer trust is also an essential factor that companies must consider to gain customer loyalty. Usually, good experiences and information will build consumer trust in a product or service, because the experience formed in the consumer's memory can create a sense of trust if the experience is enjoyable and satisfying.

Currently, the use of the Shopee application in Medan city is very widespread, almost everyone uses the Shopee application. However, there are problems with the Shopee

application, where every Shopee user, whether a buyer or seller, experiences problems within Shopee and contacts Shopee's customer service, they will receive very slow responses and a lengthy problem-solving process. Additionally, there are frequent issues with lost items during the use of certain courier services, which makes consumers feel distrustful. This leads to consumer disappointment, resulting in decreased customer loyalty.

1.1 Theoretical Framework

Service quality can be defined as focusing on meeting needs and requirements, as well as timeliness in meeting customer expectations (Chandra et al., 2020). Service quality is a central point for companies because it affects customer satisfaction, and customer satisfaction will emerge if the quality of service provided is good (Nurdin, 2019). Based on these definitions, it can be concluded that service quality is a crucial factor in meeting customer needs and expectations, which can have a positive impact on the company. The indicators of service quality according to Kotler & Keller are (Kotler, 2019):

i. Reliability
ii. Responsiveness
iii. Assurance
iv. Empathy
v. Tangible

Customer trust is another essential factor companies must consider to gain customer loyalty. Positive experiences and information build consumer trust. However, in Medan City, Shopee users often face problems like slow customer service responses and lost items, which can lead to distrust, disappointment, and decreased customer loyalty. Trust is the foundation of business. A business transaction between two or more parties will occur if each party trusts the other (Syah, 2021). Trust is the foundation of a relationship, and a relationship between two or more parties will occur if each party trusts the other (Rifa'i, 2019). Trust is a descriptive idea that someone has about something (Rahayu & Afrilliana, 2021). Trust is defined as a dimension of business relationships that determines the extent to which people feel they can rely on the integrity of promises offered by others (Haryanto, 2020). Based on these definitions, it can be concluded that trust is a crucial factor in business relationships, where parties must trust each other and rely on the integrity of promises made. The indicators of customer trust according to (Rifa'i, 2019):

i. Ability
ii. Benevolence
iii. Integrity

Customer loyalty is a deep commitment to repurchase or re-transact a product or service consistently in the future, despite situational influences and marketing efforts that may change behavior (Hermanto, 2019). Customer loyalty is demonstrated by regular purchases or a condition where customers are required to make at least two purchases within a certain time frame (Manihuruk, 2023). Based on these definitions, it can be concluded that customer loyalty is a condition where customers commit to repurchasing products or services consistently in the future. The indicators of customer loyalty according to Hermanto are (Hermanto, 2019):

i. Makes regular repeat purchases
ii. Purchases across product and service lines
iii. Refers other
iv. Demonstrates an immunity to the pull of the competition

Customer loyalty, characterized by repeat purchases and customer trust in the products consumed, as well as customers' willingness to recommend the business to their acquaintances, indicates that customers are loyal to the business. However, the quality of service provided must also be maintained and continuously improved to build customer trust (Kristanto, 2022). Customer trust can increase customer loyalty by way of one party's

willingness to accept risk from the actions of another party based on the expectation that the other party will take important actions to benefit the trusting party, and control the actions of the trusted party (Aini, 2020). The conceptual framework of this study is illustrated in the diagram below.

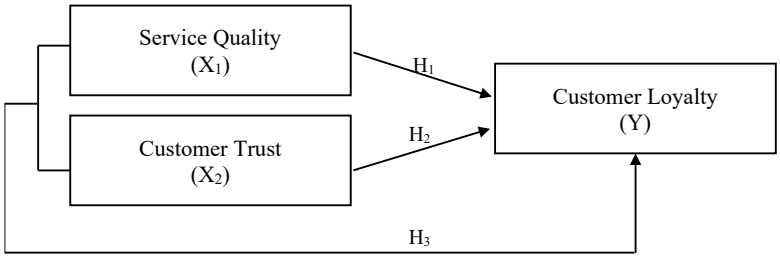

Fig. 1. Conceptual Framework

Based on this framework, the following hypotheses are formulated:
H1: It is suspected that there is an influence of Service Quality on Customer Loyalty of Shopee users in Medan City.
H2: It is suspected that there is an influence of Customer Trust on Customer Loyalty of Shopee users in Medan City.
H3: It is suspected that there is an influence of Service Quality and Customer Trust on Customer Loyalty of Shopee users in Medan City.

2. Methodology

This research employs a quantitative method. Quantitative research methods are based on positivist philosophy and are used to study specific populations or samples. Data collection utilizes research instruments, and data analysis is quantitative/statistical, aiming to test established hypotheses. This study uses the Statistical Program for Social Science (SPSS) version 27 (Sahir, 2021). The researcher spent 3 months conducting this study, which included proposal development and ongoing guidance until the final thesis was completed.
The population in this study consists of all Shopee marketplace consumers in Medan City, North Sumatra, where the exact population size is unknown. "A sample is a part of a population that possesses certain characteristics used for research" (Ghozali, 2021). The sampling technique used is non-probability sampling, specifically accidental sampling. Accidental sampling involves selecting respondents as samples based on chance encounters, where anyone who happens to meet the researcher can be used as a sample if they fit the criteria as a data source (Sugiyono, 2019). Given the unknown population size, the sample size in this study is determined using the Lemeshow formula, which is suitable for cases where the population size is unknown or infinite. The Lemeshow formula is as follows:

$$n = \frac{Z^2(1-P)}{d^2} \quad (1)$$

Where:
n = sample size
Z = Z-score at 95% confidence level = 1,96
P = maximum estimate = 0,5
d = alpha (0,10) or sampling error = 10%

Using the above formula, the sample size calculation is as follows:

$$n = \frac{1{,}96^2 . 0{,}5\ (1 - 0{,}5)}{0{,}1^2} = 96{,}04 = 97\ respondents$$

In this study, the minimum sample size required is 96.04, which is rounded up to 97 respondents. To collect relevant data for this study, a questionnaire-assisted interview will be conducted. The data collection technique will be carried out through a questionnaire, which will be measured using a Likert scale of 1-5. The Likert scale itself has answers in the form of positive statements, with 5 response options weighted as follows:

i. Strongly Disagree (score 1).
i. Disagree (score 2).
ii. Neutral (score 3).
iii. Agree (score 4).
iv. Strongly Agree (score 5).

3. Results and Discussion

3.1 Reliability Test

A questionnaire is considered reliable if the Cronbach's Alpha value is greater than 0.6.

Table 1. Reliability Test

Variable	Cronbach's Alpha	N of Items
Service Quality	0,803	10
Customer Trust	0,706	8
Customer Loyalty	0,727	8

Based on the table above, both the independent and dependent variables have Cronbach's Alpha values above 0.6, indicating acceptable reliability.

3.2 Classical Assumption Test

The normality test of residuals is used to determine whether the residuals resulting from the regression are normally distributed or not. The results of the normality test are as follows:

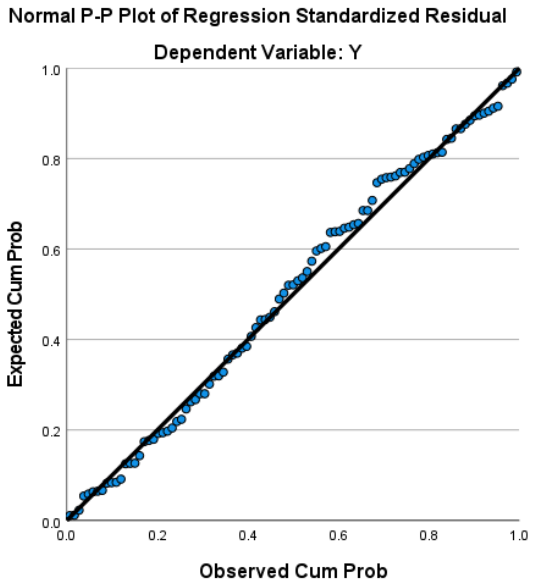

Fig. 2. *Normal P-Plot*

From Figure 2 above, the points are close to the diagonal line, indicating that the data are normally distributed and meet the normality assumption.

Table 2. One-Sample Kolmogorov-Smirnov Test

		Unstandardized Residual
N		97
Normal Parameters[a,b]	Mean	30.6597938
	Std. Deviation	1.99337739
Most Extreme Differences	Absolute	.074
	Positive	.051
	Negative	-.074
Kolmogorov-Smirnov Z		.074
Asymp. Sig. (2-tailed)		.200[a]

Furthermore, based on Table 2 above, the Kolmogorov-Smirnov normality test results show that the significance level is greater than 0.05, specifically 0.200. Therefore, it can be concluded that the normality test results indicate a normal distribution.

3.3 Multicollinearity Test

Based on Table 3 below, it can be observed that the correlation values for the variables Service Quality and Customer Trust have a tolerance value (0.981) greater than 0.1 and a VIF value (1.019) less than 10.

Table 3. Multicollinearity Test Results

Model		Collinearity Statistics	
		Tolerance	VIF
1	(Constant)		
	Service Quality	.981	1.019
	Customer Trust	.981	1.019

Therefore, it can be concluded that there is no multicollinearity issue between the variables Service Quality and Customer Trust.

3.4 Heteroscedasticity Test

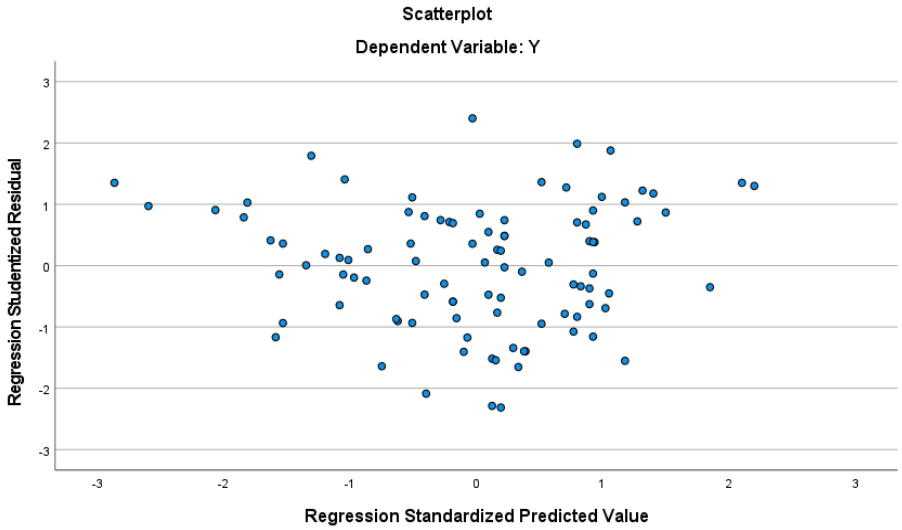

Fig. 3. Scatterplot Graph

From Figure 3 above, it can be seen that the points in the scatterplot are randomly distributed above and below the 0 value on the Y-axis, without forming any specific pattern. This suggests that heteroscedasticity is not present in the data.

3.4 Multiple Linear Regression Analysis

Table 4. Multiple Linear Regression Analysis Results

Model		Unstandardized Coefficients		Standardized Coefficients
		B	Std. Error	Beta
1	(Constant)	9.288	4.498	
	Service Quality	0.252	0.092	0.255
	Customer Trust	0.447	0.120	0.344

Based on Table 4 above, the multiple linear regression equation is formulated as follows:

$$\text{Customer Loyalty} = 9.288 + 0.252\ \text{Service Quality} + 0.447\ \text{Customer Trust} + e$$

The equation can be interpreted as follows: The constant (α) is 9.288, which indicates that if the independent variables Service Quality and Customer Trust are zero, Customer Loyalty will remain constant at 9.288. The coefficient for Service Quality is 0.252, which shows that Service Quality (X1) has a positive effect on Customer Loyalty. This means that for every one-unit increase in Service Quality, Customer Loyalty will increase by 0.252. Finally, the coefficient for Customer Trust is 0.447, indicating that Customer Trust (X2) also has a positive effect on Customer Loyalty. This means that for every one-unit increase in Customer Trust, Customer Loyalty will increase by 0.447.

3.5 Coefficient of Determination Test (R^2)

The results of the coefficient of determination test are presented in the table:

Table 5. Coefficient of Determination Test

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.456[a]	0.208	0.191	3.933

Based on Table 5, the R Square (R^2) value or coefficient of determination is 0.208, indicating that 20.8% of the variation in Customer Loyalty can be explained by the variables Service Quality and Customer Trust. The remaining 79.2% is influenced by other factors outside of this research model, such as consumer behaviour and product quality. Based on the partial hypothesis testing results, Service Quality (X1) has a significant positive effect on Customer Loyalty for Shopee users in Medan City. The t-count value for Service Quality was 2.751, which is greater than the t-table value of 1.985, and its significance level was 0.007, which is less than 0.05. Similarly, the partial hypothesis testing results for Customer Trust (X2) show a significant positive effect on Customer Loyalty for Shopee users in Medan City. The t-count value was 3.717, exceeding the t-table value of 1.985, and the significance level was 0.000, which is less than 0.05. Furthermore, the simultaneous hypothesis testing using the F-test indicates that both Service Quality and Customer Trust have a significant simultaneous effect on Customer Loyalty. The F-count value was 12.328, which is greater than the F-table value of 3.09, with a significance level of 0.000.

4. Conclusion

The partial test results indicate that Service Quality has a positive and significant influence on Customer Loyalty among Shopee users in Medan City. The partial test results also show that Customer Trust has a positive and significant influence on Customer Loyalty on Shopee in Medan City. Furthermore, the simultaneous test results confirm that Service Quality and Customer Trust together have a positive and significant influence on Customer Loyalty on

Shopee in Medan City. For future research, it's recommended to explore other variables that could influence customer loyalty, such as brand image and customer satisfaction. This would provide a more comprehensive understanding of the factors that drive customer loyalty.This study was limited to a sample of 97 respondents due to constraints in time, effort, and cost. Therefore, future research should aim to increase the number of respondents to better represent the actual situation. This can enhance the generalizability and reliability of the findings.

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SERVICE QUALITY ON CUSTOMER SATISFACTION IN FAMILY POULTRY FARM

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Abstract

This study aims to analyze the influence of service quality on customer satisfaction in family poultry farming. A quantitative explanatory approach was used, with a survey of 96 poultry farm customers, employing purposive sampling. Data were collected through structured questionnaires based on the SERVQUAL dimensions, then analyzed using descriptive statistics, correlation tests, and simple linear regression. The results showed that service quality had a significant positive effect on customer satisfaction, with a correlation coefficient of 0.775 and a coefficient of determination (R^2) of 0.600. This indicates that 60% of the variation in customer satisfaction is explained by service quality. Regression analysis confirmed a positive influence with a coefficient of 0.593 ($p < 0.000$). These findings support previous studies and reinforce the importance of service-oriented practices such as responsiveness, empathy, and reliability to strengthen satisfaction and loyalty in poultry businesses. The results also highlight that other factors may influence customer satisfaction beyond service quality, which can be explored in future studies. This study contributes to service quality research in the agribusiness context and provides practical insights for poultry farm managers to improve service delivery and build stronger customer relationships.
Keywords: Service quality; Customer satisfaction; Poultry farming.

1. Introduction

The livestock sector, particularly poultry farming, plays a vital role in meeting global food security demands. As consumer demand for chicken products rises, poultry farms must not only focus on product quality but also prioritize delivering excellent service quality to satisfy increasingly demanding customers. Customer satisfaction is an essential aspect for business sustainability (Widodo et al., 2023) and is a feeling that buyers experience when a company's performance meets their expectations (Hadi & Indradewa, 2019). Service quality has been identified as a key determinant of customer satisfaction across various service-based industries (Parasuraman et al., 1988). The SERVQUAL model identifies five dimensions of service quality that influence customer satisfaction: tangibles, reliability, responsiveness, assurance, and empathy (Parasuraman et al., 1988). However, its significance in agribusiness settings like poultry farming has received limited empirical attention (Gronroos, 1984). In the poultry sector, customers frequently interact with farm staff regarding product inquiries, health guarantees, supply reliability, and after-sales support (Rao et al., 2025). Poor service quality in these interactions may negatively affect customer satisfaction, loyalty, and business sustainability (Rao et al., 2025).

This study aims to examine the influence of service quality on customer satisfaction among poultry farm consumers, thereby providing empirical evidence and practical insights for service quality improvements in the livestock sector (Widodo et al., 2023). Several previous studies have shown that service quality affects customer satisfaction, such as the research conducted by Rokmah and Mulyani (2023), Firmawati (2022), and Ramadhan et al. (2019) . However, other research by Dzulfikri and Kusworo (2025) and Syariful and Untung (2020) showed that service quality does not affect customer satisfaction. This is particularly relevant as competition increases and customer expectations rise in agricultural markets. This research seeks to fill that gap by empirically examining the influence of service quality on customer satisfaction among poultry farm consumers. The findings are expected to provide both theoretical contributions to service quality literature in agribusiness and practical insights for poultry farm managers aiming to improve customer-oriented strategies. The research framework is shown in Fig. 1.

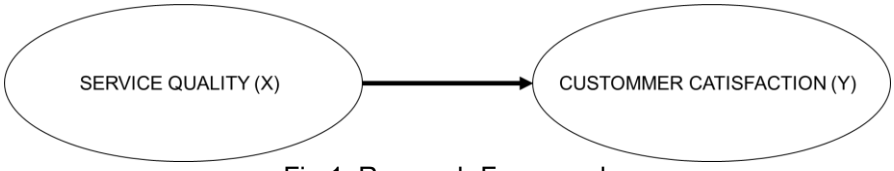

Fig.1. Research Framework

Despite this growing evidence, there is still limited empirical investigation into how service quality impacts customer satisfaction, specifically in the context of poultry farming in developing countries. Most prior studies have focused on industrial or retail service sectors, leaving a research gap in understanding how farm-level service delivery influences satisfaction among poultry farm customers. This is particularly relevant as competition increases and customer expectations rise in agricultural markets. Therefore, this research seeks to fill that gap by empirically examining the influence of service quality on customer satisfaction among poultry farm consumers. The findings are expected to provide both theoretical contributions to service quality literature in agribusiness and practical insights for poultry farm managers aiming to improve customer-oriented strategies.

2. Methodology

This research employed a quantitative approach with an explanatory design to analyze the influence of service quality on customer satisfaction in poultry farming. The study used a survey method by distributing structured questionnaires to poultry farm customers. The population consisted of poultry farm consumers in the research area. Using purposive sampling, 96 respondents were selected based on their experience as regular customers of the poultry farm. A structured questionnaire was developed based on the servqual framework by Parasuraman et al. (1988) , measuring five dimensions of service quality: tangibles, reliability, responsiveness, assurance, and empathy. Customer satisfaction was measured using adapted indicators from previous customer satisfaction research (Nugroho et al., 2021). Responses were recorded on a five-point Likert scale ranging from “strongly disagree” to “strongly agree”. Data analysis was carried out using descriptive statistics, correlation tests, coefficient of determination (R2), and simple linear regression to examine the relationship between service quality and customer satisfaction. Data normality was tested using the Kolmogorov-Smirnov method, and linearity was evaluated through ANOVA. Statistical analysis was performed using SPSS software.

3. Results and Discussion

The normality test result, according to Ghozali (2021), aims to determine the distribution of data within the variables employed in the study. Based on the results of the Kolmogorov-Smirnov normality test, the Asymp. Sig. (2-tailed) value was 0.200, which is greater than 0.05.

This indicates that the data residuals are normally distributed, allowing for the use of parametric statistical analysis. The linearity test showed a significant linear relationship between service quality and customer satisfaction (Vivi, 2019). The deviation from linearity was not significant (Sig. = 0.265), confirming that a linear model can adequately describe the relationship.

Table 1. Normality Test Result

		Unstandardized Residual
N		96
Normal Parameters[a,b]	Mean	.0000000
	Std. Deviation	2.57684055
Most Extreme Differences	Absolute	.055
	Positive	.055
	Negative	-.055
Test Statistic		.055
Asymp. Sig. (2-tailed)		.200[c,d]

This indicates that the data residuals are normally distributed, allowing for the use of parametric statistical analysis. With p > 0.05, the data met the normality assumption, thus supporting the validity of further parametric statistical tests used in the analysis.

3.1 Linearity Test Result

The linearity test is frequently employed as a prerequisite for conducting correlation or linear regression analyses. The criterion for the decision-making process in the linearity test stipulates that if two variables demonstrate a significant value (sig. Deviation from linearity) greater than 0.1, it can be concluded that both variables are linear.

Table 2. Linearity Test Result

				Sum of Squares	df	Mean Square	F	Sig.
Kepuasan Konsumen * Kualitas Pelayanan	Between Groups	(Combined)		1118.758	23	48.642	7.610	.000
		Linearity		948.148	1	948.148	148.341	.000
		Deviation from Linearity		170.609	22	7.755	1.213	.197
	Within Groups			460.201	72	6.392		
	Total			1578.958	95			

The linearity test showed a significant linear relationship between service quality and customer satisfaction, with an F-value of 148.341 and a significance of 0.000 on the linearity component. The deviation from linearity was not significant (Sig. = 0.265), confirming that a linear model can adequately describe the relationship between the two variables.

3.2 Correlation Test Result

The correlation coefficient (R) indicates the strength or weakness of the relationship between two variables. This study adopts Product-Moment correlation analysis.

Table 3. Correlation Test Result

		Gamification	Student Learning Motivation
Kualitas Pelayanan	Pearson Correlation	1	.775**
	Sig. (2-tailed)		.000
Kepuasan Konsumen	Pearson Correlation	.775**	1
	Sig. (2-tailed)	.000	

The findings of this research emphasize the critical role of service quality in influencing customer satisfaction within poultry farming enterprises. The significant positive correlation ($r = 0.775$, $p<0.01$) is consistent with the well-established SERVQUAL theory developed by Parasuraman et al. (1988). The coefficient of determination ($R2=0.600$) demonstrates that service quality alone accounts for a substantial proportion (60%) of the variation in customer satisfaction. The positive and significant regression coefficient also aligns with the results of Ramadhan et al. (2019). These findings have practical implications: poultry farms that emphasize employee training, consistent service delivery, and customer-focused processes will more likely secure customer loyalty (Kotler & Keller, 2019).

3.3 Coefficient of Determination Test Result

Table 4. Coefficient of Determination Test Result

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.775[a]	.600	.596	2.591

While service quality accounts for a large portion of customer satisfaction, the remaining 40% suggests the potential impact of other elements, such as product quality, price competitiveness, and farm accessibility. This aligns with the framework proposed by Gronroos (1984), who argued that perceived quality comprises technical quality, functional quality, and image.

3.4 Simple Linear Regresion

Table 5. Simple Linear Regresion

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.211	1.913		.110	.913
	Kualitas Pelayanan	.593	.050	.775	11.886	.000

The results of the simple linear regression analysis showed that service quality has a positive and significant effect on customer satisfaction, with a regression coefficient of 0.593. The regression equation was Customer Satisfaction = 0.211 + 0.593 × Service Quality. The t-test results confirmed that Service Quality had a statistically significant effect on customer satisfaction, as the p-value was below 0.05; thus, the null hypothesis was rejected (Ghozali, 2021).

3.5 Hypothesis Test Result (t-test)

The findings of this research emphasize the critical role of service quality in influencing customer satisfaction within poultry farming enterprises. The significant positive correlation ($r=0.775$, $p<0.01$) suggests that customers perceive better quality of service as directly enhancing their satisfaction. This is consistent with the well-established SERVQUAL theory developed by Parasuraman et al. (1988), which identifies five key dimensions of service quality—tangibles, reliability, responsiveness, assurance, and empathy—as determinants of customer perceptions and satisfaction. Furthermore, the coefficient of determination ($R2=0.600$) demonstrates that service quality alone accounts for a substantial proportion (60%) of the variation in customer satisfaction. This supports earlier findings in the agribusiness sector, for instance, a study by Anno (2025) on poultry production and marketing strategies.

The positive and significant regression coefficient ($\beta=0.593$, $p<0.000$) also aligns with the results of Ramadhan et al. (2019), who found that service quality has a significant influence on customer satisfaction in broiler chicken companies. This is in line with the view that service

quality is among the most powerful predictors of customer satisfaction in any service-based or product-augmented business. In poultry farming specifically, farmers who invest in more transparent communication, faster response times, and problem-solving capabilities can build higher satisfaction and trust. These findings have practical implications: poultry farms that emphasize employee training, consistent service delivery, and customer-focused processes are more likely to secure customer loyalty. While service quality accounts for a large portion of customer satisfaction, the remaining 40% suggests the potential impact of other elements, such as product quality, price competitiveness, and farm accessibility. This is in line with the framework proposed by Gronroos (1984), who argued that perceived quality is a combination of technical quality, functional quality, and image. Future research can explore these additional factors to develop a more holistic and integrated model of customer satisfaction within poultry farming, strengthening the competitive advantage of livestock agribusiness in an increasingly demanding market.

4. Conclusion

This study empirically demonstrates that service quality has a significant and positive influence on customer satisfaction among poultry farm consumers. The correlation coefficient of 0.775 indicates a strong relationship, while the regression analysis confirms that improvements in service quality meaningfully enhance customer satisfaction. The coefficient of determination shows that service quality accounts for 60% of the variation in customer satisfaction, confirming its critical role in shaping positive customer perceptions. These findings highlight the importance of consistently delivering high-quality services to meet and exceed customer expectations in the poultry farming sector. The results of this research provide valuable insights for poultry farm managers, practitioners, and policymakers. By prioritizing investments in improving service quality —employee responsiveness, communication, reliability, and empathy —poultry farms can substantially increase customer satisfaction and foster stronger loyalty.

Furthermore, the high explanatory power of service quality in predicting customer satisfaction underscores the need for continuous monitoring and evaluation of service quality as part of a strategic customer relationship management plan. Training programs to develop service-oriented skills among farm workers, along with the implementation of standard operating procedures that ensure consistent service delivery, could significantly improve customer experiences. Lastly, while service quality is a key driver, the remaining unexplained variance suggests other factors, such as product quality, pricing strategies, and farm accessibility, may also affect satisfaction. Future initiatives could adopt a more holistic customer-centered strategy, integrating these elements to achieve even higher levels of satisfaction and competitive advantage.

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EMPLOYEE JOB SATISFACTION REVIEW IN 2019 AT AGIA SOPHIA ELEMENTARY SCHOOL (SD) DELI SERDANG

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Abstract

Job satisfaction influences employee discipline. Employees who derive satisfaction from their work tend to demonstrate higher levels of discipline, whereas employees whose job satisfaction is not fulfilled are more likely to exhibit lower levels of discipline. Some employees arrive late or engage in activities such as playing games during working hours, which reflects a lack of discipline and hinders the achievement of company goals. Employee job satisfaction must be fostered as effectively as possible in order to enhance morale, dedication, affection for their work, and discipline. Job satisfaction is a positive emotional attitude that reflects an employee's affection for their work. This attitude is influenced by morale, discipline, and work performance. This study was conducted at Agia Sophia Tanjung Anom, Deli Serdang, with the aim of determining the level of employee job satisfaction at Agia Sophia Elementary School. Using a qualitative descriptive method, the study revealed that employees experienced dissatisfaction related to salary, workload, work equipment, the lack of assertiveness from leaders, and the monotonous nature of their tasks.
Keywords: Job satisfaction; Discipline; Time.

1. Introduction

The Indonesian business sector is currently experiencing rapid growth, resulting in increased competition. One way to achieve organizational goals is by developing reliable and high quality human resources, as they are the driving force that enables other company resources to function effectively. Human as an essential element of the company plays an important role in determining the success or failure of a company. One of the key sources of a company's success in achieving high performance is a qualified workforce with adequate work effectiveness. Company goals can be achieved when employees support each other. Therefore, the potential of human resources plays an important role as the primary actor directly involved in the company's success. Employee performances that yield products of good quality and quantity according to established standards contribute to gaining the trust of the community.

Agia Sophia Elementary School (SD) located in Tanjung Anom Deli Serdang is also known as Agia Sophia Orthodox Elementary School (SD). Based on the researcher's observations, some employees arrive late, use their cell phones during working hours, and show little concern for their surroundings. These behaviours reflect a lack of discipline, which in turn affects employee job satisfaction. According to (Mukhtar 2019) "Job satisfaction is an emotional attitude that is pleasant and loves one's job. This attitude is reflected by work morale, discipline, and work performance. This study aims to examine employee job satisfaction at Agia Sophia Elementary School (SD) Deli Serdang. The scope of the research

was limited to employee job satisfaction at Agia Sophia Elementary School (SD) located in Tanjung Anom, Deli Serdang, and the study was conducted from May to July. According to Rahmaoktaviani and Setiawan (2020), research methods are scientific approaches used to obtain data for specific purposes and applications. Research enables humans to utilize its findings, and in general, the data obtained can be applied to understand, address, and anticipate problems.

According to (Suyuti and Siraj 2019), employee job satisfaction must be created as well as possible so that employee morale, dedication, love, and discipline increase. According to (Surur 2022) job satisfaction is a person's general positive attitude towards their organizational life. According to (Pipit Muliyah, Dyah Aminatun, Sukma Septian Nasution, Tommy Hastomo, Setiana Sri Wahyuni Sitepu 2020) job satisfaction is a worker's feelings about various aspects of the work framework. According to (Nitisemito (2019:89) 2021) job satisfaction is a general attitude towards one's job, which shows the difference between the amount they believe they should receive. According to (Yanto, Widodo, and Susetyo 2022) Describes job satisfaction as a positive or negative attitude that individuals have towards their jobs.

According to (Rodríguez, Velastequí 2019) there are various understandings or limitations of job satisfaction. First, the understanding that views job satisfaction as a complex emotional reaction. This emotional reaction is a result of the drive, desire, demands and expectations of employees towards work that are connected to the realities felt by employees, thus causing a form of emotional reaction in the form of feelings of happiness, satisfaction or dissatisfaction. According to (Supriyadi 2021) job satisfaction is meant as an employee's emotional state where there is or is not a meeting point between the value of employee work rewards from the company and the level of reward value desired by the employee concerned. This work reward is either financial or non-financial.

According to (Yanto et al. 2022) describes job satisfaction as a positive or negative attitude that individuals have towards their work. Vecchio (1995) states job satisfaction as a person's thoughts, feelings and tendencies to act, which are a person's attitude towards work. Gibson (2000) states job satisfaction as the attitude that workers have about their work. Job Satisfaction Theory seeks to explain why some individuals are more satisfied with their jobs than others. It also aims to provide a basis for understanding the processes underlying employees' perceptions of job satisfaction. Among the prominent theories of job satisfaction are the Two-Factor Theory and the Value Theory. According to Apriasty & E. Simbolon (2022), factors influencing job satisfaction include both challenging work and monotonous tasks, with the latter often serving as a source of dissatisfaction reflected in high levels of boredom.

2. Methodology

The research design adopted in this study is a discourse analysis within a qualitative approach. Data were collected through participant observation and structured interviews. The analysis was conducted using the Miles and Huberman interactive model, which consists of three stages: data reduction, data display, and conclusion drawing.nThe data sources used in this study are internal, consisting of information originating from within the company that pertains to all organizational activities. The data collection methods used in this study is as follows:

a. Observation
b. Interview

This research was conducted at Agia Sophia Deli Serdang Elementary School (SD) located in Tanjung Anom with the following stages:

i. researcher determines the topic
ii. researcher identifies the problem and formulates the issues being faced

iii. researcher collected data related to the research by interviewing employees of SD Agia Sophia Tanjung Anom
iv. Compile the interview results and process the data using the data analysis method to obtain findings
v. Formulate overall research conclusions and provide useful suggestions for SD Agia Sophia Tanjung Anom

Agia Sophia Elementary School, also known as Agia Sophia Orthodox Elementary School, is an educational institution operated by the Indonesian Orthodox Faith Foundation, legally recognized as Yayasan Sahabat Iman Orthodox Indonesia. Established on July 17, 2000, the school embodies the values and teachings of the Orthodox Christian faith within the Indonesian education system. It is located in Tanjung Anom, Deli Serdang, and is one of the few elementary schools in Indonesia affiliated with the Orthodox tradition, fostering both academic growth and spiritual development grounded in Orthodox values. Towards the end of the 1999/2000 school year, a student asked the teacher:

"When we graduate from this kindergarten, which school will we attend?' The teacher shared this question with the Foundation administrators, who then discussed how best to respond. Driven by their strong conviction and determination, the Foundation administrators founded Agia Sophia Elementary School. On July 17, 2000, the first grade officially began, with Ir. ATB. Gultom, SE serving as Principal and Mrs. Surya Surlita Situmorang as the first-grade teacher. In the 2000/2001 school year, the combined enrolment of Kindergarten and Elementary School totalled 50 students.

"To create students who are intelligent, skilled, responsible, healthy, noble in character, faithful, and devoted to God Almighty." This is the core vision guiding the school's long-term, medium-term, and short-term goals. The vision motivates the school community to continually strive to realize it sustainably and achieve the school's objectives.

3. Results and Discussion

Based on the observations, the researcher concluded that several challenges exist in the workplace. There are recurring delays in salary payments, accompanied by employee dissatisfaction over compensation that is perceived as not proportional to the work performed. Despite these issues, employees generally manage to complete their tasks effectively and in line with their respective skill sets. However, many have expressed concerns about an excessive workload, often feeling burdened by the volume of tasks assigned. Additionally, complaints have been raised regarding the lack of sufficient office equipment needed to support their daily responsibilities. While the leader maintains a friendly and approachable relationship with employees, there appears to be a lack of firmness in implementing disciplinary measures when necessary.

Furthermore, there are instances where employees are required to take on tasks beyond their designated roles, contributing to feelings of overload and role ambiguity. Based on the results of interviews and observations, there is a consistent finding regarding employee dissatisfaction with salaries at Agia Sophia Elementary School, Tanjung Anom. Employees reported that their compensation does not align with the work performed, which was confirmed during observations. Additionally, in positions that match their job roles, employees are able to complete their tasks effectively, indicating that their skills are well-suited to their assigned responsibilities.

4. Conclusion

Employee job satisfaction at Agia Sophia Elementary School, Tanjung Anom, is generally positive in terms of job placement and the work environment. A supportive and comfortable

atmosphere enables staff to perform their duties effectively, and job placements that align with individual expertise contribute to the production of high-quality work. However, satisfaction is notably lower when it comes to salary, with employees expressing concerns that their compensation is not commensurate with the workload. This dissatisfaction is further compounded by instances where employees are assigned tasks beyond their official job descriptions, resulting in additional burdens and interfering with their primary responsibilities. Satisfaction also varies depending on job position and access to work-related resources, with some staff members needing to rely on personal equipment to fulfil their duties. Although the school's leadership is generally viewed as wise and approachable, a lack of firmness in enforcing discipline and the repetitive nature of certain tasks may negatively affect overall job satisfaction for some employees.

It is recommended that the school provide fair and appropriate salaries that reflect the workload and clearly define the responsibilities associated with each role to prevent the assignment of double duties. This aligns with Hasibuan (2007) theory, which emphasizes balanced compensation and workload management. Additionally, the school should pay closer attention to the individual needs of employees, particularly in ensuring access to adequate equipment and recognizing differences in tolerance for monotonous work. Providing the necessary tools and offering recognition or rewards can significantly boost motivation and performance. Finally, leadership should balance wisdom with firmness to ensure employees follow established rules and reduce the likelihood of repeated mistakes, thereby fostering a more disciplined and effective work environment.

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THE INFLUENCE OF INFORMATION TECHNOLOGY, INFLUENCERS, AND CUSTOMER RELATIONSHIPS ON ATTRACTING VISITORS TO THE BEAUTY IN THE POT MEDAN RESTAURANT

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Abstract

This study aims to determine the influence of Information Technology, Influencers, and Customer Relationship on visitor interest in the Beauty in the Pot Restaurant in Medan. The method used in this study is quantitative descriptive with data collection techniques in the form of observation and distribution of questionnaires to individuals who have visited or are interested in the restaurant. Data analysis was conducted using SPSS version 25. The results of the study indicate that the three independent variables contribute 45.5% to visitor interest, while the remaining 54.5% is influenced by other variables not examined in this study. Additionally, the results also indicate a desire among customers to enhance their ability to utilize technology as a means of obtaining relevant information about the restaurant. Therefore, optimal use of digital media, collaboration with suitable influencers, and effective customer relationship management are crucial strategies for attracting visitor interest.
Keywords: Information Technology; Influencer; Customer Relationship; Visitor Interest

1. Introduction

In the digital era, the application of technology in marketing has significantly changed customer engagement strategies. Especially among the millennial generation, platforms such as Instagram and TikTok have become powerful tools to promote brands and influence consumer behaviour (Kapoor & Kapoor, 2021). The increasing number of new social media users has made businesses shift their marketing focus from traditional media to digital media to take advantage of the prevalence of social media which plays an important role in building brand awareness and direct interaction with consumers. Instagram, as one of the most popular social media platforms, has become an effective marketing tool with a visual format that allows companies to display their products in the form of attractive images and videos. The development of digital technology has changed the marketing landscape in various industries, including the hospitality industry. Marketing strategies that previously used traditional methods are now shifting to a digital approach, especially through the use of social media. (Kapoor and Kapoor, 2021). Influencers rely on the trust and relationships that influencers have built with their followers, allowing companies to expand their market reach in a more personal and effective way (Veirman, Cauberghe and Hudders, 2017).

Fig.1 Beauty in the Pot logo

The observed phenomena include the lack of visible use of technology for online interactions, minimal use of influencers to attract new customers, and suboptimal service interactions that can reduce customer retention. The potential of digital strategies, if fully implemented, can increase customer awareness, engagement, and revisit intentions (Veirman, Cauberghe & Hudders, 2017). Therefore, this study aims to analyze how information technology, influencers, and customer relationships influence customer interest in the restaurant, providing data-based insights for managerial improvement. The limitations of this research are:

- Focus on costumer at the Beauty in the Pot Restaurant Medan: this research is limited to Beauty In the pot Restaurant Medan as the research object. Therefore, the results and findings obtained may not be directly applicable to other locations.
- The research used information technology, influencers, and customer relationships as variables to increase visitor interest.
- Time continuity: the time limit for this research is from February to June 2025. Therefore, the influence of each variable may not be the same at any given time.
- Research Method: The analytical method and quantitative approach chosen will influence the results and conclusions obtained from this research.

2. Methodology

This study uses a descriptive-associative quantitative approach with the aim of determining the relationship between independent variables (X1: Information Technology, X2: Influencers, X3: Customer Relations) and dependent variables (Y: Customer Interest). The research was conducted at Beauty In The Pot Restaurant in Medan, located at Sun Plaza, Medan. The population in this study included all restaurant visitors, with a total of 80 respondents selected using total sampling technique. Data collection was conducted using a Likert scale questionnaire, interviews, documentation, and literature review. The variables are defined as follows:

- Information Technology: hardware, software, brainware (Azhar Susanto, 2023).
- Influencer: attractiveness, credibility, expertise (Luthfiany et al., 2018).
- Customer Relationship: technology, people, process (Fauziah, 2021).
- Customer Interest: transactional, preferential, and exploratory interest (Sari & Pangestuti, 2018).

The data were processed using SPSS version 25 by applying descriptive analysis, validity and reliability tests, multiple linear regression, and hypothesis testing (t-test and F-test). Research Location: The location of this research was the Beauty In the Pot Restaurant in Medan, located at Jl. KH. Zainul Arifin No. 7, Madras Hulu, Medan Polonia Sun Plaza District, G Floor, EL Block D No. 03, North Sumatra 20152. Population: A population is the entire generalized area consisting of subjects or objects with certain characteristics, which the researcher determines as the focus of the study and from which conclusions are drawn (Sugiyono, 2017). Based on this definition, a population can be defined as a group of people, events, or objects with certain characteristics that serve as the object of research. The population in this study was 80 visitors to the Beauty In the Pot Restaurant in Medan.

Operational Definition:
In this study, an operational definition refers to the description of research variables based on observable and empirically measurable characteristics. This definition is used to explain how each variable is practically defined within the research context, thus facilitating the measurement and analysis process.

- An independent variable is a variable that influences or causes changes in the dependent variable. In this study, the independent variables consist of three aspects: Information Technology (X1), Influencers (X2), and Customer Relationships (X3).

- A dependent variable is a variable that is influenced by or results from the independent variable. In the context of this study, the dependent variable studied is Visitor Interest (Y), which is the extent to which visitors are interested in visiting the Beauty In the Pot Restaurant in Medan because of the influence of these three independent variables.

Table 1. Operational Definition Table of Variables

Variable	Definition	Indicator	Scale
Visitor Interest	Interest in visiting can be interpreted as a person's drive or desire to come to or visit a particular tourist destination.	1. Desire to Transact 2. Interest Based on Preference 3. Interest in Exploration	Likert
Information Technology	Technology is a collection of tools, methods, and processes used to meet human needs and improve comfort and sustainability. Human use of technology began with efforts to utilize natural resources through the creation of simple tools as solutions to various needs.	1. Hardware 2. Software 3. Brainware (Individual)	Likert
Influencer	Influencer. This strategy has developed significantly in the digital era, with brands partnering with influential individuals on social media platforms to support the promotion of the products or services offered.	1. Attraction 2. Trust 3. Expertise	Likert
Customer Relationship	A customer is an individual or group of people who continually purchase and use products, whether goods or services. Therefore, the existence of customers plays a crucial role for a company, as it is through them that the company's operations can run optimally and support business growth and development.	1. Technology 2. People 3. Process	Likert

3. Results and Discussion

The characteristics of the research respondents were obtained from personal data or subject identities listed on the scale collected in this study. The number of respondents was 80 people based on gender and age among customers of the Beauty In the Pot Restaurant in Medan. The following is a description and identity of the research respondents:

Table 2. Characteristics of Respondents Based on Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Laki-Laki	25	24.5	31.3	31.3
	Perempuan	55	53.9	68.8	100.0
	Total	80	78.4	100.0	
Missing	System	22	21.6		
Total		102	100.0		

Based on the table above, the number of respondents based on gender is 80 customers of Restaurant Beauty in the Pot Medan, with more women than men.

Table 3. Characteristics of Respondents Based on Age

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	18-21 Tahun	18	17.6	22.5	22.5
	22-25 Tahun	34	33.3	42.5	65.0
	26-30 Tahun	23	22.5	28.7	93.8
	>30 Tahun	5	4.9	6.3	100.0
	Total	80	78.4	100.0	
Missing	System	22	21.6		
Total		102	100.0		

Based on the table above, the number of respondents by age is 80 restaurant customers, both those who can afford Medan and those who are productive, namely 22-25 years old. Multiple Linear Regression Test Results. This test was conducted to determine the effect of Information Technology, Influencers, Customer Relationships, and Customer Loyalty on attracting visitors to the Beauty in the Pot Medan Restaurant, which was carried out by the Beauty in the Pot Medan Restaurant Employees. The following is a table of multiple linear regression test results, namely:

Table 4. Multiple Linear Regression Test Results

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
1 (Constant)	6.439	3.371		1.910	.060
Teknologi_Informasi	.134	.108	.168	1.231	.222
Influencer	.269	.140	.319	1.917	.059
Customer_Relationship	.239	.130	.250	1.840	.070

Based on the test results above, the multiple linear regression equation is obtained as follows:

$$Y = 6.439 + 0.134\ (X1) + 0.269\ (X2) + 0.239\ (X3) \quad (1)$$

In the multiple linear regression model, the constant value of visitor interest is 6.439, meaning that if the value of the independent variables of information technology, influencers and customer relationships is 0, then the dependent variable of visitor interest is 6.439. The regression coefficient of each independent variable is positive, meaning that visitor interest in the Beauty In the Pot Medan restaurant can be influenced by information technology, influencers, and customer relationships.

a. Hypothesis Testing

The determination coefficient quantifies the magnitude of the independent variable (X) 's influence on the dependent variable (Y).

Table 5. Multiple Linear Regression Test Results

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.674[a]	.455	.433	3.995

Based on the test above, the determination coefficient value obtained is 0.455 or 45.5% stating that the percentage of influence of independent variables (Information Technology, Influencers, and Customer Relationships) on the dependent variable (Visitor Interest) is 45.5%. The remaining 54.5% is explained or influenced by other variables not used as statements in this study.

a. Simultaneous Test (F test)

Table 6. Snail Test Results

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	1012.180	3	337.393	21.136	.000[b]
	Residual	1213.208	76	15.963		
	Total	2225.388	79			

Based on the table above, the F-count value of 21.136> from the F-table value of 2.67 and the significant value of 0.000 < from alpha 0.05. So the decision taken, H0 is rejected, H1 is accepted, thus simultaneously Information Technology, Influencers, and Customer Relationships have a positive and significant effect on Visitor Interest in the Beauty in the Pot Medan Restaurant.

b. Simultaneous Test (F test)

Fig. 7: Partial Test Results

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	6.439	3.371		1.910	.060
	Total_X1	.134	.108	.168	1.231	.222
	Total_X2	.269	.140	.319	1.917	.059
	Total_X3	.239	.130	.250	1.840	.070

From the test results above, it is explained that:

- The T-count value on the Information Technology variable is 1.231 <Ttable 1.689 and a significant value of 0.222> from alpha 0.05 (5%), then H0 is accepted and H1 is rejected, thus partially Information Technology does not affect Visitor Interest.
- The T-count value on the Influencer variable is 1.917> Ttable 1.689 and a significant value of 0.059> from alpha 0.05 (5%), then H0 is accepted and H1 is rejected, thus partially Influencer does not affect Visitor Interest.
- The T-count value on the Customer Relationship variable is 1.840> Ttable 1.689 and a significant value of 0.070 <from alpha 0.05 (5%), then H0 is accepted and H1 is rejected, thus partially Customer Relationship does not affect Visitor Interest

Based on the results of the partial t-test, it is known that the three variables in this study, namely Information Technology, Influencers and Customer Relationships, do not have a significant effect on the interest of visitors to the Beauty In the Pot Medan restaurant, this can be seen from the significance value of the three variables which are all at the critical limit of 0.05, so that H0 is accepted and H1 is rejected. These results indicate that although in theory the three variables have the potential to influence consumer interest, in practice they have not been able to provide a significant real impact. The use of information technology must be able to support effective and interactive communication in order to provide added value for consumers (Jogiyanto, 2007)

Likewise, the influence of influencers will be effective only if there is a match between the character of the influencer and the target audience (Sumarwan, 2011). Strong customer relationships can build loyalty and ongoing interest, but this requires consequences in service and personal communication that is right on target (Kotler and Keller, 2012). Thus, these results indicate that restaurants need to re-evaluate their strategies in utilizing technology, selecting influencers and approaching customers to be more effective in increasing visitor interest.

4. Conclusion

Based on the results of data analysis conducted through partial multiple linear regression testing (t-test), it can be concluded that the three independent variables in this study, namely Information Technology, Influencers, and Customer Relationship, do not have a significant partial effect on the interest of visitors to the Beauty In the Pot restaurant in Medan. This is evidenced by the statistical calculations showing that the significance levels of the three variables are greater than the significance level (α) of 0.05, specifically Information Technology at 0.222, Influencer at 0.059, and Customer Relationship at 0.070. Therefore, statistically, the null hypothesis (H0) is accepted, and the alternative hypothesis (H1) is rejected.

These results indicate that, individually, each variable has not been able to make a significant contribution in influencing visitor interest in the restaurant. However, theoretically, these three variables are considered to have the potential to influence consumer behaviour. For example, the use of information technology can help companies convey information quickly and accurately to customers and enhance the user experience. However, if the technology is not maximized or does not align with the preferences of the target consumers, its impact becomes suboptimal (Jogiyanto, 2007). An influencer has the power to shape opinions and influence consumer purchasing decisions, especially if they have credibility and relevance to the promoted product (Sumarwan, 2011). However, if the chosen influencer does not align with the characteristics of the target market, the message conveyed will not be effective in attracting consumer interest. Similarly, customer relationships: Building good long-term relationships with customers can increase loyalty and repeat visits (Kotler and Keller, 2012), but if the approach used is too general, unprofessional, or inconsistent, the relationship will not be strong enough to significantly influence visitor interest.

Thus, this study identifies that Beauty In the Pot Medan restaurant needs to evaluate the strategies used in the areas of information technology, influencer utilization, and customer relationship approaches. These strategies must be tailored to the characteristics and needs of consumers to be more relevant and effective in attracting visitor interest. Additionally, there may be other factors beyond these three variables that are more dominant in influencing visitor interest, such as food quality, price, location, or direct promotions, which could be the focus of further research. Suggestions for next research include adding or replacing other potentially more relevant and influential variables, such as food quality, price, restaurant atmosphere, and comfort. With these developments, it is hoped that future research can make a stronger contribution to understanding the factors influencing consumer interest in the modern restaurant sector.

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DEVELOPMENT OF A WEB-BASED POINT OF SALES (POS) INFORMATION SYSTEM FOR COFFEE SHALTER

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Abstract

The purpose of this research is to design and implement an effective web-based Point of Sales (POS) information system for managing raw materials and menu items at Coffee Shelter, while also evaluating the impacts of system implementation on daily café operations. The study aims to provide an integrated solution that enhances efficiency in sales transactions, streamlines inventory management, and supports data-driven decision-making. A qualitative research approach is employed, utilizing observation, interviews, and literature review as primary methods for data collection. Observations are carried out to understand the current workflow and operational challenges faced by Coffee Shelter. In-depth interviews with the café owner and staff help uncover system requirements and user expectations. In parallel, literature studies are conducted to explore the theoretical foundations of POS systems, including system architecture, usability, and implementation strategies. The anticipated result of this research is the development of a user-friendly, web-based POS system that facilitates faster transactions, automates inventory tracking, and generates real-time sales reports. These features are expected to improve operational control, reduce manual errors, and support strategic planning within the café environment.
Keywords: POS; System; Transaction.

1. Introduction

The increasing popularity of coffee consumption in Indonesia has led to the rapid development of modern cafés offering a wide variety of coffee-based beverages and snacks. Coffee Shelter, located in Medan Selayang, is one such café that serves various contemporary coffee drinks and light foods. However, its current operational activities—such as recording sales transactions, managing inventory, and handling customer orders—are still performed manually using paper-based methods or simple spreadsheets, which can be inefficient and prone to errors. Manual data handling has caused several operational challenges for Coffee Shelter including slow services, order inaccuracies, and difficulties in real-time stock monitoring. These inefficiencies not only reduce service quality but may also lead to customer dissatisfaction and financial losses due to mismanaged inventory. Therefore, implementing a well-structured information system is essential to improve transaction accuracy, inventory control, and service speed. To address these problems, a web-based Point of Sales (POS) system is proposed as a solution. The system is expected to automate the sales and inventory processes in an integrated and real-time manner. A web-based POS provides flexibility, accessibility, and centralized data management that can enhance operational efficiency and improve decision-making. The system would also offer a user-friendly interface for both cashiers and admins, enabling them to interact seamlessly with the platform.

Several previous studies support the effectiveness of web-based POS systems. found that implementing such systems improved transaction management efficiency at Toko A3 Jaya. showed that a web-based POS at Point Coffee Banjarmasin accelerated payment processes and increased accuracy. Emphasized that real-time data access from POS applications supports more effective managerial decision-making. These studies indicate that a well-

developed POS system is critical to solving operational issues like those faced by Coffee Shelter. Based on these findings, this research aims to design and implement a web-based POS information system specifically tailored for Coffee Shelter. The system will be developed to meet the café's operational needs, focusing on transaction recording, menu management, and inventory monitoring. This initiative is expected to significantly enhance service performance, reduce human error, and ultimately support the café's business growth.

2. Methodology

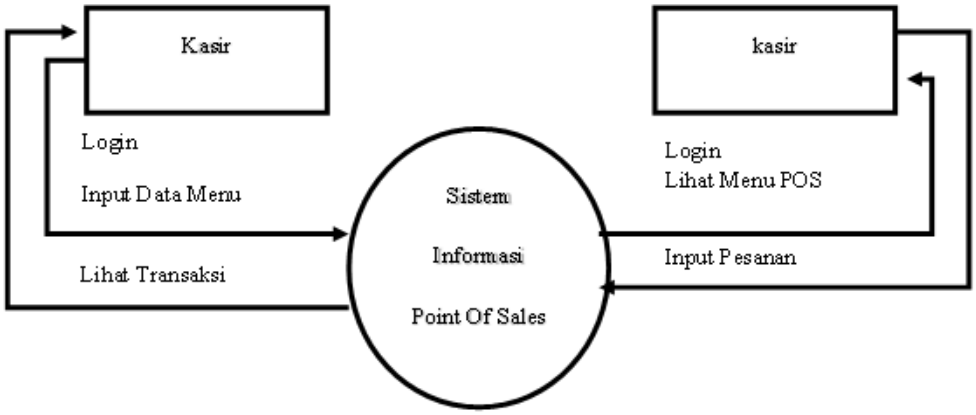
This study employs a qualitative approach using a descriptive method. This approach was chosen because it allows researchers to explore phenomena in depth, particularly regarding operational processes and issues in transaction recording at Coffee Shelter. The descriptive method is used to describe actual conditions in the field and to provide a systematic explanation of the observed processes without manipulating variables. The aim of this study is to design a web-based Point of Sales (POS) information system that aligns with real operational needs, which makes this approach appropriate. The research was conducted at Coffee Shelter, a café located on Jalan Bunga Ester XII, Padang Bulan, Medan Selayang, from March to May 2025. Coffee Shelter was selected as the research site due to its real-life problems in recording transactions and managing inventory, which are still handled manually. These manual processes often result in service delays and recording errors. Considering these issues, the development of a web-based POS system is expected to improve efficiency and accuracy in the café’s daily operations.

The types of data used in this study are primary data and secondary data. Primary data were collected directly through interviews with the café owner and staff, as well as through observations of the inventory and sales transaction processes. Primary data plays a crucial role in qualitative research because it comes directly from first-hand experience or field conditions. As states, primary data are original sources of information obtained specifically for the research objectives. Meanwhile, secondary data were gathered from various references such as literature, documents, books, scientific journals, and previous studies relevant to web-based POS system development. The data collection techniques used in this research include observation, interviews, and literature review. Direct observations were conducted to examine the daily operational activities at Coffee Shelter, including how inventory and transactions are recorded. According to [5], observation is an effective data collection method that allows researchers to obtain contextual insights through direct examination of the research object. Additionally, interviews were carried out with the café’s owner and staff to explore system requirements, operational challenges, and their expectations for the new system. Interviews facilitate deeper understanding by allowing two-way communication with key informants [6]. Literature review was also conducted to gather theoretical foundations from sources related to information systems, web technologies (PHP, HTML, MySQL), and POS concepts to support the system design.

The data analysis process in this study follows five stages as described by [6]: data collection, data reduction, data presentation, conclusion drawing, and evaluation. Data were first collected using observation, interviews, and literature review. The next step was data reduction, where relevant information was filtered and focused on the research objectives. The reduced data were then organized and presented in a structured way to facilitate analysis. Conclusions were drawn based on the patterns and findings from the field. Finally, an evaluation was conducted to ensure the accuracy and consistency of the results and to provide recommendations for future system development. Through the qualitative approach and descriptive method, this study is expected to produce a web-based POS information system that not only fits the operational conditions of Coffee Shelter but also improves the effectiveness of transaction recording and inventory management in an integrated, real-time, and accurate manner.

3. Results and Discussion

The results of the design and development of the web-based Point of Sales (POS) information system at Coffee Shelter show that the system was successfully implemented according to operational needs. The system replaces the previous manual processes—such as handwritten records and spreadsheets—with a structured, efficient web application accessible to both admin and cashier. It simplifies the sales process, accelerates transaction recording, and supports real-time data monitoring to aid in decision-making. To illustrate how the system works, a Data Flow Diagram (DFD) was created to show the interaction between external entities—namely the cashier and the admin—and the core processes of the POS system. The DFD consists of a single main process that represents the entire system, with the cashier interacting to record orders, view menus, and access transaction data, while the admin manages the menu data and edits transaction records.



Fg. 1. Data Flow Diagram (DFD)

The database structure for the system consists of several main tables, including users, roles, menu, transaction, transaction detail, and payments. The users table stores information on both admin and cashier accounts, while the roles table defines their access levels. The menu table holds data on available food and beverage items. Meanwhile, the transaction and transaction detail tables record each sale and its detailed items. The payments table logs payment information for each transaction.

Table 1. *Category*

Column	Data Type	Description
category_id	INT(11)	PRIMARY KEY, AUTO_INCREMENT
category_name	VARCHAR(50)	NOT NULL, UNIQUE, nama kategori menu

Table 2. Menu

Column	Data Type	Description
menu_id	INT(11)	PRIMARY KEY, AUTO_INCREMENT
menu_name	VARCHAR(100)	NOT NULL, nama menu
price	DECIMAL(10,2)	NOT NULL, harga menu
category_id	INT(11)	NOT NULL, FOREIGN KEY ke categories(category_id)
description	TEXT	opsional, deskripsi menu
image	VARCHAR(255)	opsional, nama file gambar
status	ENUM(...)	status ketersediaan menu (default: 'available')
created_at	TIMESTAMP	otomatis, waktu dibuat
updated_at	TIMESTAMP	otomatis, waktu update terakhir

Table 3. Transaction

Column	Data Type	Description
order_id	INT(11)	PRIMARY KEY, AUTO_INCREMENT
no_bon	VARCHAR(50)	NOT NULL, nomor bon
order_date	DATETIME	waktu pemesanan (default: current_timestamp)
user_id	INT(11)	NOT NULL, FOREIGN KEY ke users(user_id)
total_price	DECIMAL(12,2)	NOT NULL, total harga pemesanan
order_status	ENUM(...)	status pesanan (default: 'pending')

Table 4. Transaction Detail

Column	Data Type	Description
detail_id	INT(11)	PRIMARY KEY, AUTO_INCREMENT
order_id	INT(11)	NOT NULL, FOREIGN KEY ke orders(order_id)
menu_id	INT(11)	NOT NULL, FOREIGN KEY ke menu_items(menu_id)
quantity	INT(11)	NOT NULL, jumlah item dipesan
subtotal_price	DECIMAL(12,2)	NOT NULL, total harga berdasarkan kuantitas

Table 5. Payment

Column	Data Type	Description
payment_id	INT(11)	PRIMARY KEY, AUTO_INCREMENT
order_id	INT(11)	NOT NULL, FOREIGN KEY ke orders(order_id)
payment_method	ENUM(...)	NOT NULL, metode pembayaran (cash, credit_card, dll)
amount_paid	DECIMAL(12,2)	NOT NULL, jumlah uang yang dibayarkan
payment_date	DATETIME	waktu pembayaran (default: current_timestamp)
payment_status	ENUM(...)	status pembayaran (default: 'pending')

Table 6. Role

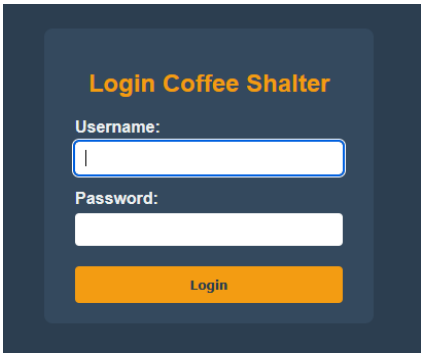
Column	Data Type	Description
role_id	INT(11)	PRIMARY KEY, AUTO_INCREMENT
role_name	VARCHAR(50)	NOT NULL, UNIQUE, nama peran (kasir, dll)
description	TEXT	opsional, deskripsi peran

Table 7. User

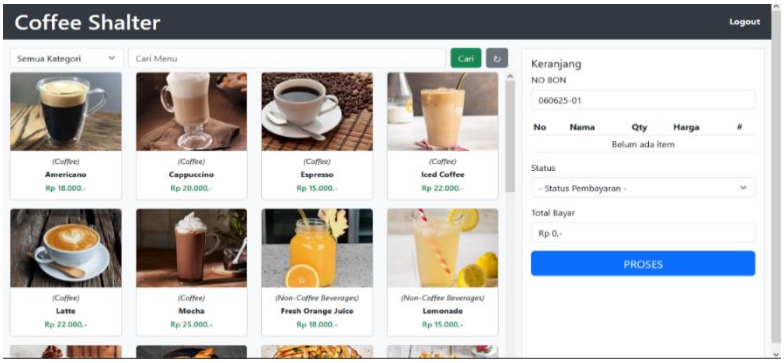
Column	Data Type	Description
user_id	INT(11)	PRIMARY KEY, AUTO_INCREMENT
username	VARCHAR(50)	NOT NULL, UNIQUE, nama pengguna
password	VARCHAR(255)	NOT NULL, hash kata sandi
full_name	VARCHAR(100)	NOT NULL, nama lengkap pengguna
role_id	INT(11)	NOT NULL, FOREIGN KEY ke roles(role_id)
last_login	DATETIME	opsional, waktu terakhir login
created_at	TIMESTAMP	waktu pembuatan akun
updated_at	TIMESTAMP	waktu pembaruan terakhir data akun

The user interface is designed to be user-friendly and accessible for both cashier and admin roles. The interface includes key pages such as the login screen, admin dashboard, menu management, transaction management, and transaction details. Admins can manage menu data, view reports, and configure user accounts, while cashiers can efficiently record transactions through a streamlined input page. The overall layout is kept simple and responsive to support smooth daily operations.

The system was implemented using PHP and MySQL for the backend, along with HTML, CSS, and Bootstrap for the frontend interface. System testing was conducted on all major functions including login, transaction input, menu management, and reporting. The results confirmed that all features functioned as intended. Screens such as login, dashboard, transaction list, transaction details, and cashier pages all displayed correctly and responded well.



Fg. 2. Login Page



Fg. 3. POS Page

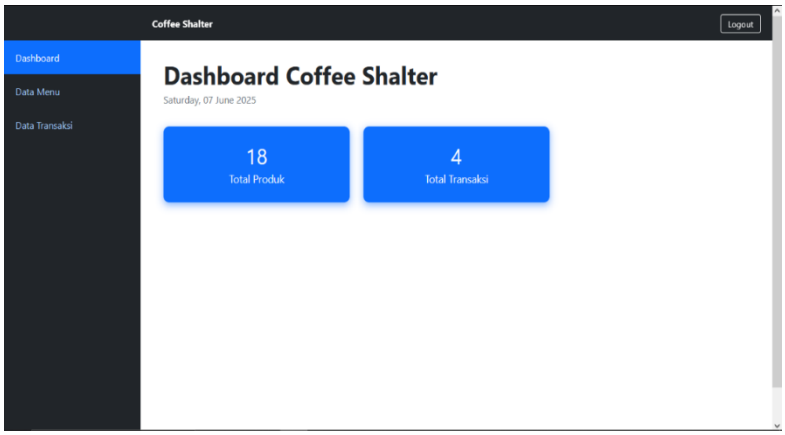


Fig. 4. Dashboard Page

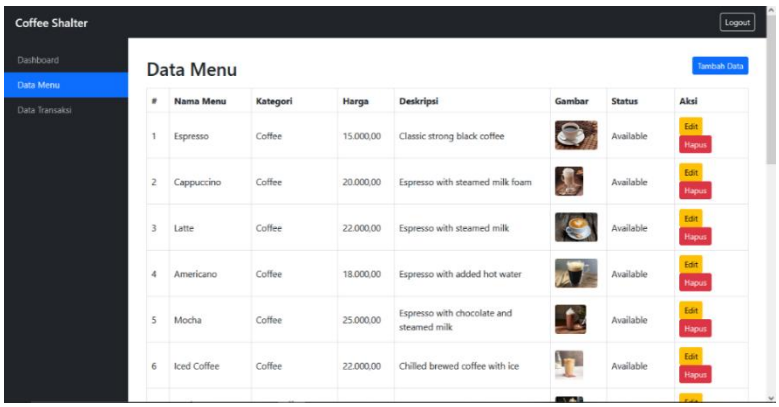


Fig. 5. Menu Page

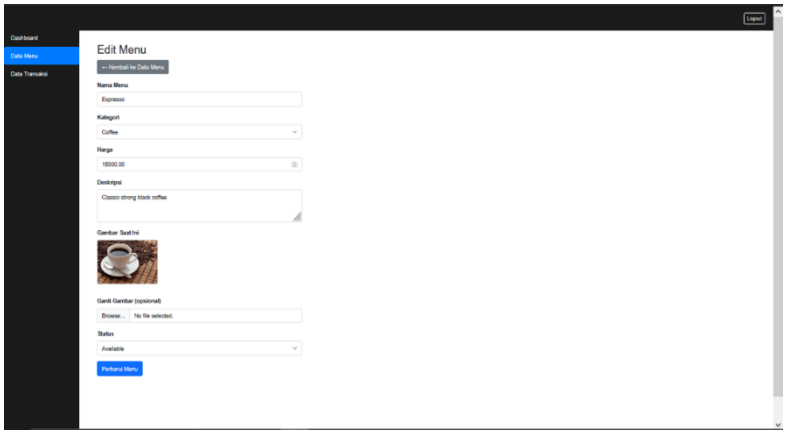
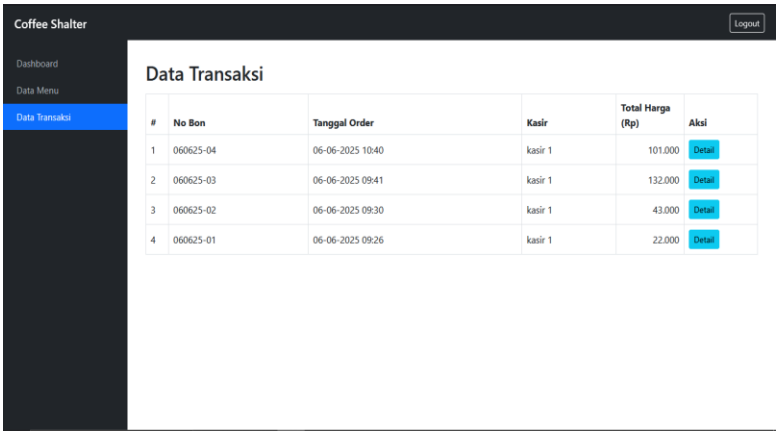


Fig. 6. Add / Edit Menu Page



Fg. 7. Transaction Page

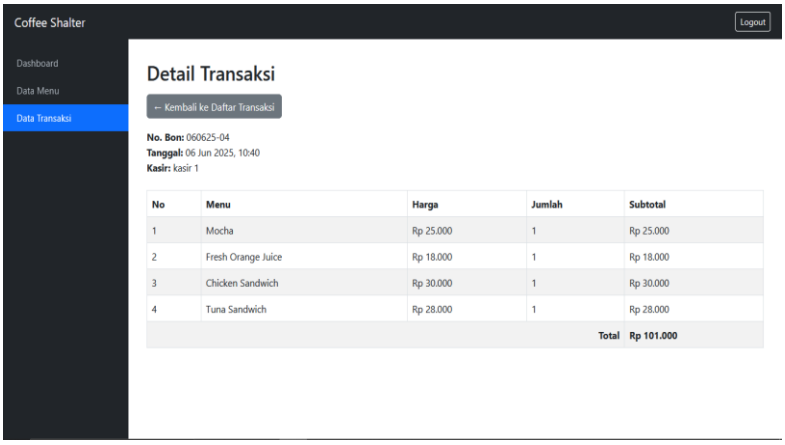


Fig. 8. Detail Transaction Page

Overall, the web-based POS system developed for Coffee Shelter successfully addresses the challenges of manual recordkeeping previously faced by the business. It simplifies transaction processes, reduces errors, and improves the speed and accuracy of service. With its clear workflow and intuitive interface, the system enhances operational efficiency and provides reliable control over sales activities.

4. Conclusion

Based on the design and implementation of the web-based Point of Sales (POS) information system at Coffee Shelter, it can be concluded that the system was successfully developed according to the operational needs of the business. The system replaces manual recording processes with a digital platform, thereby improving work efficiency, speeding up transaction input, and reducing errors in data management. The developed system provides essential features such as login access, menu management, transaction processing, receipt printing, and sales reporting. With a simple interface and a clear workflow, the system makes it easier for both the admin and the cashier to carry out their respective tasks. All data is stored in a centralized database, allowing for easier retrieval, summarization, and transaction analysis. Overall, the web-based POS system has proven effective in addressing the operational challenges previously faced by Coffee Shelter. It contributes directly to smoother operations and supports faster, more accurate decision-making. The success of this system implementation highlights the importance of digitizing sales processes as a step towards improving professionalism and efficiency in business management.

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DESIGNING THE ERLANGGA SHOP WEBSITE AS A PROMOTIONAL AND INFORMATIVE PLATFORM TO IMPROVE BRAND AWARENESS AND SALES

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Abstract

This research aims to design the Erlangga Shop website as an effective promotional and informational medium to enhance brand awareness and product sales. The primary focus of this study is to explore design elements that can attract visitors' attention while creating a positive user experience and encouraging further interaction with the brand. The research method employed is qualitative in nature, utilizing observation, interviews, and literature studies to gather relevant data regarding user needs and best practices in web design. Through observations of user behaviour and interviews with business owners as well as potential customers, it is expected to gain in-depth insights into their preferences regarding the appearance and functionality of the website. Preliminary user feedback and basic usability testing were also considered during the design process, indicating that a clean layout, responsive interface, and simplified navigation significantly improve user satisfaction and engagement. The anticipated outcome of this research is the creation of an Erlangga Shop website that is not only visually appealing but also easy to navigate; thus significantly enhancing brand awareness and driving increased product sales through digital platforms.
Keywords: Website; Product; Brand.

1. Introduction

In the digital era, the development of information and communication technology has encouraged micro, small, and medium enterprises (MSMEs) to utilize the internet as a promotional tool. One of the most effective strategies to reach a wider audience and build brand identity is through the creation of a professional and informative website. For fashion businesses such as Erlangga Shop, the lack of a digital platform becomes a barrier to promoting products efficiently, especially in an increasingly competitive online market. Fashion is not only a lifestyle but also a growing business sector that relies heavily on visual appeal and brand awareness. Brand awareness plays a crucial role in influencing customer preferences and trust in a product. To compete with other fashion brands, Erlangga Shop must increase its visibility and engagement with potential customers. This can be achieved by designing a website that not only showcases products but also delivers clear, structured information to enhance the customer experience.

Previous studies have shown the importance of digital media in brand communication and promotion. (Rakhmadhona 2020) demonstrated that digital marketing strategies through social media significantly increase brand awareness. (Kurniasari 2023) emphasized the importance of websites as promotional media for MSMEs. (Aryanto et al. 2024) also found that a website's visual quality and usability positively influence consumer buying decisions, particularly among millennials. These findings support the notion that a well-designed website can serve as a strategic medium to build brand awareness and boost customer interest. However, many local businesses still do not utilize websites optimally. Either the design is unattractive, the content is not updated, or the information is difficult to access. A well-developed website is not only a promotional tool but also a communication bridge between

business and consumer. Therefore, the design must consider user experience, responsive layout, ease of access, and clarity of information.

This research aims to design a website for Erlangga Shop as a promotional and informational media that helps increase brand awareness and supports potential sales growth. The system will be designed to display product information, categories, and promotional content clearly and attractively. With a structured interface and user-focused design, the website is expected to become a valuable asset for Erlangga Shop in expanding its reach and building a strong digital brand identity.

2. Methodology

This study adopts a descriptive qualitative approach aimed at designing a website to serve as a promotional and informational medium for Erlangga Shop, with the objective of increasing brand awareness and attracting customer interest. The research was conducted at the Erlangga Shop business location from March to May 2025. The location was chosen because it reflects the focus of the study: a small-medium fashion business that requires digital promotion support through a structured information system. The data used in this study consist of primary data and secondary data. Primary data were obtained through direct observation of business activities at Erlangga Shop and interviews with the store owner to identify system needs and promotional challenges. Meanwhile, secondary data were collected from literature reviews of scientific journals, articles, and books related to digital promotion and web-based information system design. According to Rohmah (2024), secondary data are crucial for strengthening the theoretical foundation and supporting system design based on real user needs. Observational techniques used in this study also align with (Ismail 2020), who asserts that observation allows researchers to understand user activity and system requirements from a functional perspective.

Data collection methods in this study include field research and literature studies. Field research consisted of observing the existing promotional processes and interviewing the business owner to obtain in-depth information. Literature studies were used to support the development of a theoretical framework on digital promotion strategies and web-based system development. As stated by (Sugiyono 2020), qualitative methods are effective in capturing comprehensive data, especially in system design that directly relates to user interaction and experience. Data were analysed using the Miles and Huberman model, which involves four stages: data collection, data reduction, data presentation, and conclusion drawing. Data reduction was carried out by filtering relevant information from the observations and interviews. The selected data were then presented in the form of narratives and system design schemes. Finally, conclusions were drawn based on the field findings and user needs, which were used as the foundation for designing the proposed website system.

Through this approach and methodology, the study is expected to produce a website design that is not only functional but also aligned with the practical needs of Erlangga Shop in enhancing brand visibility, delivering structured product information, and expanding digital marketing reach.

3. Results and Discussion

The results of this research are presented through the implementation of a web-based information system in the form of the Erlangga Shop website. Before the implementation process, a Data Flow Diagram (DFD) was designed to illustrate the flow of data between users and the system. The context diagram shows two main entities interacting with the system: admin and visitors. The admin is responsible for managing product and promotion data, while visitors can only view product listings and their details. All main processes are identified using

standard DFD notations to represent the flow of input and output data and the internal system processes (Safwandi 2021).

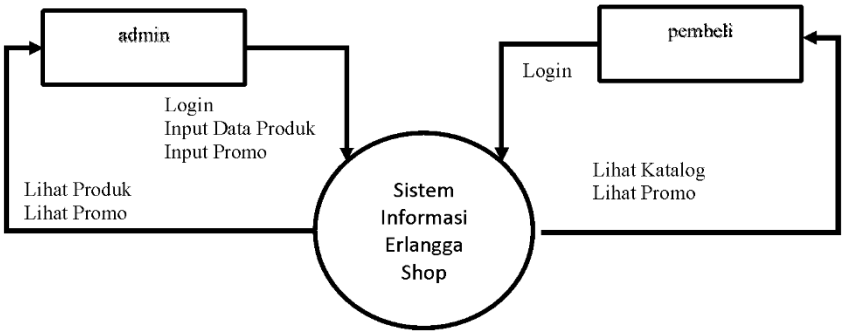

Fig. 1. Data Flow Diagram (DFD)

As the foundation for system development, a structured database design was created consisting of several key tables. These include the users table, which stores user data such as name, email, and role; the product category table for organizing fashion categories; the product table for storing product names, descriptions, prices, images, and category references; and the promo, promo_kategori, and promo_produk tables used for managing promotional data either by product or category. To support personalization and behaviour analysis, the log browsing table and recommendation table were also developed (Coronel 2020).

Table 1. Users

Column	Data Type	Description
user id	INT(11)	PRIMARY KEY, AUTO_INCREMENT
full name	VARCHAR(100)	NOT NULL, nama lengkap pengguna
email	VARCHAR(100)	NOT NULL, UNIQUE, alamat email
password_hash	VARCHAR(255)	NOT NULL, kata sandi (plaintext atau hash)
role	ENUM('admin','pelanggan')	DEFAULT 'pelanggan', peran pengguna
registration date	DATETIME	DEFAULT CURRENT_TIMESTAMP, waktu registrasi

Table 1 displays the structure of the users table, which stores user information such as name, email, role, and registration time.

Table 2. Product Category

Column	Data Type	Description
category id	INT(11)	PRIMARY KEY, AUTO_INCREMENT
category name	VARCHAR(50)	NOT NULL, UNIQUE, product name category

Table 2 defines the product category table used to organize products based on their respective categories.

Table 3. Product

Column	Data Type	Description
product id	INT(11)	PRIMARY KEY, AUTO_INCREMENT
product name	VARCHAR(100)	NOT NULL, product name
description	TEXT	Product description
price	DECIMAL(10,2)	NOT NULL, price
picture	VARCHAR(255)	Path/filename, picture
Category id	INT(11)	FOREIGN KEY → kategori_produk.id_kategori
Input date	DATETIME	DEFAULT CURRENT_TIMESTAMP, waktu input data
Index		Untuk percepat query berdasarkan kategori

Table 3 contains the structure of the product table, including product name, description, price, image, and its category reference.

Table 4. Promo

Column	Data Type	Description
Promo id	INT(11)	PRIMARY KEY, AUTO_INCREMENT
Promo name	VARCHAR(100)	NOT NULL, judul/tema promo
description	TEXT	Rincian promo
Pct deduction	DECIMAL(5,2)	Presentase diskon (mis. 10.00 = 10 %)
Start date	DATE	Tanggal mulai promo
Last date	DATE	Tanggal akhir promo
active	BOOLEAN	DEFAULT 1 (1 = aktif, 0 = nonaktif)

Table 4 shows the promo table that holds information about promotional campaigns including title, discount percentage, and active period.

Table 5. Promo Category

Column	Data Type	Description
id_promo	INT(11)	PRIMARY KEY (gabung), FOREIGN KEY → promo.id_promo
id_kategori	INT(11)	PRIMARY KEY (gabung), FOREIGN KEY → kategori_produk.id_kategori

Table 5 illustrates the promo_category table used to link promotions to specific product categories.

Table 6. Product Promo

Column	Data Type	Description
id_promo	INT(11)	PRIMARY KEY (gabung), FOREIGN KEY → promo.id_promo
id_produk	INT(11)	PRIMARY KEY (gabung), FOREIGN KEY → produk.id_produk

Table 6 outlines the promo_product table, which connects promotions directly to individual products.

Table 7: Search Log

Column	Data Type	Description
id_log	BIGINT	PRIMARY KEY, AUTO_INCREMENT
id_user	INT(11)	FOREIGN KEY → users.id_user, pengguna yang melihat produk
id_produk	INT(11)	FOREIGN KEY → produk.id_produk, produk yang dilihat
waktu	DATETIME	DEFAULT CURRENT_TIMESTAMP, waktu kunjungan

Table 7 describes the log_browsing table that logs user interactions with product views on the website.

Table. 8. Product Recommendation

Column	Data Type	Description
id_user	INT(11)	PRIMARY KEY (gabung), FOREIGN KEY → users.id_user
id_produk	INT(11)	PRIMARY KEY (gabung), FOREIGN KEY → produk.id_produk

Table 8 presents the recommendation table used to store product recommendations tailored to each user.

During the system design phase, the user interface was created for both visitor and admin roles. The visitor interface includes the homepage with general information and promotions, a product page with filtering and search features, a product detail page, and login/register pages. For admin users, pages were designed for the dashboard, product management, promotion management, and pages to add, edit, and delete product and promotion entries. These interface designs are described narratively in this section and do not require image inserts, as

the layout and navigation logic are explained according to user needs and the promotional objectives of the business. After the design process, system implementation and testing were carried out using PHP as the programming language and MySQL as the database. The implementation results are shown through active web pages featuring login, personalized product recommendations based on categories or visitor behaviour, and promotional displays where applicable. Key resulting pages include the homepage, product listings, product detail views, admin dashboard, and product and promotion management pages. The system output images should be inserted here as visual representations of the final implementation.

Fig. 2. Home Page

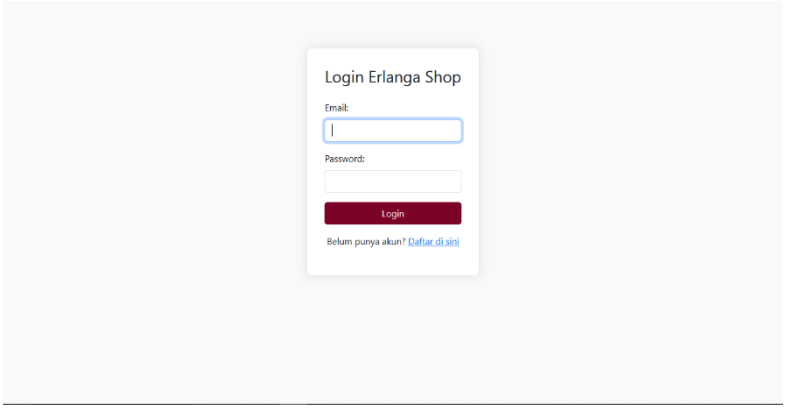

Fig. 3. Login Page

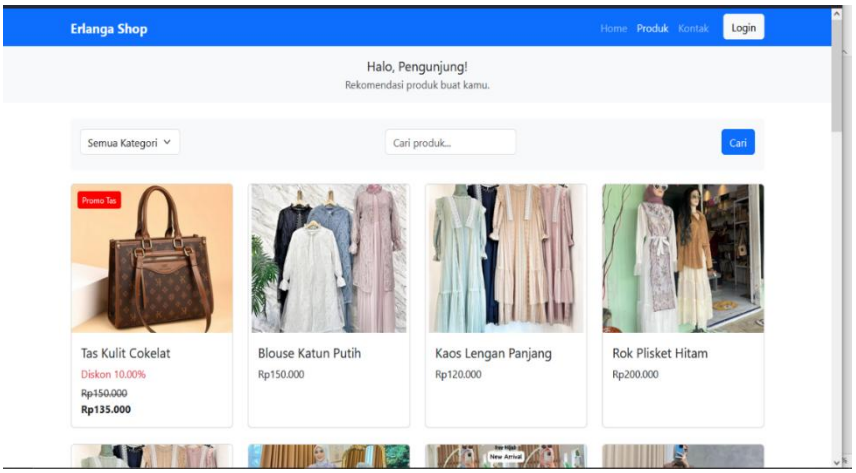

Fig. 4. Product Catalogue Page

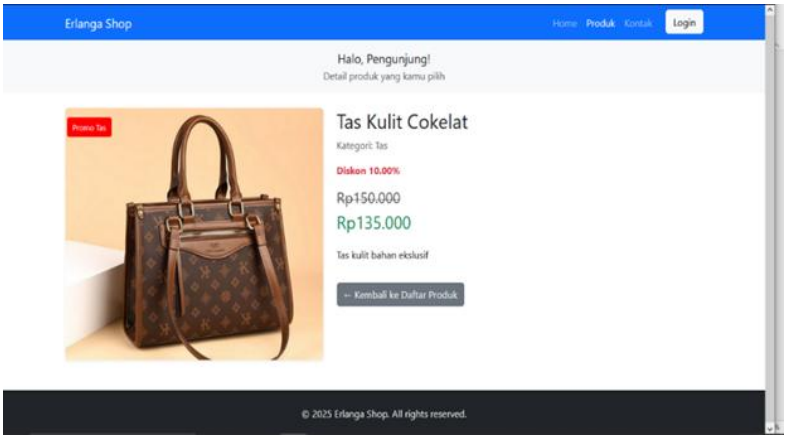

Fig. 5. Product Detail and Promo Page

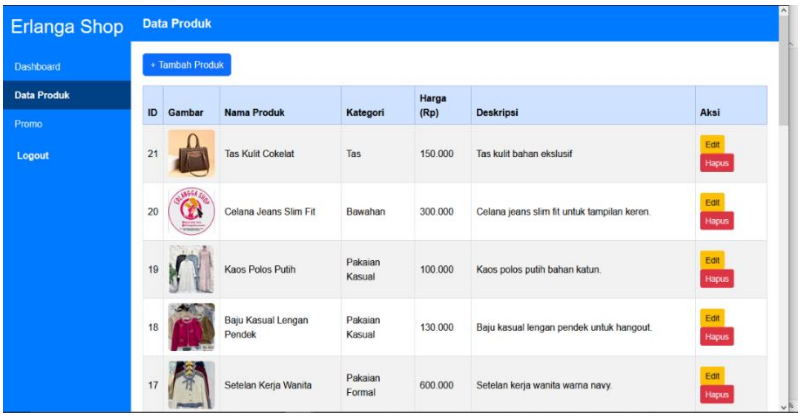

Fig. 6. Data of Product Page

The design of the Erlangga Shop website as a promotional and informational platform aims to enhance brand awareness and support increased online sales. This responsive and user-friendly website allows visitors to easily access structured product information, current promotions, and available categories. By utilizing modern web technologies and database integration, the system dynamically displays product listings and ongoing offers, making it easier for users to find attractive deals. Features like search and category filters streamline the shopping experience, while user authentication adds a layer of personalization and security. The website is built using the Bootstrap framework to ensure consistent, responsive design across devices, reinforcing a professional and modern brand image. Additionally, the admin-friendly content management system allows for efficient updates of products and promotions. Ultimately, the Erlangga Shop website serves as an effective tool for reaching a broader audience, providing reliable product information, fostering customer engagement, and strengthening the brand's position in the competitive digital market.

4. Conclusion

Based on the design and implementation of the Erlangga Shop website as a promotional and informational medium, it can be concluded that the developed system effectively addresses the research questions. First, the website successfully presents product and promotional information in a structured and appealing manner, which significantly contributes to increasing Erlangga Shop's brand awareness. The website was designed as a digital catalogue that replaces conventional promotional methods that previously had limited reach. Second, the user interface was designed with a user-friendly and responsive approach using the Bootstrap framework, providing a pleasant and intuitive experience. The colour scheme, layout, and navigation are aligned with the brand identity and user needs, supporting a more efficient and

enjoyable product browsing experience. Third, the system features such as product search, category filters, and promotional tags offer convenience for users in finding the products they are interested in. These features enhance user interaction with the website and create greater opportunities to attract customer attention toward the displayed products.

In addition, the presence of the website provides benefits for the admin, allowing easy content management, real-time updates, and broader digital promotional reach. The system also enhances the professional image of Erlangga Shop and enables more efficient and targeted communication with potential customers. Future enhancements could include integrating online payment features, customer review systems, and personalized marketing based on user behaviour. Further research may explore the impact of such features on customer satisfaction and purchasing behaviour in the context of small to medium fashion businesses. In conclusion, the development of the Erlangga Shop website not only succeeds as an information and promotional tool but also contributes to strengthening brand identity and increasing sales opportunities in the increasingly digital market landscape.

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IMPACT ANALYSIS OF THE USE OF E-WALLET APPLICATIONS ON CHANGES IN ONLINE SHOPPING HABITS IN THE DIGITAL ERA

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Abstract

The growing adoption of e-wallet applications has significantly transformed online shopping habits, especially among Generation Z. This generation, known for its high level digital literacy, often chooses digital payment methods for convenience and speed. Previous studies have shown that financial technology tools can influence consumer behavior, but limited research focuses specifically on e-wallet usage among young users in developing countries. This study aims to analyze the impact of e-wallet use on changes in online shopping habits among Generation Z in Medan, Indonesia. A quantitative descriptive method was employed, using a simple linear regression technique to analyze data collected from 110 respondents. The results show that e-wallet usage has a positive and significant impact on changes in online shopping habits, with a contribution rate of 51.5%. Key factors driving this behavior include convenience, transaction efficiency, and perceived security. However, the findings also reveal potential risks such as impulsive buying behavior and increased digital dependence. In conclusion, this research highlights the dual role of e-wallets: as facilitators of modern consumer convenience and as tools that may encourage overconsumption. The study recommends responsible usage among youth, improved digital marketing strategies by business actors, and enhanced financial literacy education promoted by app developers.
Keywords: E-wallet applications; Online shopping habits; Generation Z; Consumer behavior.

1. Introduction

The development of human culture evolves every year, creating new behaviors and adaptations in how individuals or groups interact with their environment. As time progresses, technology plays an increasingly crucial role in shaping these adaptations. Users of modern technology must be able to adjust to rapidly changing human behavior patterns. As social beings, humans experience satisfaction through interactions, including in their roles as consumers. According to Kotler and Keller (Lilis Cucu S & Dini Fajriany A.T., 2019), customer satisfaction is defined as the level of feeling resulting from comparing expectations with actual outcomes in consumption. In a digital economy, one such technological advancement is the use of e-wallets, which provide seamless payment options without the need for physical cash (Megadewandanu et al., 2016).

One of the leading marketplace platforms in Indonesia today is Shopee. According to Chris Feng, CEO of Shopee, the platform is among many that have capitalized on the E-Commerce boom by innovating in mobile shopping. Shopee's social commerce approach resonates particularly in Southeast Asia, where social media usage is high, especially in Indonesia (Namira Shafinazh, 2020).

As digital technology evolves, human interaction and transaction behavior also shift to accommodate technological progress. This change is particularly visible in how younger

generations adopt and adapt to digital services, especially those that enhance convenience and speed in daily routines. These digital transformations affect not only individual lifestyles but also the broader consumer culture in Indonesia.

Generation Z, those born in the digital era, are the most familiar with the use of smartphones, internet-based applications, and financial technology services. As noted by (Alfira Dwi Astuti & Ani Fauziah (2023), their interaction with mobile devices, gadgets, and platforms forms a significant part of their daily lives, shaping both their social behaviors and economic choices. One prominent example is Shopee, a leading e-commerce platform in Southeast Asia. Chris Feng, Shopee's CEO, emphasized the company's role in leveraging mobile-based commerce, particularly in Indonesia where users are highly active on social media (Namira Shafinazh, 2020). The popularity of Shopee illustrates how digital platforms have reshaped the way people engage in buying and selling.

E-wallets, as part of financial technology (fintech), provide an effective alternative to cash payments, enabling consumers to perform transactions efficiently and securely. Megadewandanu et al. (2016) defined e-wallets as digital payment tools that facilitate transactions through mobile devices without the need for physical money. The COVID-19 pandemic further accelerated the shift toward digital payments. Although initially arising globally, its impact was significantly felt in Indonesia as people adopted e-wallets to reduce physical contact and prevent virus transmission (Anastasia & Nugroho, 2024). As a result, the digital economy experienced a surge, particularly in urban and youth populations.
According to a report by IPSOS, a global market research firm, 68% of active e-wallet users in Indonesia belong to Generation Z. These users conduct digital transactions at least twice a week, indicating a high frequency of engagement and reliance on cashless systems (Publicis Sapient, 2024). This growing trend raises questions about behavioral shifts and financial decision-making patterns among digital-native consumers.

E-wallets, also known as mobile wallets, are digital payment services operated under financial regulations and conducted via mobile devices. They are considered a new form of m-commerce that enables users to perform various transactions, including online shopping, bookings, and service payments (Sharma, S.K., Gaur, A., Saddikuti, V., & Rastogi, A., 2017). In today's digital era, many businesses are competing to offer convenience in online transactions. These services range from bill payments, online credit, ticket reservations, online loans, online shopping, and e-banking. All of these can be accessed through e-wallet applications such as DANA, OVO, GoPay, and ShopeePay, which are widely used by people, including in rural areas like Pekalongan. The widespread adoption of e-wallets has provided users with various conveniences and served as a bridge for the transition from manual to digital, internet-based transactions.

From an Islamic perspective, non-cash transactions are permissible as long as they fulfill specific conditions and are used for legitimate purposes, such as in debt or credit agreements. According to Islamic legal principles (fiqh), all types of muamalah (transactions) are considered permissible unless there is a clear prohibition. Based on this, the use of non-cash transactions is allowed under Islamic law, as supported by DSN-MUI Fatwa No.54/DSN-MUI/X/2006.

The table below shows the development of the use of various payment methods in Indonesia over the period 2020 to 2025. This data illustrates the shifting trend from traditional payment methods, such as cash and credit cards, to more practical and efficient digital methods, such as e-wallets, QRIS, and PayLater/BNPL. This significant increase in digital methods reflects technological advancements as well as changing consumer preferences in making transactions.

Table 1. Trending payment methods 2020 - 2025

Payment Method	2020	2021	2022	2023	2024	2025
E-Wallet (GoPay, OVO, DANA, ShopeePay)	65%	72%	80%	87%	92%	94%
QRIS (Integrated QR Code)	30%	38%	45%	52%	60%	68%
PayLater / BNPL (Buy Now Pay Later)	12%	18%	24%	31%	38%	46%
Debit Card	55%	53%	50%	47%	44%	40%
Payment Method	2020	2021	2022	2023	2024	2025
Credit Card	20%	18%	16%	14%	12%	10%
Cash	40%	35%	28%	22%	15%	7%

Based on the table shown above, it can be seen that digital payments or e-wallets are becoming the dominant payment method among Gen Z, with a significant increase from 65% in 2020 to 94% in 2025, which even beat the bank transfer or virtual account method used by generation Z.

Table 2. E-Wallets that are often used

Rating	E-Wallet	Usage Rate (%)
1	GoPay	88%
2	OVO	79%
3	ShopeePay	77%
4	FUNDS	71%
5	LinkAja	48%

The explanation of table 1.2. shows that GoPay digital wallet or e-wallet leads as the most popular e-wallet among Gen Z, thanks to its collaboration with the Gojek ecosystem and attractive features such as GoPayLater. Changes in the consumption behavior of generation Z are driven by the advancement of information and communication technology which triggers a higher level of consumption in generation Z because it makes it easy to find information related to products that are needed in a fast time and in a scope that has no limitations. Because generation Z always maintains their appearance to always exist and generally likes to be tempted by various kinds of attractive advertisements, especially supported by advances in internet technology which offers several application features by providing easy access to shopping (Fadhilah, 2023).

The main factor influencing Generation Z's consumptive behavior is the use of online shopping applications. Online shopping is defined as the activity of buying or selling products and services through internet-based platforms. Consumers can easily identify and evaluate products via photos and videos provided on these apps. Popular platforms used include Shopee, Lazada, Tokopedia, Bukalapak, and others. Generation Z tends to use online shopping applications to satisfy wants rather than needs (Fadhilah, 2023).

A Digital Wallet, or E-Wallet, refers to a financial technology application that enables users to store, manage, and conduct financial transactions digitally using internet-connected devices such as smartphones, tablets, or computers. E-Wallets are part of the broader evolution of FinTech (Financial Technology) that has transformed how individuals interact with their finances. According to Somantri (2024), "Electronic wallets are software applications or platforms that allow users to securely store and manage their payment information." These platforms are typically equipped with features such as QR code payments, integration with online marketplaces, digital receipts, and even micro-investment or bill payment systems.

Furthermore, Megadewandanu, Suyoto, and Pranowo (2016) explain that digital wallets can be categorized into open, semi-closed, and closed systems, depending on the transaction

scope and the level of integration with external financial institutions. Open e-wallets, for instance, allow full interoperability between banks, merchants, and users. Semi-closed wallets are accepted by specific partners, while closed wallets are restricted to specific platforms or merchants only.

Digital wallets are not just a replacement for physical cash but also function as financial management tools. As highlighted by Sharma et al. (2017), e-wallets encourage financial inclusion by making transactions faster, safer, and accessible for younger users, particularly in emerging economies. Features such as low transaction costs, reward systems, and user-friendly interfaces have made e-wallets increasingly popular among digital-native generations.
Key characteristics of digital wallets include:

i. Mobility: Access anytime via mobile apps
ii. Security: Encrypted transactions and biometric authentication
iii. Integration: Compatible with e-commerce platforms, transportation apps, and more
iv. Efficiency: Reduces the need for physical cash handling
v. Transaction History: Provides digital receipts and spending summaries.

According to Bank Indonesia (2023), e-wallet usage in Indonesia has risen significantly post-pandemic, driven by government support for cashless economies and increased consumer trust in digital systems.

From a behavioral economics perspective, e-wallets can subtly influence consumer habits. The reduction of friction in spending (e.g., just tapping to pay) can lead to increased impulsive purchases, especially among youth segments (Alfira & Faujiah, 2023). This makes financial literacy education critical alongside technological adoption. In conclusion, digital wallets represent not just a payment method but also a convergence point between technology, finance, and lifestyle. Their integration into everyday life reflects the growing reliance on digital tools for personal and commercial finance.

2. Methodology

This study employs a descriptive quantitative method with a simple linear regression analysis to examine the impact of e-wallet usage on the online shopping behavior of Generation Z in Medan, Indonesia. The research was conducted from April to June 2025, focusing on young individuals who live in or frequently visit the Wahid Hasyim area.

According to Sugiyono (as cited in Roflin, 2021), population refers to a generalization area that consists of objects or subjects with certain qualities and characteristics defined by the researcher to be studied and from which conclusions are drawn. In this study, the population includes customers and visitors in the Wahid Hasyim area, including those at Restaurant Kodagu, Café Habitat, Ucok Durian, local residents, and other frequent visitors. The research focuses specifically on individuals from Generation Z who are active users of e-wallet applications and who engage in online shopping activities within the region.

The sample was selected using purposive sampling, a non-probability sampling method where respondents are chosen based on specific criteria defined by the researcher (Sugiyono, 2017).
The criteria used were as follows:

i. 17. Belong to Generation Z (born between 1997 and 2012)
ii. 18. Have used an e-wallet to make a payment at least once in the last three months
iii. 19. Possess a sufficient understanding of how to use e-wallet services

A sample is a subset of the population. According to Sugiyono (2017), a good sample must give every unit in the population a fair chance to be selected and must be large enough to accurately represent the population characteristics.

In this study, a total of 110 respondents were selected as the research sample. They consist of both residents and visitors to the Wahid Hasyim area, including individuals found in popular public locations such as Restaurant Kodagu, Café Habitat, and Ucok Durian.

The population includes individuals classified as Generation Z (born between 1997 and 2012) who actively use e-wallet services and participate in online shopping activities. Using the Slovin formula with a 5% margin of error, the minimum sample size was determined to be 110 respondents from a total population of 217.

$$n = \frac{N}{1+N(e^2)} \quad (1)$$

$$where\ (N\ =\ 217)\ and\ (e\ =\ 0.05), giving\ (n\ \approx 110)$$

The data were collected through a structured questionnaire distributed to respondents via a direct approach. The questionnaire consisted of closed-ended Likert-scale questions.

3. Results and discussion

In this study, researchers used IBM SPSS Statistics 25 as a tool to analyze validity and reliability tests. Based on the calculation results, the calculated r value for all items exceeds the r table value, so that all instrument items in this study are declared valid. In addition, the reliability test results show that the Cronbach's Alpha value is more than 0.70, which means that each statement in the questionnaire has a good level of consistency and is suitable for use in this study. All variable question items (X1), (X2), (Y) are declared valid r count is greater than 0.361. Descriptive Analysis Descriptive statistics are used to provide an overview of respondents' responses to the variables studied, namely the impact of using the E-Wallet application (X1), and changes in online shopping habits (Y).

Table 3. Characteristics of Respondents Based on Age

Frequency	Percent
17 - 25 Years	75
26 - 35 Years	28
> 35 Years	7
Total	110

It is concluded that Generation Z who uses the E-Wallet application in Medan Baru District is

Table 4. Characteristics of Respondents Based on Gender

Frequency	Percent
Male	49
Female	61

It can be concluded that the majority of E-Wallet Apps are male-dominated.

Table 5. Characteristics of Respondents Based on Occupation

Frequency	Percent
HIGH SCHOOL/VOCATIONAL SCHOOL	66
Diploma	12
S1	32

This shows that the majority of the use of E-Wallet student applications is 66%

Table 6. Characteristics of Respondents Based on Purchase Frequency

Frequency	Percent
Yes	106
No	4
Total	110

Multiple linear regression is applied to determine the extent to which the independent variable, the impact of using the E-Wallet application (X1), influences the dependent variable, changes in online shopping habits (Y). Based on Table 3, the linear regression equation is:

$$Y= 9.182+ 0.456\ X1+ 0.482\ X2 \quad (2)$$

Table 4. Multiple Linear Regression Analysis Results

Unstandardized Coefficients		Standardized Coefficients	t	Sig.
B	Std. Error	Beta		
9.182	4.610		-1.992	0.049
0.456	0.084	0.464	5.419	0.000
0.482	0.101	0.407	4.745	0.000

Based on the regression equation obtained, it can be described as follows:
The constant (β_0) = 4.425 indicates that if the variable Impact of Using the E-Wallet Application (X_1) is zero, then the level of Change in Online Shopping Habits (Y) on the E-Wallet Application in Medan Baru District is estimated at 4.425, assuming no influence from other variables.

4. Conclusion

This research confirms that the usage of e-wallet applications significantly affects changes in online shopping habits among Generation Z in Medan. Based on the regression analysis, e-wallet usage positively influences online shopping activity, with an influence of 51.5%. Several factors—such as transaction speed, convenience, ease of use, and promotional features—were identified as drivers of frequent e-wallet use. However, the increased convenience also carries risks, such as impulsive buying, reduced financial discipline, and greater dependence on digital systems. Recommendations:

i. For users: Practice self-control and responsible usage of e-wallets to avoid overspending.
ii. For developers: Incorporate financial literacy features and tools that help users monitor their spending behavior.
iii. For businesses: Use e-wallets in marketing strategies to increase transaction efficiency and improve customer experience.
iv. For future researchers: Extend this study by including other demographic groups or testing moderating variables such as financial literacy or digital lifestyle.

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THE INFLUENCE OF VIRAL MARKETING AND FEAR OF MISSING OUT (FOMO) ON IMPULSIVE BUYING ON E-COMMERCE PLATFORMS (TIKTOK SHOP)

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Abstract

This study examines the influence of Viral Marketing and Fear of Missing Out (FOMO) on Impulsive Buying behavior on the TikTok Shop e-commerce platform. The research population consists of university students classified as part of Generation Z from the 2021 intake in Medan A quantitative research method was employed, using a survey approach through questionnaires distributed to 47 respondents. Data were analyzed using multiple linear regression with the assistance of SPSS software. The findings indicate that both Viral Marketing and FOMO have a statistically significant effect on Impulsive Buying behavior, both partially and simultaneously. The regression coefficient for Viral Marketing is 0.426 (significant at p = 0.031), while the coefficient for FOMO is 0.760 (significant at p = 0.000), indicating that FOMO is the more dominant factor. The coefficient of determination (R^2) is 0.496, which means that 49.6% of the variation in impulsive buying behavior can be explained by these two independent variables. These results underscore that viral content and the creation of a sense of urgency through FOMO are effective in stimulating impulsive purchasing behavior among young consumers. Therefore, understanding consumer psychology is essential in developing effective digital marketing strategies.
Keywords: Marketing; FOMO; Impulsive.

1. Introduction

The digital era has significantly transformed consumer behavior, particularly with the increasing prevalence of online shopping through e-commerce platforms such as TikTok Shop. Originally known for short video content, TikTok has evolved into a popular e-commerce platform among younger generations due to its ease of access, diverse product offerings, and interactive shopping experience. In a competitive business environment, companies are required to be more creative in promoting their products, and viral marketing has proven to be an effective strategy. By leveraging social networks and user interaction, viral marketing enables rapid dissemination of promotional messages. Content marketing strongly influences impulse buying behavior on TikTok Shop [1]. In addition, Fear of Missing Out (FOMO)—a psychological phenomenon describing the fear of missing opportunities or experiences—has also shown a significant impact on impulsive buying behavior, especially in TikTok Shop purchase [2] [3]. FOMO can drive consumers to make spontaneous purchases when observing peers or influencers buying trending products. The integration of viral marketing with e-commerce platforms like TikTok Shop creates a powerful synergy in triggering impulse buying behavior, [4], [5], where viral videos easily spark FOMO. Features like live streaming further amplify this effect by creating urgency to purchase before missing out on limited time offers. This phenomenon illustrates how digital platforms have reshaped consumer purchasing patterns, making it essential for companies to innovate and understand psychological drivers in order to succeed in today's competitive market. In light of this phenomenon, this study aims to investigate whether viral marketing influences impulsive buying behavior on the TikTok Shop platform, whether FOMO affects impulsive buying behavior, and whether both factors simultaneously impact impulsive buying behavior among TikTok Shop users.

2. Methodology

This research was conducted at the Medan City, North Sumatra, within a timeframe from April to June 2025, with a total research duration of four months from initiation to completion. The research focuses on university students classified as part of Generation Z from the 2021 intake in Medan users of the TikTok Shop platform. This study adopts a quantitative approach with a structured questionnaire as the primary instrument, utilizing a Likert scale to measure the influence of viral marketing and Fear of Missing Out (FOMO) on impulsive buying behavior. Data collected were analyzed using multiple linear regression through the SPSS software to test the effects of the independent variables. The study employs both primary and secondary data; primary data were obtained directly through questionnaire distribution. The population consisted of 87 students, and the sample was determined using the Slovin formula with a 10% margin of error, resulting in a sample size of 47 respondents selected randomly. These respondents are considered to adequately represent the population in analyzing the relationship between viral marketing, FOMO, and impulsive buying behavior on TikTok Shop.

3. Results and discussion

Table 1. Gender

	Frequency	Percent	Valid Percent	Cumulative Percent
Laki-laki	5	10,6	10,6	10,6
Perempuan	42	89,4	89,4	100,0
Total	47	100,0	100,0	

Based on the data presented in the table above, it is evident that majority of respondents are female, comprising 89.4% of the total, whereas male respondents account for only 10.6%.

Table 2. Years of birth

Category	Frequency	Percent	Valid Percent	Cumulative Percent
1997-2000	5	10,6	10,6	10,6
2001-2004	42	89,4	89,4	100,0
Total	47	100,0	100,0	

Referring to the table above, it is also evident that respondents born between 2001 and 2004 constitute the dominant age group, accounting for 89.4% of the sample, while the remaining 10.6% were born between 1997 and 2000.

Table 3. Multiple Linear Regression Analysis

Model	Variable	B	Std. Error	Beta	t	Sig.
1	(Constant)	-8.719	8.052		-1.083	.285
	Viral Marketing	0.426	0.191	0.261	2.234	.031
	FOMO	0.76	0.159	0.559	4.787	<.001

Based on the results of the multiple linear regression analysis presented in the *Coefficients Table*, the regression equation is as follows:

$$\text{Impulsive Buying} = -8.719 + 0.426(\text{Viral Marketing}) + 0.760(\text{FOMO})$$

From the table above, the following interpretations can be made:

The constant value of -8.719 indicates that if both the Viral Marketing and FOMO variables are equal to zero, the predicted value of Impulsive Buying is -8.719. However, this constant is

not statistically significant (Sig. = 0.285 > 0.05), and thus does not have a meaningful independent effect. The Viral Marketing variable has a regression coefficient of 0.426, which means that for every one-unit increase in Viral Marketing, Impulsive Buying increases by 0.426 units, assuming other variables remain constant. The significance value of 0.031 (< 0.05) indicates that this variable has a statistically significant effect on Impulsive Buying. The FOMO variable has a regression coefficient of 0.760, indicating that a one-unit increase in FOMO results in a 0.760 unit increase in Impulsive Buying, assuming other variables remain constant. The significance value of 0.000 (< 0.05) confirms that FOMO has a statistically significant effect on Impulsive Buying. Moreover, this variable has the highest Beta value (0.559), suggesting that FOMO is the most dominant factor influencing impulsive buying behavior.

Table 4. R Square

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.704	0.496	0.473	4.14014

Based on the Model Summary table, the correlation coefficient (R) is 0.704, indicating a strong relationship between the independent variables (FOMO and Viral Marketing) and the dependent variable (Impulsive Buying). The coefficient of determination (R Square) is 0.496, suggesting that 49.6% of the variance in Impulsive Buying can be explained by the variables FOMO and Viral Marketing. Meanwhile, the remaining 50.4% is attributable to factors outside the scope of this research model. The Adjusted R Square value of 0.473 accounts for the number of variables in the model and reflects the degree of model adjustment to the data.

Table 5. F Table

Model	Source	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	742.657	2	371.329	21.663	<.001
	Residual	754.194	44	17.141		
	Total	1496.851	46			

The ANOVA results indicate that the regression model is statistically significant. This is evidenced by the F-value of 21.663 and a significance level (Sig.) of <0.001. Since the significance value is less than 0.05, it can be concluded that the regression model, including the variables FOMO and Viral Marketing, has a significant simultaneous effect on the Impulsive Buying variable.

Table 6. T-table

Model	Variable	B	Std. Error	Beta	t
1	(Constant)	-8.719	8.052		-1.083
	Viral Marketing	0.426	0.191	0.261	2.234
	FOMO	0.76	0.159	0.559	4.787

Based on the SPSS output, the t-test results show the following:

1. The Viral Marketing variable has a t-value (2.234) greater than the t-table value (2.03), indicating that this variable has a significant effect on Impulsive Buying.
2. The FOMO variable has a t-value (4.787) greater than the t-table value (2.03), suggesting that this variable also has a significant effect on Impulsive Buying.

The results of the study indicate that both independent variables, Viral Marketing and FOMO, have a highly significant effect on the dependent variable (Impulsive Buying). The Viral Marketing variable has a significant and positive effect on Impulsive Buying. This suggests that the greater the exposure consumers have to viral marketing, the higher the likelihood of engaging in impulsive buying behavior.

The FOMO (Fear of Missing Out) variable also has a significant effect on Impulsive Buying, with a more dominant influence compared to Viral Marketing. This means that the higher an individual's fear of missing out on trends or moments, the stronger their tendency to engage in impulsive purchases.

4. Conclusion

In conclusion, this study demonstrates that both Viral Marketing and Fear of Missing Out (FOMO) have a significant and positive impact on Impulsive Buying behavior. The findings suggest that social media-driven marketing strategies, combined with psychological factors such as FOMO, play a crucial role in influencing consumers' spontaneous purchasing decisions. Notably, FOMO exerts a more dominant effect than Viral Marketing, indicating the importance of addressing emotional and psychological triggers in marketing approaches. Therefore, understanding consumer behavior in the digital era requires not only innovative marketing techniques but also a strong grasp of the psychological aspects that drive impulse purchases.

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THE EFFECT OF EXPERIENTIAL MARKETING AND EMOTIONAL BRANDING ON CUSTOMER LOYALTY OF PT CAHAYA BINTANG HOLIDAYS

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Abstract

This study aims to determine the effect of experiential marketing and emotional branding on customer loyalty at PT Cahaya Bintang Holidays. The research is grounded in the importance of creating memorable experiences and emotional connections to retain customer loyalty in the competitive tourism industry. A quantitative approach was used, employing a survey method through questionnaires distributed to 60 respondents who are customers of PT Cahaya Bintang Holidays. Data analysis was conducted using multiple linear regression with the help of SPSS. The results show that experiential marketing has a positive and significant effect on customer loyalty, with a t-value of 2.901 and a significance level of 0.005. Emotional branding also has a positive and significant effect, with a t-value of 7.440 and a significance level of 0.000. Simultaneously, both variables significantly influence customer loyalty, as indicated by an F-value of 162.103 and a significance level of 0.000. Emotional branding was found to have a more dominant impact than experiential marketing. The coefficient of determination (R^2) is 0.850, indicating that 85% of the variation in customer loyalty can be explained by these two variables. These findings highlight the crucial role of emotional and experiential strategies in fostering customer loyalty.
Keywords: Experiential-marketing; Emotional-branding; Loyalty.

1. Introduction

People's lifestyles are now growing rapidly, resulting in progress and change in every industrial sector including the tourism industry. In the increasingly competitive tourism industry, travel companies as service providers must be able to create memorable experiences for customers in order to survive and grow. One strategy that can be used is experiential marketing, which is a marketing approach that emphasizes the customer's direct experience of the products or services offered (Detmuliati et al., 2023). The marketing concept that not only provides information and opportunities for customers to gain experience of the benefits obtained but also arouses emotions and feelings that have an impact on marketing, especially sales, is known as experiential marketing (Yuningsih et al., 2021). The existence of experiential marketing in a series of tourism service marketing helps travel to create a distinctive feature of its marketing strategy so that it becomes a differentiator from competing companies. In addition, emotional branding is also a component that plays an important role in building an emotional bond between a brand and a customer, when an emotional bond between a customer and a brand has been formed, it can ultimately increase customer loyalty to the brand. Emotional branding is a concept of forming a brand with an emotional nuance (Sutomo et al., 2024). In practice, companies must be able to create an emotional closeness between the brand and the customer. This emotional closeness can be in the form of a positive or negative assessment.

PT Cahaya Bintang Holidays is a travel company operating in Medan, providing various travel services, both domestic and international, hotel reservations, tours and tourism accommodation rentals. In an era of increasingly competitive business competition, customer loyalty is a crucial element that determines the sustainability and growth of a company, including in the tourism services industry. PT Cahaya Bintang Holidays, as a travel service

provider, is required to continue to present memorable experiences and build strong emotional relationships with its customers. Two approaches that are now widely used in modern marketing strategies are experiential marketing and emotional branding, both of which play an important role in creating sustainable customer loyalty.

Meanwhile, emotional branding is a strategy to build emotional attachment between customers and brands. This approach creates a personal relationship that goes beyond the basic function of the product, through elements such as trust, emotional closeness, and touching brand stories. When customers feel emotionally connected, brand loyalty will grow stronger and be resistant to temptation from competitors. This study focuses on how experiential marketing and emotional branding affect customer loyalty of PT Cahaya Bintang Holidays. The formulation of the problems raised includes how experiential marketing affects customer loyalty, how emotional branding affects customer loyalty, and to what extent the two variables together affect loyalty. This study is limited to customers who have used the services of PT Cahaya Bintang Holidays and only includes two independent variables: experiential marketing and emotional branding. Theoretically, this research is expected to enrich studies in the field of marketing, especially regarding strategies for building customer loyalty based on experience and emotion. Practically, the results of this study can be used by PT Cahaya Bintang Holidays and other travel service companies as a basis for designing more effective marketing strategies in creating long-term loyalty.

2. Methodology

This study was conducted on individuals who had used PT Cahaya Bintang Holidays Travel services in April–June 2025 in Medan City and its surroundings. The variables observed in this study consisted of independent variables in this study were experiential marketing and emotional branding, while the dependent variable was customer loyalty. This study used a quantitative approach with a questionnaire survey method. Primary data were collected by distributing online questionnaires (Google Form) to 60 respondents who were customers of PT Cahaya Bintang Holidays. The sampling technique used was purposive sampling, namely by selecting respondents who had used the company's services. Each variable was measured using relevant indicators, such as sense, feel, think, act, relate for experiential marketing; trust, attachment, storytelling for emotional branding; and repeat purchases, recommendations, brand loyalty for customer loyalty. The data processing of this study was done using multiple linear regression analysis using SPSS statistical software.

3. Results and Discussion

Respondent characteristics are the identities of the research participants. In this study, the sample consisted of 60 people who could be identified based on age, occupation and level of education.

Table 1. Respondent characteristics based on age

No	Age	Amount
1	15 - 25 years	31
2	26 - 35 years	14
3	36 - 45 years	13
4	46 - 55 years	0
5	> 55 years	2
Total	60	

From the table above, it can be seen that the largest number of respondents is in the 15-25 year age group, as many as 31 people, this is because individuals in this age range tend to still be active and have a lot of energy to explore the world, see new things and do physical activities, one of which is traveling and vacationing, this is what makes individuals from this

age range the dominant respondents in this study. Furthermore, the second largest number of respondents is occupied by individuals in the 26 to35 year age range. Followed by individuals in the 36-to-45-year age range. The fewest respondents are individuals in the age range over 55 years as many as 2 people, this is because individuals at this age are categorized as parents or elderly people who mostly no longer have the ability to travel or vacation due to health problems. Most of them have stayed at home enjoying their old age peacefully with their families.

Table 2. Respondent characteristics based on occupation

No	Work	Amount
1	Pharmacist	2
2	Assistant	1
3	Asn	1
4	Chef	2
5	Lecturer	2
6	Teacher	10
7	Employee/ Staff	9
8	Cashier	2
9	Chairman of the committee	1
10	Contractor	1
11	Student	12
12	Manager	1
13	Marketing	1
14	Waiter	3
15	Self-employed	4
16	Businessman	7
17	Seamstress	1
	Total	60

The table above shows the professions of the respondents who have filled out the questionnaire for this study, based on the data it can be seen that the largest number of respondents are those who are students, namely 12 people, this is most likely due to the high activity of students so that they tend to be bored and need healing or refreshment by traveling or vacationing. Furthermore, the second largest number of users of travel services are those who work as teachers, namely 10 people and followed by other professions.

Table 3. Respondent characteristics based on gender

No	Gender	Amount
1	Man	23
2	Woman	37
	Total	60

From the table above, it can be seen that the number of respondents who provided data for this study was more from women, 37 people. While men were only 23 people. In other words, the majority of users of PT Cahaya Bintang Holidays travel services are women. These data show that, in practice, women vacation and travel more often than men do. The research results will be valid if the collected data are similar to the actual data observed in the object being studied. A valid instrument is one that is used to obtain the data. A valid instrument will be obtained if r_{count} is bigger than or equal to r_{table}, and is not valid if the r_{count} is smaller than or equal to r_{table}.

A reliable instrument is an instrument that, if used several times to measure the same object, will obtain the same data. A rubber measuring instrument is an example of a non-reliable instrument (Priadana & Sugiono, 2021). If the Crombach alpha value is 0.6, the research instrument is reliable and if the Crombach alpha value is 0.6, it is not reliable.

Table 4. Results of the experiential marketing validity test

Instrument	Validity Value		Conclusion
	r_{count}	r_{table}	
Experiential Marketing 1	0.759		Valid
Experiential Marketing 2	0.816		Valid
Experiential Marketing 3	0.809	0.2542	Valid
Experiential Marketing 4	0.872		Valid
Experiential Marketing 5	0.785		Valid

From the table above, the r value can be seen$_{count}$ for the experiential marketing variable in statements 1 to 5 the value is < r_{table}0.2542 then it can be concluded that the statement on this variable is declared valid. In other words, the list of statements in this questionnaire is filled consistently from time to time.

Table 5. Results of the validity test of emotional branding variables

Instrument	Validity Value		Conclusion
	rcount	r_{table}	
Emotional branding 1	0.872		Valid
Emotional branding 2	0.842		Valid
Emotional branding 3	0.855	0.2542	Valid
Emotional branding 4	0.799		Valid
Emotional branding 5	0.800		Valid

From the table above, the r value can be seen$_{count}$ for the emotional branding variable in statements 1 to 5 the value is < r_{table}0.2542 then it can be concluded that the statement on this variable is declared valid. In other words, the list of statements in this questionnaire is filled consistently from time to time.

Table 6. Results of the validity test of customer loyalty variables

Instrument	Validity Value		Conclusion
	r_{count}	r_{table}	
Customer Loyalty 1	0.866		Valid
Customer Loyalty 2	0.810		Valid
Customer Loyalty 3	0.838	0.2542	Valid
Customer Loyalty 4	0.799		Valid
Customer Loyalty 5	0.824		Valid

From the table of results of the customer loyalty validity test, it is known that the r value$_{count}$ in statements 1 to 5 the value is < r_{table}0.2542 then it can be concluded that the statement on this variable is declared valid. In other words, the list of statements in this questionnaire is filled consistently from time to time.

Table 7. Reliability test results for all variables

Cronbach's Alpha	N of Items
0.953	15

The research is declared reliable if the Cronbach's alpha value is > 0.6 based on the reliability test results table above. Because Cronbach's alpha value is 0.895, the research instrument is declared reliable, or its authenticity can be believed. This test was conducted to determine the effect of experiential marketing and emotional branding on customer loyalty of PT Cahaya

Bintang Holidays. The following is a table of the results of multiple linear regression tests on each variable, namely:

Table 8. Results of multiple linear regression tests

	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
(Constant)	1.665	1.236		1.346	0.184
Experiential Marketing	0.268	0.092	0.268	2.901	0.005
Emotional Branding	0.668	0.09	0.687	7.44	0

Based on the test results above, the following multiple linear regression equation is obtained:

$$Y= 1.665 + 0.268\ X_1 + 0.668\ X_2 \quad (1)$$

In the multiple linear regression model, the customer loyalty constant value is 1.665, meaning that if the value of the independent variables, experiential marketing and emotional branding, is 0, then the dependent variable purchasing decision is 1.665 units. The coefficient of each independent variable is positive, meaning that customer loyalty of PT Cahaya Bintang Holidays can be influenced by experiential marketing and emotional branding.

Table 9. Results of determination coefficient test

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.922	0.85	0.845	0.84312

The coefficient of determination value obtained was 0.850 (85%), indicating that experiential marketing and emotional branding were able to explain the variation in customer loyalty at PT Cahaya Bintang Holidays, while the remaining 15% was explained by other variables not examined in this study.

Table 10. Simultaneous test results

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	230.464	2	115.232	162.103	.000[b]
Residual	40.519	57	0.711		
Total	270.983	59			

Based on the table above, it can be seen that the F value$_{count}$ 162.103 > from F value$_{table}$ which is 3.16 and significance 0.000 < alpha 0.05. So, the decision taken is H_0rejected H_1accepted, thus experiential marketing and emotional branding have a positive and significant influence on customer loyalty at PT Cahaya Bintang Holidays.

Table 11. Partial test results

		Understandardized Coefficients		Standardized Coefficients		
	Model	B	Std. Error	Beta	t	Sig.
1	(Constant)	1.665	1.236		1.346	0.184
	Experiential_marketing	0.268	0.092	0.268	2.901	0.005
	Emotional_Branding	0.668	0.09	0.687	7.44	0.000

Based on the table above, it can be seen that:

a. t value $_{count}$ for experiential marketing variable 2.901 > t_{table} 1.671 and a significant value of 0.005 < 0.05 (5%), then H_0 says H_1 accepted, thus experiential marketing has a partial effect on customer loyalty at PT Cahaya Bintang Holidays.
b. t value $_{count}$ variable emotional branding 7.440 > t_{table} 1.671 and a significance value of 0.000 < alpha 0.05 (5%), then H_0 rejected and H_1 accepted, thus partially emotional branding has a positive and significant influence on customer loyalty at PT Cahaya Bintang Holidays.

4. Conclusion

Based on the results of the research that has been conducted, it can be concluded that experiential marketing and emotional branding have a positive and significant effect on customer loyalty of PT Cahaya Bintang Holidays. A pleasant, interesting, and memorable experience can form a positive impression that encourages customers to remain loyal, while emotional branding creates a strong emotional bond through a sense of trust, security, and personal closeness. Simultaneously, these two variables contribute greatly to the formation of customer loyalty, with emotional branding having a more dominant influence. This finding confirms that in the tourism industry, the combination of memorable experiences and strong emotional bonds is a key factor in building long-term loyalty.

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THE INFLUENCE OF TRUST LEVEL AND SHOPEE PAYLATER FACILITIES ON GEN Z STUDENTS' PURCHASE DECISIONS

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Abstract

This study aims to investigate the influence of trust and the Shopee PayLater service on purchasing decisions among Generation Z university students. With the rapid advancement of information and communication technologies, Generation Z, known for their active engagement with digital platforms, tends to favor payment methods that are both efficient and convenient, such as Shopee PayLater. The research adopts a quantitative approach by distributing questionnaires to university students. The analytical techniques employed include t-tests, F tests, multiple linear regression analysis, residual tests, and the coefficient of determination test. The collected data are analyzed using multiple linear regression to examine the relationships among the variables. The findings reveal that the level of trust yields a statistically significant t-value, indicating a positive and significant impact on purchasing decisions. Similarly, the Shopee PayLater feature also demonstrates a significant t-value, suggesting it has a favorable and substantial influence on purchase choices among Generation Z students.
Keywords: Trust-Level; Shopee-Features; Purchasing-Decision.

1. Introduction

Shopee has emerged as a well-established e-commerce platform, particularly popular among members of Generation Z. Through Shopee, buying and selling processes are streamlined and user-friendly. The rapid evolution of information and communication technologies has transformed the way consumers engage with goods and services, especially within the e-commerce landscape. Generation Z, defined as individuals born between 1997 and 2012 is widely recognized for its deep integration with digital technology and a strong preference for online shopping. This generation tends to opt for simple and efficient payment solutions, such as the “PayLater” feature offered by platforms like Shopee.

According to Indonesia’s Ministry of Communication and Information Technology (Kominfo, 2021), the PayLater payment system presents significant potential as an alternative to conventional credit, especially considering the stagnation in credit card adoption, particularly among lower- to middle-income groups. Both Millennials and Generation Z display high tendencies toward purchasing digital products. Furthermore, activating PayLater features is significantly more straightforward in terms of requirements and application processes when compared to credit cards. Although PayLater services often charge higher interest rates, many consumers still prefer them due to the speed of the transaction process and the added security regulated by the Financial Services Authority (OJK). Nevertheless, there is growing concern that consumers may engage in impulsive spending without fully considering their financial capabilities and readiness.

Trust refers to the perception individuals hold toward their surroundings. It is shaped by personal experience, perspective, and evaluation, all of which influence how individuals perceive brands and products. When consumers place their trust in Shopee, they are more inclined to use Shopee PayLater as a preferred method for online transactions. This

widespread consumer confidence has contributed to Shopee's position as one of the most frequently used marketplaces, boasting a higher transaction rate than its competitors. This trust can be observed in users' belief in the services and products offered by Shopee, even in the face of potential risks, as they expect to receive satisfactory outcomes. Trust also plays a critical role in the decision-making process when choosing to use Shopee PayLater (Gratia et al., 2022) (Saputra & Sudarwanto, 2023)

Perceived ease of technology use is another factor influencing trust. It refers to an individual's belief in the effectiveness of a system to support task completion. This concept is tied to a system's ability to enhance users' efficiency. The accessibility and user-friendliness of digital loan applications, such as Shopee PayLater, enable users to make quick, well-informed decisions. Ease of use, therefore, is also a measure of how confident individuals feel that the technology will perform reliably and support their tasks effectively (Saputra & Sudarwanto, 2023).

According to (Ningsih Wijaya et al., 2024) purchasing decisions represent a crucial phase in the buying process that precedes post-purchase behavior. At this stage, consumers evaluate multiple options and eventually decide whether to proceed with a purchase based on their assessments. The purchasing decision, therefore, reflects an effort to solve a perceived problem or to achieve a goal in a cost-effective and timely manner.

Generation Z university students exhibit distinct behavioral and consumption patterns. Many face financial management challenges, making alternative payment methods like Shopee PayLater appealing. However, studies that deeply explore the influence of trust and perceived ease of use of Shopee PayLater on purchasing decisions among students remain limited. Thus, this research is essential for understanding the relationship between trust, ease of use, and purchasing decisions among Generation Z university students.

2. Methodology

This research was conducted by distributing questionnaires to university students belonging to Generation Z, specifically those aged between 18 and 23 years. The majority of the targeted respondents were students who actively utilized the Shopee application. These individuals frequently engage in online shopping through Shopee and commonly conduct transactions using the Shopee PayLater feature. This research was conducted for five months, from February to June 2025.

Table 1. Research Schedule

No	Activities	Month				
		February	March	April	May	June
1	Title submission					
2	Research proposal writing					
3	Research permit application					
4	Research implementation					
5	Thesis writing					
6	Thesis guidance					
7	Publish					

The type of data used in this study is quantitative data derived from primary data, namely data obtained directly from respondents, by distributing questionnaires to Gen Z students utilizing or using Shopee Paylater services. The goal is to measure and statistically analyze the impact of the level of trust and Shopee Paylater facilities on purchasing decisions. This research is also supported by secondary data, taken from literature, journals, and relevant previous research to strengthen the theoretical basis and conceptual framework of this study.

The data collection method used in this study was quantitative, using a questionnaire. The questionnaire was designed to gather data on the influence of trust and ease of use of ShopeePay Later on purchasing decisions among Generation Z. This questionnaire was distributed to Gen Z students to obtain relevant and numerically measurable information. In addition to descriptive analysis, this study incorporated hypothesis testing using several statistical methods, including the t-test, F-test, coefficient of determination (R^2), multiple linear regression, and residual analysis of the questionnaire responses.

3. Results and discussion

The characteristics of the respondents refer to the demographic and identity-related data of the individuals who participated in this study. The selected respondents were Generation Z university students aged 18 to 23. A total of 33 of the 100 distributed questionnaires were completed and returned by participants, and the sample was categorized by current semester of study. The demographic profile of the respondents is described in detail below:

Table 2. Respondent's identity

Number	Level	People
1.	2	14
2.	4	10
3.	6	16
4.	8	60
Total		100

This analysis was conducted to examine the influence of trust and the ease of use of Shopee on the purchasing decisions of Generation Z university students. The results of the multiple linear regression analysis for each variable are presented below:

Table 3. Multiple Linear Regression Test Results

Model		Unstandardized coefficients		Standardized coefficient	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	8.357	2.054		4.068	0
	tingkat kepercayaan	0.436	0.102	0.509	4.283	0
	fasilitas shopee	0.355	0.118	0.358	3.01	0.003

Based on the regression analysis presented above, the multiple linear regression equation is formulated as follows:

$$Y = 8.357 + 0.436X_1 + 0.355X_2 \quad (1)$$

In this regression model, the constant value for the purchasing decision variable (Y) is 8.357. This indicates that if the independent variables—X_1 (trust level) and X_2 (Shopee features)—are both equal to zero, the predicted value of the dependent variable (purchasing decision) would be 8.357. The positive regression coefficients for both independent variables suggest that the purchasing decisions made through Shopee PayLater are positively influenced by the level of trust and the features provided by the Shopee platform.

Before proceeding with the multiple linear regression analysis, a normality test was conducted on the residual data to ensure that one of the key assumptions of regression was satisfied—namely, that the residuals are normally distributed. The normality test was performed using the One-Sample Kolmogorov-Smirnov Test. The results of this analysis are presented in the following table:

Table 4. Residual Test

N		100
Normal Parameters	Mean	0.0000000
	Std. Deviation	3.98007564
Most Extreme Differences	Absolute	0.078
	Positive	0.078
	Negative	-0.051
Test Statistic		0.078
Asymp. Sig. (2-tailed)		0.134

The table above presents the results of the normality test conducted using the One-Sample Kolmogorov-Smirnov test on the regression residuals, based on a sample of 100 respondents. The residual mean is 0, with a standard deviation of 3.980, indicating that the residuals are centered around zero—as expected in a well-fitted regression model. The Kolmogorov-Smirnov test statistic is 0.078, with an asymptotic significance value (2-tailed) of 0.134. Since the significance value exceeds the threshold of 0.05, it can be concluded that the residuals are normally distributed from a statistical standpoint.

The coefficient of determination is used to measure the extent to which the independent variables are capable of explaining the variance in the dependent variable. The R^2 value provides an indication of the model's explanatory power. The coefficient of determination obtained in this study is presented in the following table:

Table 5. Hypothesis Testing Results

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.843	.711	.705	4.021

The coefficient of determination (R^2) obtained in this study is 0.711, or 71.1%. This indicates that the variables' trust level and Shopee features collectively explain 71.1% of the variation in the purchasing decisions of Generation Z students. The remaining 28.9% is influenced by other variables not included in the model.

The simultaneous test, also known as the F-test, was conducted to evaluate whether the variables' trust level and Shopee features jointly have a significant effect on purchasing decisions. The test was carried out at a 95% confidence level, or a significance level of α = 0.05 (5%). The criteria for decision-making are as follows:

- If the calculated F-value (F_{calculated}) ≤ F-table, then the null hypothesis (H_0) is accepted and the alternative hypothesis (H_1) is rejected, indicating that the independent variables do not have a simultaneous effect on the dependent variable.
- If the calculated F-value (F_{calculated}) ≥ F-table, then the null hypothesis (H_0) is rejected and the alternative hypothesis (H_1) is accepted, meaning that the independent variables do have a simultaneous effect on the dependent variable.

Table 6. Simultaneous Test (F-Test)

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	3850.581	2	1925.29	119.083	.000
Residual	1568.259	97	16.168		
Total	5418.84	99			

Based on the table above, it can be concluded that the calculated F-value (F_{calculated}) is 119.083, which is greater than the F-table value of 3.09. Additionally, the significance value is 0.000, which is lower than the alpha level of 0.05. Therefore, the decision is to reject the null hypothesis (H_0) and accept the alternative hypothesis (H_1). This result indicates that the independent variables—trust level (X_1) and Shopee features (X_2)—collectively have a significant explanatory power on the dependent variable (purchasing decision (Y)). Thus, it can be concluded that trust and Shopee features have a simultaneous positive and significant effect on the purchasing decisions of Generation Z students. The partial test, also referred to as the T-test, is used to determine the individual effect of each independent variable—trust level and Shopee features—on the dependent variable, purchasing decision. The criteria for hypothesis testing are as follows:

If the calculated t-value (t_{calculated}) ≤ t-table, then the null hypothesis (H_0) is accepted and the alternative hypothesis (H_1) is rejected. This implies that the variable, when tested individually, does not have a significant effect.
If the calculated t-value (t_{calculated}) ≥ t-table, then the null hypothesis (H_0) is rejected and the alternative hypothesis (H_1) is accepted. This indicates that the variable, when tested individually, does have a significant effect.

Table 7. Partial Test (T-Test)

Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	8.357	2.054		4.068	0
	tingkat kepercayaan	0.436	0.102	0.509	4.283	0
	fasilitas shopee	0.355	0.118	0.358	3.01	0.003

Based on the table presented, the following conclusions can be drawn:

i. The calculated t-value for the trust level variable is 4.283, which is greater than the t-table value of 1.984, with a significance level of 0.000, which is less than the alpha value of 0.05. Therefore, H_0 is rejected and H_1 is accepted. This indicates that, partially, the trust level variable has a positive and significant effect on purchasing decisions.
ii. The calculated t-value for the Shopee features variable is 3.010, which also exceeds the t-table value of 1.984, with a significance level of 0.003, which is less than the alpha level of 0.05. As a result, H_0 is rejected and H_1 is accepted, meaning that, individually, the Shopee features variable has a significant influence on purchasing decisions.

4. Conclusion

Based on the research findings, it can be concluded that both trust and the Shopee PayLater service have a positive and significant influence on the purchasing decisions of Generation Z university students, both individually and simultaneously. Among the two variables, trust emerged as the most dominant factor. This conclusion is supported by the results of the t-test and F-test, both of which yielded significance values below the 0.05 threshold. Additionally, the coefficient of determination (R^2) was 71.1%, indicating that these two factors accounted for the majority of the variance in purchasing decisions. The remaining 28.9% is influenced by other variables not examined in this study. Therefore, enhancing consumer trust and ensuring that the Shopee PayLater service remains accessible, convenient, and user-friendly can

encourage Generation Z students to increasingly choose Shopee as their preferred online shopping platform.

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STRATEGIES FOR MANAGING PRODUCTION COSTS AND SETTING SELLING PRICES TO INCREASE THE INCOME OF SMALL FISHING BOAT MANUFACTURING BUSINESSES IN BELAWAN

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Abstract

Small-scale boat manufacturing in Belawan is classified as a medium-sized business. This small-scale fishing boat manufacturing business plays a vital role in Belawan's economy, as it is the most important port on the island of Sumatra and one of the areas with a fairly large fishing sector. Belawan is also a gathering place for fishermen. This study focuses on identifying the cost management strategies used to set selling prices and assessing the income generated by small-scale fishing boat manufacturers. The objective of this study is to examine cost management strategies and pricing decisions to enhance the income of fishing boat manufacturing businesses. The research method employed in this study is qualitative, involving direct observation and interviews with business owners. The results of this study indicate that the production cost management strategies employed by business owners involve reducing raw material costs and implementing effective production planning. Meanwhile, selling prices are determined based on production costs, desired profit margins, and market analysis. The study also shows that appropriate production costs and selling prices can increase business income and generate profits commensurate with the production costs incurred.
Keywords: Strategy; Pricing; Production costs; Selling price; Income.

1. Introduction

Small-scale fishing boat manufacturing in Belawan is one of the small business sectors with great potential to increase the income and economy of the surrounding community. This business manufactures small fishing boats for catching fish in the sea and rivers. These fishing boats are available in small, medium, and large sizes. However, the owners of these small businesses only produce small and medium-sized boats. This small-scale fishing boat manufacturing business plays a crucial role in the economy of Belawan, as it is one of the most important ports on the island of Sumatra and one of the regions with a significant fishing industry. Belawan is also a gathering place for fishermen. Therefore, this small-scale fishing boat manufacturing business is crucial for the local economy. These boats are the primary tool for fishermen to catch fish, becoming the main commodity in domestic and international markets. Additionally, this boat-making business can provide employment opportunities for the local community.

However, this industry often faces high production costs, low selling prices, and intense market competition. High production costs can decrease business income. Therefore, effective and efficient production cost management strategies are needed to increase the income of these small businesses. Setting the right selling price is crucial to increasing business income. A selling price that is too low can decrease income, while a selling price that is too high can deter

consumers from purchasing. This small-scale fishing boat manufacturing business is classified as a micro, small, and medium enterprise (MSME). MSMEs are businesses with limited initial capital, few assets, and a small number of employees. Public authorities or other institutions determine the definition of capital value or the number of employees for specific purposes. Therefore, MSMEs are businesses that fall under the small or limited-scale category. However, MSMEs continuously strive to maintain customer satisfaction (Alimudin et al., 2019).

This small-scale fishing boat manufacturing business is classified as a microenterprise owned by an individual. This business is located at Lk 9 Bom Lama, Medan Labuhan District, Medan City, North Sumatra. This small-scale fishing boat manufacturing business, owned by Mr. Ifan, has operated since 2010 and continues to thrive today, receiving positive feedback from the community. However, one thing that has prevented this small business from updating its operations is that the business owner still uses manual data management methods, such as manually recording transactions and production costs. This makes it difficult for the business owners to analyse their performance and determine whether the business is growing. Therefore, research is needed to find effective and efficient strategies for managing production costs and setting selling prices to increase the income of small-scale fishing boat manufacturing businesses in Belawan. For this reason, the author has conducted research titled "Strategies for Managing Production Costs and Setting Selling Prices to Increase the Income of Small-Scale Fishing Boat Manufacturing in Belawan".

This study was conducted to develop effective strategies for managing production costs and setting selling prices to increase the income of small fishing boat manufacturing businesses in Belawan, considering the findings of previous similar studies, such as:

i. "Pricing Strategies for Products to Increase Sales Volume at PT. Bowok ITAB Bahagia Palembang" by Melvia Anggraini (2022). This qualitative study aimed to determine how product pricing strategies can increase sales volume at PT. The researcher used Fandy Tjiptono's theory, specifically the pricing and price flexibility strategies for new products. The results of this study indicated that the company has implemented pricing strategies effectively, although there are some challenges and obstacles in their implementation.
ii. "Production Cost Management in Determining Farmer Income in Citrus Farming in Sidomulyo Village, Semboro District, Jember Regency" by Dwi Setia Nur Laili (2023). The focus of this study was on how production costs are managed in citrus farming operations, as well as to determine how much income citrus farmers earn. This research used a qualitative approach and descriptive research. The subjects of this study were selected using purposive sampling. Data collection techniques included observation, interviews, and documentation.
iii. "Determining the Selling Price at Bofet Martabak Wadesta Bandar Buat" by Agusra (2022). This study aimed to determine how to set the selling price at Bofet Martabak Kubang Bandar Buat. The method used was qualitative descriptive research. Data collection was carried out using documentation and observation methods.

Strategy is the science of planning and determining the direction of large-scale business operations, mobilising all company resources that can be profitable. John A. Bryne defines strategy as a fundamental pattern of goals and plans, resource allocation, and organisational interactions with the market, competitors, and environmental factors. According to David, strategy is a unified, comprehensive, and integrated plan that connects a company's strategic advantages with environmental challenges. It ensures the organisation can achieve its primary objectives through proper implementation. Strategy is a set of integrated and coordinated actions taken to leverage core competencies and gain a competitive advantage. A company's success, as measured by strategic competitiveness and high profitability, is a function of its ability to develop and use new core competencies faster than competitors' efforts to imitate existing advantages.

Building a buying and selling business will inevitably involve pricing. Price is important in the sale and purchase agreement between producers and consumers (Luo et al., 2022). Through pricing, the economic value of a product can be determined. Because of this issue, companies usually agree on prices before goods are distributed in the market.

Mulyadi (2010) states that production costs are costs incurred in managing raw materials into products. Production costs are used to calculate the cost of finished products and those still in process at the end of the accounting period. Production costs are an important source of information for analysing business strategies. Determining and analysing a company's costs can illustrate its future performance. Production costs are the total costs of manufacturing or producing goods and services. They include all expenditures incurred by a company to obtain production factors and raw materials used in the production process and to produce the final products manufactured by the company.

Production costs are all costs and economic resources incurred during the production process to transform raw materials into finished goods. Production costs are classified into direct material, direct labour, and factory overhead. On the other hand, non-production costs are unrelated to production functions, such as research and development, distribution, customer service, and general administration. Production costs can be effective and efficient if the produced output meets quantity and quality standards commensurate with the price. This ensures that the incurred costs are appropriately utilised and do not indicate waste. Therefore, management must evaluate various production cost factors to achieve efficiency and reduce standard costs, inevitably impacting the company's profitability.

Price is the amount of money that can be exchanged for a good or service by purchasing it, thereby fulfilling consumers' needs and desires. In addition, price can also be understood as the value exchanged between consumers and sellers, whereby consumers obtain benefits from products or services and sellers receive compensation in the form of money. Selling price directly impacts a company's profitability; optimal pricing can help a company achieve its profit targets and maximise revenue. A company can set prices that support long-term business growth by understanding production costs, market structure, and demand levels. Competitive and adaptive pricing management is the key to successful marketing, enabling a company to remain more competitive, build consumer trust, and achieve its financial goals.

According to economics, revenue results from selling goods or services by a company during a specific period. In fact, it is not only the result of sales; a company's revenue can also come from interest on company assets used by other parties, dividends, and royalties. All of these are totalled and recorded in the company's books. Income can also be defined as the costs charged to customers or consumers for the price of goods or services. Income is a crucial factor in a company as it serves as a measure of the company's progress or decline. The larger the income, the more advanced the company is considered, and vice versa.

2. Methodology

The research method used is qualitative descriptive, with data collection through field observation and direct interviews with business owners. The research method analyses data by describing or depicting the collected data as it is, without intending to make conclusions that apply to the general public. Using data obtained from business owners, researchers can analyse and conclude what costs are incurred by business owners and how much income is earned by business owners.

This study's sample focuses on one small fishing boat manufacturing business. The data collected was related to this business. The data included all financial data, production costs, and selling prices for December 2024.

3. Results and discussion

The production cost management strategy implemented by business owners is to collect the total production costs and calculate the costs incurred to produce both large and small ships. The following are some of the production costs for large and small boats.

Table 1. The Production Costs for Large Boats

Standard chart costs	Cost	Total
Wood	Rp12.950.000	
Rope	Rp150.000	Rp13.940.000
Special Materials	Rp840.000	
Labor costs		
3 people × 8 days	Rp130.000/person	Rp3.120.000
Overhead costs		
Other costs	Rp1.250.000	Rp.1.250.000

Table 2. The Production Costs for Small Boats

Standard chart costs	Cost	Total
Wood	Rp6.600.000	
Rope	Rp75.000	Rp7.125.000
Special Materials	Rp450.000	
Labor costs		
3 people × 8 days	Rp130.000/operson	Rp1.950.000
Overhead costs		
Standard chart costs	Rp1.250.000	Rp1.250.000

The table above shows that the production cost of a 30-foot (large) boat is Rp18,310,000, and for a 20-foot (small) boat is Rp325,00000. The production cost includes labour costs and overhead costs. This is a strategy for business owners to calculate and manage boat production costs so that it is easier to calculate all the costs incurred.

Effective production cost management and pricing strategies can increase business revenue. Additionally, business owners must implement the right strategy to reduce production costs and set competitive selling prices. The total production costs for a small-scale fishing boat manufacturing business in Belawan for three boats, two large and one small, amount to Rp46,945,000, with raw material costs being a significant portion of the total. Thus, it is critical for business owners to manage raw material costs to enhance production efficiency.

In determining the selling price of products, business owners must consider the optimal selling price to match the price listed on the market. The cost of production is not the only factor in determining the selling price of a business; by calculating the cost of production, business owners can calculate the amount of income generated and whether it is profitable or not. According to business owners, the calculation of the selling price of ships is as follows:

No	Type of ship	Selling price (Rp)	Produksi volume
1	30-foot boat	Rp25.000.000	1
2	20-foot boat	Rp13.000.000	1

According to the results of interviews with business owners, the table above shows that large boats are sold for Rp25,000,000 and small boats for Rp13,000,000. So, if the business owner produces two large boats and one small boat in one month, the calculation is as follows.

Large ship = 25.000.000 × 2 = 50.000.000
Small ship = 13.000.000 × 1 = 13.000.000
Total = 63.000.000

Therefore, the total sales of two large and one small boat during the month amounted to Rp63,000,000. Boat sales calculations depend on consumer demand each month. However, according to a direct interview with the business owner, he only accepts three boats per month. The selling price is also set according to the market price or the price that other boat business owners agreed upon. In setting the selling price of the product, the business owner also considers the optimal selling price to align with the prices listed in the market. The business owner themselves determines the boat's selling price, with the set prices being Rp25,000,000 for a 30-foot (large) boat and Rp13,000,000 for a 20-foot (small) boat. The prices set by the business owner have been calculated and considered based on other factors such as market prices and product quality. Based on interviews with business owners, business revenue is calculated from sales minus expenses such as raw material costs, direct labour costs, and overhead costs, and it can be broken down as follows.

i. For a large boat:
   Revenue from the sale of two ships = Rp50,000,000
   a. Production costs for two ships = Rp13,940,000
   b. Salary costs × 16 working days = Rp6,240,000
   c. Overhead costs = Rp1,250,000
   d.

   To calculate the total cost above, subtract all expenses from the two large boats' total sales revenue.

   Rp50.000.000
   Rp13.940.000
   Rp6.240.000
   Rp1.250.000 -
   Rp.28.570.000

   So, after totalling, the net income received by the business owner producing two large boats is Rp28,570,000.

ii. For a small boat
   Ship sales revenue = Rp13.000.000
   Production cost of 1 ship = Rp7.125.000
   Salary cost × 5 days = Rp1.950.000

   From the details above, overhead costs are not listed because the production process is still the same as the previous ship production, which can be summarised as follows:

   Rp13.000.000
   Rp7.125.000
   Rp1.950.000 -
   Rp3.925.000

   Based on the details above, the total income from one small ship after deducting production, salary, and overhead costs is Rp3,925,000. So, to calculate the total production costs for three boats, it can be broken down as follows:

   Rp.63.000.000
   Rp.21.065.000
   Rp.8.190.000
   Rp.1.250.000 -
   Rp.32.495.000

   According to the above calculation, the total net income from the sale of three ships minus the cost of raw materials, labour, and overhead costs is Rp. 32,495,000 for a total of 21 working days. This is a significant income in line with the total expenditure for ship production costs for one month. There is a significant difference in income from

the sale of large and small boats. According to the research findings, revenue from selling large-sized boats is more profitable than from small boats.

4. Conclusion

Based on the results of the research conducted, it can be concluded that:

i. Production cost management strategy

In this study, the production cost management strategy implemented by the business owner involves calculating the total production costs and determining all expenses incurred in producing both large and small boats. An effective production cost management strategy and proper pricing can present an opportunity to increase business revenue. The business owner must also implement the appropriate strategy to manage production costs and maintain competitive pricing. The total production costs for a small fishing boat manufacturing business in Belawan for three boats, two large and one small, amount to Rp. 46,945,000, with raw material costs being a significant portion of the total. This highlights the importance of managing raw material costs to enhance production efficiency.

ii. Setting the selling price of products

The cost of production is not the only factor in setting the selling price of a business; by calculating the cost of production, business owners can calculate the amount of income generated and whether it is profitable or not. The selling price is also set in line with market prices or prices agreed upon by other boat owners. When setting the selling price of products, business owners also consider the optimal selling price to align with market prices. The business owner determines the vessel's selling price, with the set price being Rp. 25,000,000 for a 30-foot (large) vessel and Rp. 13,000,000 for a 20-foot (small) boat. The prices set by the business owner have been calculated and considered based on other factors such as market prices and product quality.

iii. Revenue

There is a significant difference in revenue between the sale of large and small boats. According to the results, revenue from selling large boats is more profitable than that from small boats. After deducting raw material, labour, and overhead costs, the net revenue from the small-scale fishing boat manufacturing business amounts to Rp32,495,000. This is substantial revenue and aligns with the total production costs for building a ship over one month.

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THE INFLUENCE OF CONSUMER PERCEPTION AND BRANDING STRATEGY ON THE SUSTAINABILITY OF MOTORIZED PEDICAB TRANSPORTATION SERVICES IN BINJAI CITY

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Abstract

This study aims to analyse the influence of consumer perception and branding strategy on the sustainability of motorised pedicab (becak mesin) transportation services in Binjai City, North Sumatra, Indonesia. The method used in this study is a quantitative approach through a survey using questionnaires distributed to users of motorised pedicab services. The research sample consisted of individuals previously using motorised pedicab services in Binjai City. The sampling techniques employed were accidental sampling and purposive sampling. Data analysis techniques included validity tests, reliability tests, multiple linear regression, t-test, F-test, and the coefficient of determination. The findings reveal that consumer perception and branding strategy collectively influence the sustainability of motorised pedicab businesses. However, branding strategy plays a more dominant role in ensuring business continuity because, partially, consumer perception does not have a significant effect, as indicated by a significance value. These findings highlight the importance of motorised pedicab drivers in Binjai City, strengthening their branding strategies, as they strongly impact the sustainability of their business operations.
Keywords: Branding; Consumer-perception; Motorised-pedicab.

1. Introduction

To support economic advancement in every region, transportation is essential in facilitating the movement of people from one place to another. In the city of Binjai, motorised pedicabs have long been recognised as one of the most popular modes of public transportation. A motorised pedicab is a motor-powered vehicle that has become integral to the city's culture and history. Typically, it "accommodates two passengers and one driver, operating on three wheels for its movement" (Setiawan, 2021; Ikhsana et al., 2024). "Before the rise of online transportation services, motorised pedicabs were the primary choice for residents travelling short to medium distances" (Haryanto et al., 2022). Almost every corner of Binjai City could easily be found with pedicab drivers ready to take passengers to their destinations. However, in recent years, the transportation landscape in Binjai has undergone significant changes due to the emergence of various online transportation applications. These services offer "easy access, competitive pricing, and a variety of appealing features, providing the public with new alternatives to meet their mobility needs" (Nurlaela et al., 2023; Haryanto et al., 2022).

Pedicabs first arrived on the island of Sumatra, specifically in Medan, in the early 1950s as manually-pedalled rickshaws (Zuliana & Lukitaningsih, 2022). The Chinese community initially brought these rickshaws from Hong Kong to the Deli region. Over time, they evolved and made their way into the city of Binjai, transforming into a motor-powered means of transport known today as the motorised pedicab. Motorised pedicabs have existed in Binjai city since the 1980s, originally referred to as bromfit, which were traditional pedicabs with an attached fuel-powered tax engine (Zuliana & Lukitaningsih, 2022). The propulsion systems of these pedicabs have also developed over time. With the introduction of motorcycles in the 1990s, motorised pedicabs began to use newer motorcycle models as their driving engines. Since

then, they have continued to evolve as a widely used means of transportation, particularly among traders who rely on them to transport goods. Motorised pedicabs were favoured during that period because "they could carry a large amount of cargo, were faster than other traditional transport options such as horse- or buffalo-drawn carts, and were more affordable than cars" (Zuliana & Lukitaningsih, 2022). Moreover, motorised pedicabs were easily accessible and offered lower fares than other transportation modes.

Fig. 1. Motorised Pedicab

The advantages of motorised pedicabs have made them a popular means of transportation that is deeply rooted in the community. Many residents have chosen to make a living through this mode of transport, as seen in the widespread emergence of motorised pedicab drivers offering transportation services to the public. Over the years, the primary users of motorised pedicabs have been housewives shopping at traditional markets and traders transporting their goods. This phenomenon occurs because motorised pedicab drivers often wait for passengers in densely populated areas and public places such as traditional markets, shopping centres, parks, tourist attractions, and other public facilities. Considering their deep historical roots in the community, motorised pedicabs remain a transportation mode worth preserving and are still needed today. They are especially relevant in traditional markets, shopping centres, and public open spaces, where they serve as a convenient, affordable, and practical option. Their capacity to carry a significant cargo greatly benefits housewives who shop in bulk and small-scale traders who need to transport goods.

The main factor contributing to the decline in public interest in using motorised pedicab services—once a preferred choice before the digital era—is the shift in consumer perception. Consumer perception refers to the way individuals interpret problems, phenomena, environments, experiences, service quality, and brands based on conceptual frameworks, assumptions, values, ideas, and specific perspectives within a given context (Rachman et al., 2022; Sahputri et al., 2023; Kaban & Kunci, 2022). This shift in perception has led consumers to transition from motorised pedicabs to online ride-hailing services, which offer more advantages. These include lower fares, features such as "trip tracking, cashless payments, and driver ratings, all of which contribute to a more comfortable riding experience" (Pribadiono, 2016).

Branding strategy is a coordinated plan that unifies all aspects of management to achieve final objectives such as profit, trust, added value, and a positive image to attract and retain customers in both goods and services sectors (Nurdiansyah & Rugoyah, 2021; Karsono et al., 2021). Therefore, according to Utomo et al. (2023), an effective branding strategy is essential to build public trust and interest in encouraging people to return to using motorised pedicabs as a viable accommodation mode. Previous studies have shown that appropriate branding strategies, such as popularising the term 'sharia pedicab' in Aceh and aligning motorised pedicab fares with those of online ride-hailing services, can assist motorised pedicab drivers in sustaining their businesses" (Ikhsana et al., 2024; Setiawan, 2021). Based on initial observations and interviews with several motorised pedicab drivers operating near the Binjai Train Station, it was found that public interest has significantly declined in recent times, with

most people opting for alternative transportation options. The drivers reported that prospective passengers often rejected their services for various reasons, including higher fares compared to online rides, discomfort during rides, difficulty locating pedicabs, untidy appearance of the drivers, and perceived lack of safety of the vehicles. As a result, many pedicab drivers face negative responses from potential passengers when offering their services.

Given the current reality that consumer perception and branding strategies of motorised pedicab drivers in Binjai city remain suboptimal, the decline in customer interest and passenger numbers is inevitable. This situation directly impacts the income levels of motorised pedicab drivers. The phenomenon poses a serious threat, as reduced earnings can jeopardise the sustainability of the pedicab drivers' businesses, which often serve as their sole source of livelihood. Therefore, this research is highly significant. The urgency of this study is undeniable, and its findings are expected to provide a solution that helps motorised pedicab drivers develop appropriate branding strategies and foster positive consumer perceptions, thereby ensuring the long-term sustainability of the motorised pedicab industry.

Table 1. Literature Review

No.	Research Title	Author	Research Method	Research Findings
1	Strategies of Pedicab Drivers in Maintaining Their Occupation After the Emergence of Online Motorcycle Transportation (Case Study: Banda Aceh City)	Farhan Setiawan (2021)	Utilised a qualitative method with data collected through observation, interviews, and documentation.	The findings were categorised into two main strategies. The first was additive strategies, including extending waiting hours, ensuring customer comfort and satisfaction, and maintaining personal appearance.
2	Survival Strategies of Pedicab Drivers in Facing Transportation Competition in Banda Aceh	Liza Ikhsana (2024)	Employed a qualitative case study approach. Data were gathered through observation and in-depth interviews, involving five informants with at least five years of experience as pedicab drivers and over 30 years old.	Strategies included popularising the term “syar’i pedicab” in line with Aceh Province's authority in enforcing Islamic law, and income diversification, where drivers engaged in multiple income-generating activities to compensate for insufficient earnings from their main profession.
3	Branding Strategy in Developing Tourism Industry 4.0 Through Competitive Multimedia in the Digital Era	Isdarmanto[1], Christantinus[2] (2020)	Adopted a qualitative method aimed at exploring and understanding in-depth issues.	The study found that branding development through multimedia programs is highly effective worldwide within institutional and corporate contexts and must be appropriately managed.

2. Methodology

This research was conducted in Binjai City, North Sumatra, Indonesia, specifically in areas where motorised pedicabs operate and around public facilities such as the Taman Balita (Toddler Park), Taman Remaja (Youth Park), Taman Edukasi (Education Park), the terminal, the train station, and the surrounding areas of shopping centres located at various points across five districts: Binjai Kota, Binjai Selatan, Binjai Timur, Binjai Barat, and Binjai Utara. The research is scheduled to be carried out from February to June 2025.

This is quantitative research. The research sample consisted of 100 individuals who had previously used the motorised pedicab transportation service in Binjai City. The sampling techniques used were accidental sampling and purposive sampling. The data analysis technique applied in this study was multiple linear regression analysis, utilising SPSS Statistics software to examine the relationship between variable X1 (consumer perception) and X2 (branding strategy) on Y (business sustainability).

The regression model is formulated as follows:

$$Y = a + b_1X_1 + b_2X_2 + e \quad (1)$$

Information:
- Y = Dependent variable (business sustainability)
- X_1 = Independent variable (consumer perception)
- X_2 = Independent variable (branding strategy)
- a = Constant
- b = Regression coefficient of each independent variable
- e = Error term (other influencing factors not studied)

The data collection technique used was distributing questionnaires to the sample in Binjai City during the predetermined research period. The study also included hypothesis testing through t-test, F-test, coefficient of determination (R^2) test, and validity and reliability testing for the questionnaire statements.

3. Results and Discussion

3.1 Respondent Characteristics

Table 2 shows more female respondents (64 individuals) than male respondents, who were 36 individuals. This was attributed to the fact that most users of motorised pedicab services were women. Field observations revealed a phenomenon in which the majority of public transportation users, including those utilising motorised pedicabs, were women. This tendency was linked to the commonly held perception of women as more gentle, feminine, and dependent on men. As a result, many women lacked the confidence or ability to operate a vehicle independently. Consequently, women tended to be the dominant users of motorised pedicab services to support their daily routines and to travel in a manner they perceived as safe and comfortable. In contrast, men were generally perceived as braver, more masculine, and physically stronger, often leading them to prefer driving their own vehicles. This explained the lower number of male users of motorised pedicab services.

Table 2. Respondents' Characteristics Based on Gender

No.	Gender	Quantity
1	Male	36
2	Female	64
	Total	100

3.2 Validity and Reliability Test

The criterion for the validity test is that the research results are considered valid if there is consistency between the collected data and the actual conditions of the object being studied. An instrument is deemed valid if the measuring tool can accurately obtain the intended data (Priadana & Sugiono, 2021). The data is considered valid if the value of *r-count* is greater than or equal to the *r-table* value, and invalid if it is less than or equal to the r-table value.

Table 3. Validity Test

No	Instruments	Validity Value Rtabel	Validity value Rcount	conclusion
1	X1P1	0.1654	0.937	Valid
2	X1P2	0.1654	0.877	Valid
3	X1P3	0.1654	0.923	Valid
4	X1P4	0.1654	0.927	Valid
5	X1P5	0.1654	0.910	Valid
6	X1P6	0.1654	0.858	Valid
7	X2P1	0.1654	0.702	Valid
8	X2P2	0.1654	0.764	Valid
9	X2P3	0.1654	0.841	Valid
10	X2P4	0.1654	0.763	Valid
11	X2P5	0.1654	0.731	Valid
12	X2P5	0.1654	0.688	Valid
13	YP1	0.1654	0.921	Valid
14	YP2	0.1654	0.890	Valid
15	YP3	0.1654	0.755	Valid
16	YP4	0.1654	0.738	Valid
17	YP5	0.1654	0.870	Valid
18	YP6	0.1654	0.865	Valid

3.3 Reliability Test

A reliable instrument is one that, when used repeatedly to measure the same object, will yield consistent data. A rubber measuring tape, for example, is considered an unreliable instrument due to its tendency to stretch or shrink (Priadana & Sugiono, 2021). An instrument is regarded as reliable if the Cronbach's Alpha value is greater than 0.6. Conversely, the instrument is considered unreliable if the Cronbach's Alpha value is less than 0.6.

Table 4. Reliability Test

Reliability Statistics	
Cronbach's Alpha	N of Items
0.935	18

A questionnaire study was considered reliable if the Cronbach's Alpha value was greater than 0.6. In the table above, the Cronbach's Alpha value obtained for the 18 statements in the questionnaire was 0.935, which was greater than 0.6. Therefore, the questionnaire used in this study was declared reliable, meaning it could be depended on, trusted for its authenticity, and consistent results.

3.4 Multiple linear regression test

This multiple linear regression test was conducted to determine the effect of consumer perception and branding strategy on the business sustainability of motorised pedicab transportation services in Binjai City. The following table presents the results of the multiple linear regression test for each variable:

Table 5. The Result of the Multiple Linear Regression Test

Model	Unstandardized Coefficients (B)	Std. Error	Standardized Coefficients (Beta)	t	Sig.
(Constant)	-0.384	2.706	—	-0.142	0.888
Persepsi Konsumen	0.104	0.124	0.092	0.841	0.402
Strategi Branding	0.875	0.149	0.637	5.854	0.000

Based on the results of the test using SPSS Statistics software, the multiple linear regression equation was obtained and could be written as follows:

$$Y = -0.384 + 0.104\ X_1 + 0.875\ X_2 \quad (2)$$

In the multiple linear regression model, the constant value for business sustainability was -0.384, which meant that if the values of the consumer perception variable and branding strategy variable were zero, the value of business sustainability would be -0.384. This indicated that without the support of these two variables, the level of business sustainability would be very low or even negative.

The coefficient value for consumer perception was 0.104, meaning that every one-unit increase in consumer perception would increase business sustainability by 0.104 units, assuming the branding strategy variable remained constant. However, the significance value (Sig.) for consumer perception was 0.402, greater than 0.05. This indicated that consumer perception did not have a statistically significant effect on business sustainability.

The coefficient value for branding strategy was 0.875, meaning that every one-unit increase in branding strategy would increase business sustainability by 0.875 units, assuming consumer perception remained constant. The significance value (Sig.) for branding strategy was 0.000, which was less than 0.05, indicating that branding strategy had a statistically significant effect on business sustainability.

3.5 Hypothesis Test

Coefficient of Determination (R^2)

Table 6. Hypothesis Test

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.708[a]	0.502	0.492	2.86391

Based on the coefficient of determination test results, the R^2 value was found to be 0.502 or 50.2%, indicating that consumer perception and branding strategy collectively explained 50.2% of the variation in the sustainability of motorised pedicab transportation services in Binjai City. The remaining 49.8% were influenced by other variables not included in this study, such as pricing, service quality, and other external factors.

Simultaneous Test (F-Test)

Table 7. Simultaneous test

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	801.800	2	400.900	48.879	.000[b]
Residual	795.590	97	8.202		
Total	1597.390	99			

From the F-test results, the calculated F-value was 48.327, greater than the critical F-table value of 3.09, and the significance value was 0.000, less than the significance level of 0.05. Therefore, the null hypothesis (H_0) was rejected, and the alternative hypothesis (H_1) was accepted. This indicated that consumer perception and branding strategy had a joint and statistically significant positive influence on the sustainability of motorised pedicab transportation services in Binjai City. The result was primarily influenced by the strong impact of branding strategy, which significantly contributed to the overall effect when combined with consumer perception.

Partial Test (T-Test)

Table 8. Partial Test

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	-0.384	2.706		-0.142	0.888
	Persepsi Konsumen	0.104	0.124	0.092	0.841	0.402
	Strategi Branding	0.875	0.149	0.637	5.854	0.000

The T-test results revealed the following:

a. The t-value for consumer perception was 0.841, less than the t-table value of 1.660, with a significance level of 0.402 (greater than 0.05). Hence, the null hypothesis was accepted, and the alternative hypothesis was rejected. This suggested that consumer perception had no significant partial effect on the sustainability of motorised pedicab transportation services.
b. The t-value for branding strategy was 5.854, which exceeded the t-table value of 1.660, and the significance value was 0.000 (less than 0.05). Thus, the null hypothesis was rejected and the alternative hypothesis was accepted. This confirmed that the branding strategy had a positive and statistically significant partial effect on the sustainability of motorised pedicab services in Binjai City.

4. Conclusion

The research concluded that consumer perception did not significantly affect the sustainability of motorised pedicab services in Binjai City. Although perceptions were generally positive, they did not strongly influence continued usage, as practical needs often outweigh personal opinions. In contrast, branding strategy had a significant and positive effect, indicating that the public trusted and preferred services with a strong visual identity and added value. Together, consumer perception and branding strategy had a simultaneous positive and significant impact, explaining 50.2% of the variation in business sustainability. This underscores the importance of building a strong brand and maintaining positive customer impressions to support the long-term viability of motorised pedicab services.

It is recommended that drivers continue to maintain and improve their branding strategies. Visual identity elements—such as signature colours, banners, or symbols—along with cleanliness, polite service, and small innovations (like music or rain covers) could be key differentiators attracting customers. Additionally, pedicab drivers were encouraged to use local social media platforms or community networks for simple promotional efforts. Future studies were encouraged to expand this research by incorporating additional variables, such as customer satisfaction, consumer loyalty, information technology, or even the integration of local transportation systems. Moreover, qualitative methods could be applied to explore in-depth experiences from users and motorised pedicab drivers, providing richer insight into the service dynamics.

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THE INFLUENCE OF OWN CAPITAL, LOAN CAPITAL, AND LENGTH OF BUSINESS ON MSMES INCOME IN MEDAN BARU DISTRICT

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Abstract

Micro, Small, and Medium Enterprises (MSMEs) play an important role in the Indonesian economy but often face obstacles to increasing income due to limited capital. Previous studies have shown that capital structure and business length can affect MSMEs' income level. This study aims to analyse the effect of own capital, loan capital, and length of business on the income of MSMEs in Medan Baru District. This research uses a quantitative approach with descriptive methods. Data were obtained from 87 MSMEs through questionnaires, interviews, and observations, and analysed using multiple linear regression. The results showed that own capital (β = 0.218), loan capital (β = 0.341), and length of business (β = 0.459) had a positive and significant effect on income. Simultaneously, the three variables also significantly affect MSME income (F = 15.059; sig. = 0.000). This finding indicates that combining internal capital, access to external financing, and long business experience are key factors in increasing MSME income and business sustainability.
Keywords: MSMEs; Own capital; Loan capital; Length of business; Income.

1. Introduction

Micro, small, and medium enterprises (MSMEs) play an important role in the Indonesian economy in job creation and as a pillar of national economic stability. This is clearly evident during times of crisis, when MSMEs remain resilient while large companies experience stagnation or even closure. This happened because people's incomes declined during the monetary crisis, but this did not affect demand for goods. This is in contrast to large businesses, which actually collapsed due to a decline in market demand. Therefore, MSMEs succeeded in saving the Indonesian economy at that time (Helmalia & Afrinawati, 2018). MSMEs are huge in Indonesia's economic growth, contributing 99% of total business units. In 2023, there will be an estimated 66 million MSMEs. MSMEs contribute 61% of Indonesia's Gross Domestic Product (GDP), equivalent to Rp9,580 trillion. MSMEs employ around 117 million workers (97%) of the total workforce (Kementrian Perekonomian, 2023).

Amid intense business competition and uncertain economic conditions, many micro, small and medium enterprises (MSMEs) have difficulty increasing their income. Income is significant because it is the object of company activities (Widarma, 2019). The greater the revenue earned, the greater the ability of the business to finance all expenses or daily operational costs that will be carried out (Salim & Rahmadhani, 2024). The main problem MSMEs face in increasing their business income relates to capital (Rahma, 2021). Business capital is used to establish or manage a business (Muhammad,2020).
Own capital and loan capital are the two primary funding sources for MSMEs. Equity capital comes from personal assets or personal funds, which is often considered a more stable source of funding because it does not incur interest payments. Many MSME entrepreneurs start their businesses using their own capital. However, in practice, equity capital is often insufficient to maintain business continuity. Initial surveys indicate that equity capital is insufficient to meet long-term operational needs, mainly due to low sales volume and low Return on Equity (ROE), which is the ratio of profit to capital owned. As a result, the income generated is insufficient to

cover operational costs and even to return the capital that has been spent. This makes it difficult for the company to produce new goods or expand its operations.
To maintain business continuity, MSMEs depend on loan capital from external sources, such as formal financial institutions, such as banks and informal institutions, such as cooperatives or digital lending platforms (Fintech). Based on Law No. 25 of 1992, loan capital can come from members, cooperatives, banks or non-bank institutions, debt securities, and other legal sources. Parties involved in business activities are required to settle or pay debts agreed upon by both parties, and the use of loan capital will be subject to administrative fees, interest, and commissions (Chaedar, Blongkod, & Taruh, 2023).

Fintech combines technology and economics to facilitate online financial transactions (Darmika, 2021). It refers to the latest technology applied in innovative financial products and services (Harrison & Arifin, 2024). Despite higher interest rates, Fintech is very helpful for MSMEs that do not have access to formal financial institutions.

Apart from the type and source of capital, the length of business also dramatically affects the income of MSMEs. According to Marfuah & Hartiyah (2019), the length of business is the length of time business actors run their business. Long-established businesses have regular customers, better management systems, and experience facing business challenges. In contrast, newly established MSMEs often do not have a strong customer base and still face challenges stabilising revenue.

To illustrate the conditions in the field more clearly, researchers conducted an initial survey of MSMEs in Medan Baru sub-district. The survey was conducted on six MSMEs with different characteristics. The results showed significant variations in the age of the business, the amount of loan obtained, the interest rate, the loan tenure, and the source of financing. MSMEs that have been operating for a long time, such as Toko Baju Nd Intan (8 years) and Ebyna Studio (6 years), obtain financing from formal financial institutions such as banks with relatively low annual interest rates of 10% and 12%, respectively. In contrast, newly established MSMEs, such as Toko Salju (8 months) and Bajumu (1.5 years), tend to obtain financing from cooperatives and fintech platforms with much higher interest rates, ranging from 24% to 30% per year.

In terms of loan tenors, MSMEs that have been operating for an extended period generally obtain longer loan tenors of between 4 and 5 years. Meanwhile, newer MSMEs only obtain tenors of around 2 to 3 years. In addition, differences in financing sources are also evident. Established MSMEs can more easily access bank loans, while newly established MSMEs rely more on non-bank institutions such as cooperatives and Fintech as financing alternatives.
This finding suggests that the age of the business plays an important role in determining the ease of access to formal financing. This affects not only the amount of loan received but also the interest rate and loan term agreed upon. This poses a challenge for efforts to strengthen the sustainability and growth of MSMEs, especially amid evolving economic dynamics and uncertainties.

Trio Rinjaya (2020) states that one's capital has no positive effect on MSME income. Yunus (2021) shows that loan capital has a positive effect on the income of micro, small, and medium enterprises in Jayapura city. Alkumairoh and Warsitasari (2022) state that the length of business has a positive effect on MSME income, while Polandos, Engka, and Tolosang (2019) show that the length of business has no significant effect on the income of MSME entrepreneurs in Langowan Timur sub-district.

Based on this background, the following problem formulation can be made:

i. How does own capital affect the income of MSMEs in Medan Baru District?
ii. How does loan capital affect the income of MSMEs in Medan Baru sub-district?

iii. How does the length of business affect the income of MSMEs in Medan Baru sub-district?
iv. What is the effect of own capital, loan capital and length of business on the income of MSMEs in Medan Baru sub-district?

2. Methodology

The type of research used in this study is quantitative research with a descriptive approach. The research location is at Jl. Jamin Ginting No.354, Padang Bulan, Kec. Medan Baru, Kota Medan, Sumatera Utara 20157. The types of data used in this study are primary and secondary. The data collection techniques used in this study are observation, interviews, and questionnaires. The data analysis technique used is multiple linear regression analysis, Hypothesis testing (partial test (t-test), simultaneous test (F-test)) and coefficient of determination (r^2).

3. Results and discussion

Multiple linear regression analysis is an analytical tool used to predict changes in the value of the dependent variable if the value of the independent variable is increased or decreased (Sugiyono, 2020). This study uses multiple linear regression analysis because it aims to examine the simultaneous influence of several independent variables, namely own capital (X1), loan capital (X2), and length of business (X3), on MSME income (Y). This method is considered appropriate because it can explain the linear relationship between these variables and provide a statistical description of the contribution of each variable (Sugiyono, 2021). Calculations using SPSS version 26 produce the following data:

Table 1. Results of the multiple linear regression test

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.278	3.240		-.086	.932
	MS TOTAL	.218	.102	.191	2.133	.036
	MP TOTAL	.341	.092	.348	3.714	.000
	LU TOTAL	.459	.142	.308	3.240	.002

Based on the table, from the data processing results, the following multiple linear regression equation was obtained:

$$Y = -0{,}278 + 0{,}218X1 + 0{,}341X2 + 0{,}459X3 \quad (1)$$

Based on the multiple linear regression equation, this means the following:

i. The constant value indicates that if all independent variables (own capital, borrowed capital, and length of business) are 0, then the income of MSMEs in Medan Baru Sub-district is predicted to be -0.278 units. While this is practically impossible, as no business runs without capital and time, the constant value is still important as a starting point in the regression equation. This negative value does not indicate that the revenue will be negative, but serves as a mathematical basis in the estimation model.
ii. This means that every one unit increase in the own capital variable will increase MSME income by 0.218 units, assuming other variables remain constant. Although the effect is positive, the effect of own capital on income is relatively smaller than that of loan capital and the length of business. This can be caused by the limited personal capital owned by MSME actors, so the scale of investment made is also limited.

iii. Every one unit increase in loan capital will increase MSME income by 0.341 units, assuming other variables remain constant. This shows that loan capital plays an important role in increasing business income. External financing allows MSMEs to develop production scale, expand business, and improve service quality, which positively impacts income.
iv. The highest coefficient in this model indicates that each additional year of business duration will increase revenue by 0.459 units. This indicates that the length of business has a very strong influence on revenue. Longer-established businesses generally have better experience, wider customer networks, and stronger business reputations. In addition, established businesses have easier access to financing from formal institutions with lower interest rates, which can increase income.

The hypothesis in this study is formulated as follows:

a. H_0 (Null Hypothesis): There is no significant influence between own capital, loan capital, and length of business on the income of MSMEs in Medan Baru District.
b. H_1 (Alternative Hypothesis): There is a significant influence of own capital, loan capital, and length of business on the income of MSMEs in Medan Baru District.

Results of the t-test (partial test)

According to Sugiyono (2020, p.31), partial tests are used to determine the effect of each independent variable on the dependent variable. This test is performed by comparing the t-value with the t-table or looking at the significance column for each t-value. This test aims to compare t_{count} with t_{table} at a significance level of 5%. The t-test is considered significant if the result of t_{count} with t_{table} or the error probability is less than 5% (sig <0.05). The basis for decision making is as follows:

a. If t count> t table, then H_0 is rejected and H_1 is accepted.
This means that the independent variable tested has a significant effect on the dependent variable, partially.
b. If t count < t table, then H_0 is accepted and H_1 is rejected.
This means that the independent variable does not have a significant effect on the dependent variable, partially.

Partial testing can be seen from the value $t_{count} > t_{table}$. To determine the value of the t-table, first calculate the degrees of freedom using the formula Df=n-k.
Df = 87-4 = 83, the t-table value at DF=83 with a significance level of 0.05 is 1.989.

Table 2. Results of the t-test (paired test)

Model		t	Sig.
1	(Constant)	-.086	.932
	MS TOTAL	2.133	.036
	MP TOTAL	3.714	.000
	LU TOTAL	3.240	.002

Based on Table 2, the relationship between each independent variable and the dependent variable can be seen as follows:

1. The variable of own capital has a t of 2.133 > t_{table} 1.989 and a significance value of 0.036 < 0.05, which means that the variable is significant. It can be concluded that own capital

has a positive and significant effect on the income of MSMEs in Medan Baru District, so the hypothesis is accepted.
2. The loan capital variable has a t_{count} of 3.714 > the$_{table}$ of 1.989 and a significance value of 0.000 < 0.05, which means that the variable is significant. It can be concluded that loan capital has a positive and significant effect on the income of MSMEs in Medan Baru District, so the hypothesis is accepted.
3. The business duration variable has a t_{count} of 3.240 > the t_{table} of 1.989 and a significance value of 0.002 < 0.05, which means that the variable is significant. It can be concluded that business duration has a positive and significant effect on the income of MSMEs in Medan Baru District, so the hypothesis is accepted.

F-test results (simultaneous test

A simultaneous test (F test) was conducted to determine how much the independent variables collectively influence the dependent variable (Ghozali, 2020). An F-test was also conducted to analyse the combined effect of all independent variables on the dependent variable. The significance level used is 0.05 or 5%. If the significance value of F < 0.05, this can be interpreted as the independent variables simultaneously affecting the dependent variable or vice versa. The F test can use a significant multiple correlation formula. The guidelines for comparing $F_{calculated}$ and F_{table} are:
a. If the value of Fcount ≤ Ftable, then H_0 is accepted and H_1 is rejected (that is, there is no significant simultaneous effect).
b. If the value of Fcount > Ftable, then H_0 is rejected and H_1 is accepted (that is, there is a significant simultaneous influence between the independent variables on MSME income).

Df1 = k - 1, so df1 = 4 - 1 = 3
Df2 = k - 1, so df2 = 87 - 4 = 83
So the F table value is 2.715

Table 3. F-test Results (simultaneous test)

	Model	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	358.391	3	119.464	15.059	.000[b]
	Residual	658.460	83	7.933		
	Total	1016.851	86			

Based on the F test in Table 3 above, the $F_{calculated}$ is 15.059 with a significance level of 0.000. Since $F_{calculated}$ is greater than F_{table} (15.059 > 2.715), H3 is accepted. Thus, equity capital, loan capital, and the length of business operation simultaneously affect the income of MSMEs in Medan Baru District.

In regression analysis, the coefficient of determination (R^2) measures the extent to which the regression model can explain variations occurring in the dependent variable based on the independent variable. The use of R^2 is important because it provides information about the level of fit of the model with the data being analysed. The higher the R^2 value, which ranges from 0 to 1, the greater the proportion of variation in the dependent variable that can be explained by the independent variable, which indicates that the model has good predictive power (Sugiyono, 2022).

In addition to R^2, the adjusted coefficient of determination or Adjusted R^2, is also used, especially in multiple regressions involving more than one independent variable. Adjusted R^2 provides a more accurate estimate because it considers the number of independent variables in the model, so it can avoid the overestimation that may occur with the usual R^2 value (Ghozali, 2018: 97). According to Perdana (2020: 105), Adjusted R^2 is more suitable for use in multiple regression analysis. This is in line with the opinion of Supriyanto et al. (2022: 252),

which states that Adjusted R² provides a more realistic picture of the contribution of each independent variable to the dependent variable. The coefficient of determination test value can be seen in the Adjusted R Square value in Table 5:

Table 4. Results of the coefficient of determination test

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.594[a]	.352	.329	2.817

The Adjusted R² value obtained in this study is 0.329 or 32.9%, indicating that the independent variables consisting of own capital, loan capital, and length of business can only explain 32.9% of the variation in MSME income. Meanwhile, the other 67.1% variation is influenced by other factors that are not included in this regression model. This relatively low determination value indicates the possibility of model bias, especially omitted variable bias, a condition where important variables are not included in the model, thus reducing estimation accuracy and predictive power.

Similar conditions were also found in previous studies. For example, research by Taha (2022) on MSMEs in South Halmahera Regency shows an Adjusted R² value of 15.0% which indicates that most of the variation in income cannot be explained by the variables in the model. The same thing was also found by Widiatmika (2019), who examined the factors affecting the performance of MSMEs in Indonesia, and obtained a determination value of 26%, thus concluding that there are still many other variables that have not been included in his analysis model. Thus, the Adjusted R² value of 32.9% reflects the need to expand the model by including other variables such as the number of workers, strategic location, and business digitalization so that the analysis of MSME income in Medan Baru Sub-district can be more comprehensive.

From various trials conducted, answers to each problem formulation were obtained. The discussion of the research will be explained as follows:

Own capital has a positive and significant effect on the income of MSMEs in Medan Baru District. The study results indicate that own capital has a positive and significant effect on the income of MSMEs in Medan Baru District. The paired test (t) produced a t-value of 2.133 with a significance level of 0.036. Since the significance level is less than 0.05, own capital has a positive and significant effect on the income of MSMEs in Medan Baru District. Therefore, it can be concluded that hypothesis (H1) is accepted.

Loan capital has a positive and significant impact on the income of MSMEs in Medan Baru District. The study results indicate that loan capital has a positive and significant effect on the income of MSMEs in Medan Baru District. Based on the paired significance test (t-test) using SPSS, the t-value is 3.714 with a significance level of 0.000. Since the significance level is less than 0.05, it can be concluded that loan capital has a positive and significant effect on the income of MSMEs in Medan Baru District. Therefore, it can be concluded that hypothesis (H2) is accepted.
Operating hours have a positive and significant impact on the income of MSMEs in Medan Baru District. The study's results indicate that the length of time a business has been operating has a positive and significant effect on the income of MSMEs in Medan Baru District. Based on a one-sample partial significance test (t-test) using SPSS, the t-value obtained was 3.240 with a significance level of 0.002. Since the significance value is less than 0.05, it can be concluded that the loan has a positive and significant effect on the income of MSMEs in Medan Baru District. Therefore, it can be concluded that hypothesis (H3) is accepted.

Own capital, loan capital, and the length of business operation have a positive and significant impact on the income of MSMEs in Medan Baru District. The study results indicate that own

capital, loan capital, and length of operation have a positive and significant effect on the income of MSMEs in Medan Baru District. The simultaneous test produced an F value of 15.059 and a significance value of 0.000. Thus, it can be concluded that own capital, loan capital, and length of operation have a significant effect on the dependent variable, namely MSME income.

4. Conclusion

Conclusions after conducting tests on the variables of own capital, loan capital, and length of business against MSME income in Medan Baru District using quantitative methods with a descriptive approach using SPSS version 26, with a sample size of 87 MSMEs using the Slovin formula. The conclusions of this study are:

i. Own capital has a positive effect on MSME income. This shows that the more personal funds or profits business actors reinvest, the greater the potential income generated. Own capital also reflects independence and initial financial stability, which are important in supporting business activities.
ii. Loan capital has a positive impact on MSME income. This means that access to loans, whether from formal or informal institutions, greatly helps business actors expand their businesses, increase production capacity, and add working capital, which directly impacts income growth.
iii. The length of time a business has been operating also positively impacts MSME income. The longer a business has been operating, the more experience, customer networks, and ability to adapt to the market its owners have. This makes the business more stable and consistently increases its income.
iv. The three independent variables (own capital, loan capital, and length of operation) simultaneously have a significant effect on MSME income. This means that a combination of sufficient own capital, loan support, and business experience will have a greater impact on MSME income growth than just one factor alone.

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THE EFFECT OF SERVICE QUALITY AND BRAND IMAGE OF BBM SHELL ON CONSUMER PURCHASING DECISIONS AT GENERAL FUEL FILLING STATIONS (SPBU)

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Abstract

This study analyses the simultaneous and partial effects of service quality and brand image on consumer purchasing decisions at Shell gas stations (SPBU). A quantitative approach was applied, using an online Google Forms survey administered to 105 respondents. The data were analysed using multiple linear regression in SPSS. The results indicate that service quality and brand image have a significant effect ($r^2 = 0.565$), explaining 56.5% of the variation in consumer purchasing decisions. However, when examined individually, only brand image has a significant impact ($p < 0.05$), while service quality does not. The results highlight the importance of strengthening the brand image as a priority for Shell to maintain and expand consumer loyalty.
Keywords: Service quality; Brand image; Purchase decision.

1. Introduction

Shell is known as one of the world's leading energy companies, originating from the Netherlands and the United Kingdom, operating under the full name Royal Dutch Shell plc. The company was founded in 1907 due to a merger between Royal Dutch Petroleum Company (Netherlands) and The Shell Transport and Trading Company Limited (United Kingdom). One of the key strategies for winning market competition is to improve service quality and build a strong brand image. In this context, companies need to understand the various factors that can influence consumer purchasing decisions at gas stations.
Service quality plays a key role in influencing customer satisfaction and purchasing decisions. It measures expected excellence and the ability to manage it to meet customer needs and expectations. Good service, such as speed of service, friendliness of staff, cleanliness of facilities, and clarity of information, creates a positive experience for customers, which in turn influences their purchasing decisions (Tjiptono, 2017).

A brand's image also plays an important role in influencing consumer choices. Brand image is the customers' perception and belief about a brand, which is formed through experience and marketing communications. As a global brand, Shell is known for its relatively good quality and environmentally friendly innovations. However, this perception may not be fully shared by all consumers in Indonesia, particularly among daily gas station users (Kotler & Keller, 2016). In marketing, consumer purchasing decisions are one of the main benchmarks for assessing the effectiveness of a company's strategy. Purchasing decisions are the stages that consumers go through before finally deciding to buy a product or service, and they are influenced by many factors, including perception, experience, and brand image (Schiffman & Kanuk, 2008).

In marketing, consumer purchasing decisions are one of the main benchmarks for assessing the effectiveness of a company's strategy. Purchasing decisions are the stages that consumers go through before finally deciding to buy a product or service, and they are influenced by many factors, including perception, experience, and brand image (Schiffman & Kanuk, 2008).

This research is important to address Shell's challenges in the dynamic Indonesian fuel market. It analyses the impact of service quality and brand image on purchasing decisions.

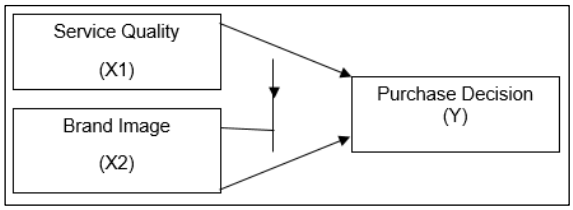

Fig.1. Framework of thinking

1. How does service quality affect consumer purchasing decisions at Shell gas stations?
2. How does brand image influence consumer purchasing decisions at Shell gas stations?
3. Do service quality and brand image simultaneously influence consumer purchasing decisions at Shell gas stations?

2. Methodology

The study was conducted between March and May 2025 using a quantitative approach. The research site was the Shell gas stations (SPBU) across Indonesia, focusing on customers who had used the service. The population comprised Shell SPBU customers across various regions, with a sample of 105 respondents selected through a non-probability accidental sampling technique via an online survey administered through TikTok. The data were collected using a structured questionnaire based on three indicators: Service Quality, Brand Image, and Purchase Decision, measured on a 5-point Likert scale. The instrument included questions on reliability, responsiveness, assurance, empathy, and tangibles for service quality; brand association, brand uniqueness, brand trust, and overall brand impression for brand image; and need recognition, information search, evaluation of alternatives, decision making, and post-purchase behaviour for the purchasing decision..

This study is a quantitative study using multiple linear regression analysis. The analysis was conducted using SPSS Statistics software to test the effect of independent variables (X1 = Service Quality and X2 = Brand Image) on the dependent variable (Y = Purchase Decision), both simultaneously and partially.

$$Y = a + b_1 X_1 + b_2 X_2 + e \quad (1)$$

Explanation:
Y = Purchase Decision
X_1 = Service Quality
X_2 = Brand Image
a = Constant
b_1, b_2 = Regression Coefficients
e = Error Term

Data was collected by distributing questionnaires to the research sample, namely Shell fuel consumers, during the abovementioned research period.

3. Results and Discussion

Respondent characteristics are the identities of respondents who were sampled for the study. The sample comprised 105 consumers who completed the questionnaire based on gender, age, and location. The following data presents the characteristics of the respondents:

Table 1. Characteristics by gender

No.	Gender	Frequency	Percentage (%)
1.	Male	40	38,1
2.	Female	65	61,9
Amount		105	100

Table 1 shows that 65 of the customers in this study were women (61.9%), and 40 were men (38.1%).

Table 2. Characteristics based on age

No.	Age	Frequency	Percentage (%)
1.	18-19 years old	3	3
2.	20-21 years old	24	23
3.	22-23 years old	61	58
4.	24-26 years old	17	16
Amount		105	100

Table 2 shows that most of the consumers in this study are aged 18-19, totalling three people (3%), 20-21, totalling 24 people (23%), 22-23, totalling 61 people (58%), and 24-26, totalling 17 people (16%).

Table 3. Characteristics based on location

No.	Location	Frequency	Percentage (%)
1.	North Sumatra	10	10
2.	West Java	32	28
3.	East Java	22	20
4.	Jakarta	41	42
Amount		105	100

Table 3 shows that most consumers are located in North Sumatra (10 people or 10%), West Java (32 people or 28%), East Java (22 people or 20%), and Jakarta (41 people or 42%).

Validity testing is conducted to determine the accuracy and precision of an instrument in performing its measurement function. In this study, validity testing aims to measure whether the items in the questionnaire can describe the variables being studied, namely Service Quality, Brand Image, and Purchase Decisions.
The testing was conducted using SPSS software and the Pearson Product-Moment correlation analysis method. A research result can be considered valid if the data obtained corresponds to the conditions or facts that occurred in the object being studied. According to Priadana and Sugiono (2021), an instrument can be considered valid if the rhitung value is greater than the rtabel value, while a r-count value smaller than the r-table value means the instrument is not valid.

In addition, the instrument also needs to be tested for reliability. An instrument is considered reliable if it can produce consistent data when used repeatedly to measure the same object. For example, a rubber ruler is considered unreliable (Priadana & Sugiono, 2021). For reliability testing, Cronbach's alpha is used, where a value greater than 0.60 indicates the instrument is reliable, while a value less than 0.60 means it is unreliable.

Table 4. Validity of the service quality variable instrument (X1)

Instrument	r_calculate	r_table	Conclusion
X1.1	0.546	0.361	Valid
X1.2	0.53	0.361	Valid
X1.3	0.569	0.361	Valid
X1.4	0.509	0.361	Valid
X1.5	0.454	0.361	Valid

X1.6	0.724	0.361	Valid
X1.7	0.623	0.361	Valid
X1.8	0.607	0.361	Valid
X1.9	0.723	0.361	Valid
X1.10	0.444	0.361	Valid

Based on Table 4 above, most instrument items for the Service Quality variable (X1) have a rhitung value greater than 0.361. This indicates that all statement items for the Service Quality variable (X1) can be declared valid.

Table 5. Validity of brand image variable instrument (X2)

Instrument	r_calculate	r_table	Conclusion
X2.1	0.514	0.361	Valid
X2.2	0.522	0.361	Valid
X2.3	0.729	0.361	Valid
X2.4	0.557	0.361	Valid
X2.5	0.604	0.361	Valid
X2.6	0.524	0.361	Valid
X2.7	0.268	0.361	Invalid
X2.8	0.541	0.361	Valid
X2.9	0.651	0.361	Valid
X2.10	0.618	0.361	Valid

Table 5 above shows that the test results for most of the Brand Image (X2) variable instruments have a rhitung value > 0.361. Thus, it can be concluded that the statement instruments of the Brand Image (X2) variable used are valid, and only the seven statement instruments are declared invalid.

Table 6. Validity of the purchase decision (Y) variable instrument

Instrument	r_calculate	r_table	Conclusion
Y1	0.428	0.361	Valid
Y2	0.546	0.361	Valid
Y3	0.587	0.361	Valid
Y4	0.531	0.361	Valid
Y5	0.597	0.361	Valid
Y6	0.394	0.361	Valid
Y7	0.655	0.361	Valid
Y8	0.415	0.361	Valid
Y9	0.650	0.361	Valid
Y10	0.616	0.361	Valid

Based on the data in Table 6 above, most of the instrument items for the Purchase Decision (Y) variable have a rhitung value greater than 0.361. Thus, it can be concluded that all statement items for the Purchase Decision (Y) variable are valid.

Table 7. Research instrument reliability results

Variable	Cronbach's alpha Calculate	Cronbach's alpha Tolerance	Conclusion
Service Quality (X1)	0.771	0.60	Reliable
Brand Image (X2)	0.746	0.60	Reliable
Purchase Decision (Y)	0.733	0.60	Reliable

The reliability test results indicate that Cronbach's alpha value exceeds 0.60, suggesting that this research questionnaire is reliable. This test was conducted to determine the effect of service quality and the Shell fuel brand image on consumer purchasing decisions at public

fuel filling stations (SPBU). The following table shows the results of multiple linear regression testing on each variable:

Table 8. Multiple linear regression results

Model		Unstandardised Coefficients		Standardised Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	10.658	3.042		3.503	.001
	Service Quality	-.049	.064	-.060	-.777	.439
	Brand Image	.805	.080	.783	10.064	.000

Based on the results of the analysis, the multiple linear regression equation can be formulated as follows:

$$Y = 10.658 - 0.049X1 + 0.805X2 \quad (2)$$

The multiple linear regression model's constant value for purchase decisions is 10.658. This indicates that Service Quality and Brand Image have a value of 0, so the average value of the dependent variable (Y) is estimated at 10.658. The regression coefficients for each independent variable are negative for X1 (-0.049) and positive for X2 (0.805), meaning that only the Brand Image (X2) variable influences the decision to purchase Shell fuel.

Table 9. Results of the coefficient of determination (R2) test

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.752[a]	.565	.556	2.702

The coefficient of determination value of 0.565 or 56.5% indicates that the variables of service quality and brand image can explain the variation that occurs among Shell fuel consumers in Indonesia. Meanwhile, the remaining 43.5% is attributed to other variables that fall outside the scope of this study.

A simultaneous test (F-test) was conducted to determine the influence of service quality and brand image on purchasing decisions. The test was conducted at a confidence level of 95% or an error rate of α=0.05% with the criteria.

1. If fcount ≤ ftable, then H0 is accepted, H1 is rejected, meaning that simultaneously this study has no effect.

2. If fcount > ftable, then H0 is rejected, H1 is accepted, meaning that this study has a simultaneous effect.

Table 10. Simultaneous test results (F Test)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	966.705	2	483.352	66.181	.000[b]
	Residual	744.953	102	7.303		
	Total	1711.657	104			

Based on the results of the ANOVA test in the table, the F value of 66.181 with significance (Sig.) 0.000 < 0.05 indicates that the regression model used is statistically significant. This means that the independent variables collectively have a significant effect on the dependent variable. The regression Sum of Squares value of 966.705 describes the variation in data that the model can explain, while the residual Sum of Squares of 744.953 reflects the variation that cannot be explained by the model. Thus, the regression model tested is suitable for predicting the dependent variable in this study.

Partial test (t-test) aims to see the effect of service quality and brand image on purchasing decisions, with the following criteria:

1. If tcount ≤ ttable, then H0 is accepted, H1 is rejected, meaning that this study has no partial effect;

2. If tcount ≥ ttable, then H0 is rejected, H1 is accepted, meaning that this study has a partial effect.

Table 11. Partial test results (t-test)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	10.658	3.042		3.503	.001
	Service Quality	-.049	.064	-.060	-.777	.439
	Brand Image	.805	.080	.783	10.064	.000

Based on the table, it can be seen that:

1. The t-value for service quality is -0.777 < 1.983, so H0 is accepted, meaning that service quality does not have a significant partial effect on purchasing decisions.
2. The t-value for brand image is 10.064 > 1.983, so H0 is rejected, meaning that brand image has a significant partial effect on purchasing decisions.

4. Conclusion

Based on the results of the data analysis in this study, it can be concluded that in terms of service quality (X1), the majority of respondents gave positive responses, with 90% agreeing or strongly agreeing with statements reflecting the facilities, services, and cleanliness of Shell gas stations. However, in the multiple linear regression test and t-test (partial), the service quality variable was found to have no significant effect on purchasing decisions (significance value 0.439 > 0.05 and t-calculated -0.777 < t-table 1.983). Conversely, brand image (X2) also received very positive ratings from respondents, averaging 89% agreeing or strongly agreeing. Regression analysis showed that only brand image had a significant influence on purchasing decisions, with a positive coefficient value of 0.805 and a significance level of 0.000. The results of the simultaneous test (F test) show that both independent variables (service quality and brand image) together have a significant effect on purchasing decisions, with an F-count value of 66.181 > F-table and a significance value of 0.000 < 0.05. The coefficient of determination (R^2) value of 0.565 indicates that these two variables can explain 56.5% of the variability in Shell fuel purchasing decisions, while other factors outside the research model explain the remaining 43.5%. These results reinforce that although service quality does not have an individual effect, its presence still contributes when combined with brand image in influencing consumer decisions.

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THE INFLUENCE OF DIGITAL MARKETING STRATEGIES AND PRODUCT QUALITY ON SALES GROWTH IN SMALL AND MEDIUM-SIZED ENTERPRISES: A CASE STUDY OF MAMAK FROZEN FOODS

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Abstract

This study aims to examine the influence of digital marketing strategy and product quality on sales growth among micro, small, and medium enterprises (MSMEs). The development of information and communication technology has enabled MSME to adopt digital marketing strategies to improve sales performance. This study addresses the need to understand the key factors that supports sales growth of MSMEs in the digital era. In addition, product quality is considered an important factor in attracting customers and maintaining market share. This research employs a quantitative approach using multiple linear regression analysis.
The results indicate that digital marketing strategy has a significant partial effect on sales growth ($t = 5.250$; $p < 0.001$), whereas product quality does not have a significant partial effect ($t = 1.232$; $p = 0.227$). Simultaneously, the two variables have a significant effect on sales growth ($F = 267.734$; $p < 0.001$). The coefficient of determination (R^2) is 0.942, indicating that the model provides a very strong explanation of the variance in the dependent variable. The model also satisfies classical assumption tests, including normality, absence of multicollinearity, and absence of heteroscedasticity. These findings suggest that digital marketing strategy is a key factor in driving sales growth among MSME or SME. (inconsistent terminology) whereas product quality alone does not have a significant impact on sales growth in this context.
Keywords: Digital Marketing Strategy; Product Quality; Sales Growth

1. Introduction

Frozen Food Mamak is a local small and medium enterprises (SMEs) engaged in the frozen food sector, oriented toward household and student market. Along with the increasing need for instant, practical, and durable food, frozen food products are increasingly in demand by various levels of society. Changes in urban lifestyles and the high mobility of modern society leadconsumers to choose ready-to-eat foods. This phenomenon creates significant opportunities for business such as Frozen Food Mamak. However, this high demand has not been matched by an integrated and sustainable marketing and product quality management strategy. Many MSMEs only focus on production, without developing a systematic approach to the digital market and customer satisfaction.

Based on observations, Frozen Food Mamak has relied on conventional marketing strategies such as word-of-mouth recommendations, peer-to-peer promotions, and occasional social media posts without careful planning. In fact, the digital ecosystem provides great potential to reach a wider market quickly and cheaply. Changes in people's consumption patterns since the COVID-19 pandemic have prompted consumers to switch to online purchases for food, including frozen food. Research by Rezky et al. (2003) shows that consumers purchase of frozen food products via online platforms has increased significantly. However, MSMEs that have not adopted digital marketing systematically will lag behind competitors, especially in terms of reach and brand perception.

On the other hand, product quality plays a vital role in retaining and attracting new customers. In the frozen food industry, factors such as taste, texture, colour, packaging, and product durability are very important. MSMEs such as Frozen Food Mamak often ignore the importance of quality standardization, both in the production and packaging processes. According to (Suryanti, 2021), consistently poorly product quality can lead to customer dissatisfaction, which ultimately affects repurchase decisions. Therefore, business development strategies should not rely solely on digital marketing, but also they need to be supported by a planned and measurable quality management system. The combination of the two forms an important foundation for driving continuous sales increase.

A study by (Lestari et al., 2022) examining the influence of product quality and price perception on sales through digital marketing provides an important insight into the relationship between variables. However, their focus is still limited to the food industry in general, not to frozen food. In addition, their approach does not highlight the special characteristics of household-scale MSMEs such as Frozen Food Mamak, which has limited resources but is flexible in product innovation and distribution.

This research developed a quantitative model to analyse the influence of digital marketing strategies and product quality on sales. t This research used a case study of Frozen Food Mamak, providing a realistic and relevant picture of the conditions faced by MSMEs in the field. . Therefore, the results of this study are not only theoretical but also practical and can be directly applied by business owners, particularly in the frozen food sector

The findings of this study are expected to make a practical contribution in designing marketing strategies that are more effective and oriented to the needs of digital consumers. With measurable research results, Frozen Food Mamak and similar MSME can develop targeted promotional plans and improve product quality based on direct market input. This will accelerate their adaptation to the changing dynamic digital business environment.

Thus, the main purpose of this study is to analyze and demonstrate empirically that digital marketing strategies and product quality have a significant influence on it the sales growth of frozen food MSMEs. This research is also expected to make a real contribution to the development of science in the field of MSME marketing management and more sustainable business practices at the local community level.

2. Methodology

This study uses a quantitative approach with associative and cross-sectional design. The quantitative approach was chosen because it allows researchers to objectively measure and analyze the relationships between variables through numerical data. The cross-sectional design was chosen because the data were collected at a single point in time, without repeated observations. This study is associative, because it aims to determine the simultaneous and partial influence between independent and dependent variables.

The independent variables in this study consisted of:
X_1 = Digital Marketing Strategy
X_2 = Product Quality

While the dependent variables:
Y = Increase in Sales

This research was conducted t MSME Frozen Food Mamak, with respondents being consumers who had made at least two purchases. The total sample of 50 respondents was obtained through purposive sampling, using a digital questionnaire (Google Form).

The questionnaire was compiled based on indicators from each variable that had been validated in previous research. Each statement item was measured using a 5-point Likert scale, ranging from "Strongly Disagree" (1) to "Strongly Agree" (5). Before use, the questionnaire was tested for validity and reliability.

The data obtained from the questionnaire were analyzed using multiple linear regression to find out:
The simultaneous influence of X_1, X_2, on Y,
The partial influence of each independent variable on the dependent variable.

a Population and sample

The population in this study includes all MSME in the culinary sector who actively use social media as the main means of marketing their products, especially those operating in Medan City area, North Sumatra Given the large number of MSMEs and wide geographical conditions, this study is focused on one business unit as a case study, namely MSMEs Frozen Food Mamak, which is located on Jalan Pelita VI, Medan Perjuangan District. This business unit was chosen because it consistently utilizes digital marketing strategies and has active consumers with repeat purchase rates, making it relevant to the research to the objectives

The sampling technique used is purposive sampling, a deliberate selection method based on certain criteria relevant to the needs of the research. In this context, only respondents with direct experience of digital marketing aspects, product quality, and service innovation were involved so that the data generated are valid, focused, and in accordance with the research context.

The number of 50 respondents was considered optimal for the quantitative approach because it provided a sufficient basis for statistical analysis, especially multiple linear regression, which requires the representation of data from _multiple perspectives. . This sample size is expected to be able to provide an accurate empirical picture of the relationship between the variables studied, as well as produce findings that can be used as a basis for strategic decision-making for the development of MSME businesses in the frozen food sector.

b Variable Operational Definition

The following operational definitions of variables are designed to provide a clear measurement of the research variables.

Table 1. Operational definitions of variables

Variabel	Dimension	Indicator	Measurement Scale
Digital Marketing (X1)	Google Business for Visibility	Completeness of your Google Business profile and easy access to location, business hours, contact information	Likert (1–5)
	Local Marketing	Leveraging Google Business to reach local consumers and promote through Google Posts	Likert (1–5)
	Customer Reviews Management	Demand for positive reviews, and the influence of reviews on purchase decisions	Likert (1–5)
	Analytics & Performance Measurement	Use Google Business analytics data to monitor performance and adjust marketing strategies	Likert (1–5)
	Ads Feature Utilization	Use of Google Ads advertising features to increase product reach and promotion	Likert (1–5)

Product Quality (X2)	Product Performance	Taste suitability, quality, and ease of preparation of products	Likert (1–5)
	Product Reliability	Availability of the product in good condition and free of damage	Likert (1–5)
	Product Durability	Durability of the product during storage in the freezer	Likert (1–5)
	Product Design	Attractive, informative, easy to open and maintain freshness	Likert (1–5)
	Ease of Use	Clear and easy-to-follow instructions for consumers	Likert (1–5)
Sales Increase (Y)	Sales Promotion Strategy	The use of discounts, bundling, coupons, and their effect on increased purchases	Likert (1–5)
	Social Media Marketing	Promotional activities on social media and their impact on customer reach	Likert (1–5)
	Customer Reviews	The use and influence of customer reviews on digital platforms on purchases	Likert (1–5)
	Data-driven Marketing & Analytics	Use of customer data and digital analytics in the evaluation and improvement of marketing strategies	Likert (1–5)
	Paid Ads	Use of paid advertising to expand the market and increase product visibility	Likert (1–5)

c Data Collection Techniques

The data collection technique was carried out using primary data The primary data in this study was obtained from 50 respondents of Frozen Food Mamak consumers who were selected purposively, with the main criterion being that they had made purchases at least twice. These criteria are used to ensure that respondents have sufficient experience and knowledge in evaluating aspects of products and services. Data collection was carried out online through the questionnaires administered via Google Forms.

d Data Analysis Techniques

Data obtained from 50 Frozen Food Mamak consumer were processed and analyzed using SPSS software, with several stages of analysis to ensure validity, reliability, and to test the relationship between the variables studied. This technique was used to answer research questions regarding the influence of digital marketing strategy (X_1) and product quality (X_2) on sales growth (Y).

e Location and Time of the study

The research was conducted at MSMEs Frosen Food Mamak, which is located at JL. Pelita VI, Medan Perjuangan District, Medan City, North Sumatra. Data collection was carried out from March to May 2025

3. Results and Discussion

a. Classic Assumption Test

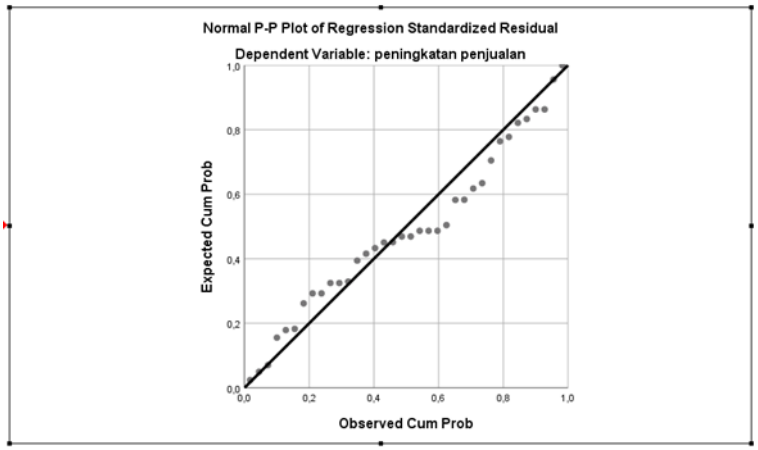

Fig. 1. Normality test

For the Kolmogorov–Smirnov normality test, the test statistic must have a p-value greater than 0.05, indicating that the data can be considered normal.

One-Sample Kolmogorov-Smirnov Test

		Unstandardized Residual
N		36
Normal Parameters[a,b]	Mean	,0000000
	Std. Deviation	2,30559033
Most Extreme Differences	Absolute	,134
	Positive	,134
	Negative	-,093
Test Statistic		,134
Asymp. Sig. (2-tailed)		,098[c]

a. Test distribution is Normal.
b. Calculated from data.
c. Lilliefors Significance Correction.

Fig. 2. NPar test

Based on the Kolmogorov–Smirnov normality test, an Asymp. Sig. (2-tailed) value of 0.098 was obtained.

b. Hypothesis Test

Table 1. Coefficient of hypothesis test

Model	B	Std. Error	Beta	t	Sig.
(Constant)	-4.719	2.058		-2.293	.028
strategi digital marketing	.895	.170	.791	5.250	.000
kualitas produk	.216	.176	.186	1.232	.227

Based on SPSS version 25 output, the multiple linear regression produced a constant of −4.719, a digital marketing coefficient of 0.895, and a product quality coefficient of 0.216. The regression equation is:

Formula:

$$Y=-4.719+0.895X1+0.216X2 \quad (1)$$

The multiple regression results can be interpreted as follows:

a. The value of the constant = -4.719 which means that if the Digital Marketing variable(X1) and the Product Quality variable(X2) are zero-0, then the dependent variable(Y) remains valued at -4.719.
b. The value of the coefficient of the Digital Marketing variable (X1) has a positive value of 0.895 which means that if the Digital Marketing variable (X1) increases, while other independent variables remain constant, the dependent variable (Y) will increase by 0.895
c. The value of the coefficient of the Product Quality variable (X2) has a positive value of 0.216 which means that if the Product Quality variable (X2) increases, while other independent variables remain constant, the variable (Y) will increase by 0.216

c. Determination Coefficient Test (R Square)

Table 2. Coefficient test of R square

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.971[a]	.942	.938	2.374

R Square (R^2) = 0.942. This means that 94.2% of the variation in the dependent variable (increase in sales) can be explained by two independent variables used in the model, namely digital marketing strategy and product quality.

Adjusted R^2 = 0.938. Adjusted R^2 provides an adjustment to the number of independent variables used. This value is also high, indicating that the regression model remains robust and that no overfitting occurs despite the presence of two predictors.

Standard Error of the Estimate = 2.374. This indicates the degree to which the predicted value deviates from the actual value. The smaller this value, the better the model is at predicting the data.

The determination coefficient of 94.2% indicates that this regression model has a very strong ability to explain the variable of sales increase. This means that digital marketing strategies and product quality, together, have a significant influence on increasing sales. The remaining 5.8% is attributed to other variables outside this model.

b. Simultaneous Determination Coefficient

Table 3. Coefficient test of simultaneous

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.971[a]	.942	.938	2.374

It is known that based on table VI.23 the value of the Adjusted R square is 0.938, it is concluded that the contribution of the influence of independent variables on the dependent variables simultaneously or jointly is 93.8%,

c. Partial T test

Table 4. Coefficient of partial T test

Model	Unstandardized Coefficients (B)	Std. Error	Standardized Coefficients (Beta)	t	Sig.	
1	(Constant)	-4.719	2.058		-2.293	.028
	strategi digital marketing	.895	.170	.791	5.250	.000
	kualitas produk	.216	.176	.186	1.232	.227

The t-test results indicate that only the digital marketing strategy variable has a significant effect on sales growth. Meanwhile, product quality did not have a significant partial effect in this regression model.

d. Simultaneous F–test

Table 5. Coefficient of partial F test

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	3018,921	2	1509,461	267,734	,000
Residual	186,051	33	5,638		
Total	3204,972	35			

The value of Sig. = 0.000, much smaller than 0.05. This means that the regression model is jointly significant, indicating that digital marketing strategy and product quality together have a significant effect on sales growth.

Based on the results of ANOVA's analysis, an F value of 267.734 was obtained with a significance value (Sig.) of 0.000. Since the significance value is smaller than the significance level of 0.05, it can be concluded that the regression model is simultaneously significant.
In other words, digital marketing strategy and product quality together have a significant influence onsales growth. This shows that the regression model used in this study is feasible and reliable for explaining the variations in the sales growth variable.

4. Conclusion

Frozen Food Mamak is an example of a frozen food MSME facing the demands of an increasingly digital market. Demand for convenient food products has indeed increased rapidly, but many businesses still rely on conventional marketing methods without an integrated strategy. However, post-pandemic consumer behavior has driven a shift to online purchasing, creating significant digital market potential. This study aimed to examine the influence of digital marketing strategies and product quality on sales growth.

The results showed that the hypothesis regarding the influence of digital marketing strategies was confirmed, whereas the hypothesis regarding the influence of product quality was only partially supported. In other words, digital marketing strategies played a significant role in increasing Frozen Food Mamak's sales growth. Product quality, while important for customer satisfaction, did not show a significant effect separately in this regression model. However, both variables simultaneously had a significant impact on sales. This finding confirms that the implementation of digital marketing strategies is a key factor in driving MSME sales growth in the study context, while quality improvement remains crucial within an overall strategy framework.

Practically, the findings of this study provide concrete contributions to frozen food MSMEs. With a deeper understanding of the influence of digital marketing and product quality, Frozen Food Mamak and similar businesses can design targeted online promotional plans and improve product quality based on market feedback. This approach accelerates business adaptation to the dynamics of the digital environment and enriches the development of MSME marketing management knowledge at the local level.

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THE INFLUENCE OF SOCIAL MEDIA PROMOTION AND CONSUMER REVIEWS ON PURCHASING DECISIONS ON FASHION PRODUCT PURCHASE FOR GEN Z IN MEDAN

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Abstract

The purpose of this study is to ascertain how social media promotion affects Generation Z's decisions to buy fashion products, how consumer reviews affect Gen Z's decisions to buy fashion products, and how social media promotion and consumer reviews work together to affect Gen Z's decisions to buy fashion products in Medan City. The study uses an associative descriptive methodology and is quantitative in nature. There are 89,589 members of the Gen Z population in Medan, and 100 respondents' responses were collected through purposive sampling techniques. A Likert scale-based questionnaire was used to gather the data, and t-tests, F-tests, multiple linear regression analysis, validity, reliability, and traditional assumption tests were used for analysis. The findings show that Gen Z fashion product purchasing decisions in Medan City were positively and significantly impacted by social media promotion (X_1), with a t-count value of 6.042> t-table 1.66071 and a significance level of 0.000 <0.05. Attractive social media promotions can lead to more purchases, according to the regression coefficient of 0.582. Additionally, t-count 4.758> t-table 1.66071, significance 0.000 <0.05, and a regression coefficient of 0.426 show that Consumer Reviews (X_2) also have a positive and significant influence, indicating that favourable customer reviews reinforce purchase decisions. With an F-count value of 160.328> F-table 3.09, significance 0.000, and an R2 value of 0.768, both variables concurrently have a significant impact on purchasing decisions. This indicates that social media promotions and customer reviews account for 76.8% of the variables that influence purchasing decisions.
Keywords: Social media promotion; Consumer reviews; Purchasing decisions.

1. Introduction

Korean fashion products are experiencing a surge in popularity in Indonesia, especially among Gen Z, because the design is unique, modern, and in line with the trend of Korean pop culture, such as K-pop and Korean dramas (Asia Commerce, 2025). Korean Wave, or Hallyu, has expanded its influence on music entertainment and the fashion industry, where Korean celebrities have become a reference for young adults (W. Wicaksono, 2021). Fashion is also becoming a means of expressing self and social identity, influencing lifestyle and decision-making, and influencing Gen Z consumption (Nurcaya, 2021). Social media has become a primary channel for Korean fashion promotion. Platforms like Instagram and TikTok allow brands to showcase products visually and interactively, forming a positive perception and attracting Gen Z attention (Aprianti, 2021). Packaged promotions in a creative way on social media have proven capable of influencing purchase decisions, because consumers feel more connected with products viewed directly in everyday activities (MI Sari and PH Heng, 2024).

Consumer reviews also play an important role in the decision-making process. Consumers tend to trust experienced buyers because reviews are considered more objective than advertisements. Positive reviews increase trust, whereas negative reviews can lower interest in buying (Sujarweni, 2022) (Sagia, 2023). In the Korean fashion context, many consumers depend on online testimonials before making a purchase (Nurmalasari, 2022).

The results of a pre-survey of 30 Gen Z respondents in Medan showed that once they see Korean fashion promoted on social media, they will likely be interested in buying the product. Most respondents mentioned that they would read the product's reviews before buying and stated that positive reviews would influence their buying decisions. This shows that social media promotion and customers' reviews can influence significant decisions to purchase Korean fashion products. Based on the pre-survey results, the researchers were interested in researching how social media promotion and consumer reviews influence Gen Z purchase behaviour in Medan.

2. Methodology

This study uses a purposeful quantitative approach to test the influence of social media promotion and consumer reviews on the decision to purchase Korean fashion products among Gen Z in Medan (Sinambela, 2020), (Bougie, 2021). The study was conducted from May to June 2025 in Medan. The study population was Gen Z, aged 18-25, who are active in social media and have purchased Korean fashion products at least once.

One hundred respondents were selected using purposive sampling, a non-probability sampling method, based on certain criteria (Bahri, 2021) , (Sugiyono, 2022). The primary data was a questionnaire distributed personally and online. The Likert scale uses a five-point scale from "strongly disagree" to "strongly agree" to evaluate respondents' perceptions of the variables in the research (Ghozali, 2020). Test validity was conducted to ensure the instrument could measure what it should be measuring, whereas Cronbach's Alpha was used to measure the reliability. Cronbach's alpha values range from 0 to 1. A higher value indicates greater internal consistency. Typically, values above 0.7 are considered acceptable (Tham, 2021).

Before doing the regression analysis, test assumptions classic consisting of test normality (using Kolmogorov-Smirnov), test heteroscedasticity (with scatter plot), and test multicollinearity (with tolerance value and VIF) (Keller, 2020), (Solomon, 2022). A multiple linear regression model was used to predict the influence of social media promotion (X1) and consumers' reviews (X2) towards purchase decision (Y), with equation $Y = \alpha + \beta1X1 + \beta2X2 + e$ (Tham, 2021) (Bahri, 2021). Hypothesis testing was conducted using a t-test to determine how each independent variable partially influences the outcome and an F-test to assess the simultaneous influence. The coefficient of determination (R^2) measures how well a statistical model predicts an outcome, represented by the model's dependent variable (Keller, 2020).

3. Results and Discussion

One-Sample Kolmogorov-Smirnov Test		
		Unstandardized Residual
N		100
Normal Parameters[a,b]	Mean	.0000000
	Std. Deviation	4.52531870
Most Extreme Differences	Absolute	.118
	Positive	.068
	Negative	-.118
Test Statistic		.118
Asymp. Sig. (2-tailed)		.200[c]
a. Test distribution is Normal.		
b. Calculated from data.		
c. Lilliefors Significance Correction.		

Fig.1. Kolmogorov-Smirnov Normality Test Result

The One-Sample Kolmogorov-Smirnov test results above show that the residual data is normally distributed with a significance value of 0.200 (>0.05). Therefore, the normality

assumption is met, and the data can be analysed using regression or other parametric statistical tests.

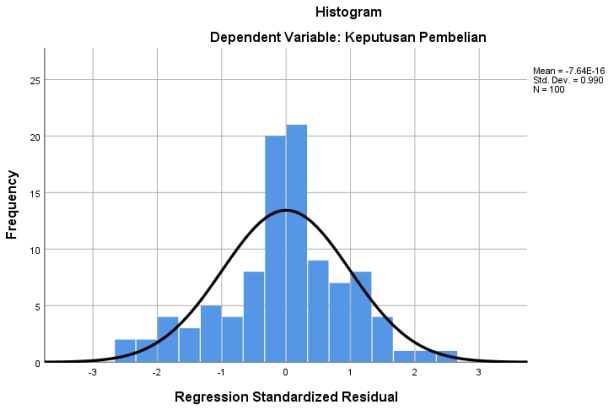

Fig. 2. Histogram of Normality Test Results

The histogram above shows that the distribution of regression standardised residuals for the purchase decision variable is close to the normal curve shape. This indicates that the residual data is normally distributed, so the normality assumption is met and the regression model is suitable for further analysis.

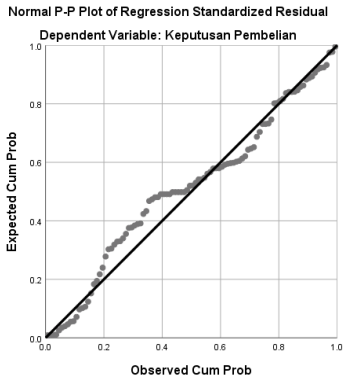

Fig. 3. P-Plot Normality Test Results

Figure 3 shows a Normal PP Plot of regression standardised residuals for the purchase decision dependent variable. The dots on the graph mostly follow the diagonal line, which indicates that the residual distribution is close to a normal distribution. This supports the assumption of normality in regression analysis, so the regression model can be considered valid for further testing.

Table 2. Glejser test for Heteroscedasticity Result

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	T	Sig.
1	(Constant)	6.565	1.381		4.754	.420
	Promosi Di Media Sosial	-.188	.061	-.511	-3.067	.103
	Ulasan Konsumen	.094	.057	.275	1.650	.102

a. Dependent Variable: ABS_RES

The results of the heteroscedasticity test using regression analysis show that the values (Sig.) for the social media promotion variables and consumer reviews are both significant and greater than 0.05. Thus, it can be concluded that there are no symptoms of heteroscedasticity

in the model. This means that the residual variance is constant, and the regression model fulfils the assumption of homoscedasticity.

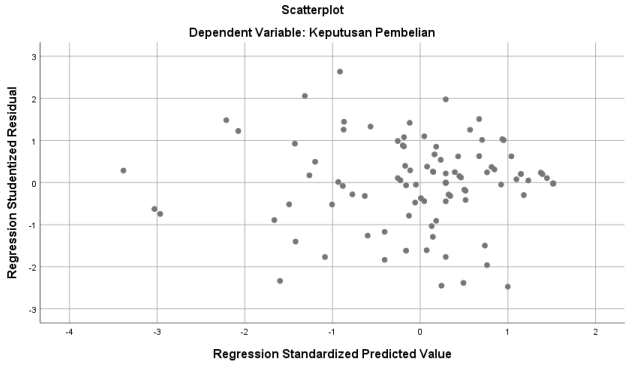

Fig. 3. *Scatterplot* Heteroscedasticity Test Result

The scatterplot shows that the points spread randomly and do not form a certain pattern (for example, a widening or narrowing spread pattern). This random distribution pattern indicates that the residual variance is constant or that homoscedasticity is fulfilled

Table 3. Multicolinearity Test Result

Coefficients[a]								
		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
Model		B	Std. Error	Beta	T	Sig.	Tolerance	VIF
1	(Constant)	-.298	2.167		-.137	.891		
	Promosi Di Media Sosial	.582	.096	.514	6.042	.000	.331	3.020
	Ulasan Konsumen	.426	.089	.405	4.758	.000	.331	3.020
a. Dependent Variable: Keputusan Pembelian								

The multicollinearity test results show that the tolerance value for social media promotion and consumer reviews is 0.331, and the VIF value for both is 3.020. As the tolerance value is> 0.10 and the VIF is < 10, it can be concluded that there is no multicollinearity in the regression model. This means that the two independent variables do not have a high correlation and are suitable for further analysis.

Table 4. Multiple Linear Regression Analysis

Coefficients[a]						
		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	-.298	2.167		-.137	.891
	Promosi Di Media Sosial	.582	.096	.514	6.042	.000
	Ulasan Konsumen	.426	.089	.405	4.758	.000
a. Dependent Variable: Keputusan Pembelian						

The multiple linear regression results show the equation:
Y = -0.298 + 0.582X, + 0.426X2, which means that social media promotion (X_1) and Consumer Reviews (X_2) have a positive effect on Purchasing Decisions (Y). The coefficient value of X_1 is 0.582. Both variables are statistically significant because they have a substantial value of 0.000 (<0.05), while the constant of -0.298 is not significant (sig 0.891), so its contribution to the model is less meaningful.

Table 5. Partial Hypothesis Test Results (t-test)

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.298	2.167		-.137	.891
	Promosi Di Media Sosial	.582	.096	.514	6.042	.000
	Ulasan Konsumen	.426	.089	.405	4.758	.000
a. Dependent Variable: Keputusan Pembelian						

a) Promotion on Social Media (X_1)
The Promotion on Social Media variable has a t-count value of 6.042 and a t-table value of 1.66071. This variable has a significant impact on purchasing decisions since t-count> t-table (6.042> 1.66071). Furthermore, since the significance value of 0.000 is less than 0.05, social media promotion significantly and favourably influences purchasing decisions. As a result, H1 is accepted and H0 is rejected.

b) Review Consumers (X_2)
The Consumer Reviews variable has a t-count value of 4.758 and a t-table value of 1.66071. This variable also significantly influences purchasing decisions because t-count > t-table (4.758 > 1.66071). The conclusion that consumer reviews have a positive and significant influence on purchasing decisions is further supported by the significance value of 0.000, which is less than 0.05. Consequently, H2 is accepted and H0 is rejected.

Table 6. Simultaneous Significant Test Results (F-test)

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	6701.938	2	3350.969	160.328	.000[b]
	Residual	2027.372	97	20.901		
	Total	8729.310	99			
a. Dependent Variable: Keputusan Pembelian						
b. Predictors: (Constant), Ulasan Konsumen, Promosi Di Media Sosial						

The results of the F test show that the F-count value of 160.328 is greater than the F-table of 3.09, and the significance value is 0.000 <0.05. This suggests that, simultaneously, social media promotion and consumer reviews have a significant impact on purchasing decisions. Thus, the regression model is feasible, and the alternative hypothesis (H_a) is accepted.

Table 7. Results of the Coefficient of Determination (R^2)

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.876[a]	.768	.763	4.57173
a. Predictors: (Constant), Ulasan Konsumen, Promosi Di Media Sosial				

According to the Model Summary output, a strong correlation exists between social media promotion and customer reviews when making purchases, as indicated by the R value of 0.876. With an R Square value of 0.768, these two variables account for 76.8% of the variation in purchasing decisions, with other factors outside the model influencing the remaining 23%. Since the Standard Error of the Estimate value of 4.57173 indicates a low error rate and the

Adjusted R Square value of 0.763 strengthens the model's predictive power, the model is considered.

1. The Influence of Social Media Promotion on Purchase Decisions
This study reveals that social media promotion positively and significantly impacts the purchase decisions of fashion products among Generation Z in Medan. This generation is closely connected to digital technology and spends a considerable amount of time on social media, making them more receptive to promotional content that is visually and audibly engaging (Aprianti, 2021). Social media promotion also allows for flexible outreach using personalised approaches. Content such as influencer reviews, short videos, or promotional stories tailored to the Gen Z lifestyle can create emotional engagement that leads to stronger purchase intent (MI Sari and PH Heng, 2024). In modern marketing, social media is an information channel and a persuasive tool that shapes consumer perception and preference. Previous studies have confirmed the effectiveness of social media as a promotional medium that enhances brand awareness and influences purchase actions.

2. The Influence of Consumer Reviews on Purchase Decisions
Consumer reviews have been shown to significantly influence purchasing decisions, as indicated by the t-test results in this study, where the t-value greatly exceeded the critical value and the significance level was well below 0.05. Consumer reviews act as social proof, boosting potential customers' confidence in a product or service. Gen Z frequently seeks user reviews through digital platforms before purchasing (Sagia, 2023). This behaviour aligns with consumer behaviour theory, which explains that external influences, such as the opinions of others, play a crucial role in shaping purchasing behaviour. Rather than being supplementary, consumer reviews have become a critical factor in determining how products are perceived and ultimately purchased (Nurmalasari, 2022)].

3. The Simultaneous Influence of Promotion and Consumer Reviews on Purchase Decisions
The F-test results in this study show that social media promotion and consumer reviews collectively significantly impact the purchase decisions of fashion products among Gen Z consumers. Promotions help build product appeal, while consumer reviews reinforce trust by lowering perceived risk and hesitation. Together, these elements complement one another and strengthen consumers' final decisions to purchase (al, 2021). With social media enabling direct interaction between consumers and brands, and the presence of user-generated reviews, a digital ecosystem emerges that effectively supports purchase decisions. The electronic word-of-mouth (e-WOM) model is particularly relevant to the digital behaviour patterns of Generation Z (Aprianti, 2021).

4. Conclusion

Based on the result analysis that has been discussed, it can be concluded that social media promotion (X_1) has a positive and significant influence on the decision to purchase Korean fashion products by Gen Z in Medan. This was proven with a t-value of 6,042, which is much bigger than the t-table 1,66071, and significance of 0.000 < 0.05. Coefficient regression of 0.582 shows that the more interesting and intensive promotion through social media, the higher the tendency of Gen Z to make a purchase decision. Consumers' review (X_2) also proved significantly influential, with a t-count of 4.758 > 1.66071 and significance 0.000 < 0.05, and a regression coefficient of 0.426, which indicates that a positive review from consumers can push a decision to purchase. Simultaneously, both variables have a significant influence on the decision to purchase, as shown by the F-value calculated at 160.328, which far exceeds the F-table value of 3.09 with significance of 0.000. The R Square value of 0.768 indicates that 76.8% of the variation in purchase decisions can be explained by social media promotion and consumer reviews, while other variables outside of this study influenced the rest.

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THE INFLUENCE OF SERVICE QUALITY, PRODUCT QUALITY ON CUSTOMER SATISFACTION AT INDOMARET WAHIDIN

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Abstract

This study aims to find out whether Service Quality and Product Quality Affect Customer Satisfaction at Indomaret Wahidin. This research method uses a quantitative research approach. The data collection technique used is the Slovin Technique; the sample used is 36 respondents. The sampling technique used in this study uses non-probability with the number of populations in this study taken from customers who have shopped at Inomaret Wahidin. The scale used is the Likert scale, the data analysis technique uses correlation analysis, classical assumption test, determination correlation, multiple linear regression analysis and T test. Two asterisks mean a significant correlation at the level of 0.01 with a 2-sided test. Meanwhile, the closeness of the relationship is substantial because the value is more than 0.918. Which means that the variables X1, X2 and Y have a strong positive correlation. Then from the correlation test, the percentage determination between Service Quality, Product Quality and customer satisfaction was 84.8%, of which the remaining 15.2% was influenced by other factors outside of this study.
Keywords: Service quality; Product quality; Customer satisfaction.

1. Introduction

The retail business in Indonesia, especially in Medan, has experienced quite rapid development in recent years, with various forms and types. Retail is a business that sells household products, including daily necessities, using a self-service system (consumers take the goods they want themselves). Every day, competition in the business world is getting tighter with the advancement of technology and information so that consumers have complete information about the choice of products available in the market. Therefore, consumers are the main thing that must be considered in addition to the products we present. According to Annisa & Hasoloan (2021), to win increasingly competitive competition, business actors are required to be able to create a competitive advantage over their products and services in an effort to satisfy customers. This is very important because the marketing concept states that meeting consumer needs is an economic and social requirement for the survival of a company.

Indomaret itself is a retail company and company that strictly maintains and prioritizes service quality and product quality in order to achieve consumer satisfaction and increase profits for the company. Indomaret is a chain of minimarkets that provides basic and daily necessities with a sales area of less than 200 m². The first store under the name Indomart was opened in Ancol, North Jakarta, on June 20, 1988, managed by PT Indomarco Prismatama. In 1997, the company developed the first outlet franchise business in Indonesia, after having more than 230 outlets. The number of outlets until 2015 was 11,400 outlets with details of 60% of the outlets being owned by themselves and the rest franchises owned by the community. As of June 2022, the number of outlets is 20,000 outlets.The purpose of the research is to prove empirically whether Service Quality and Product Quality have a positive and significant effect on Customer satisfaction at Indomaret Wahidin?

Fig. 1. The first Indomaret in Indonesia.

As shown above, this is the first image of idomaret in Indonesia.

2. Methodology

According to Veronica et al., (2022), research methods are scientific ways to obtain evidence or information in order to achieve the desired goals and benefits. According to Balaka, (2020) research means searching again and continuing to search again. In a more specific sense, scientific research is a series of observations that are made continuously and continuously, accumulating and will eventually produce theories that can explain phenomena.

In this study, I used a quantitative method where to find out how many samples should be taken, I used the solving formula sample technique, and used a data collection technique using a questionnaire or closed questionnaire technique. In this study, I used 2 independent variables and 1 dependent variable where the variables that could not be maintained were Service Quality (X1), Product Quality (X2) and the bound or dependent variable was Customer Satisfaction (Y).

According to Janna (2020) Research Variables are attributes, values or properties of a research object (individual or activity) that have certain variations between one object and another. According to (Misbahuddin et al., 2021), the operational definition of a variable is to explain the research variable and the measurement scale of the variable and provide a limit to the variable being studied.

According to Amin et al., (2023), sampling techniques are indispensable in a study because they are used to determine who are the members of the population to be sampled. For this reason, sampling techniques must be clearly explained in the research plan so that they are clear and not confusing when entering the field.

According to Firmansyah & Dede (2022) sampling techniques are carried out to resemble the purpose of which is to eliminate confusion between techniques that look somewhat similar to each other. The technique used by the researcher is the sampling technique, which uses non-probability sampling which means giving equal opportunities to each member of the sampling.

According to Mardiatmoko (2020) the classical assumption test is an analysis carried out to assess whether there is a problem with the classical assumption in the OLS linear regression model. According to Jackie et al., (2022), simple linear regression is used for only one independent variable and one independent variable. According to Iskandar Yahya et al., (2023) simultaneous regression testing (f test) is useful for testing the influence of each independent variable simultaneously (together) on the dependent variable.

According to Basyit et al., (2020), the multicollinearity test was carried out with the aim of finding out if there is a correlation between independent variables in the regression model.

In data collection, I made direct observations on the level of proficiency of students through the learning platform. In this study, I used primary data, where I directly confronted the audience and got data directly from research sources directly.

In this study, I used Primary data, where I directly confronted the audience and got data directly from research sources directly. According to (Onesya Sarwana et al., 2023) the validity test determines the feasibility of the question list element (construction) when defining variables. The validity test aims to find out whether the questionnaire used by the researcher in measuring and obtaining research data from respondents is valid or not.

The tester uses the SPSS 25 program, and the tester also uses a validity test, where I use Product Moments, which is by linking the score of each item to the total score. The total score is the sum of the entire item. Items that are significantly correlated with the total score indicate that they are able to provide support in expressing what they want to express. According to Wijaksana, (2022) reliability tests are the level of consistency and stability of data or findings. The reliability that is considered quite high is > 0.6 with the Cronbach alpha formula as follows:

$$r =] [1- [ ][\frac{k}{(k-1)} \frac{\sum \sigma_b 2}{\sigma_r^2}$$

Information:
r = Reliability of the instrument coefficient (Cronbach alpha)
k = number of question items
∑ = total variants butir
s = variant total

Reliability test criteria
If the value of R ≥ 0.6 then the question item is reliable.
If R < 0.6, then the question item is unreliable.
Conclusion in the reliability test The author used Cronbach's harp formula.

2.3.3 Normality Test

According to (Wijaksana, 2022) the normality test aims to determine whether the regression model of dependent variables and independent variables has a contribution to the normality test of data using the author will use the Liliefors test by looking at the value on the Kolmogorov smirnow or not. The data is declared to be normally distributed if the significance is greater than 0.05.

According to Wijaksana, (2022) the formula used is:

$$p = \frac{t_t - \underline{t}}{s} \quad (1)$$

Information:
t_t : Sample value to t
$\underline{t}$: average score
s : Standard Division

The conclusion is that the Normality test examiner uses *the Smirnov-Kolmogorov formula.*

According to (Jusmawati et al., 2020), linearity is assessed to determine the linear relationship with the value of the sig value greater than α in the ANOVA table for Deviation from Linearity in SPSS software. The linearity test is a requirement in personal correlation analysis or linear regression.

The results of the linearity test/linearity test with the SPSS 25 program identified a significant level of 0.05. Two variables are said to have no linear relationship when the significant (Deviation FromLineierity) is less than 0.05.

i. If the value of Sig DeviationFrom Lineierity > 0.05, then there is a linear relationship between the independent variable and the bound variable
ii. If the value of Sig DeviationFrom Lineierity < 0.05 then there is no linear relationship between the independent variable and the bound variable

The conclusion is that the tester's Linearity test is pegged to DeviationFrom Linearity, because the Variable is more than 2. According to (Wijaksana [2], 2022) The T test aims to see the effect of Service Quality and product quality on consumer satisfaction. The proposed research hypothesis is approved if the calculation t-value is greater than the table t-value, and vice versa. The participation rate is (a)= 5%= 0.05. The criteria can be seen in the statement below: If the calculated t-value is smaller than the t-table, then Ha is rejected and H0 is accepted, meaning that this study is not affected. If the t-statistical value is greater than the t-table value (t-statistic > 1.96), then Ha is accepted and H0 is rejected, meaning that this study is negatively impacted.

3. Results and Discussion

The type of research used in this study is a type of quantitative descriptive research. This type of research aims to analyze and draw conclusions about the state of the object being researched based on the facts contained in the company. Based on the results of research that has been carried out on 36 respondents through the distribution of questionnaires to Indomaret Medan customers. The number of respondents used, namely 36 respondents with gender categories, can be seen in the following table:

Table 1. Definitions by number of Audiences

Criterion	Frequency	Present (%)
Woman	15	42%
Men - Men	21	58%
Entire	36	100%

In determining the validity test, the author uses SPSS 25 with the Bivariate Correlation formula. The value of the table with N = 200 and a significance level of 0.05 is 0.116. The questionnaire item was declared valid ifr_hitung> 0.116

Table 2. Validity Test Results

Variabel	Thing	rCalculation	rTable	Validity
Quality of Service (x1)	Benda	0,833	0,116	Saw
	Benda	0,970	0,116	Saw
	Benda	0,880	0,116	Saw
	Benda	0,930	0,116	Saw
	Benda	0,970	0,116	Saw
	Benda	0,722	0,116	Saw
	Benda	0,638	0,116	Saw
	Benda	0,662	0,116	Saw
	Benda	0,897	0,116	Saw
	Benda	0,721	0,116	Saw
	Benda	0,794	0,116	Saw
	Benda	0,956	0,116	Saw
Product Quality (x2)	Benda	0,791	0,116	Saw
	Benda	0,956	0,116	Saw
	Benda	0,915	0,116	Saw
	Benda	0,791	0,116	Saw

Variabel	Thing	rCalculation	rTable	Validity
Consumer Satisfaction (Y)	Benda	0,984	0,116	Saw
	Benda	0,813	0,116	Saw
	Benda	0,898	0,116	Saw
	Benda	0,956	0,116	Saw
	Benda	0,898	0,116	Saw
	Benda	0,791	0,116	Saw
	Benda	0,699	0,116	Saw
	Benda	0,791	0,116	Saw
	Benda	0,791	0,116	Saw
	Benda	0,956	0,116	Saw
	Benda	0,812	0,116	Saw
	Benda	0,812	0,116	Saw
	Benda	0,950	0,116	Saw
	Benda	0,927	0,116	Saw
	Benda	0,947	0,116	Saw
	Benda	0,927	0,116	Saw
	Benda	0,912	0,116	Saw
	Benda	0,678	0,116	Saw
	Benda	0,889	0,116	Saw
	Benda	0,836	0,116	Saw

Based on the table above, all items are valid above >0.5, so the validity of this study is accepted.

The instrument is declared reliable if the value of the Alpha Cronbach coefficient > 0.6.

Table 3. Reliability test results

No	Variable	Criterion	Alfa Cronbach	Information
1	Product Quality	0,6	0,811	Reliable
2	Quality of Service	0,6	0,774	Reliable
3	Consumer Satisfaction	0,6	0,813	Reliable

Based on the results of the data above, all reliability results are >0.6 which indicates that all data results are accepted. This Normality Test uses Kolmogorov-Smirnov. The data is stated to be distributed normally if the p-value is significant > 0.05.

Table 4. Normality Test Results

Kolmogorov-Smirnov Test One Sample	
	Non-Standard Residue
N	36
Monte Carlo Sig. (2 oaks)	200

Based on the results of the Normality Test, it is known that the significant value is 0.200 > 0.05, so it can be concluded that the residual value is distributed normally. Based on the results of the Brand Image, Product Quality to Consumer Satisfaction test, linearity is known *to have a Deviation From Linearity* of Brand Image (X1) of 0.285 > 0.05 and Product Quality (X2) of 0.341 > 0.05, it can be concluded that the variables X1, X2 and Y have a linear relationship. According to Hardani, the Determination coefficient test is used to determine how much the presentation contributes to the dependent variable's influence. In this study, the author used the adjusted R-squared value.

Table 6. Determination Test Results

Summer models			
Pattern	R	Customized R Box	Std. estimation error
	.916a	.834	.72518

a. Predictor: (Constans) brand image

From the data above, the value of R is 0.834 which means that the relationship between the variables X1 and X2 and the variable Y is very strong. The Adjusted R squared value (determination coefficient) is 0.848 which means that the magnitude of the influence of variable X on Y is 84.8 and the remaining 15.2% is influenced by other variables outside of this study. The partial test (T test) aims to see the influence of brand image on consumer satisfaction. The proposed research hypothesis is approved if the calculated t-value is greater than the t-value of the table, and vice versa. The participation rate is (a)= 5%= 0.05.

Table 7. T-test results

Non-Standard Coefficients			Standard Coefficient		
Pattern	Number of Squares	Df	Square Average	t	Alone
Regression	92.675	1	92.675	176.226	000b
Return	70.880	34			
Entire	110.556	35	.526		

Based on the above data, it can be concluded that it is known that the value of the degree of freedom in the residual result is 42. Then T-table = (significance $\propto$) = 0.05, two tails. From the t-test result data, the calculation results of t service quality (X1) = 2,116 and Product Quality (X2) = 3,000 are greater than the table t, which is 2,018 (2,116 (X1) and 3,000 (X2) is greater than 2,018), then the hypothesis is accepted, which means that Service Quality and Product Quality affect Customer Satisfaction.

4. Conclusion

Indomaret is one of the largest retail franchises in Indonesia that has managed to achieve great success in the retail industry. With more than twenty years of experience, Indomaret has become one of the icons in the Indonesian business scene. Here is a conclusion that summarizes various aspects about Indomaret:

First of all, the success of Indomaret can be seen from their very extensive network of stores. With thousands of outlets spread across the archipelago, Indomaret has become one of the largest and most accessible retailers in Indonesia. Their widespread presence makes it easier for consumers to get various products and services easily. In addition, Indomaret is also known for providing a wide range of products at affordable prices. This makes Indomaret the main choice for many people, especially those who want to shop frugally. This friendly pricing policy has made Indomaret a popular choice among all walks of life.

Furthermore, friendly and efficient service is also one of Indomaret's advantages. Indomaret employees are trained to provide the best service to customers, making the shopping experience at Indomaret fun and comfortable. In addition, the existence of additional services such as bill payment and credit top-up also strengthens Indomaret's position as a complete shopping center. Indomaret has also shown their commitment to innovation and technology. Through programs such as mobile applications and customer loyalty programs, Indomaret continues to strive to improve the convenience and shopping experience for their customers. In addition, these measures also help Indomaret remain relevant in the face of growing online retail competition.

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THE INFLUENCE OF FINANCIAL LITERACY AND RISK PERCEPTION ON STUDENTS INVESTMENT INTEREST IN MEDAN CITY

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Abstract

Investment interest among university students is increasingly vital in cultivating a financially literate young generation. However, limited financial knowledge and increased risk perceptions often hinder this interest. This study aims to analyze the impact of financial literacy and risk perception on students' investment interest in Medan. Employing a quantitative approach with a survey method, data were collected through questionnaires distributed to 399 students from various universities in Medan. Multiple linear regression analysis revealed that both independent variables significantly influence investment interest (F-value = 544.069; Sig. = 0.000). Individually, financial literacy and risk perception positively and significantly affect investment interest, with an R^2 value of 0.733. This indicates that 73.3% of the variation in investment interest can be explained by these two variables. The findings suggest that enhancing financial literacy and effectively managing risk perceptions can encourage students to invest more actively. These insights are crucial for educational institutions and stakeholders in developing more effective financial education programs.
Keywords: Financial Literacy; Risk Perception; Investment Interest.

1. Introduction

Investment interest is a person's tendency or desire to carry out investment activities either in the form of real assets or financial assets, with the hope of making a profit in the future. This interest is not only formed instantly, but through a series of complex rational and emotional consideration processes. A person will consider the extent of their understanding of investment instruments, capital readiness, confidence in the returns obtained, and the potential risks that may be faced. In the context of the younger generation, especially students, investment interest can be the first step in forming financial independence and a visionary mindset towards personal financial management (Yusup, 2024). However, in reality, there are still many students who show a passive attitude towards investment and prefer to save money in the form of conventional savings or allocate it for short-term consumption.

One important aspect that greatly influences investment interest is financial literacy. Financial literacy is an individual's ability to understand and apply basic concepts in personal financial management, including financial planning, budgeting, saving, credit utilization, and making smart investment decisions (Kusumawati et al., 2023). This literacy allows individuals to make appropriate and rational financial decisions according to their conditions and life goals. A student who has a high level of financial literacy will more easily recognize the importance of long-term financial planning, realize the benefits of investment, and have the ability to manage risk wisely. Conversely, students with low financial literacy tend to ignore the importance of investment and focus more on meeting momentary consumptive needs, even potentially experiencing financial difficulties in the future.

Every student is expected to have financial knowledge, including individual *understanding* of basic principles of finance including interest, risk, inflation, diversification, and financial instruments such as savings, credit, and investment. According to Lusardi & Mitchell, this basic

knowledge is important so that individuals are able to recognize the financial options available and avoid financial traps (El Ikhwan & SE, 2023). In addition, self-confidence in financial decision making also plays an important role. Individuals with good financial literacy knowledge are expected to have self-confidence when they start investing. The indicators include a sense of confidence in choosing an investment instrument after obtaining sufficient information, not being easily influenced by external opinions, and readiness to face investment risks. In addition, self-confidence is also seen as the motivation to continue learning and improving financial understanding in order to get better financial targets in the future (Loprang et al., 2022).

Financial literacy is becoming increasingly relevant amidst the rapid development of financial technology (fintech), where various financial products and services are easily accessible to the wider community, including students. Digital investment applications such as Bibit, Ajaib, and Bareksa allow anyone to start investing with only a small capital and through a simple process. However, this convenience does not necessarily increase students' interest in investing if it is not accompanied by an adequate understanding of the functions, benefits, and risks of these financial products. Many students are hesitant or even afraid to invest because they think that investment is only suitable for people who already have a steady income or because they are afraid of losing money due to market fluctuations. This doubt is closely related to risk perception, namely a person's perspective or assessment of the potential for loss or danger in making investment decisions. Risk perception is not something that is objective, but subjective and is greatly influenced by experience, education, information received, and the individual's psychological condition (Pracoyo et al., 2025). Students who have a high-risk perception will tend to avoid investing, even though it actually has the potential for high returns. They prefer safe zones, such as saving in banks or keeping money in cash, because they feel that investment is too risky and dangerous. In fact, investment risk can be managed through asset diversification, selecting instruments that match the risk profile, and understanding market conditions. In other words, an inaccurate risk perception will be the main barrier for students to start investing.

Medan City, as a large city and hub of higher education in North Sumatra, has a relatively large student population and holds great potential to become an active young investor segment. This city has many colleges and universities that graduate thousands of students from various majors every year. Students as an intellectual group are expected to be aware of the importance of financial literacy and good financial management. However, based on initial observations conducted by researchers through informal interviews and limited distribution of questionnaires, it was found that the level of student participation in investment activities in Medan City is still relatively low. Most of the students interviewed admitted that they had never made any investment, be it mutual funds, stocks, or digital gold. The most dominant reasons were a lack of understanding of how investment works and concerns about the risk of loss. This finding strengthens the suspicion of Devi Rifani, Andri Soemitra, and Nurlaila Nurlaila that the financial literacy of UIN North Sumatra students has not been fully formed comprehensively (Rifani et al., 2025). Even when students are familiar with digital investment platforms, they are still reluctant to begin investing due to a perceived lack of sufficient information or a fear of market uncertainty. High risk perception, although often not based on personal experience, is a significant inhibiting factor. In some cases, students also associate investment with dangerous speculative practices, even though with the right knowledge and strategy, investment risks can be minimized. Students must also understand and have trust in information sources (Trust in Information Source), assessing the extent to which individuals trust the information they obtain regarding a risk. If someone does not trust the source of information (eg media or financial institutions), then they will perceive the risk as greater because they feel the information received is inaccurate or incomplete (Yunita et al., 2023).

The lack of students' interest in investing shows the imbalance between opportunities and reality. On one hand, they have wide access to information and financial technology, but on the other hand, they do not utilize it optimally. In fact, forming investment habits from an early age will greatly help students in building financial stability in the future, including as initial capital to start a business, buy assets, or prepare for early retirement. If understanding financial literacy can be improved and perception of risk can be managed well, then the opportunity for students to become active investors will be even greater. The level of financial literacy is also an important factor in shaping risk perception. Individuals who have basic knowledge of the concepts of risk, diversification, returns, and market fluctuations will be better able to assess risk objectively and not easily panic about changes in financial situations (Gevionita et al., 2025). Also, increased self-confidence after understanding investment risks illustrates that risk perception can decrease if individuals already understand the characteristics and how to mitigate risk (Rizal et al., 2024).

Based on the description that has been explained, the researcher feels the need to conduct a scientific study that aims to examine in more depth the Influence of Financial Literacy and Risk Perception on Investment Interest in Students in Medan City. This study is expected to provide a comprehensive understanding of how these two factors shape students' attitudes towards investment. In addition, the results of this study can also be used as evaluation material and input for campuses, financial institutions, and the government in designing programs to improve financial literacy and investment education that are more effective for the younger generation.

2. Methodology

Participants

In this study, the population consisted of all undergraduate (S1) students in Medan City, estimated at approximately 175,000 people based on data from various state and private universities. Assuming that they have acquired more relevant academic experience and knowledge on investment topics compared to first semester students.

To determine the number of samples, the researcher used the Slovin formula with a margin of error of 5% (0.05) as follows:

$$n=N / (1+N(e2)) \quad (1)$$

It is known:
- n = Sample
- N = Population
- e = error tolerance 0.05 (5%)

So, the sample size (n) if adjusted n:
n=N / (1+N(e2))
n=175,000 / (1+175,000(0.052))
n=175,000 / (1+(175,000 x 0.0025))
n=175,000 / (1+437.5)
n=175,000 / (438.5)
n=399,087

Therefore, the sample used in this study consisted of 399 students in semester 2 and above, recruited from various universities in Medan City.

In the study, the initial steps included data acquisition, preparation of instruments, preparation of statements for each variable, questionnaires designed in *google form format,* distributed via social media (WhatsApp), collection of information and data from respondents, analyzing information and data from respondents, and preparation of reports. Data collection was carried out during the period of February to March 2025. In distributing this questionnaire, the sampling method was carried out on respondents who met the research criteria, the respondents were then asked to recommend other people who also met the criteria and so on (Snowball Effect). Prior to filling out the questionnaire, respondents were given an explanation regarding this study. Operational variables are the description of research variables into a form that can be measured empirically, so that it can be used as a basis for compiling research instruments and collecting data (Suriani & Jailani, 2023). The following are details of each research variable:

a. Financial Literacy

Aims to determine the scale of knowledge, understanding, and personal ability in managing personal finances effectively, including knowledge of investment products and risks. Measured by the following 10 statements:

1) I can manage my personal budget effectively, including saving and investing
2) I feel I have a pretty good understanding of the basic concepts of investing
3) I know how to choose investment products that suit my financial goals
4) I often look for information related to the stock market and other investment instruments
5) I feel I have a pretty good understanding of the risks associated with investing
6) I understand how to calculate the potential profit and risk of an investment instrument
7) I can differentiate between short term and long-term investments
8) I know various types of investment instruments, such as stocks, bonds, and mutual funds
9) I understand how the stock market works and how stock prices can change
10) I feel confident enough in making investment decisions after studying appropriate financial literacy

b. Risk Perception

Aims to find out a person's response to the possibility and impact of a decline that can occur from a decision when investing. Measured by the following 10 statements:

1) I feel that investing always has a high risk
2) I am afraid of losing money when investing without sufficient knowledge
3) Investment risks can be minimized if I understand the instrument I choose well
4) The higher the potential profit, the higher the risk I have to bear
5) I tend to avoid investments that have high risks
6) I believe that every investment decision carry risk that must be faced
7) I tend to avoid investments that have unclear risks, even if they have the potential for large profits
8) I feel uncomfortable with investments that have high price
9) I feel that investing without sufficient knowledge is a very risky decision
10) I feel more confident investing after understanding the risks that may occur

c. Investment Interest

Aims to find out the desire, interest, and readiness of individuals to make real investments in the present or future. Measured by the following 10 statements:

1) I believe that investment can provide great benefits for my finances in the future

2) I am interested in starting to invest in financial instruments
3) I plan to start investing in the near future once I feel more financially prepared
4) I believe that investing can help me achieve my financial goals in the future
5) I feel the need to start investing right now, even though I am still learning about it
6) I would consider investing if I had more information and understanding about it
7) I am interested in investing even though I don't have enough experience in this field
8) I plan to start investing after completing my studies
9) I want to start investing to prepare for the future financially
10) I feel that investing now can help with both short-term and long-term financial plans

Statistical Analysis

The analysis technique in this study is quantitative descriptive analysis, which aims to discuss the point of collection, processing, and presentation of data groups based on the results of the questionnaire that has been distributed to participants. The selection of this technique is important because the analysis can explain the performance of each research variable, as well as facilitate understanding of the data that has been collected. This study will be presented in the form of a frequency table that will describe the distribution of the data obtained.

Here are the steps:

a. Descriptive analysis, analysis that focuses on describing the attributes or characteristics of participants/respondents, including gender, age, semester, study program, and others. The goal is to understand the background of the subjects who are the samples in the study.
b. Validity and Reliability Test, Validity test is conducted to determine to which extent the items in the questionnaire are able to represent the measured variables. After all items are declared valid, it is continued with a reliability test to ensure that the instrument can provide consistent results when reused under similar conditions. Reliability testing uses the Cronbach's Alpha method, where the instrument is considered reliable if the alpha value is greater than 0.60.
c. Multiple linear regression analysis, at this stage a series of classical assumption tests are carried out to ensure that the regression model used meets the basic requirements, so that the analysis results are valid and reliable. The classical assumption tests used in this study include normality, multicollinearity, and heteroscedasticity tests. In addition, hypothesis testing is also carried out consisting of three types, namely the coefficient of determination test (R^2), partial test (t test), and simultaneous test (F test) to obtain more accurate analysis results.

3. Results and Discussion

This study involved a total of 399 respondents who were students from various universities in Medan City. All respondents were active students. Bachelor Degree (S1) from semester 2 and above, as determined in the population and sample criteria. The data obtained from the questionnaire were filled in completely without any deficiencies (missing data = 0), so that all respondents could be included in the analysis process. Thus, the value of N = 399 was used consistently for each variable in this study. For a clearer picture, this descriptive analysis is in the form of respondent characteristics that have been presented based on several parts:

1) Gender

Table 1. Results of Statistical Analysis of Gender Characteristics

Gender	Frequency	Percentage (%)
Man	196	49.1%
Woman	203	50.9%
Total	399	100.0%

From the data, it can be seen that the number of female respondents is greater than male, which is 50.9% compared to 49.1%. This means that students in this study tend to be balanced in terms of gender, thus allowing for a more objective analysis without the dominance of one group.

2) Age Group

Table 2. Results of Statistical Analysis of Age Group Characteristics

Age	Frequency	Percentage (%)
18 – 21 Years	114	28.6%
22 – 25 Years	272	68.2%
26 – 29 Years	13	3.3%
Total	399	100.0%

Most participants were in the age range of 22 to 25 years (68.2%), which generally corresponds to active students in their middle to final semesters. Meanwhile, the age group of 18–21 years comprised 28.6% of respondents, likely consisting of students in semesters 2 to 4. Meanwhile, the 26–29 years age group was the smallest group (3.3%), which probably represented students who extended their studies or completing their final assignments. This age distribution explains that most respondents are in the early adulthood phase, where awareness of personal financial management, including interest in investment, begins to form and develop significantly.

3) Colleges

This diversity of college origins aims to obtain a broader and more comprehensive representation of student investment interests across institutions. Here is the complete distribution based on college origin:

Table 3. Results of Statistical Analysis of Characteristics of Origin of Higher Education Institutions

No	College Name	Number of Respondents	Percentage (%)
1	Islamic University of North Sumatra (UISU)	65	16.3%
2	Muhammadiyah University of North Sumatra (UMSU)	56	14.0%
3	State University of Medan (UNIMED)	49	12.3%
4	University of North Sumatra (USU)	59	14.8%
5	State Polytechnic of Medan (POLMED)	24	6.0%
6	Sukma College of Management Sciences (STIM Sukma)	14	3.5%
7	Triguna Dharma University	22	5.5%
8	Panca Budi Development University (UNPAB)	16	4.0%
9	Indonesian University of Excellence (UNPRI)	5	1.3%
10	Al Washliyah University (UNIVA)	10	2.5%
	Total	399	100.0%

Participants from UISU are at (16.3%), followed by USU (14.8%) and UMSU (14.0%). Meanwhile, the universities with the fewest respondents were UNPRI (1.3%) and UNIVA

(2.5%). This variation shows that the study covers various educational institutions, both public and private, with the hope of producing more comprehensive and generalizable findings.

4) Respondent Faculty/Department

This diversity of academic backgrounds provides a broader view of students' interests and perceptions of investment. Overall, there are 399 students from more than 40 different study programs or departments.

Table 4. Results of Statistical Analysis of Faculty/Department Characteristics

No	Faculty/Department	Frequency	Percentage (%)
1	Management	55	13.80%
2	Agriculture	50	12.50%
3	Pharmacy	34	8.50%
4	Medical	31	7.80%
5	Technique	29	7.30%
6	PAI (Islamic Religious Education)	24	6.00%
7	Civil Engineering	13	3.30%
8	Islamic education	12	3.00%
9	Islamic Economics	11	2.80%
10	Computer Science	11	2.80%
11	Electrical Engineering	11	2.80%
12	Arabic literature	9	2.30%
13	Mechanical Engineering	8	2.00%
14	Economic Education	7	1.80%
15	Law	6	1.50%
16	Islamic Banking	5	1.30%
17	Business Administration	5	1.30%
18	Agrotechnology	4	1.00%
19	Accountancy	4	1.00%
20	Islamic Counseling Guidance	4	1.00%
21	Electrical Engineering Education	4	1.00%
22	Biology	16	4.00%
23	Economy	18	4.50%
24	Financial management	2	0.50%
25	Industrial Chemistry	2	0.50%
26	Public health	2	0.50%
27	Computer Engineering	2	0.50%
28	Business Management	3	0.80%
29	FKM	3	0.80%
30	Others (≤ 0.30% per major)	34	8.50%
	Total	399	100.0%

The majority of participants came from the Management (13.80%), Agriculture (12.50%), and Pharmacy (8.50%). This diversity of backgrounds is important because it can provide different insights in assessing students' understanding and interest in investment topics, depending on the field of study they are studying.

5) Semester Level

The semester levels included in this study ranged from semester 2 to semester 8, with the consideration that students in semester 2 and above are assumed to have sufficient academic experience and a more relevant understanding of investment material compared to first semester students.

Table 5. Results of Statistical Analysis of Respondents' Semesters

Semester	Frequency	Valid Percentage (%)
2	82	20.6%
3	1	0.3%
4	134	33.6%
5	3	0.8%
6	126	31.6%
7	2	0.5%
8	51	12.8%
Total	399	100.0%

The data show that the majority of respondents were from semester 4 (33.6%) and semester 6 (31.6%). This reflects that most respondents have been in the middle to final stages of their studies, so they are considered to have more mature views and readiness in providing responses to the topics studied.

6) Investment Interest

Table 6. Results of Statistical Analysis of Investment Interest

Category	Frequency	Percentage (%)
Not invested yet, but interested	277	69.4%
Not invested yet, but not interested	50	12.5%
Already invested	72	18.0%
Total	399	100.0%

The data indicates that most respondents, 69.4%, have not invested but are interested in investing in the future. Meanwhile, 18.0% of respondents have invested or are investing, and only 12.5% are not interested in investing. This finding reflects the great potential in developing investment literacy and education among students, especially to encourage groups who are interested but have not started investing to take concrete steps in managing their finances more productively.

a. Validity and Reliability Test

Validity testing is done by comparing the calculated r value to the table r. In this study, the number of respondents was 399 people, so the table r value at a significance level of 5% (α = 0.05) is 0.098. If the calculated r value is greater than the table r, then the statement item is considered valid. Conversely, if the calculated r value is smaller than the table r, then the item is considered invalid and is not used in further analysis. The results of the validity test for the Investment Interest variable are presented as follows:

Table 7. Validity Test Results

Item	Variables	Question Code	r count		r table (5%)	Information
1		X1.1	0.655	>	0.098	Valid
2		X1.2	0.703	>	0.098	Valid
3		X1.3	0.628	>	0.098	Valid
4		X1.4	0.616	>	0.098	Valid
5	Financial	X1.5	0.592	>	0.098	Valid
6	Literacy (X1)	X1.6	0.578	>	0.098	Valid
7		X1.7	0.629	>	0.098	Valid
8		X1.8	0.605	>	0.098	Valid
9		X1.9	0.623	>	0.098	Valid
10		X1.10	0.643	>	0.098	Valid
11		X2.1	0.531	>	0.098	Valid

12	Risk Perception (X2)	X2.2	0.621	>	0.098	Valid
13		X2.3	0.588	>	0.098	Valid
14		X2.4	0.621	>	0.098	Valid
15		X2.5	0.574	>	0.098	Valid
16		X2.6	0.638	>	0.098	Valid
17		X2.7	0.627	>	0.098	Valid
18		X2.8	0.593	>	0.098	Valid
19		X2.9	0.662	>	0.098	Valid
20		X2.10	0.633	>	0.098	Valid
21	Investment Interest (Y)	Y1	0.669	>	0.098	Valid
22		Y2	0.633	>	0.098	Valid
23		Y3	0.651	>	0.098	Valid
24		Y4	0.641	>	0.098	Valid
25		Y5	0.647	>	0.098	Valid
26		Y6	0.646	>	0.098	Valid
27		Y7	0.602	>	0.098	Valid
28		Y8	0.572	>	0.098	Valid
29		Y9	0.646	>	0.098	Valid
30		Y10	0.670	>	0.098	Valid

Based on the results of validity testing of all items in the variables of Financial Literacy (X1), Risk Perception (X2), and Investment Interest (Y), it was obtained that all items had a calculated r value that exceeded the r table of 0.098. This indicates that all statements in the questionnaire are valid and suitable for use as measuring instruments in this study. After its validity being confirmed, the next stage is to test the reliability to assess the extent to which the instrument is consistent and reliable in measuring each variable. Reliability testing uses the Cronbach's Alpha method, with the provision that a variable is said to be reliable if the alpha value is more than 0.60.

Table 8. Reliability Test Results

Variables	Item	Cronbach's Alpha	Information
Financial Literacy (X1)	10	0.829	Reliable
Risk Perception (X2)	10	0.811	Reliable
Investment Interest (Y)	10	0.838	Reliable

The results of the reliability test for the three variables as presented in the table above, are as follows:

a) Financial Literacy Variable (X1), consists of 10 statement items; this variable obtained a Cronbach's Alpha value of 0.829. This value is above 0.80, which indicates that the items in this variable are very reliable and have high consistency in measuring the level of financial literacy of respondents.
b) Risk Perception Variable (X2), with a total of 10 statements, the Cronbach's Alpha value obtained is 0.811. This value indicates that the instrument has very good reliability and is effective in describing individual perceptions of risk in investing.
c) Investment Interest Variable (Y) This variable also consists of 10 items, and the results of the reliability test show a Cronbach's Alpha value of 0.838. This figure reflects that the measuring instrument for assessing respondents' investment interest is classified as very reliable and can produce stable and consistent data.

Overall, all research instruments on variables X1, X2, and Y have Cronbach's Alpha values above the minimum threshold of 0.60. This indicates that all statement items in the questionnaire can be classified as reliable. This means that the measuring instrument used in

this study is able to produce reliable and consistent data. With these results, the instrument has met the validity and reliability criteria and is ready to be used in the next analysis stage, such as classical assumption tests and multiple linear regression.

b. Multiple Linear Regression Analysis

1) Classical Assumption Test

Normality Test

Normality testing aims to ensure whether the data in this study follows a normal distribution. This process is very important because it is one of the prerequisites in the application of multiple linear regression analysis. This is because one of the basic assumptions of regression is that the residuals of the data must have a normal distribution.

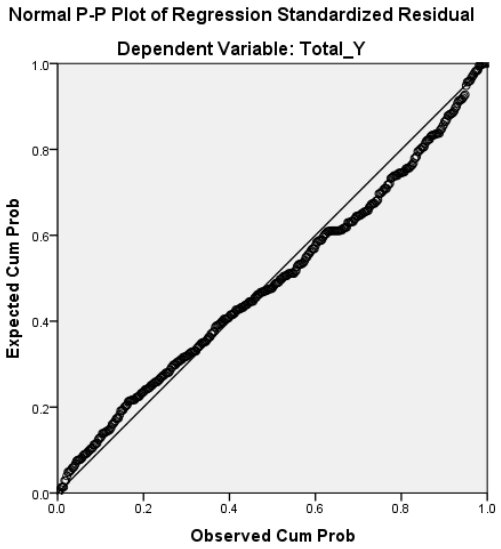

Fig. 1. PP plot graph

The PP Plot image shows that most of the residual points mapped mostly follow a pattern that is very close to the diagonal line (the ideal normal line). The symmetrical distribution of points close to the diagonal line reflects that the difference between the actual residual value and the expected residual value based on the normal distribution is relatively small. In other words, there is no systematic deviation pattern or extreme outliers that could indicate a violation of the normality assumption.

Table 9. Results of Test of Normality

	Kolmogorov-Smirnov [a]			Shapiro Wilk		
	Statistics	Df	Sig.	Statistics	Df	Sig.
MI_T	.096	399	.068	.965	399	.073

Normality testing using the Kolmogorov-Smirnov and Shapiro-Wilk methods shows that the data in this study follows a normal distribution. In the Kolmogorov-Smirnov test, a significance value of 0.068 was obtained, which exceeds the threshold of 0.05. This indicates that the data does not show deviations from the normal distribution. Likewise, the results of the Shapiro-Wilk test produce a significant value of 0.073, also greater than 0.05, which confirms that the data are normally distributed. Thus, both tests indicate that the data is considered to meet the normality assumption.

Multicollinearity test is conducted to determine whether there is a strong linear correlation between independent variables in the regression model. The presence of multicollinearity can result in inconsistent regression coefficient estimation results and make it difficult to interpret the analysis results correctly.

Table 10. Multicollinearity Test Results Coefficients [a]

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	3.855	.934		4.127	.000		
	Financial Literacy	.381	.048	.384	7,867	.000	.280	3,577
	Risk Perception	.527	.051	.508	10,408	.000	.280	3,577

Based on the output results from SPSS, it was found that the Tolerance value for the Financial Literacy and Risk Perception variables was 0.280 for each, while the VIF (Variance Inflation Factor) value for both was 3.577. Because the tolerance value is greater than 0.10 and the VIF is below 10, it can be concluded that there is no multicollinearity symptom between the independent variables in this regression model. Therefore, the regression model used meets the requirements of being free from multicollinearity and can be continued to the multiple linear regression analysis stage without being influenced by high correlation between the independent variables.

The heteroscedasticity test aims to identify whether there is a difference in residual variance in the regression model. One way to detect it is by observing the distribution pattern of points in the scatterplot graph between the Unstandardized Predicted Value and Unstandardized Residual values. This distribution pattern is used to assess whether or not there are symptoms of heteroscedasticity in the model.

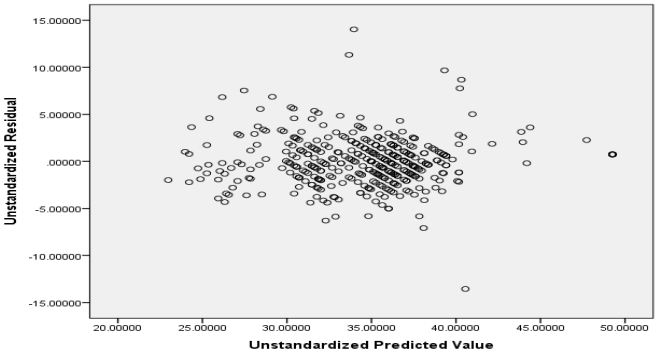

Fig. 2. Results of Heteroscedasticity Test

Based on the test results, it can be seen that the residual points are randomly distributed without forming a particular pattern. This random distribution indicates that the residual variance is constant or called homoscedastic, which means there is no indication of violation of the heteroscedasticity assumption in the regression model.

2) Hypothesis Testing

Coefficient of Determination (R^2)

The determination coefficient (R Square) functions to determine the proportion of the variation of the dependent variable that can be explained by the independent variable in a regression model. In the context of this study, Investment Interest (Y) is the dependent variable, while Financial Literacy (X^1) and Risk Perception (X^2) act as independent variables.

Table 11. R-Squared Test Results Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.856 [a]	.733	.732	.22577

Based on the results shown in the Model Summary table, it is known that the R Square value is 0.733, indicating that around 73.3% of the variation in Investment Interest can be explained jointly by Financial Literacy and Risk Perception. The remaining 26.7%, is influenced by other factors not included in this model, such as social factors, individual motivation, economic conditions, or other external factors.

In addition, the Adjusted R Square of 0.732 indicates that the R Square value has been adjusted to the number of independent variables used, so that it still reflects the strength of the model accurately. The Standard Error of the Estimate value of 0.22577 indicates the average level of model prediction error against actual data, and this value is relatively small, thus strengthening that the regression model built is quite precise and reliable.

F Test (Simultaneous)

The F test is used to assess whether the independent variables together have a significant influence on the dependent variable. In this study, the independent variables analyzed include Financial Literacy (X^1) and Risk Perception (X^2), while Investment Interest (Y) acts as the dependent variable .

Table 12. F Test Results ANOVA [a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	55,467	2	27,733	544,069	.000 [b]
	Residual	20,186	396	.051		
	Total	75,653	398			

Based on the results of the ANOVA test shown in the table, it is known that the calculated F value is 544.069 with a significance level of 0.000. To determine the significance of the regression model, the calculated F value is compared with the F table value at a significance level of 5% ($\alpha = 0.05$), with degrees of freedom df1 = 2 (number of independent variables) and df2 = 396 (n – k – 1 = 399 – 2 – 1). Based on the F distribution table, the F table value is 3.02. Since the calculated F value (544.069) is much larger than the F table (3.02) and the significance value is less than 0.05, then H_0 is rejected and H_1 is accepted. This indicates that Financial Literacy and Risk Perception simultaneously have a significant influence on Investment Interest.

T-Test (Partial)

The T-test is used to measure the influence of each independent variable on the dependent variable, partially. In this study, the independent variables tested include Financial Literacy (X^1) and Risk Perception (X^2), while the dependent variable is Investment Interest (Y).

Table 13. T-Test Results Coefficients [a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	3.264	.080		40,922	.000		
	Financial Literacy	.033	.004	.396	8,054	.000	.279	3,579
	Risk Perception	.044	.004	.495	10,072	.000	.279	3,579

a. Dependent Variable: Investment Interest

Source: SPSS Version 22 output 2025

- Financial Literacy (X^1), based on the results of the t-test, it was obtained that the calculated t value was 8.054 with a significance level of 0.000. Since the calculated t value is greater than the t table (8.054> 1.966) and the significance value is less than 0.05 (0.000 <0.05), it can be concluded that the Financial Literacy variable has a partial and significant influence on Investment Interest. This indicates that the higher a person's knowledge of finance, the greater their interest in investing. This finding supports the view that understanding financial concepts and various investment instruments provides encouragement for individuals to make investment decisions with more confidence.
- Risk Perception (X^2), the test results show that the t-value is 10.072 with a significance value of 0.000. Since the t-value exceeds the t-table (10.072> 1.966) and the significance value is below 0.05 (0.000 <0.05), it can be concluded that Risk Perception also has a significant partial effect on Investment Interest. This indicates that the more positive an individual's view of investment risk (the less fear or worry about risk), the higher the tendency to invest.

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Thus, both variables, namely Financial Literacy and Risk Perception, are proven to have a partial significant influence on Investment Interest. These results support the hypothesis proposed in the study and indicate that increasing financial understanding and managing risk perceptions are important factors in increasing people's interest in investing.

Multiple Linear Regression Analysis Results

Based on the results of multiple linear regression analysis, the following regression equation was obtained:

$$Y=3.264+0.033X1+0.044\ X2 \quad (1)$$

Information:
Y : Investment Interest
X^1 : Financial Literacy
X^2 : Risk Perception

The regression equation describes the relationship between the independent variables (Financial Literacy and Risk Perception) and the dependent variable (Investment Interest). Further explanation is as follows:

- The constant value (α) of 3.264 indicates that if Financial Literacy (X^1) and Risk Perception (X^2) are considered to have no influence or have a value of zero, then Investment Interest (Y) remains at the level of 3.264 units. This illustrates the basic level of investment interest held by respondents without being influenced by the two independent variables.
- The regression coefficient of Financial Literacy (X^1) of 0.033 indicates that every one unit increase in the Financial Literacy variable, assuming Risk Perception remains constant, will cause an increase in Investment Interest of 0.033 units. This shows that the better a person's understanding of finance, the higher their desire to invest.
- The regression coefficient of Risk Perception (X^2) of 0.044 indicates that a one-unit increase in the Risk Perception variable, assuming Financial Literacy does not change, will drive an increase in Investment Interest by 0.044 units. This indicates that the more optimistic a person is in viewing investment risk (the less afraid they are of risk), the more their interest in investing tends to increase.

Overall, both Financial Literacy and Risk Perception have a positive influence on Investment Interest. When compared, Risk Perception shows a greater contribution in increasing interest, as reflected by the higher regression coefficient value.

Based on the results of the t-test, the Financial Literacy variable is proven to have a positive and significant effect on the Investment Interest of students in Medan City, with a t-value of 8.054 and a significance value of 0.000 (<0.05). This indicates that the higher a student's level of financial literacy, the greater their interest in investing. This shows that a good understanding of basic financial concepts, investment products, risks, and investment benefits can encourage students to be more confident in making investment decisions. This finding is in line with the results of research conducted by Yuniasari et al. which concluded that financial literacy has a positive effect on investment interest, although other variables such as financial behavior and lifestyle do not have a significant effect. This study confirms the importance of the role of financial knowledge in shaping students' interest in investment activities (Yuniasari et al., 2024) .

Another study by Parulian and Aminnudin also supports this finding, showing that financial literacy and minimum investment capital have a positive effect on investment interest. This suggests that the more someone understands that investment can begin with affordable capital and offers long term profit potential, the greater their interest in starting to invest early. However, the results of this study differ from several previous studies (Parulian & Aminnudin, 2021). For example, Widhiastuti and Novianda stated that financial literacy has no effect on Generation Z's investment interest, and motivation is the most dominant factor. This implies that even if individuals possess financial knowledge, it may not be sufficient to encourage them to invest if they are not driven by strong motivation (Widhiastuti & Novianda, 2024).

Thus, although there are differences in the results of several previous studies, the findings in this study strengthen the view that in Medan City, financial literacy has a significant influence on students' investment interest. Differences in research results may be due to variations in respondent characteristics, geographic location, approaches analysis, and other variables that are taken into consideration. Therefore, efforts to improve financial literacy among students remain a strategic step to encourage investment growth from a young age.

The results of this study indicate that the Risk Perception variable has a positive and significant effect on the Investment Interest of students in Medan City. This is evidenced by the t-value of 10.072 and a significance of 0.000 (<0.05), which indicates that H_0 is rejected and H_1 is accepted. Thus, it can be concluded that the better the students' perception of investment risk, the higher their interest in investing. These results indicate that students no longer see risk as the main obstacle to investing, but rather as something that can be managed or even considered as part of a smart investment strategy. With an adequate understanding of risk,

students tend to feel more prepared to face market uncertainty and are more courageous to start investing.

In line with Dewi's research, which found that Risk Perception has a positive and significant effect on investment interest in the capital market among students at the Bali State Polytechnic (Dewi, 2022). The study explains that understanding and awareness of risk actually encourages students to be more careful and strategic, thus increasing their interest in investing wisely. Research by Putra Prayoga and Purnamawati also showed similar results, where risk perception has a positive effect on investment interest in the capital market, along with other variables such as investment education and returns. This strengthens the argument that risk perception is not merely a barrier, but can be a factor that drives investment interest if supported by a positive understanding and attitude towards investment (Putra Prayoga & Purnamawati, 2024).

However, the results of this study differ from those found by Sukma, who concluded that risk perception does not have much influence on investment decisions in sharia stocks, because risk is not the main consideration in making investment decisions, especially in the context of sharia finance (Sukma, 2021). Meanwhile, research by Johan and Azariani and Santoso and Dewi found that risk perception actually has a negative effect on investment interest. In Johan and Azariani's research, the context taken was gold investment, where high risk perception actually reduced Gen Z's interest in investing. These results illustrate that negative perceptions of risk can hinder investment participation, especially when not accompanied by good understanding (Johan & Azariani, 2025).

The difference in findings may occur due to variations in the types of investments used as research objects (stocks, gold, capital markets, sharia), respondent characteristics (location, age, education), and level of education and investment experience. In the context of Medan City students, these results indicate that understanding and readiness in facing investment risks have been formed quite well, so that risk perception is no longer an obstacle, but rather a factor that encourages them to invest wisely. The results of this study emphasize the importance of risk education in encouraging investment interest, and show that students who have good risk awareness tend to be more interested and readier to invest.

Based on the results of multiple linear regression testing shown through the ANOVA test (F-test), the calculated F value was obtained at 544.069 with a significance value of 0.000 (<0.05). These results indicate that the variables of Financial Literacy and Risk Perception simultaneously have a significant effect on the Investment Interest of students in Medan City. Thus, the hypothesis that financial literacy and risk perception jointly influence investment interest can be accepted. This finding indicates that both level of financial knowledge of students and their perception of risk have a strong contribution in shaping their interest in investing. Good financial literacy allows students to understand various investment products and strategies rationally, while perception of risk forms a cautious attitude and readiness in facing potential losses.

These results are in line with research by Angelika and Alinto (2024) which shows that financial literacy and risk perception have a significant positive effect on Generation Z investment decisions. The study stated that the higher a person's level of financial literacy, the more likely they are to make more informed investment decisions. Likewise, risk perception can strengthen decision-making by considering potential losses rationally. In addition, this finding is supported by Primasari et al (2024) which states that financial literacy, risk perception, financial behavior, and income simultaneously influence investment decisions. In this context, risk perception is believed to increase individual confidence in making investment decisions, although individual financial literacy does not always have a direct effect. However, in a simultaneous context, these two variables play a synergistic role in encouraging individuals to have an interest in investment. Jannah's research (2022) also supports these results, where

based on the ANOVA test, a significance of 0.003 was obtained, indicating that financial literacy and risk perception together influence investment interest. This study strengthens the evidence that the two variables cannot be separated in explaining the dependent variable of investment interest. However, not all studies find consistent results. For example, Putri (2025) found that financial literacy, financial behavior, and risk perception did not simultaneously influence investment decisions. This discrepancy in results is most likely due to differences in respondent characteristics, economic environment, and understanding of risk in each region or educational institution studied. Considering the results of this study and comparison with previous literature, it can be concluded that simultaneously, financial literacy and risk perception have a strong and significant influence in shaping students' investment interests in Medan City. This is an important basis for educational institutions and financial authorities to further intensify financial education and risk management programs for students in order to foster active participation in the world of investment from a young age.

4. Conclusion

Financial literacy has a significant and positive influence on students' investment interest. This suggests that the higher the level of financial understanding that students have, the higher their tendency to invest. This can be seen from the regression coefficient value of 0.033 and the t-test result of 8.054 which is significant at the 5% level. In other words, adequate financial knowledge encourages students to be more confident and interested in making investment decisions. Risk perception also shows a positive and significant influence on investment interest. The regression coefficient value obtained is 0.044, and the t-test result is 10.072, confirming that students who are able to assess risk rationally and have a positive view of risk tend to have higher investment interest. Together, financial literacy and risk perception contribute significantly to investment interest. This is evidenced by the calculated F value of 544.069, which far exceeds the F table, with a significance level of 0.000. The R Square value of 0.733 indicates that around 73.3% of the variation in student investment interest in Medan City can be explained by these two variables. While other factors outside this research model influence the remaining 26.7%. Thus, increasing financial literacy and managing risk perception are key factors in increasing investment interest among students.

This research contributes in the following aspects:

1. Adding to the literature in the field of financial management and investment behavior, especially those related to psychological factors and individual knowledge regarding investment decision making.
2. Providing an overview to educational institutions, governments, and financial institutions regarding the importance of improving financial literacy and providing students with a proper understanding of investment risks.
3. The information and data in this study can be used as a consideration for a more effective financial education program for the younger generation, especially students as potential future investors.

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PENGGUNAAN MODEL VIDEO DALAM PENDIDIKAN AUTISME: KAJIAN SISTEMATIK TENTANG CABARAN DAN IMPLIKASI

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Abstrak

Model video telah muncul sebagai intervensi yang berpotensi bagi individu dengan gangguan spektrum autisme (*autism spectrum disorder*). Ia menyediakan pengalaman pembelajaran yang berstruktur dan menarik secara visual untuk membantu mereka meningkatkan kemahiran sosial, tingkah laku, dan akademik. Kajian sistematik ini menilai keberkesanan, batasan, dan implikasi model video dalam pendidikan autisme. Dapatan kajian menunjukkan bahawa model video membantu meningkatkan interaksi sosial, komunikasi, dan kemahiran hidup berdikari dengan memanfaatkan kekuatan visual individu autisme. Selain itu, model video menawarkan alternatif kepada terapi tradisional yang selalunya memerlukan penjagaan secara satu-satu. Namun, terdapat pelbagai cabaran dalam pelaksanaannya, termasuk had teknologi, isu aksesibiliti, latihan pendidik, dan perbezaan individu dalam kalangan pelajar autisme. Kejayaan model video bergantung kepada penyesuaian kandungan, kaedah penyampaian, dan penglibatan pelajar. Kajian masa depan perlu memberi tumpuan kepada meningkatkan aksesibiliti, menggabungkan teknologi baru seperti kecerdasan buatan (AI), realiti maya (VR), dan realiti campiran (AR), serta membina model pembelajaran adaptif yang disesuaikan dengan keperluan individu.

Kata kunci: Model video; Gangguan spektrum autisme; Pendidikan.

1. Pendahuluan

Individu dengan gangguan spektrum autisme sering menghadapi cabaran besar dalam komunikasi sosial, interaksi, dan pengawalan tingkah laku, yang boleh menghalang perkembangan akademik dan sosial mereka. Pendekatan intervensi tradisional untuk gangguan spektrum autisme selalunya memerlukan sokongan intensif secara individu daripada profesional terlatih, yang boleh menjadi beban sumber dan sukar diakses oleh banyak keluarga (Zhang et al., 2022). Justeru, untuk menangani cabaran ini, penyelidik dan pendidik telah meneroka pelbagai intervensi, termasuk model video; satu teknik yang melibatkan penggunaan video rakaman awal bagi mengajar kemahiran atau tingkah laku tertentu. Kajian sistematik ini bertujuan untuk meneliti literatur sedia ada mengenai penggunaan model video dalam pendidikan autisme, dengan menumpukan kepada cabaran dan implikasi yang berkaitan dengan pendekatan ini.

Model video adalah intervensi berasaskan video yang digunakan secara meluas untuk individu dengan pelbagai ketidakupayaan, termasuk pelajar yang mengalami kesukaran pembelajaran (Kellems & Edwards, 2016; Nurbieta et al., 2022). Model video dikenal pasti sebagai intervensi untuk individu dengan gangguan spektrum autisme kerana ia boleh menyediakan persekitaran pembelajaran yang berstruktur dan boleh diramal, membolehkan pendedahan berulang kepada tingkah laku sasaran, dan meminimumkan tuntutan sosial yang mungkin sukar bagi sesetengah individu dengan gangguan spektrum autisme (Pham et al., 2019). Walau bagaimanapun, pelaksanaan model video dalam pendidikan gangguan

spektrum autisme mesti dipertimbangkan dengan teliti untuk memastikan keberkesanan dan aksesibiliti pendekatan ini. Kajian ini akan mensintesis kajian-kajian lepas mengenai penggunaan model video dalam pendidikan gangguan spektrum autisme, dengan menonjolkan cabaran utama dan implikasi untuk amalan serta penyelidikan masa depan.

Teknologi merujuk kepada penerapan pengetahuan dan prinsip saintifik untuk tujuan praktikal, terutama dalam menyelesaikan masalah dan meningkatkan keupayaan manusia. Dalam konteks pendidikan, teknologi telah memainkan peranan penting dalam mengubah kaedah pengajaran dan pembelajaran. Menurut Persatuan Komunikasi dan Teknologi Pendidikan (Chinwendu & Abraham, 2020), teknologi pendidikan merangkumi amalan etika dalam memudahkan pembelajaran dan meningkatkan prestasi melalui penciptaan, penggunaan, dan pengurusan sumber serta proses teknologi.

Penggunaan teknologi dalam pendidikan merangkumi pelbagai bentuk, daripada media tradisional seperti radio dan televisyen, kepada sistem moden seperti bilik darjah maya dan pembelajaran adaptif. Davies et al. (2014) menegaskan bahawa teknologi bukan sekadar alat, tetapi elemen penting dalam ekosistem pendidikan yang menyokong penglibatan pelajar dan pembelajaran yang diperibadikan.

Kemajuan teknologi maklumat telah melahirkan pendekatan inovatif seperti pembelajaran campuran, bilik darjah terbalik, dan pembelajaran jarak jauh. Menurut kajian terkini oleh Zhao et al. (2023), penggunaan kecerdasan buatan (AI) dan teknologi pembelajaran adaptif dalam bilik darjah telah meningkatkan pencapaian pelajar melalui penyediaan kandungan yang disesuaikan mengikut tahap individu. Selain itu, OECD (2024) melaporkan bahawa penggunaan teknologi secara strategik dapat merapatkan jurang pencapaian antara pelajar bandar dan luar bandar, terutamanya apabila digabungkan dengan latihan profesional kepada guru. Secara keseluruhan, teknologi bukan sahaja memperkasa proses pembelajaran, malah membentuk semula landskap pendidikan untuk menjadi lebih inklusif, berpusatkan pelajar, dan responsif terhadap perubahan global.

Teknologi model video semakin diiktiraf sebagai pendekatan berkesan dalam membantu individu dengan gangguan spektrum autisme menguasai tingkah laku sosial dan kemahiran hidup. Kaedah ini memanfaatkan keupayaan visual individu autisme yang cenderung bertindak balas lebih baik terhadap rangsangan visual berbanding lisan. Melalui pemerhatian video, mereka dapat memahami dan meniru tingkah laku dalam konteks sebenar dengan lebih berkesan (Elhaddadi et al., 2022).

Model video amat berkesan dalam pengajaran kemahiran sosial dan menjadi salah satu cabaran utama individu autisme. Dengan menonton video yang memaparkan interaksi sosial seperti berjabat tangan atau berbual, mereka memperoleh pemahaman dan keyakinan untuk menghadapi situasi sosial sebenar (Saidin, 2024). Selain itu, ciri pembelajaran berulang yang ditawarkan membolehkan pengukuhan tingkah laku secara berterusan (Yunita & Kurniawan, 2025), dan mengurangkan kebimbangan apabila berdepan dengan persekitaran baharu (Saidin et al., 2023).

Terkini, kajian oleh Liu et al. (2024) menunjukkan bahawa penggunaan model video interaktif yang digabungkan dengan realiti tambahan (AR) telah mempercepatkan pemerolehan kemahiran sosial dalam kalangan remaja autisme melalui pendedahan kepada simulasi sosial yang realistik. Sementara itu, kajian meta-analisis oleh Tan & Zulkarnain (2025) mengesahkan keberkesanan pembelajaran berasaskan video dalam pengajaran kemahiran hidup seperti kebersihan diri, penyediaan makanan dan pengurusan masa harian, dengan kadar retensi lebih tinggi berbanding kaedah tradisional.

Model video juga membolehkan pengajaran yang lebih fleksibel dan diperibadikan, kerana kandungan video boleh disesuaikan mengikut tahap kemahiran individu. Ini menyokong perkembangan kendiri dan meningkatkan kualiti hidup secara menyeluruh.

Secara keseluruhan, teknologi model video bukan sahaja meningkatkan keupayaan pembelajaran individu autisme, malah menyokong intervensi jangka panjang yang berkesan dan mesra pengguna dalam pelbagai konteks pendidikan dan terapi.

Autisme, atau gangguan spektrum autisme (ASD), ialah satu keadaan perkembangan neuro kompleks yang memberi kesan kepada komunikasi, interaksi sosial, dan corak tingkah laku individu. Individu dengan ASD sering mengalami kesukaran untuk berinteraksi dan berkomunikasi dengan orang lain, serta menunjukkan tingkah laku berulang dan minat yang terhad. Ciri-ciri ini biasanya muncul pada usia awal kanak-kanak dan boleh memberi kesan jangka panjang terhadap pembelajaran dan kehidupan seharian.

Di Malaysia, autisme diiktiraf sebagai satu bentuk ketidakupayaan di bawah pendaftaran OKU oleh Jabatan Kebajikan Masyarakat. Autisme didefinisikan sebagai gangguan pembelajaran yang menjejaskan keupayaan berinteraksi dan berkomunikasi secara sosial, serta disertai dengan tingkah laku yang tidak tipikal.

Kelaziman autisme dilaporkan semakin meningkat secara global. Menurut Elsabbagh et al. (2021), peningkatan ini berpunca daripada kesedaran masyarakat yang lebih tinggi, kriteria diagnosis yang diperluas, dan akses yang lebih baik kepada perkhidmatan kesihatan mental. Perkembangan teknologi kesihatan mental turut membawa pendekatan baharu dalam pengesanan awal autisme. Ismail et al. (2023) menunjukkan bahawa penggunaan pembelajaran mesin (*machine learning*) dapat meningkatkan ketepatan dan kecekapan dalam mengenal pasti corak awal gangguan autisme berdasarkan data tingkah laku dan biometrik. Kaedah ini sangat penting untuk diagnosis awal yang memungkinkan intervensi lebih cepat dan berkesan.

Tambahan pula, kajian terkini oleh Cheng et al. (2022) mendapati bahawa intervensi awal melalui sokongan digital dan pemantauan berasaskan aplikasi mudah alih dapat membantu ibu bapa dan profesional mengesan gejala awal ASD dengan lebih proaktif, terutama dalam persekitaran komuniti yang kurang akses kepada pakar klinikal.

Secara keseluruhan, autisme merupakan gangguan yang kompleks dan berterusan, tetapi kemajuan dalam teknologi dan sains tingkah laku kini menawarkan peluang yang lebih besar untuk pengesanan awal, intervensi tersusun, dan peningkatan kualiti hidup individu yang terlibat.

Gangguan Spektrum Autisme (ASD) ialah keadaan perkembangan neuro kompleks yang dicirikan oleh kesukaran berterusan dalam komunikasi sosial, interaksi, serta corak tingkah laku yang berulang dan minat yang terhad. ASD dianggap sebagai "spektrum" kerana tahap keterukan dan persembahan gejalanya berbeza-beza antara individu.

Kajian terkini menunjukkan peningkatan ketara dalam kelaziman ASD. Menurut Maenner et al. (2021), di Amerika Syarikat, ASD kini dianggarkan menjejaskan kira-kira 1 dalam 44 kanak-kanak, menunjukkan peningkatan berbanding anggaran sebelumnya. Peningkatan ini sebahagiannya disumbangkan oleh kesedaran yang lebih tinggi, penambahbaikan dalam proses saringan, dan kriteria diagnostik yang lebih luas.

Punca ASD melibatkan gabungan faktor genetik dan persekitaran. Kajian oleh Hodges et al. (2020) dan disokong oleh Satterstrom et al. (2020) mendapati bahawa pelbagai variasi genetic, termasuk mutasi *de novo* dan variasi bilangan salinan (CNV), berkaitan rapat dengan perkembangan ASD. Selain faktor genetik, pengaruh persekitaran seperti komplikasi semasa

kehamilan, jangkitan pranatal, dan faktor metabolik ibu turut dikenalpasti sebagai penyumbang (Hodges et al., 2020).

Dari sudut klinikal, persembahan ASD sangat pelbagai iaitu daripada individu yang memerlukan sokongan intensif kepada mereka yang berfungsi tinggi dengan kemahiran bahasa dan kognitif yang baik. Manual Diagnostik dan Statistik Gangguan Mental edisi kelima (DSM-5) menggabungkan subkategori sebelumnya seperti Sindrom Asperger dan PDD-NOS ke dalam satu diagnosis spektrum bagi menangkap kepelbagaian ini secara lebih holistik.

Diagnosis awal dan intervensi awal terbukti memainkan peranan penting dalam meningkatkan kualiti hidup dan hasil jangka panjang bagi individu dengan ASD. Menurut Zwaigenbaum et al. (2022), intervensi intensif dan pelbagai disiplin yang dimulakan seawal usia dua tahun dapat memperbaiki kemahiran bahasa, komunikasi, dan tingkah laku. Intervensi ini merangkumi terapi tingkah laku berstruktur, terapi pertuturan, terapi carakerja, dan latihan kemahiran sosial yang berasaskan bukti.

Dalam dekad terakhir, intervensi berasaskan teknologi telah berkembang pesat sebagai pendekatan yang efektif dalam menyokong pembelajaran kanak-kanak dengan gangguan spektrum autisme (ASD). Peranti seperti iPad, tablet, dan komputer telah digunakan untuk membina strategi pengajaran yang lebih responsif dan diperibadikan, membolehkan pelajar autisme meneroka, mensimulasikan, dan mempelajari kemahiran asas mengikut tahap dan keperluan mereka (Alpaydın, 2020; Wan Fatimah & Satiakumar, 2022).

Salah satu pendekatan terkini yang semakin mendapat perhatian ialah model video, iaitu strategi pembelajaran berasaskan video yang terbukti berkesan dalam meningkatkan kemahiran komunikasi, sosial, permainan, dan kehidupan harian bagi individu dengan ASD. Kajian oleh Seok et al. (2025) menunjukkan bahawa model video merupakan satu bentuk amalan berasaskan bukti yang kukuh, digunakan secara meluas dalam pendidikan khas untuk pelbagai keperluan perkembangan.

Model video melibatkan penggunaan rakaman video yang memaparkan seseorang mempersembahkan tingkah laku atau kemahiran sasaran, yang kemudiannya ditiru oleh pelajar. Teknik ini berfungsi secara visual, menjadikannya sangat sesuai untuk individu dengan autisme yang lebih responsif terhadap rangsangan visual berbanding lisan. Video juga dapat diulang tayang, membolehkan pengukuhan pembelajaran secara konsisten dan tanpa tekanan sosial secara langsung.

Pendekatan ini menyediakan persekitaran pembelajaran yang terkawal dan boleh diramal, yang sangat bermanfaat bagi individu dengan ASD yang cenderung berkembang dalam rutin yang stabil dan terstruktur. Ia turut mengurangkan beban kognitif serta kebimbangan yang biasa dihadapi dalam persekitaran pembelajaran konvensional. Yu et al. (2020) dan Wan Fatimah & Satiakumar (2022) menekankan bahawa teknik ini boleh disesuaikan dengan pelbagai tahap perkembangan dan keperluan pelajar, menjadikannya fleksibel dan sangat berkesan untuk intervensi jangka panjang.

Jadual 1. Jenis-jenis model video

Jenis model video *(Types of video modelling)*	Penerangan *(Description)*
Model video asas *(Basic video modelling)*	Tingkah laku yang diinginkan dirakam sama ada oleh seorang individu atau rakan sebaya dalam model asas. Selepas itu, kanak-kanak autisme menonton video tersebut untuk mempelajari tindakan atau tugasan tertentu.

Model video kendiri *(Video self-modelling)*	Kanak-kanak autisme melaksanakan tugasan yang diingini untuk ditunjukkan kepada kanak-kanak autisme lain melalui model video kendiri. Pada masa yang lain dalam video tersebut, kanak-kanak akan melihat dirinya sendiri melakukan tugasan itu.
Model video sudut pandangan *(Point-of-view Video Modelling)*	Video dirakam dari perspektif kanak-kanak autisme dan ditunjukkan dalam simulasi video sudut pandangan.
Pemangkinan video *(Video Prompting)*	Apabila mengajar kemahiran langkah demi langkah, pemangkinan video digunakan. Kemahiran yang diingini dipecahkan kepada beberapa tindakan kecil dan video dihentikan seketika selepas setiap tindakan untuk membantu kanak-kanak autisme mempelajari setiap langkah.

Model video ialah kaedah pengajaran berasaskan teknologi yang semakin mendapat perhatian dalam pendidikan individu dengan gangguan spektrum autisme (ASD). Kaedah ini menggunakan rakaman video untuk mempersembahkan tingkah laku atau kemahiran tertentu yang boleh ditiru oleh pelajar autisme dalam suasana yang terkawal dan bebas tekanan. Persekitaran video yang dapat diramal ini membantu mengurangkan rangsangan deria dan tekanan sosial, seterusnya meningkatkan tumpuan terhadap pembelajaran (Zhang, 2022).

Keberkesanan model video telah dibuktikan dalam pelbagai domain kemahiran, termasuk interaksi sosial, komunikasi, kemahiran penyelesaian masalah, dan kemahiran hidup harian. Kajian oleh Seok et al. (2025) menunjukkan bahawa penggunaan model video secara sistematik dapat meningkatkan pemerolehan kemahiran sosial dan kendiri dalam kalangan kanak-kanak dengan autisme. Model ini juga dapat disesuaikan mengikut tahap dan gaya pembelajaran setiap individu, menjadikannya intervensi yang fleksibel dan diperibadikan.

Teknologi terkini seperti realiti maya (VR) turut memperkukuh keberkesanan model video. Kajian oleh Kim & Park (2021) mendapati bahawa penggunaan model video dalam persekitaran maya interaktif membolehkan pelajar autisme melatih kecekapan sosial secara selamat, tanpa kebimbangan terhadap akibat negatif dalam situasi sebenar. Ini sekaligus menyokong pembangunan kemahiran perbualan dan pengawalan emosi dalam konteks simulasi yang realistik.

Walau bagaimanapun, keberkesanan pelaksanaan model video bergantung kepada penyusunan kandungan yang teliti dan penglibatan profesional yang berkelayakan. Intervensi ini perlu dirancang mengikut keperluan individu dan disokong oleh pemantauan berterusan agar hasil pembelajaran dapat dioptimumkan.
Individu dengan gangguan spektrum autisme (ASD) lazimnya menghadapi cabaran dalam komunikasi sosial, interaksi, dan pengawalan tingkah laku, yang boleh menjejaskan kemajuan akademik dan kesejahteraan sosial mereka. Kaedah intervensi konvensional sering memerlukan sokongan intensif dan berterusan daripada profesional terlatih, yang mungkin membebankan dari segi kos dan sumber serta sukar diakses dalam sesetengah komuniti.

Sebagai alternatif, model video telah muncul sebagai pendekatan intervensi yang efektif dan praktikal untuk pendidikan autisme. Teknik ini menggunakan rakaman video yang memaparkan tingkah laku atau kemahiran sasaran untuk ditiru oleh pelajar. Menurut kajian oleh Zhang et al. (2022), model video memberikan persekitaran pembelajaran yang terstruktur, mengurangkan tekanan sosial, dan membenarkan pengulangan kendiri, ciri-ciri yang amat sesuai dengan keperluan pelajar autisme.

Namun begitu, pelaksanaan model video juga mempunyai cabaran tersendiri. Kajian oleh Yunita & Kurniawan (2025) melaporkan beberapa halangan utama, termasuk kekurangan penYauaian kandungan video mengikut tahap perkembangan pelajar, keperluan pemantauan berterusan oleh guru atau ibu bapa, serta isu akses kepada teknologi dan infrastruktur digital, terutamanya dalam kalangan komuniti luar bandar atau berpendapatan rendah.

Tambahan pula, kajian sistematik oleh Seok et al. (2025) menekankan bahawa keberkesanan model video banyak bergantung kepada kualiti penyampaian, kesesuaian konteks pembelajaran, dan penglibatan aktif daripada pelajar dan fasilitator. Mereka mencadangkan perlunya garis panduan pelaksanaan yang jelas serta latihan profesional kepada pendidik bagi memastikan intervensi ini dimanfaatkan sepenuhnya.

Kajian-kajian terkini ini menunjukkan bahawa model video berpotensi besar sebagai alat pendidikan dan intervensi dalam kalangan individu dengan ASD, tetapi memerlukan pelaksanaan yang strategik dan disesuaikan dengan keperluan individu serta realiti pendidikan semasa.

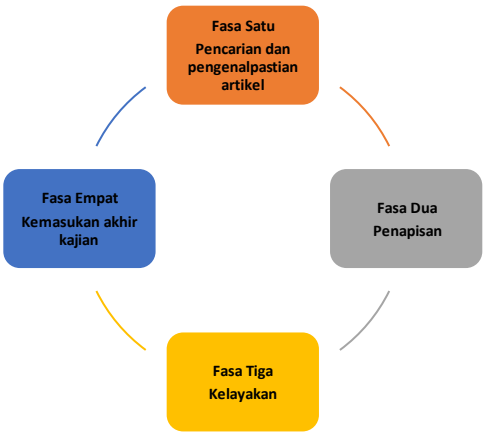
2. Metodologi

Item Pelaporan Pilihan untuk Kajian Sistematik dan Meta-Analisis (PRISMA)
Preferred Reporting Items for Systematic Review and Meta-Analyses (PRISMA)

Kajian ini mengikuti PRISMA 2020 (Page et al., 2021) untuk memastikan ketelusan dan kebolehpercayaan dalam tinjauan sistematik dan meta-analisis. PRISMA menyediakan kerangka sistematik untuk pencarian, penapisan, penilaian, dan sintesis kajian lepas, khususnya berkaitan intervensi model video untuk gangguan spektrum autisme.
Proses PRISMA:

- Pencarian & Pengenalpastian – Artikel relevan dikenal pasti melalui pangkalan data akademik.
- Penapisan – Artikel disaring berdasarkan kriteria kemasukan (contoh: penerbitan selepas 2020).
- Kelayakan – Kajian dinilai secara kritis untuk kualiti dan relevansi.
- Kemasukan – Hanya artikel terpilih dianalisis bagi menjawab objektif kajian.

Pendekatan ini memastikan sintesis bukti empirikal yang kukuh dan terkini, selaras dengan kajian sistematik (Shaffril et al., 2021; Nurul & Shahabuddin, 2023).



Rajah 1. Carta aliran model PRISMA

Kajian ini menilai literatur terkini yang disemak rakan sebaya dalam bahasa Inggeris antara tahun 2020 hingga 2025, berkaitan penggunaan pemodelan video sebagai intervensi pendidikan untuk kanak-kanak dan remaja dengan gangguan spektrum autisme (ASD). Artikel yang dipilih memenuhi kriteria berikut:

a) Populasi: Kajian melibatkan kanak-kanak atau remaja berumur antara 4 hingga 19 tahun, selaras dengan julat umur pendidikan formal.
b) Diagnosa: Peserta mestilah telah didiagnosis secara rasmi dengan gangguan spektrum autisme, mengikut takrifan yang diiktiraf seperti DSM-5 atau piawaian Kementerian Kesihatan/Kementerian Pendidikan.
c) Jenis Intervensi: Kajian mesti menilai model video sebagai intervensi berasaskan bukti yang digunakan untuk meningkatkan pelbagai kemahiran termasuk sosial, komunikasi, atau kawalan tingkah laku.
d) Penyertaan Aktif: Intervensi perlu melibatkan penyertaan langsung kanak-kanak atau remaja dalam proses pembelajaran melalui video.
e) Reka Bentuk Kajian: Kajian yang menggunakan pendekatan kuantitatif, kualitatif, atau reka bentuk campuran akan dipertimbangkan. Kajian tinjauan (scoping reviews), ulasan naratif atau sistematik lain tanpa data primer akan dikecualikan.
f) Hasil Kajian: Kajian perlu menilai pembolehubah hasil yang relevan, seperti perubahan dalam kemahiran sosial, tingkah laku adaptif, interaksi komunikasi, atau keberkesanan intervensi video secara keseluruhan.

Kajian-kajian terpilih termasuk intervensi yang memanfaatkan model video sebagai alat pedagogi yang menyokong pembelajaran berstruktur dan berulang, seperti dibuktikan oleh Zhang et al. (2022) dan Castro et al. (2021) yang menunjukkan peningkatan ketara dalam kemahiran sosial dan pematuhan arahan dalam kalangan murid ASD. Kajian Alzrayer & Banda (2023) turut menyokong keberkesanan video modeling dalam pengajaran kendiri dan pengurangan tingkah laku mencabar.

Artikel untuk ulasan literatur sistematik ini dikenal pasti melalui *Springer Nature Link* dan *Google Scholar*. Penyelidik telah menggunakan pelbagai istilah yang menekankan cabaran dan impak penggunaan pemodelan video sebagai intervensi. Tahap awal carian artikel melibatkan identifikasi artikel atau jurnal dengan menggunakan kata kunci dalam bahasa Melayu dan bahasa Inggeris. Jadual 2 menunjukkan susunan hasil carian artikel berdasarkan kata kunci yang berkaitan dalam dua pangkalan data yang boleh diakses.

Jadual 2. Carian artikel berdasarkan kata kunci

Pangkalan Data	Kata Kunci (Bahasa Melayu)	Kata Kunci (Bahasa Inggeris)
Springer Nature Link	"Pemodelan video autisme"	"Video modelling autism"
	"Intervensi kanak-kanak autisme"	"Autism intervention children"
Google Scholar	"Strategi pembelajaran autisme"	"Learning strategies autism"
	"Pemodelan tingkah laku video"	"Behavior video modelling"

Seterusnya, selepas carian artikel dalam Fasa 1: Identifikasi artikel atau jurnal, penyelidik akan memilih artikel untuk dinilai dalam Fasa 2: Penapisan. Dalam fasa ini, artikel yang diperoleh daripada dua pangkalan data akan dinilai mengikut kriteria pemilihan yang telah ditentukan. Artikel yang dimuat turun dipilih berdasarkan kriteria inklusi, termasuk:

Akses terbuka (*open access*) untuk memastikan artikel boleh diakses tanpa bayaran.
Berkaitan dengan sains sosial dan sains kesihatan, khususnya dalam konteks pendidikan dan intervensi autisme.
Memberi tumpuan kepada cabaran dan implikasi pemodelan video sebagai kaedah intervensi dalam pendidikan autisme.
Jumlah artikel yang disaring:
Sebelum saringan: 1,314 artikel dari *Springer Nature Link* dan 711 artikel dari *Google Scholar.*

Selepas saringan: 173 artikel dari *Springer Nature Link* dan 142 artikel dari *Google Scholar.*

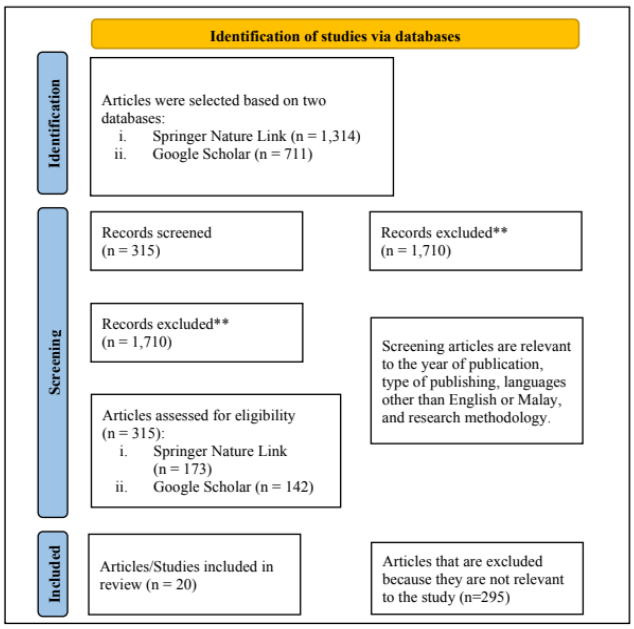
Jadual 3 akan menunjukkan dengan lebih terperinci kriteria inklusi untuk pemilihan artikel dalam kajian ini.

Jadual 3. Kriteria Kemasukan untuk Pemilihan Artikel

Kriteria Kemasukan	Kriteria Pengecualian
Jenis Artikel	Artikel penyelidikan/jurnal
Tahun Penerbitan	2020 hingga 2025
Bahasa	Bahasa Inggeris atau Bahasa Melayu
Kaedah Penyelidikan	Kajian kualitatif, kajian kuantitatif, kaedah campuran

Dalam Fasa 3: Penilaian kelayakan artikel/jurnal terpilih, penyelidik menilai artikel yang berkaitan berdasarkan kesesuaian dengan objektif kajian dan kata kunci. Sepanjang proses saringan dalam fasa kelayakan ini, 295 artikel telah ditolak kerana tidak memenuhi kriteria yang ditetapkan. Akhirnya, 20 artikel dipilih untuk dimasukkan ke dalam ulasan literatur sistematik ini kerana relevansi yang ketara dengan objektif kajian.

Rajah 2 menunjukkan prosedur pemilihan artikel yang mengikuti empat (4) fasa berdasarkan model PRISMA. Artikel tersebut diperoleh daripada dua pangkalan data utama iaitu Springer Nature Link dan Google Scholar. Penyelidik berjaya mengumpulkan 20 artikel yang relevan dengan matlamat dan kandungan kajian, yang akan digunakan sebagai bahan perbincangan dalam kajian ini.



Rajah 2. Prosedur pemilihan artikel mengikuti empat fasa berdasarkan model PRISMA

Di dalam Fasa 3: Penilaian artikel/jurnal terpilih, artikel yang telah melepasi saringan akan dinilai dengan lebih teliti berdasarkan kualiti metodologi, kesesuaian intervensi, serta hasil yang dilaporkan. Penilaian akan menitikberatkan relevan kajian dengan objektif penyelidikan, reka bentuk kajian sama ada kuantitatif, kualitatif, atau campuran dan kebolehpercayaan data serta bukti sokongan untuk pemodelan video sebagai intervensi dalam pendidikan autisme.

Hanya artikel yang memenuhi kriteria ketat ini akan beralih ke Fasa 4: Termasuk/Pemilihan akhir artikel/jurnal.

Dalam Fasa 4: Termasuk/Pemilihan artikel/jurnal akhir, hanya artikel yang memenuhi semua kriteria akan dimasukkan dalam analisis akhir. Tujuannya adalah untuk memastikan hasil kajian ini berdasarkan sumber yang sahih, berkualiti tinggi, dan relevan dengan penggunaan pemodelan video dalam pendidikan autisme. Hasil akhir akan Menyusun jumlah artikel yang dipilih berdasarkan pangkalan data, kategori intervensi sama ada fokus pada kemahiran sosial, komunikasi, atau tingkah laku dan metodologi kajian yang digunakan, seperti eksperimen, kajian lapangan, atau kajian kendiri.

3. Dapatan dan Perbincangan

Sebanyak 2,205 kajian telah dikenal pasti. Selepas 1,710 kajian duplikasi dikeluarkan, 315 kajian kekal untuk dinilai. Kajian-kajian ini ditapis berdasarkan tajuk dan abstrak, dan 1,710 artikel yang tidak memenuhi kriteria kemasukan dan pengecualian (rujuk Jadual 3) telah dikecualikan. Daripada 315 artikel yang mara ke fasa penilaian teks penuh akhir, 295 artikel lagi dikecualikan kerana gagal memenuhi kriteria yang ditetapkan. Akhirnya, 20 artikel dipilih untuk dimasukkan ke dalam fasa akhir ulasan sistematik ini. Jadual 4 akan memaparkan ringkasan aspek utama bagi setiap kajian.

Penilaian kualiti dijalankan menggunakan alat penilaian yang sesuai untuk kajian tinjauan sistematik dan sintesis penyelidikan, dikenali sebagai Joanna Briggs Institute Critical Appraisal Checklist (JBI) (Jordan et al., 2019). Alat penilaian ini menilai kualiti kajian berdasarkan sebelas kriteria, termasuk menjelaskan kriteria kemasukan sampel, mengenal pasti dan mengurus faktor perancu dan memastikan hasil kajian adalah tepat dan sah. Setiap kriteria dinilai dengan pilihan jawapan: "ya", "tidak", "tidak jelas", dan "tidak relevan". Kajian yang mendapat 6 atau lebih jawapan "ya" dianggap sebagai kajian berkualiti tinggi. Oleh itu, hanya kajian yang mendapat 6 atau lebih akan dimasukkan dalam tinjauan ini (Burks et al., 2021; Milea et al., 2024). Jadual 5 menunjukkan penilaian berdasarkan pemarkahan kualiti bagi 20 penerbitan yang dipilih untuk kajian ini.

Jadual 4. Hasil aspek asas setiap kajian

Pengarang (Tahun)	Jumlah (N)	Kaedah/Reka Bentuk	Objektif Kajian	Intervensi	Keputusan	Kesimpulan
Alhuzimi (2020)	N=6 (4 kanak-kanak gangguan spektrum autisme berusia 8 hingga 12 tahun & 2 guru dari sekolah khas)	Reka bentuk pelbagai asas dengan eksperimen, temu bual & pemerhatian	Menyelidik keberkesanan intervensi model video dalam meningkatkan dua kemahiran sosial tertentu dalam kalangan kanak-kanak lelaki dengan gangguan spektrum autisme di persekitaran pendidikan khas: bermain dengan rakan sebaya dan memberi salam di sekolah.	Intervensi model video selama 18 minggu untuk membangunkan kemahiran sosial.	Hasil menunjukkan model video asas memberi kesan positif terhadap kemahiran sosial pelajar dengan gangguan spektrum autisme.	Model video berkesan dalam membangunkan tingkah laku sasaran dalam kalangan kanak-kanak autisme yang terlibat.
Rizki et al. (2024)	N=10 kanak-kanak dengan gangguan spektrum autisme (berumur 6-13 tahun)	Reka bentuk eksperimen subjek tunggal	Menilai kesan model video kendiri (VSM) dalam meningkatkan keupayaan kanak-kanak dengan gangguan spektrum autisme untuk memberus gigi sendiri.	Eksperimen pra dan pasca menggunakan model video kendiri untuk latihan memberus gigi.	Hasil kajian menunjukkan model video kendiri secara signifikan meningkatkan keupayaan memberus gigi secara berdikari dalam kalangan kanak-kanak dengan gangguan spektrum autisme.	Model video kendiri berkesan membantu kanak-kanak autisme membangunkan kemahiran tingkah laku dan intelektual.
Yakubova et al. (2023)	N=1 kanak-kanak dengan gangguan spektrum autisme (5 tahun)	Reka bentuk kajian eksperimen kes tunggal dengan pelbagai uji kemahiran	Mengkaji keberkesanan pengajaran kemahiran matematik seperti tambah, banding nombor, dan tolak kepada seorang kanak-kanak autisme berusia 5 tahun menggunakan pakej intervensi model video.	Persekitaran maya serentak menyampaikan pakej intervensi model video yang merangkumi manipulatif maya dan pembetulan kesilapan	Kajian menunjukkan kanak-kanak dengan gangguan spektrum autisme mendapat manfaat daripada menonton model video dalam talian semasa belajar matematik. Penemuan utama termasuk peningkatan kemahiran matematik, interaksi positif, dan pengurangan tahap kebimbangan.	Model video dalam talian adalah sumber yang berguna untuk mengajar matematik kepada kanak-kanak autisme. Video ini menawarkan kaedah yang lebih mudah dan berkesan untuk membantu kanak-kanak autisme yang bergelut memahami konsep matematik asas.

Egarr & Storey (2022)	N = 4 kanak-kanak (8-15 tahun) dengan gangguan spektrum autisme	Reka bentuk subjek tunggal, rawatan berselang-seli (ATD)	Menentukan kesan pemodelan video terhadap kefasihan membaca pelajar dengan gangguan spektrum autisme	1. Pemodelan video menggunakan guru sebagai model. 2. Pemodelan video "feedforward self-modelling" (FFVSM) di mana pelajar bertindak sebagai model.	Peningkatan kefasihan membaca diperhatikan pada 2 peserta.	FFVSM berkesan apabila pelajar melihat model yang serupa dengan mereka.
Kellems et al. (2020)	N = 6 orang dewasa muda (18-20 tahun) dengan gangguan spektrum autisme & kecacatan intelektual	Reka bentuk asas pelbagai pasangan (baseline across dyads)	Mengkaji kesan arahan eksplisit, pemodelan video, dan maklum balas video dalam mengajar kemahiran memulakan perbualan	Pemodelan video dan maklum balas video	5 daripada 6 peserta mengekalkan kemahiran memulakan perbualan dalam jangka panjang.	Intervensi ini berkesan dan peserta suka menonton video mereka sendiri dan video model.
Dogan (2023)	N = 1 (remaja lelaki, 16 tahun) dengan gangguan spektrum autisme	Reka bentuk prob pelbagai dalam kajian kes tunggal	Menilai keberkesanan pemodelan video maya untuk mengajar kemahiran kehidupan harian asas	Pemodelan video perspektif orang pertama oleh pelajar berusia 17 tahun yang berkembang tipikal	Peserta mempelajari, mengekalkan, dan mengaplikasikan kemahiran harian (memasak sup segera, menyediakan meja, memasukkan pinggan kotor ke mesin basuh pinggan)	Pemodelan video berkesan dalam mengajar 3 kemahiran kehidupan harian kepada remaja dengan gangguan spektrum autisme.

Thull (2024)	N = 1 (pelajar lelaki, 19 tahun) dengan gangguan spektrum autisme	Kajian kes tunggal (pemerhatian dan nota lapangan)	Menghasilkan "Video-Based Instruction" (VBI) untuk membantu pelajar dengan gangguan spektrum autisme melaksanakan aktiviti secara berdikari dalam persekitaran kerja komuniti	VBI dihasilkan dengan kamera dan aplikasi gambar iPad, menunjukkan langkah-langkah penyediaan kopi	Peserta berjaya melaksanakan setiap langkah penyediaan kopi secara berdikari	VBI menggunakan iPad adalah pendekatan pengajaran yang praktikal untuk pembangunan kerjaya individu dengan gangguan spektrum autisme.
Elhaddadi et al. (2022)	N = 18 (kanak-kanak dengan gangguan spektrum autisme, 5-8 tahun)	Kaedah eksperimen dengan dua kumpulan eksperimen. Menggunakan tiga alat ukur: Skala Kemahiran Bermain, Ujian Matriks Progresif Raven, dan Skala Penilaian Autisme Kanak-kanak (CARS).	Menilai keberkesanan dua program: pemodelan video dan tiruan berulang dalam mengajar kemahiran bermain kepada kanak-kanak autisme.	Pemodelan video dan tiruan berulang	Kedua-dua teknik meningkatkan kemahiran bermain dengan tahap kemajuan berbeza bergantung pada umur, tahap autisme, dan jenis program.	Pemodelan video lebih berkesan kerana ia menggunakan arahan sistematik dengan setiap kemahiran dipecahkan kepada langkah kecil yang mudah difahami.
Ohanele (2024)	N = 90 (kanak-kanak dengan gangguan spektrum autisme, 9-13 tahun)	Pendekatan kuasi-eksperimen dengan reka bentuk kumpulan kawalan praujian-pascaujian	Mengkaji kesan pemodelan video dan arahan langsung terhadap kemahiran sosial pelajar autisme tahap 1.	Pemodelan video dan arahan langsung	Kumpulan pemodelan video mencapai skor purata lebih tinggi (60.70) berbanding kumpulan arahan langsung (50.09).	Pemodelan video dan arahan langsung berkesan untuk mengajar kemahiran sosial bagi pelajar pada semua tahap spektrum dan individu kurang upaya lain.

Lee et al. (2022)	N = 4 (kanak-kanak dengan gangguan spektrum autisme, 4.5-5 tahun)	Reka bentuk eksperimen dengan rawatan berselang-seli untuk menilai hasil pembelajaran pemodelan video dan intervensi berasaskan gambar (PI).	Menyiasat kesan pemodelan video dan intervensi berasaskan gambar dalam melatih kanak-kanak autisme mengenal pasti emosi dalam konteks.	Pemodelan video dan intervensi berasaskan gambar	Semua kanak-kanak memberi respon positif dan menikmati sesi pembelajaran. 3 daripada 4 kanak-kanak lebih tepat dengan pemodelan video berbanding PI.	Kedua-dua kaedah berkesan, tetapi pemodelan video lebih memberi ketepatan dalam memahami emosi.
Lee et al. (2022)	N = 4 (kanak-kanak dengan gangguan spektrum autisme, 4.5-5 tahun)	Reka bentuk eksperimen dengan rawatan berselang-seli untuk menilai hasil pembelajaran pemodelan video dan intervensi berasaskan gambar (PI).	Menyiasat kesan pemodelan video dan intervensi berasaskan gambar dalam melatih kanak-kanak autisme mengenal pasti emosi dalam konteks.	Pemodelan video dan intervensi berasaskan gambar	Semua kanak-kanak memberi respon positif dan menikmati sesi pembelajaran. 3 daripada 4 kanak-kanak lebih tepat dengan pemodelan video berbanding PI.	Kedua-dua kaedah berkesan, tetapi pemodelan video lebih memberi ketepatan dalam memahami emosi.
Bell (2022)	N = 6 (kanak-kanak dengan gangguan spektrum autisme, 6-12 tahun)	Reka bentuk garis dasar pelbagai peserta	Mengkaji kesan mengajar kemahiran pencegahan penculikan kepada kanak-kanak autisme menggunakan pemodelan video.	Intervensi pemodelan video untuk mengajar reaksi yang betul apabila didekati oleh penculik berpotensi	Semua kanak-kanak menunjukkan peningkatan dalam reaksi yang betul terhadap situasi penculikan secara nyata dan dalam video.	Pemodelan video berkesan untuk mendorong kanak-kanak autisme bertindak balas dengan betul terhadap ancaman penculikan.

Petursdottir & Gudmundsdottir (2023)	N = 4 (kanak-kanak dengan gangguan spektrum autisme, 4-5 tahun)	Reka bentuk eksperimen (kajian subjek tunggal dengan probe berganda merentas peserta)	Menilai kesan pemodelan video mudah alih terhadap interaksi sosial kanak-kanak autisme.	Peranti mudah alih (iPod Touch®) dengan fungsi rakaman dan main balik video digunakan untuk pemodelan video	Peningkatan interaksi sosial antara kanak-kanak autisme prasekolah dengan rakan sebaya mereka.	Pemodelan video dengan peranti mudah alih berkesan membantu kanak-kanak prasekolah autisme memperoleh dan mengaplikasikan kemahiran sosial dalam persekitaran sebenar.
Piraneh et al. (2022)	N = 137 (pelajar lelaki dengan ASD, 7-15 tahun)	Reka bentuk eksperimen kuasi rawak (Penilaian susulan dengan soal selidik)	Mengkaji keberkesanan dua intervensi pendidikan memberus gigi terhadap status kebersihan mulut pelajar ASD, diukur dengan Indeks Kebersihan Mulut Ringkas (OHI-S).	Latihan memberus gigi berasaskan pemodelan video	Kedua-dua program pendidikan meningkatkan kebersihan mulut dan pengetahuan ibu bapa.	Latihan memberus gigi melalui pemodelan video lebih berkesan berbanding kaedah bercerita sosial biasa.
Bross et al. (2020)	N = 5 (belia dewasa muda dengan ASD)	Kajian reka bentuk kes tunggal	Mengkaji kesan intervensi pemodelan video terhadap kemahiran perkhidmatan pelanggan lima belia dengan ASD.	Pemodelan video untuk kemahiran perkhidmatan	Pemodelan video berkesan meningkatkan kualiti interaksi perkhidmatan.	Pemodelan video membantu memperbaiki ucapan salam, layanan, dan ucapan penutup dalam konteks pekerjaan.
Edwards et al. (2020)	N = 5 (pelajar sekolah menengah dengan ASD, 16-17 tahun)	Reka bentuk probe berganda subjek tunggal	Menilai kesan pemodelan video pada iPad terhadap kemahiran matematik fungsi pelajar remaja ASD ringan hingga sederhana.	Video pada iPad menunjukkan cara mengira harga selepas diskaun	Hubungan fungsian ditunjukkan antara intervensi dan penguasaan langkah pengiraan.	Pemodelan video berkesan mengajar teknik matematik kepada remaja dengan ASD atau kesukaran pembelajaran.
Stauch & Plavnick (2020)	N = 2 (remaja dengan ASD)	Reka bentuk probe berganda merentas tingkah laku	Menilai keberkesanan pemodelan video dalam mengajar kemahiran sosial dan vokasional di persekitaran seperti pekerjaan.	Pemodelan video 1-3 kali seminggu selama lebih kurang 2 jam setiap sesi	Pemodelan video berkesan mengajar kemahiran vokasional.	Pemodelan video terbukti berkesan untuk melatih kemahiran vokasional.

Akmanoğlu & Pektaş-Karabekir (2020)	N = 3 (kanak-kanak lelaki dengan ASD, 5-6 tahun)	Reka bentuk probe berganda merentas subjek	Menentukan keberkesanan pemodelan video pendek menggunakan iPad dalam mengajar kanak-kanak ASD melukis.	Pemodelan video pendek melalui iPad	Pemodelan video pendek melalui iPad meningkatkan hasil pembelajaran kanak-kanak.	Pemodelan video pendek sesuai untuk melatih kemahiran melukis.
Aljehany & Bennett (2020)	N = 3 (pelajar menengah dengan ASD, 12-15 tahun)	Reka bentuk eksperimen (meneroka kaedah)	Menentukan sama ada Pemodelan Video atau Prompting Paling-Sedikit-Ke-Paling berkesan untuk mengajar tugas pejabat kepada pelajar ASD.	Perbandingan Pemodelan Video dengan Prompting Paling-Sedikit-Ke-Paling	Intervensi pemodelan video lebih cekap berbanding prompting paling-sedikit-ke-paling.	Pemodelan video lebih berkesan dan menjimatkan masa.
Ayvazo et al. (2024)	N = 3 (pelajar dengan ASD, 16-18 tahun)	Reka bentuk eksperimen	Menyelidik intervensi yang mensasarkan keperluan perbualan remaja dengan ASD.	Intervensi pemantauan kendiri dengan sokongan pemodelan video	Semua peserta menunjukkan peningkatan tingkah laku perbualan secara konsisten.	Pemantauan kendiri dengan video berkesan membantu remaja ASD meningkatkan kemahiran berbual.
Wu (2023)	N = 3 (pelajar dengan ASD, 10-11 tahun)	Reka bentuk eksperimen	Membangunkan dan mengesahkan model pengajaran yang menggunakan realiti tambahan dan pemodelan video untuk meningkatkan ketepatan menyelesaikan masalah matematik.	Pemodelan video dengan model pengajaran realiti tambahan	Model pemodelan video dengan realiti tambahan menawarkan pendekatan alternatif.	Model ini membantu kanak-kanak dengan ketidakupayaan perkembangan meningkatkan kemahiran menyelesaikan masalah matematik.

Jadual 5. Penilaian kualiti kajian selepas aplikasi *Joanna Briggs Institute Critical Appraisal* (JBI)

	Item 1	Item 2	Item 3	Item 4	Item 5	Item 6	Item 7	Item 8	Item 9	Item 10	Item 11	Penilaian Keseluruhan
Alhuzimi (2020)	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	11/11
Rizki et al. (2024)	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	11/11
Yakubova et al. (2023)	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	11/11
Egarr & Storey (2022)	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	11/11
Kellems et al. (2020)	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	11/11
Dogan (2023)	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Tidak relevan	Ya	10/11
Thull (2024)	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	11/11
Elhaddadi et al. (2022)	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	11/11
Ohanele (2024)	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	11/11
Lee et al. (2022)	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	11/11
Bell (2022)	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	11/11
Petursdottir & Gudmundsdottir (2023)	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	11/11
Piraneh et al. (2022)	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	11/11
Bross et al. (2020)	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	11/11
Edwards et al. (2020)	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	11/11
Stauch & Plavnick (2020)	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Tidak relevan	Ya	10/11
Akmanoğlu & Pektaş-Karabekir (2020)	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	11/11
Aljehany & Bennett (2020)	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	11/11
Ayvazo et al. (2024)	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	11/11
Wu (2023)	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	Ya	11/11

Item daripada *Joanna Briggs Institute Critical Appraisal Checklist* (JBI) adalah seperti berikut:

Item 1: Adakah soalan kajian dinyatakan dengan jelas dan eksplisit?
Item 2: Adakah kriteria kemasukan sesuai untuk soalan kajian?
Item 3: Adakah strategi pencarian sesuai?
Item 4: Adakah sumber dan bahan yang digunakan untuk mencari kajian mencukupi?
Item 5: Adakah kriteria untuk menilai kajian sesuai?
Item 6: Adakah penilaian kritikal dijalankan secara bebas oleh dua atau lebih penilai?
Item 7: Adakah terdapat kaedah untuk meminimumkan ralat dalam pengekstrakan data?
Item 8: Adakah kaedah yang digunakan untuk menggabungkan kajian sesuai?
Item 9: Adakah kemungkinan bias penerbitan dinilai?
Item 10: Adakah cadangan untuk dasar dan/atau amalan disokong oleh data yang dilaporkan?
Item 11: Adakah arahan khusus untuk penyelidikan baharu sesuai?

Artikel penyelidikan yang telah dianalisis menunjukkan bahawa intervensi pemodelan video sangat relevan, dan secara tidak langsung hasil kajian ini menyokong penemuan penyelidikan terdahulu. Objektif utama semua kajian yang termasuk dalam ulasan ini adalah untuk

menganalisis dan menilai manfaat, batasan, dan kesan praktikal pemodelan video sebagai alat pendidikan dan intervensi bagi individu dengan gangguan spektrum autisme (ASD). Tambahan pula, semua kajian yang dimasukkan adalah berkualiti tinggi, dengan skor 6 atau lebih berdasarkan *Joanna Briggs Institute Critical Appraisal Checklist* (JBI).

Selain itu, hasil intervensi menunjukkan bahawa pemodelan video asas boleh memberi kesan positif ke atas kemahiran sosial pelajar ASD. Pemodelan video terbukti berkesan dalam membentuk tingkah laku sasaran pada kanak-kanak ASD (Alhuzimi, 2020; Rizki et al., 2024). Namun, setiap individu ASD adalah unik dengan kekuatan dan cabaran tersendiri. Oleh itu, tiada pendekatan "satu saiz sesuai untuk semua" dalam terapi dan intervensi autisme (Autism Speaks, 2019; Alhuzimi, 2020). Hal ini menjadikan pelbagai proses dan intervensi, termasuk pemodelan video, terus dikaji.

Pemodelan video juga membantu kanak-kanak dan remaja ASD meningkatkan kemahiran sosial serta tingkah laku. Ayvazo et al. (2024) menyatakan bahawa pemantauan kendiri yang digabungkan dengan terapi berasaskan video adalah teknik berkesan untuk meningkatkan kemahiran perbualan dalam kalangan remaja ASD. Model berasaskan video memberi contoh visual kepada peserta untuk memahami dan meniru tabiat perbualan yang sesuai. Kajian ini menekankan keperluan menggabungkan beberapa strategi intervensi, seperti pemantauan kendiri dan pemodelan video, untuk membantu pembangunan kemahiran sosial remaja ASD agar mereka lebih cekap dalam interaksi sosial.

Walaupun terdapat penemuan positif, Stauch dan Plavnick (2020) telah mengenal pasti beberapa cabaran. Salah satu cabaran utama adalah memastikan kandungan video menarik dan sesuai dengan keperluan unik setiap remaja. Beberapa peserta mungkin mempunyai gaya pembelajaran yang berbeza atau bertindak balas lebih baik kepada model video tertentu.

Cabaran lain adalah memastikan generalisasi kemahiran di luar situasi latihan video. Walaupun terdapat peningkatan dalam keadaan berstruktur, usaha lebih lanjut diperlukan untuk memastikan remaja boleh menggunakan kemahiran mereka dalam situasi dunia nyata yang tidak berstruktur. Selain itu, teknologi mungkin menjadi halangan bagi sesetengah individu atau situasi yang kekurangan akses kepada peralatan atau sokongan asas.

Namun, Kellems et al. (2020) menyatakan bahawa pemodelan video sebagai intervensi dalam latihan kemahiran sosial memberikan implikasi besar, terutama untuk individu ASD. Kajian ini merumuskan bahawa pemodelan video adalah cara yang realistik dan berkesan untuk membangunkan kemahiran perbualan yang sering menjadi cabaran bagi individu ASD. Penemuan ini menunjukkan bahawa terapi berasaskan video boleh digunakan dalam pelbagai konteks, termasuk program latihan vokasional, pusat komuniti, dan program kediaman untuk membantu individu ASD meningkatkan kemahiran sosial mereka.

Kajian ini menunjukkan bahawa penggunaan pemodelan video mempunyai potensi besar dalam membantu pelajar dengan gangguan spektrum autisme (ASD) meningkatkan kemahiran sosial, tingkah laku, dan pembelajaran akademik. Bagi pendidik, implikasinya adalah keperluan untuk mempelbagaikan pendekatan pengajaran yang melibatkan teknologi, termasuk penggunaan video sebagai alat intervensi yang bersifat visual dan berstruktur. Ini membantu guru menyampaikan maklumat dengan lebih jelas, terutamanya kepada pelajar ASD yang cenderung memahami melalui pemerhatian. Sementara itu, pelajar mendapat manfaat melalui pendedahan kepada situasi pembelajaran yang konsisten dan boleh diulang, sekaligus membina keyakinan diri serta memperbaiki interaksi sosial.

Bagi kajian masa depan, penyelidikan disarankan menumpukan kepada meningkatkan aksesibiliti teknologi dalam komuniti berpendapatan rendah serta menyesuaikan pemodelan video mengikut keperluan dan gaya pembelajaran individu. Kajian juga boleh meneroka penggunaan teknologi canggih seperti AI, AR, dan VR bagi mencipta persekitaran

pembelajaran yang lebih interaktif. Di samping itu, pemodelan video boleh diperluas untuk kemahiran akademik, vokasional dan kendiri, bukan sekadar sosial. Penyelidikan lanjut dapat membantu menjadikan pendekatan ini sebagai satu intervensi jangka panjang dan inklusif, dengan memastikan ia sesuai digunakan merentas pelbagai latar sosioekonomi dan budaya.

4. Kesimpulan

Kajian ini mengesahkan bahawa pemodelan video merupakan pendekatan pengajaran yang berkesan dalam membantu individu dengan gangguan spektrum autisme (ASD), khususnya dalam meningkatkan kemahiran komunikasi sosial, tingkah laku positif, dan pencapaian akademik. Pendekatan ini sangat sesuai untuk pelajar ASD yang memerlukan pembelajaran secara visual, berstruktur, dan berulang. Implikasinya terhadap dunia pendidikan adalah besar, di mana pendidik dapat memanfaatkan teknologi ini untuk menyampaikan kandungan pembelajaran dengan lebih berkesan dan menarik. Potensi untuk menggabungkan pemodelan video dengan teknologi moden seperti AI, AR dan VR juga membuka ruang baharu dalam penyediaan persekitaran pembelajaran yang lebih imersif dan disesuaikan. Namun, kajian ini mempunyai beberapa limitasi, termasuk kebergantungan kepada akses teknologi, kekurangan latihan khusus untuk pendidik, keperluan penyesuaian yang kompleks untuk variasi individu, dan fokus kajian sedia ada pada kesan jangka pendek. Limitasi ini menekankan keperluan penyelidikan lanjut untuk meningkatkan aksesibiliti, latihan guru, pendekatan diperibadikan, dan penilaian jangka panjang.

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KEBERKESANAN PELAKSANAAN KURSUS PASTRI DAN PEMPROSESAN MAKANAN LEMBAGA KEMAJUAN PERTANIAN MUDA (MADA) DI KOLEJ KOMUNITI BANDAR DARUL AMAN

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Abstrak

Kajian ini bertujuan menilai keberkesanan Kursus Pastri dan Pemprosesan Makanan yang dilaksanakan oleh Kolej Komuniti Bandar Darul Aman (KKBDA) kepada usahawan di bawah bimbingan MADA Kedah. Kajian berbentuk kuantitatif ini menggunakan reka bentuk tinjauan melalui edaran soal selidik kepada peserta yang terlibat. Data yang dikumpul dianalisis secara deskriptif menggunakan perisian SPSS bagi mendapatkan gambaran menyeluruh melalui peratusan, skor min dan sisihan piawai. Hasil kajian menunjukkan bahawa keseluruhan komponen yang dinilai iaitu perancangan program, pelaksanaan, penilaian pengajar serta pengurusan urus setia telah mencapai tahap keberkesanan yang tinggi. Peserta memberikan maklum balas yang sangat positif terhadap kesesuaian kandungan kursus, keberkesanan penyampaian, dan kecekapan pengurusan kursus. Selain itu, kursus ini juga didapati berjaya meningkatkan pengetahuan, kemahiran teknikal, keyakinan diri serta potensi keusahawanan dalam kalangan peserta. Secara keseluruhannya, pelaksanaan kursus ini berjaya mencapai objektif utamanya dan memberi impak yang signifikan kepada pembangunan keusahawanan komuniti setempat. Kajian mencadangkan agar kursus seumpama ini diteruskan dengan penambahbaikan dari segi fasiliti, ruang pembelajaran serta pendekatan latihan yang lebih interaktif dan berfokuskan keperluan peserta.
Kata kunci: Keberkesanan kursus; Usahawan MADA; Pembelajaran sepanjang hayat.

1. Pengenalan

Setiap Organisasi yang menganjurkan sesuatu program perlu bersedia dalam pelaksanaan sesuatu program agar keberkesanan pengurusan program dapat menjamin kualiti pelaksanaan kursus. Kecekapan dan teratur semua pengurusan memainkan peranan utama dalam mencapai matlamat kursus dan peserta dapat memperoleh pengalaman pembelajaran yang positif. Terdapat beberapa perkara utama dalam pengurusan program yang perlu diberi perhatian untuk menjamin keberkesanannya, antaranya ialah pengurusan sebelum kursus, interaksi yang positif antara urus setia dan peserta, penerimaan serta pelaksanaan maklum balas, dan penyediaan fasiliti yang selesa semasa kursus. Menurut Noorzihidayah et al. (2020) pengurusan memainkan peranan penting dalam sesebuah organisasi kerana ia menyumbang secara langsung kepada kecemerlangan dan kecekapan operasi keseluruhan. Pengurusan program yang baik dapat meningkatkan keyakinan peserta terhadap keberkesanan kursus dan dapat meningkatkan tumpuan peserta terhadap aktiviti yang dijalankan dan mereka akan lebih cenderung untuk menyertai kursus-kursus seterusnya sekiranya mereka berpuas hati dengan aspek pengurusan sepanjang kursus. Manakala, menurut Rizarina Ekhwan et al. (2020), pelaksanaan kursus pendek dilakukan berdasarkan permintaan masyarakat setempat melalui pelbagai inisiatif promosi dan pameran yang bertujuan menarik penyertaan peserta, terutamanya dari kalangan sekolah, jabatan kerajaan, institusi pengajian tinggi, dan lokasi awam. Selain itu, setiap kursus yang ditawarkan perlu dirancang dengan teliti, merangkumi pemilihan tenaga pengajar yang berkelayakan, penyediaan bahan pengajaran yang mencukupi, taklimat awal yang jelas kepada peserta, serta penggunaan platform pendaftaran yang mudah dan mesra pengguna.

Di peringkat Kolej Komuniti, *Garis Panduan Pelaksanaan Pembelajaran Sepanjang Hayat Kolej Komuniti Edisi 2023* telah diperkenalkan sebagai rujukan rasmi dalam pelaksanaan kursus pendek di seluruh negara. Oleh itu, Unit Pembelajaran Sepanjang Hayat (PSH) di Kolej Komuniti Bandar Darul Aman (KKBDA) perlu memastikan setiap kursus yang ditawarkan dilaksanakan mengikut garis panduan ini, demi menjamin kualiti penyampaian serta memenuhi piawaian institusi. Unit PSH juga perlu sentiasa menjalin hubungan strategik dengan pelbagai jabatan kerajaan dan agensi khususnya di sekitar daerah Kubang Pasu dan Alor Setar. Salah satu rakan kerjasama yang aktif ialah Lembaga Kemajuan Pertanian Muda (MADA) Kedah iaitu agensi badan berkanun yang kerap bekerjasama dalam pelaksanaan kursus keusahawanan dan pengurusan perniagaan kepada kumpulan usahawan bimbingan mereka. Sambutan terhadap kursus ini sentiasa menggalakkan, malah setiap tahun terdapat permintaan khusus daripada pihak MADA agar kursus ini diteruskan, memandangkan tenaga pengajar di KKBDA mempunyai kepakaran dan pengalaman dalam bidang keusahawanan, dan pengurusan perniagaan.

Pada tahun 2024, Unit PSH KKBDA telah menyediakan kursus pastri dan pemprosesan makanan buat kali pertama kepada usahawan MADA sebagai satu lagi inisiatif memperluas bidang latihan kemahiran. Namun begitu, bagi kursus pastri dan pemprosesan makanan yang pertama kali ditawarkan kepada usahawan bimbingan MADA, masih belum terdapat sebarang penilaian menyeluruh mengenai keberkesanan pelaksanaannya. Tiada data yang dapat menunjukkan sejauh mana keberkesanan kursus ini kepada usahawan MADA dari sudut perancangan program, pelaksanaan modul, kualiti penyampaian oleh pengajar serta kecekapan pengurusan urus setia. Ketiadaan penilaian yang sistematik akan menyukarkan Unit PSH KKBDA untuk menentukan impak sebenar kursus terhadap peningkatan kemahiran peserta, tahap kebolehpasaran mereka, serta potensi untuk menceburi bidang keusahawanan makanan.

Berdasarkan isu dan permasalahan yang dinyatakan, kajian ini dijalankan bagi membincang dan menganalisis tahap keberkesanan kursus pastri dan pemprosesan makanan yang ditawarkan serta mengenal pasti kekuatan dan kelemahan dalam pelaksanaannya, agar penambahbaikan yang berkesan dapat dilakukan bagi kursus ini pada masa hadapan. Oleh itu, objektif kajian ini adalah menilai keberkesanan perancangan kursus pastri dan pemprosesan makanan dari segi penyampaian kandungan, kesesuaian bahan serta tempoh masa pelaksanaan, menilai kualiti penyampaian pengajar serta keberkesanan pengurusan urusetia dalam menyediakan kemudahan dan sokongan sepanjang kursus serta mengenalpasti tahap keberkesanan pelaksanaan kursus yang telah di ikuti oleh usahawanan bimbingan MADA.

Pembelajaran Sepanjang Hayat (PSH) di institusi TVET merupakan pendekatan utama dalam membangunkan modal insan yang berkualiti dan relevan dengan kehendak pasaran kerja masa kini. Institusi seperti kolej komuniti dan politeknik menyediakan pelbagai kursus pendek dan latihan kemahiran yang membantu individu meningkatkan kemahiran teknikal dan keusahawanan secara berterusan. Menurut kajian oleh Mohd Shahril Fahmi et al. (2023), pelaksanaan program PSH di Politeknik Port Dickson berjaya meningkatkan kemahiran peserta melalui perancangan program yang sistematik dan pengurusan yang cekap. Selain itu, Nor Asfarul et al. (2022) turut menekankan bahawa PSH ini amat signifikan kerana ia memberi kesan positif kepada individu dari pelbagai peringkat umur. Program ini bukan sahaja membantu dalam pengembangan pengetahuan dan kemahiran, malah turut menambah nilai diri seseorang sejajar dengan tuntutan semasa. Keseluruhan dapatan ini membuktikan bahawa pelaksanaan PSH yang terancang memberi impak yang memberangsangkan terhadap pengalaman pembelajaran peserta, di samping meningkatkan motivasi mereka untuk terus menyertai kursus lanjutan. Dalam hal ini, Natasha N.O. et al. (2022) pula menegaskan bahawa kecekapan dan kecemerlangan tenaga pengajar merupakan antara elemen penting yang menyumbang kepada kepuasan peserta serta mampu meningkatkan permintaan terhadap sesuatu kursus yang ditawarkan.

Di samping itu, kerjasama antara agensi kerajaan dengan institusi TVET meningkatkan akses komuniti kepada latihan kemahiran yang relevan dengan keperluan industri dan keusahawanan, sekaligus membantu memajukan ekonomi setempat. Melalui pelaksanaan program PSH di institusi TVET, bukan sahaja keupayaan teknikal individu diperkasa, malah terdapat perkembangan positif dalam aspek daya saing, keyakinan diri, dan mobiliti sosial, khususnya dalam kalangan peserta dari komuniti berpendapatan rendah atau kawasan luar bandar. Ini kerana pendekatan PSH memberikan peluang kedua kepada individu yang tidak berpeluang melanjutkan pelajaran secara formal, tetapi ingin meningkatkan kemahiran atau menceburi bidang keusahawanan. Contohnya, program kursus pendek seperti pemprosesan makanan, penghasilan pastri, serta perniagaan yang ditawarkan oleh kolej komuniti tidak hanya menumpukan kepada aspek teknikal semata-mata, tetapi turut merangkumi elemen pengurusan perniagaan, pemasaran digital, dan penjenamaan produk. Ini membolehkan peserta mengaplikasikan kemahiran tersebut dalam konteks sebenar, seterusnya membuka ruang keusahawanan yang boleh membantu menjana pendapatan dan memajukan ekonomi negara secara holistik. PSH di institusi TVET sebagai platform pembelajaran inklusif yang memberi peluang kepada pelbagai golongan masyarakat untuk mempertingkatkan kemahiran sepanjang hayat.

2. Metodologi

Kajian ini menggunakan reka bentuk kuantitatif berbentuk tinjauan, dimana data dikumpulkan melalui borang soal selidik yang diedarkan dan dijawab oleh responden secara bersemuka selepas pelaksanaan kursus di Kolej Komuniti Bandar Darul Aman (KKBDA). Metodologi ini dapat mengumpulkan data dengan lebih terperinci bagi menilai tahap keberkesanan pelaksanaan kursus pastri dan pemprosesan makanan Lembaga Kemajuan Pertanian Muda (MADA) di KKBDA.

Kajian ini dijalankan dengan menggunakan kaedah persampelan yang terdiri daripada usahawanan bimbingan Lembaga Kemajuan Pertanian Muda (MADA) Kedah yang mengikuti kursus pastri (aneka tart) dan pemprosesan makanan (pes masakan siri 1 dan pes masakan siri 2) pada Ogos 2024. Kursus ini diadakan sebanyak 3 sesi dimana setiap sesi terdiri daripada responden yang berlainan (20 peserta/kursus). Berdasarkan populasi kajian menggunakan jadual Krejcie dan Morgan (1970), sampel yang diperolehi adalah seramai 52 sampel. Jumlah ini melengkapi jumlah minimum sampel sekiranya saiz populasi adalah 60.

Instrumen yang digunakan dalam kajian ini telah diadaptasi daripada kajian yang lepas iaitu instrument Mohd Shahril Fahmi et al. (2023). Soal Selidik ini mengandungi lima bahagian iaitu Bahagian A: Maklumat Demografi, Bahagian B: Keberkesanan Perancangan Program, Bahagian C: Keberkesanan Pelaksanaan Program, Bahagian D: Penilaian pengajar dan Bahagian E: Keberkesanan Pengurusan Urusetia Program. Skala likert 5 mata digunakan seperti ditunjukkan dalam Jadual 1.

Jadual 1. Skala likert 5 mata

Tahap	Skala
Sangat tidak setuju	1
Tidak setuju	2
Tidak pasti	3
Setuju	4
Sangat setuju	5

Data yang telah diperolehi akan dianalisis menggunakan perisian *Statistical Package for Social Sciences* (SPSS) secara deskriptif seperti peratusan, skor min dan sisihan piawai. Bagi mengenalpasti tahan keberkesanan responden Jadual 2 menunjukkan penentuan tahap

keberkesanan skor min yang diadaptasi daripada Mohd Majid (2000), manakala Jadual 3 menunjukkan taksiran skor sisihan piawai (SP) daripada Jas Laile Suzana J. et al (2003).

Jadual 2. Interpretasi skor min

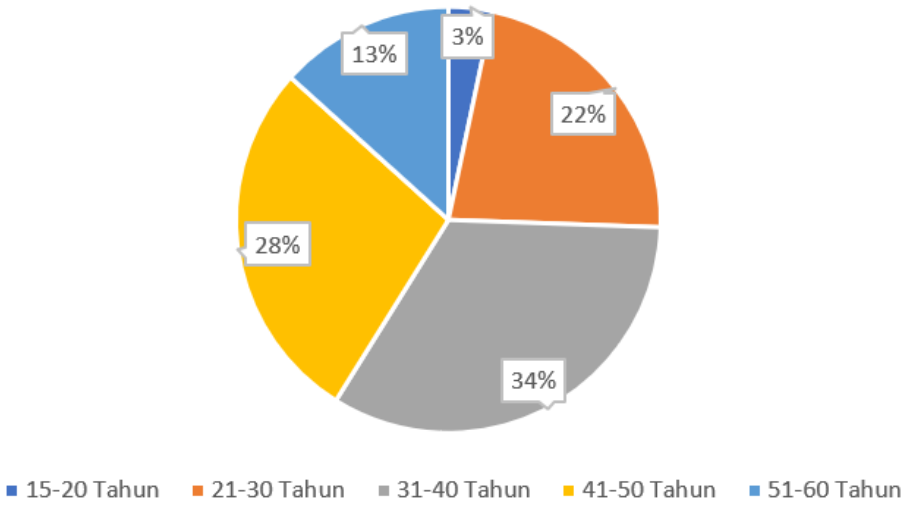
Tahap	Skor min
Rendah	1.00 – 2.33
sederhana	2.34 – 3.66
Tinggi	3.67 – 5.00

Jadual 3: Taksiran Skor Sisihan Piawai (SP)

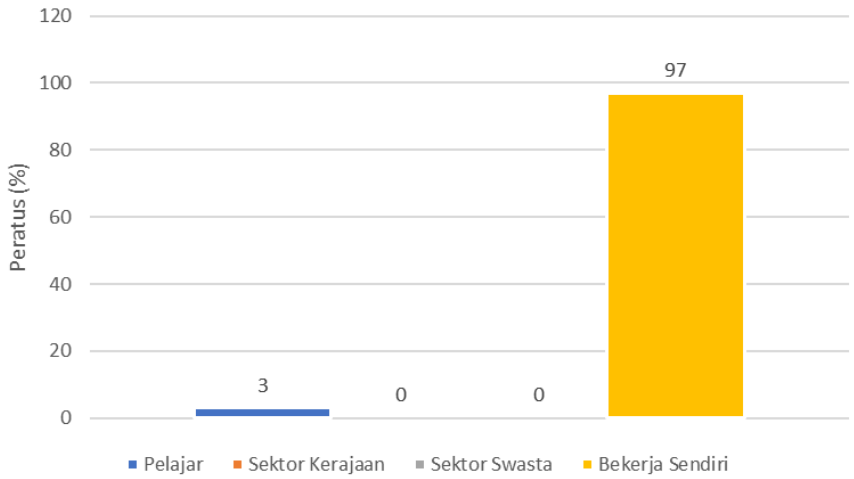
Tafsiran	Skor SP
Konsistensi tinggi (responden memberi jawapan hampir seragam)	0.00 – 0.50
Konsistensi sederhana	0.51 – 1.00
Konsistensi rendah (responden memberi jawapan yang pelbagai)	> 1.00

3. Dapatan dan Perbincangan

Maklumat demografi dalam sampel kajian merangkumi umur dan pekerjaan yang ditunjukkan pada Rajah 1 dan Rajah 2. Dapatan kajian menunjukkan terdapat 3 peringkat umur yang tertinggi peratusan (%) yang mengikuti kursus ini adalah pada peringkat umur 31 hingga 40 tahun (30%, 16 responden), peringkat umur 41 hingga 50 tahun (35%, 18 responden) dan peringkat umur 21 hingga 30 tahun (20%, 10 responden). Selain daripada itu, 2 peringkat umur yang mempunyai peringkat umur yang rendah peratusan adalah pada peringkat umur 51- 60 tahun (12%, 6 responden) dan peringkat umur 15-21 tahun (3%, 2 responden). Ini menunjukkan majoriti peserta adalah dalam lingkungan umur pertengahan dewasa diantara umur 21 tahun hingga 50 tahun yang lazimnya berada dalam fasa kerjaya aktif dan lebih cenderung mengikuti mana-mana kursus bagi tujuan meningkatkan kemahiran dan seterusnya memperkukuh potensi perniagaan yang diceburi serta pendapatan mereka.



Rajah 1. Peratusan responden mengikut umur



Rajah 2. Peratusan responden mengikut pekerjaan

Rajah 2 menunjukkan peratusan (%) pekerjaan peserta kursus, memandangkan peserta kursus adalah usahawan bimbangan MADA wajarlah dapatan kajian bagi maklumat demografi pekerjaan yang tinggi adalah bekerja sendiri (97%, 50 responden) dan yang paling sedikit adalah pelajar (3%, 2 responden) manakala bagi pekerjaan di sektor swasta dan sektor kerjaan tiada peratusan yang dicatakan. Dengan latar belakang sebagai pekerja sendiri, peserta kursus ini dapat memanfaatkan ilmu yang diperoleh untuk meningkatkan kualiti produk mereka, memperluas pasaran, dan memajukan perniagaan secara lebih sistematik. Menurut Noraini et al. (2021) latihan kemahiran dalam bidang pemprosesan makanan secara signifikan membantu meningkatkan daya saing usahawan kecil dan sederhana (PKS). Ini sejajar dengan peratusan usahawan MADA yang bekerja sendiri, di mana mereka memerlukan pengetahuan praktikal untuk memastikan perniagaan mereka mampu bertahan dan berkembang.

Dapatan kajian pada Jadual 4 menunjukkan tafsiran keseluruhan tahap keberkesanan dan konsistensi yang tinggi bagi perancangan program dengan mencatatkan skor min yang tinggi, iaitu dalam skor 4.72 hingga 4.82 dan skor sisihan piawai yang rendah iaitu dalam skor 0.3 – 0.4. Secara keseluruhan, nilai min yang tinggi dan sisihan piawai yang rendah dalam keempat-empat item (B1 hingga B4) yang dianalisis menggambarkan tahap konsistensi yang tinggi dalam maklum balas responden. Ini menunjukkan bahawa kursus yang ditawarkan oleh PSH KKBDA telah memenuhi objektifnya dengan baik dari segi kandungan, penyampaian, kesesuaian bahan, dan tempoh masa pelaksanaan. Menurut Sulaiman dan Hassan (2022), dapatan min tinggi dan SP rendah membuktikan bahawa program yang dirancang dengan baik mampu meningkatkan keyakinan dan kompetensi peserta dan perancangan modul yang tersusun, pendekatan pengajaran yang interaktif, serta kesesuaian bahan latihan memberi kesan langsung terhadap peningkatan pengetahuan dan kemahiran peserta (Noraini et al. 2021).

Item B4 mempunyai nilai min yang paling tinggi (4.82) dan nilai SP yang paling rendah (0.385) menunjukkan tempoh masa kursus yang disediakan amat bersesuai dengan tajuk kursus. Ini menandakan bahawa perancangan masa yang dilakukan oleh penganjur adalah bertepatan dengan keperluan pembelajaran peserta, membolehkan mereka memahami dan menguasai kandungan secara berperingkat tanpa rasa tergesa-gesa atau tertekan. Dalam konteks latihan kemahiran seperti kursus pastri dan pemprosesan makanan, keseimbangan antara teori dan praktikal sangat penting dan berkait rapat dengan keberkesanan masa yang diperuntukkan. Justeru, dapatan ini memperlihatkan bahawa tempoh kursus telah dirancang dengan baik dan selari dengan objektif latihan yang ditetapkan.

Jadual 4. Keberkesanan Perancangan Kursus Pastri Dan Pemprosesan Makanan Lembaga Kemajuan Pertanian Muda (MADA) di Kolej Komuniti Bandar Darul Aman

Item	Penyataan	Min	Sisihan Piawai (SP)	Tafsiran Keseluruhan
B1	Penyampaian Isi Kandungan Mencapai Objektif Kursus.	4.72	0.452	Tahap keberkesanan tinggi dan konsistensi yang tinggi
B2	Kandungan Kursus Yang Disediakan Adalah Relevan Dengan Tajuk Program Dan Teratur.	4.78	0.423	
B3	Bahan dan Peralatan Berkaitan Kursus Disediakan Dengan Cukup Dan Memberi Manfaat.	4.80	0.464	
B4	Tempoh Masa Kursus Yang Disediakan Bersesuaian Dengan Tajuk.	4.82	0.385	

Berdasarkan dapatan kajian pada Jadual 5, keberkesanan pelaksanaan kursus dari segi meningkatkan pengetahuan/kemahiran peserta, mengembangkan laluan kerjaya dan meningkatkan komitmen kepada organisasi mempunyai nilai min yang hampir kepada tahap maksimum, manakala nilai sisihan piawai yang rendah menggambarkan persepsi yang amat positif dan konsisten dalam kalangan peserta terhadap keberkesanan pelaksanaan kursus disampaikan. Item C1 memberikan nilai min yang paling tinggi iaitu 4.87 (SP: 0.362) menunjukkan bahawa majoriti peserta bersetuju bahawa kursus ini telah membantu mereka meningkatkan pengetahuan dan kemahiran dalam bidang yang dipelajari. Menurut Zainuddin et al. (2021) elemen pembelajaran berasaskan pengalaman langsung dan latihan secara praktikal merupakan antara faktor utama yang menyumbang kepada keberkesanan penguasaan kemahiran dalam kalangan peserta. Kajian tersebut melaporkan bahawa peserta yang terlibat dalam latihan praktikal menunjukkan peningkatan signifikan dari segi keyakinan, kemahiran teknikal dan kebolehan untuk mengendalikan perniagaan kecil secara lebih profesional. Oleh itu, pendekatan latihan yang sesuai, praktikal dan memenuhi kehendak peserta adalah sangat penting dalam memastikan keberkesanan pelaksanaan sesebuah program. Manakala item C2 dan C3 masih berada dalam tahap nilai min yang tinggi dan nilai SP yang rendah, menunjukkan bahawa peserta memberikan maklum balas yang konsisten dan positif terhadap aspek pengembangan laluan kerjaya (C2) dan peningkatan komitmen terhadap organisasi (C3). Nilai min yang tinggi ini mencerminkan keyakinan peserta bahawa kursus ini bukan sahaja membantu mereka dari segi kemahiran teknikal, malah turut memberi impak yang signifikan terhadap prospek kerjaya dan motivasi mereka untuk terus berkembang dalam bidang keusahawanan.

Jadual 5. Keberkesanan Pelaksanaan Kursus Pastri Dan Pemprosesan Makanan Lembaga Kemajuan Pertanian Muda (MADA) di Kolej Komuniti Bandar Darul Aman

Item	Penyataan	Min	Sisihan Piawai (SP)	Tafsiran keseluruhan
C1	Saya Dapat Meningkatkan Pengetahuan Selepas Mengikuti Kursus Ini	4.85	0.362	Tahap keberkesanan tinggi dan konsistensi yang tinggi
C2	Saya Dapat Mengembangkan Laluan Kerjaya Di Masa Akan Datang	4.75	0.494	
C3	Saya Dapat Meningkatkan Komitmen Kepada Institusi/Organisasi	4.75	0.494	

Hassan et al. (2021) tenaga pengajar yang berpengalaman dan mempunyai pendekatan pengajaran yang sistematik berupaya meningkatkan kefahaman peserta secara signifikan. Ini telah di buktikan dengan dapatan kajian yang ditunjukkan dalam Jadual 6 iaitu nilai min yang sangat tinggi dan sisihan piawai yang rendah bagi ketiga-tiga item (D1 hingga D3) yang

dinilai. Ini menggambarkan bahawa peserta kursus memberikan maklum balas yang amat positif dan konsisten terhadap peranan pengajar dalam menyampaikan kandungan kursus. Item D3 mempunyai tahap keberkesanan tinggi dan konsistensi yang tinggi dan di ikuti oleh item D2 serta D1. Mutu penyampaian pengajar memainkan peranan penting dalam mempengaruhi tahap pencapaian dan motivasi peserta kursus (Zulkifli dan Rahman, 2022). Kajian tersebut menekankan bahawa kejelasan dalam penyampaian isi kandungan dan penggunaan strategi pengajaran yang pelbagai seperti demonstrasi, perbincangan kumpulan kecil dan bimbingan secara langsung meningkatkan keberkesanan kursus secara menyeluruh. Secara keseluruhan, dapatan ini membuktikan bahawa pengajar memainkan peranan yang sangat penting dalam menentukan kejayaan kursus. Gabungan antara pengetahuan, kaedah penyampaian yang efektif dan kejelasan kandungan telah menyumbang kepada tahap kepuasan yang tinggi dalam kalangan peserta serta memperkukuh keberkesanan keseluruhan program latihan yang dijalankan.

Jadual 6. Penilaian pengajar Kursus Pastri Dan Pemprosesan Makanan Lembaga Kemajuan Pertanian Muda (MADA) di Kolej Komuniti Bandar Darul Aman

Item	Penyataan	Min	Sisihan Piawai (SP)	Tafsiran keseluruhan
D1	Pengajar Yang Berpengetahuan Dalam Bidang Yang Disampaikan	4.82	0.446	Tahap keberkesanan tinggi dan konsistensi yang tinggi
D2	Pengajar Mengajar Dengan Kaedah Dan Mutu Penyampaian Adalah Baik	4.85	0.427	
D3	Tajuk Dan Isi Kandungan Yang Disampaikan Oleh Pengajar Adalah Jelas	4.88	0.335	

Jadual 7 menunjukkan dapatan kajian tahap keberkesanan pengurusan urus setia program dari segi urus setia menguruskan program/kursus yang dirancang dengan teratur, urus setia berinteraksi dengan peserta sangat baik, urus setia sentiasa menerima maklum balas daripada peserta dan penyediaan fasiliti serta kemudahan sepanjang program/kursus adalah baik (Item E1 – E4). Item E4 mencatatkan nilai SP tertinggi dalam kalangan item lain iaitu 0.516, namun masih berada dalam kategori min yang tinggi (4.70). Ini menunjukkan bahawa secara umum, peserta berpuas hati dengan penyediaan kemudahan seperti peralatan, bahan bantu mengajar, dan keperluan asas lain. Namun begitu, sisihan piawai yang sedikit tinggi menunjukkan terdapat variasi pandangan yang mungkin disebabkan oleh perbezaan pengalaman peserta terhadap fasiliti yang disediakan. Dapatan ini selari dengan pandangan Ismail et al. (2022) yang mendapati bahawa pengurusan program latihan yang sistematik dan fasiliti yang lengkap merupakan dua faktor utama yang mempengaruhi tahap kepuasan peserta. Manakala item E1 hingga E3 menunjukkan bahawa peserta sangat berpuas hati dengan aspek pengurusan keseluruhan program. Perancangan yang sistematik termasuk dari segi penyusunan jadual, penyediaan bahan, serta koordinasi aktiviti dapat dilihat sebagai faktor utama yang menyumbang kepada skor min yang tinggi ini. Selain daripada itu, urus setia berjaya mewujudkan hubungan dua hala yang baik, responsif dan mesra dengan peserta. Keberkesanan komunikasi antara urusetia dan peserta memainkan peranan penting dalam memastikan peserta mendapat maklumat yang jelas serta merasa dihargai sepanjang program berlangsung. Nilai min yang tinggi dan SP yang rendah secara konsisten menunjukkan bahawa elemen-elemen sokongan program telah membantu menjayakan pelaksanaan kursus serta memberi pengalaman yang positif kepada peserta.

Jadual 7. Keberkesanan Pengurusan Urusetia Kursus Pastri Dan Pemprosesan Makanan Lembaga Kemajuan Pertanian Muda (MADA) di Kolej Komuniti Bandar Darul Aman

Item	Penyataan	Min	Sisihan Piawai (SP)	Tafsiran keseluruhan
E1	Urusetia Telah Menguruskan Program/Kursus Yang Dirancang Dengan Teratur	4.75	0.439	Tahap keberkesanan tinggi dan konsistensi yang tinggi/sederhana
E2	Urusetia Berinteraksi Dengan Peserta Sangat Baik	4.78	0.423	
E3	Urusetia Sentiasa Menerima Makluman balas Daripada Peserta	4.27	0.405	
E4	Penyediaan Fasiliti Dan Kemudahan Sepanjang Program/Kursus Adalah Baik	4.70	0.516	

4. Kesimpulan

Kajian ini menunjukkan bahawa penilaian tahap keberkesanan pelaksanaan Kursus Pastri dan Pemprosesan Makanan yang dianjurkan oleh Kolej Komuniti Bandar Darul Aman (KKBDA) kepada usahawan bimbingan Lembaga Kemajuan Pertanian Muda (MADA) Kedah telah mencapai objektif pelaksanaannya dengan tahap keberkesanan yang tinggi dalam semua aspek yang dikaji. Perancangan kursus menunjukkan penyampaian isi kandungan yang sistematik, kesesuaian bahan latihan, serta tempoh pelaksanaan yang menepati keperluan peserta. Dari sudut pelaksanaan, kursus ini memberi impak yang signifikan terhadap peningkatan pengetahuan dan kemahiran peserta, di samping membuka peluang untuk perkembangan kerjaya dan peningkatan komitmen dalam bidang keusahawanan makanan. Selain itu, penilaian terhadap pengajar menunjukkan bahawa mutu penyampaian dan pendekatan pengajaran yang digunakan sangat berkesan serta mampu menarik minat peserta. Dari segi pengurusan dan urus setia telah melaksanakan tanggungjawab dengan cekap dan sistematik sepanjang kursus berlangsung, tetapi kekurangan dari aspek penyediaan fasiliti terutama ruang kursus akan diambil maklum untuk kursus-kursus akan datang agar peserta kursus pada mengikuti kursus dengan selesa. Secara keseluruhan, dapatan kajian membuktikan bahawa kursus ini telah memberi pengalaman pembelajaran yang positif kepada peserta dan berpotensi memperkukuh kebolehpasaran serta memperluas peluang keusahawanan mereka. Justeru, adalah dicadangkan agar kursus ini diteruskan dan ditambah baik dari masa ke semasa, khususnya dalam aspek fasiliti fizikal seperti ruang kelas perlu dipertimbangkan, bagi memastikan penyampaian latihan kemahiran yang lebih holistik dan menyeluruh.

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LIGHTING MONITORING TRAINER FOR ENERGY PERFORMANCE MEASUREMENT AND VERIFICATION LABORATORY

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Abstract

The Lighting Monitoring Trainer (LMT) is developed to meet the requirements of the Energy Performance Measurement and Verification laboratory activity at Politeknik Port Dickson. This LMT is used to utilize the Practical Work 1 course for Semester 5 of the Diploma in Electrical Engineering (Energy Efficiency) program. The LMT system comprises both hardware and software components. The hardware includes a power consumption monitoring testbed consisting of three incandescent bulbs and three LED T8 lights. Two dimmer switches are provided to adjust the electricity supplied to each light. Additional components include a power meter, energy sensor, and current sensor. Additionally, the power meter, mounted on the distribution box (DB), displays voltage, current, and power usage when the appliances are operational. For software components, the LMT utilized an Arduino Nano as the primary microcontroller. On the other hand, the interfacing data for the system used PuTTY software on Windows. The real-time data is provided such as voltage, current, power, energy, frequency, and power factor, will be used for analysis. The results show that the 9W LED bulb demonstrated better efficacy (53.1 lumens per watt) compared to a 25W incandescent bulb (5.05 lumens per watt) over 10 seconds. Additionally, the 9W LED bulb consumed less energy (0.05 kWh) compared to the 25W incandescent bulb (0.062 kWh). A 10W LED T8 showed higher efficacy (128.21 lumens per watt) compared to a 9W LED T8 (104.12 lumens per watt) over 10 seconds. For dimmable incandescent bulbs, the 100W bulb produced the highest illuminance (770 lumens per m²) compared to 60W, 40W, and 25W bulbs. In conclusion, LED bulbs show significant efficacy and low energy consumption compared with incandescent bulbs. Moreover, higher-wattage LED T8 lights demonstrate the best and highest energy efficiency.
Keywords: Light Monitoring Trainer (LMT); Efficiency; Power consumption.

1. Introduction

The goal of this innovation is to design and build the Lighting Monitoring Trainer (LMT) for the Energy Performance Measurement and Verification laboratory activity at Politeknik Port Dickson. The LMT was used in the Practical Work 1 course for Option A, the students will work with an Energy Usage Meter to measure and display values such as current, voltage, kWh, frequency, and power factor for various types of light bulbs or tubes. Additionally, the students can download the current, voltage, kWh, frequency, and power factor via USB connection and use PuTTY Software for data recording.

The software is a versatile, open-source, and free SSH client for Windows that allows users to remotely access computers across networks and execute commands as though they were physically sitting at the terminal. This tool is widely utilized in network administration, software development, and various IT-related fields. The software proves especially valuable for accessing and managing Linux servers from a Windows environment. Mastering this tool provides students with the necessary skills to navigate remote servers securely, ensuring a reliable connection every time (W. George, 2023). This trainer is an upgraded version of the older model, which was designed as a direct measure for lighting-focused tasks.

The LMT is used as a teaching aid module to help students understand lighting concepts by utilizing bulbs, dimmers, and LED T8 lights, as an activity outlined in the DEQ50053 Energy Performance Measurement and Verification course syllabus. This innovative trainer is implemented for DEQ students to understand deeper in lighting systems. This innovation is incorporated into the DEQ50053 Energy Performance Measurement and Verification course curriculum for semester 5 students. This was necessary because the previous trainer, the GT-7500 Energy Auditing Technology Panel, was limited to only lighting with bulbs and did not focus on the broader aspects of lighting. The LMT also simplifies the monitoring of energy and power consumption in lighting, enabling students to measure lux, voltage, current, wattage, kWh, frequency, and power factors. Additionally, a video tutorial has been provided to enhance student understanding when performing the practical work.

This innovation stems from the development of a tool designed to enhance students' understanding of lighting systems. It also allows the lecturer to assess the students' practical work and evaluate the CLO2P. This study introduces an innovative tool designed to enhance students' understanding of lighting systems while enabling lecturers to assess students' practical competencies and evaluate the Course Learning Outcome (CLO2P). The primary objective of this research is to develop a lighting monitoring trainer specifically for the DEQ50053 Energy Performance Measurement and Verification course, integrating both hardware and software interfaces. The system is designed to monitor lighting performance through a power meter display and PuTTY software, allowing for real-time data acquisition. Additionally, the study aims to analyze energy efficiency by comparing different types of light bulbs, tubes, and dimmers.

The scope of this research encompasses the practical application of the trainer within the DEQ50053 Energy Performance Measurement and Verification course. The system utilizes PuTTY software to execute scripts from an Arduino Nano microcontroller, which serves as the core processing unit for reading input signals and generating output data. Various lighting sources, including different types of bulbs and dimmers, are incorporated to evaluate their energy consumption and efficiency. The trainer is capable of measuring and displaying key electrical parameters such as current, voltage, power, energy consumption (kWh), frequency, and power factor. Furthermore, in alignment with sustainability initiatives, the hardware structure is constructed using repurposed wooden panels, reinforcing environmental consciousness in educational practices. This innovation not only enhances students' technical proficiency but also promotes hands-on learning experiences that align with Industry 4.0 educational standards.

The paper titled "Automated Lighting Control System in Building," conducted by Srishti Singh and Neeta Mishra from Amity University, Raipur, India, in 2024, offers a comprehensive analysis of the features, benefits, and potential designs of these systems. The paper examines the integration of modern technologies, including daylight harvesting, motion sensors, and occupancy sensors. It categorizes different types of automated lighting control systems and examines their implementation strategies, focusing on best practices for effective deployment across various building contexts.

The research also explores hybrid approaches that combine elements of both decentralized and centralized systems. A key focus of the study is the exploration of new advancements in automated lighting control technologies, such as the increasing use of wireless connectivity, machine learning algorithms for predictive control, and integration with other building management systems. It also investigates the potential impact of these emerging technologies on future building environments.

In conclusion, automated lighting control systems represent a significant leap forward in building management, combining efficiency, flexibility, and sustainability. For optimal

performance, these systems require the strategic integration of sensors, control interfaces, and communication networks to adjust lighting based on occupancy, natural light, and preset schedules. This integration not only boosts energy efficiency but also reduces costs and minimizes negative environmental impacts. The systems offer multiple benefits, including enhanced occupant productivity and comfort, substantial energy and cost savings, and reduced maintenance through efficient lighting usage.

Additionally, the remote-control functionality enhances security and safety, providing valuable advantages for building managers and users. Automated lighting control systems play a critical role in promoting energy efficiency and supporting a sustainable future as buildings adapt to modern needs.

2. Methodology

The system comprises both hardware and software components. The hardware includes a power consumption monitoring test-bed consisting of three incandescent bulbs and three LED T8 lights. Two dimmer switches are provided to adjust the electricity supplied to each light. Additional components include a power meter, energy sensor, and current sensor. The power meter, mounted on the distribution box (DB), displays voltage, current, and power usage when the appliances are operational. For software parts, the LMT employs an Arduino Nano as its microcontroller. For interfacing, the system uses PuTTY software on Windows, providing real-time outputs such as voltage, current, power, energy, frequency, and power factor for analysis.

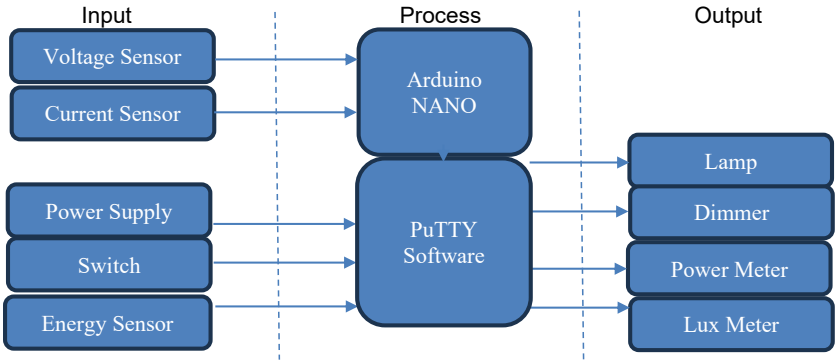

Fig. 1. Block diagram of Lighting Monitoring Trainer (LMT)

This project aims to design and develop a Lighting Monitoring Trainer for the course DEQ50053 Energy Performance Measurement and Verification. The primary goal is to create an integrated system that allows students to monitor and analyze the energy performance of different lighting setups by utilizing both hardware and software components. The system interfaces with an Arduino Nano to read sensor inputs and output real-time data related to energy consumption and performance. Additionally, the project incorporates the PuTTY software to execute scripts and control the hardware, making it a user-friendly platform for educational purposes.

Fig. 2 illustrates the flowchart of LMT for both software and hardware components. The Arduino Nano is a microcontroller that serves as the brain of the construction (Risi et al., 2025). The flowchart presented in Fig. 2 illustrates the operational workflow of an integrated hardware-software system designed for data acquisition and monitoring. The process is divided into two main sections: software and hardware, each following a structured sequence to ensure synchronized data collection.

On the software side, the process begins by connecting a USB interface to a computer or laptop, followed by launching the PuTTY software, which facilitates serial communication

with the hardware components. If PuTTY is successfully executed, the system proceeds with data collection, which is underway; the system continues to monitor until the devices are turned off, marking the end of the operation.

The hardware section operates concurrently, beginning with the activation of a switch that controls a lamp or dimmer. Once the illumination component is successfully powered, the power meter initiates data collection, synchronizing with the software's monitoring process. This interaction between the hardware and software components ensures seamless real-time data acquisition, likely for electrical parameter analysis or performance evaluation. This structured approach underscores the importance of integrating hardware-based sensing with software-driven data acquisition for efficient monitoring systems. The flowchart provides a systematic representation of the process, which could be applicable in various fields, including electrical engineering, embedded system development, and smart energy monitoring.

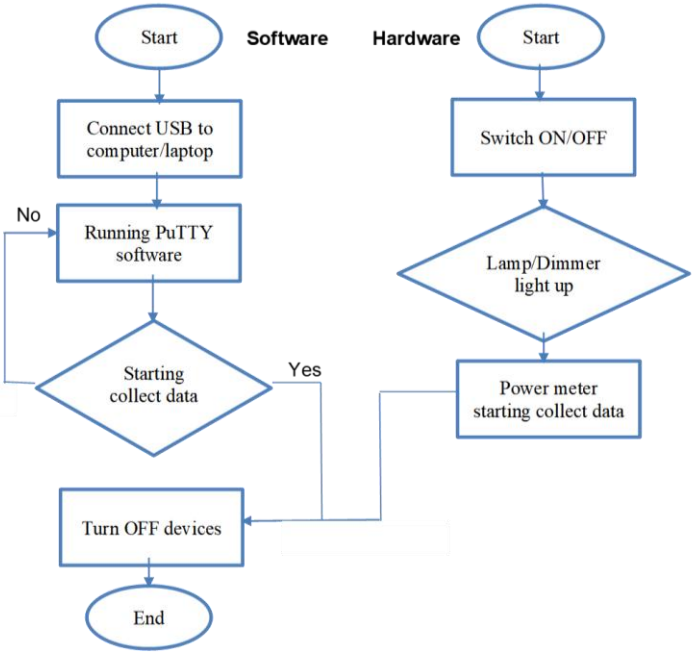

Fig. 2. Flowchart for Lighting Monitoring Trainer (LMT)

Fig. 3 illustrates the schematic diagram of an electrical control and monitoring system that integrates an Arduino microcontroller alongside Putty software for real-time data acquisition and system control. The circuit comprises several key components, including three push buttons (B1, B2, and B3), which serve as user inputs, and three potentiometers (P1, P2, and P3), which provide adjustable resistance to regulate various operational parameters. Additionally, three switches (S4, S5, and S6) facilitate further manual control of the system. The circuit also incorporates three light-emitting diodes (L1, L2, and L3) as visual indicators to represent different operational states. Furthermore, the inclusion of sensors (S1, S2, and S3) suggests that the system is designed for parameter monitoring, potentially measuring voltage, current, or environmental conditions. A dedicated current sensor (I) is integrated to provide real-time current measurement, thereby enhancing the system's monitoring capabilities. The power supply is denoted by "W" and "V," where "V" represents the voltage input to the circuit. This system architecture underscores its potential applicability in educational and research environments, where it can serve as a platform for studying sensor-based monitoring, control mechanisms, and microcontroller-based automation.

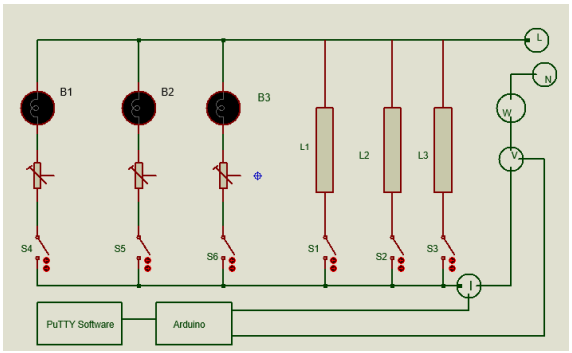

Fig. 3. Circuit using Proteus 8 professional

Three bulbs and three LED T8 lights make up the power consumption monitoring system. The setting of the experiment allows for the measurement of power consumption for each bulb or LED T8 tube, or the combination of all. Fig. 4 shows the position of the two types of appliances on the LMT.

Fig. 4. Lighting Monitoring Trainer (LMT)

The power meter, bulb switch, LED T8 tube switch, energy, and current sensor locations are shown in Fig. 5.

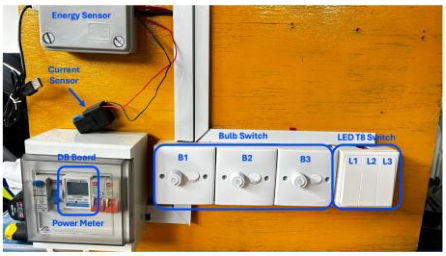

Fig. 5. Switch label

Fig. 6 shows that the power meter on the DB board displays voltage, current, and power usage when the appliance is on.

Fig. 6. Power meter

3. Result and Discussion

The LMT displays data for lamps concerning current, voltage, power, power factor, frequency, and energy consumption. An experiment is performed using different lamps and a duration of 10 seconds. The LMT outputs the data via PuTTY software. Table 1 provides a comparative analysis of various lighting technologies, including incandescent and LED lamps, based on key electrical and optical performance metrics. The table is divided into measured parameters and calculated efficacy values to assess each lamp type's efficiency. The measured parameters include luminous output (in lumens), illuminance (in lux), current (in Amperes), voltage (in volts), power consumption (in watts), power factor, frequency (in hertz), and power energy (in kilowatt-hours) over a 10-second interval. The incandescent bulb (25-Watt) produces a relatively low luminous output of 150 lumens, with a power consumption of 29.7W, yielding an efficacy of 5.05 lumens per watt (lm/W). This low efficacy highlights the inefficiency of incandescent lighting due to significant energy dissipation in the form of heat.

Conversely, LED-based lighting technologies are much more efficient. The 9-Watt LED produces 600 lumens with a power draw of 11.3W, reaching an efficacy of 53.10 lm/W, which is over ten times more efficient than an incandescent bulb. The 9-Watt LED T8 and 10-Watt LED T8 are even more energy-efficient, generating 1000 lumens each with power consumptions of 9.6W and 7.8W, respectively. Their efficacies of 104.12 lm/W and 128.21 lm/W show better luminous efficiency compared to both ordinary LED bulbs and incandescent.

In addition, power factor values reveal each lamp's electrical performance. The incandescent bulb has a relatively high-power factor (0.84), indicating efficient power use. In contrast, the LED lamps have lower power factor values (from 0.19 to 0.37), which points to reactive power components in their circuits, caused by built-in drivers and electronic control systems.

From an energy use perspective, measurements of power consumption in kilowatt-hours (kWh) show that LED lamps use significantly less energy than incandescent bulbs. This higher efficiency, along with its greater luminous efficacy, makes LED lighting a more energy-efficient choice. In summary, the comparison highlights the advantages of LED technology over incandescent lighting in terms of energy efficiency, power use, and luminous output. The results support the use of LED lighting for sustainable and energy-efficient applications, helping reduce electricity use and environmental impact.

Table 1. Analysis of bulb and lamp

Lamp	Lumen	Lux	Current	Voltage	Power	Power factor	Frequency	Power Energy	Efficacy
25 W Incandescent	150	138	0.14	246	29.7	0.84	50	0.062	5.05
9 W LED	600	970	0.26	245	11.3	0.19	50	0.05	53.10
9 W LED T8	1000	540	0.11	245.5	9.6	0.37	50	0.064	104.12
10 W LED T8	1000	604	0.10	246	7.8	0.32	50	0.064	128.21

Based on the results, it is evident that LED bulbs offer better efficacy with lower power consumption compared to incandescent bulbs. 10W LED T8 gives more efficacy than 9W LED T8. This is because the value of power for the 10W LED T8 is smaller than that of the 9W LED T8. Table 2 presents an empirical analysis of the luminous intensity of incandescent bulbs under varying dimmer power settings and actuator percentages. The table evaluates the relationship between dimmer power (W) and the corresponding illuminance (LUX in lumens/m²) over a 10-second interval, considering different actuator levels (0%, 25%, 50%, 75%, and 100%). This assessment is crucial for understanding the dimming behaviour and efficiency of incandescent lighting in variable power conditions.

The results indicate a direct correlation between the dimmer power setting and illuminance levels. At 100W, the luminous intensity ranges from 46 LUX at 0% actuator to 770 LUX at full activation (100%), demonstrating a significant increase in brightness as the dimmer setting progresses. Similarly, for 60W, the illuminance follows an increasing trend, reaching 460 LUX at full actuation. Lower wattage settings, such as 40W and 25W, exhibit lower maximum luminous intensities of 279 LUX and 138 LUX, respectively. Interestingly, at 0% actuator, the illuminance values do not drop to absolute zero but retain residual brightness (ranging from 46 LUX to 65 LUX) due to the nature of incandescent bulbs, which may retain some filament glow even at minimal power. Additionally, the rate of increase in illuminance with respect to actuator percentage varies across different power levels, indicating nonlinear dimming characteristics.
This analysis highlights that higher-wattage incandescent bulbs exhibit greater luminous efficiency under dimming conditions but also consume more power. The nonlinear dimming response suggests potential inefficiencies in traditional dimmer circuits for incandescent bulbs, reinforcing the need for advanced lighting technologies such as LEDs, which provide more efficient and linear dimming characteristics. The findings contribute to research in lighting control systems, energy efficiency in residential and commercial applications, and the development of optimised dimming circuits for incandescent lighting.

Table 2. Analysis of a dimmer using an incandescent bulb

Dimmer (W)	Lux (Lumens/m^2) Actuator (%)				
	0	25	50	75	100
100	46	136	294	564	770
60	46	98	220	379	460
40	53	91	128	198	279
25	65	77	109	128	138

The results show that a 100W incandescent bulb produces a higher lux value than 60W, 40W, and 25W bulbs, with a measurement of 770 lumens per square meter. According to the findings, a 9W LED bulb demonstrated better efficacy, at 53.1 lumens per watt, compared to a 25W incandescent bulb, which provides only 5.05 lumens per watt, over a 10-second period. Additionally, the 9W LED bulb used less energy 0.05 kWh compared to the 25W incandescent bulb, which consumed 0.062 kWh. This clearly demonstrates that LED bulbs are more energy-efficient than incandescent bulbs.

Additionally, a 10W LED T8 exhibited higher efficacy (128.21 lumens per watt) than a 9W LED

T8 (104.12 lumens per watt) during the same 10-second interval. For dimmable incandescent bulbs, the 100W bulb provided the highest illuminance (770 lumens per m²) compared to 60W, 40W, and 25W bulbs. Overall, the results indicate that LED bulbs deliver better efficacy and consume less energy than incandescent bulbs. Furthermore, higher-wattage LED T8 lights show even greater efficacy and energy efficiency.

4. Conclusion

An innovative approach integrating computational simulation using PuTTY software with hands-on experimentation has been introduced in the DEQ50053 Energy Performance Measurement and Verification laboratory course at Politeknik Port Dickson. This innovation is highly recommended for implementation across higher education institutions in Malaysia to align with Industry 4.0 (IR 4.0) educational standards. The training system incorporates advanced safety features, including an additional miniature circuit breaker (MCB) for fault isolation, a non-conductive frame, and an industry-grade power supply. Additionally, it incorporates environmental sustainability by repurposing discarded wood panels for the frame. This approach ensures active student engagement in the learning process while enhancing both safety and environmental responsibility.

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CHALLENGES FACED BY SEMESTER 1 STUDENTS IN ANSWERING ESSAY QUESTIONS ON CIRCUIT ANALYSIS TOPICS IN THE DET10103 ELECTRICAL CIRCUIT 1 COURSE

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Abstract

This study examines the challenges faced by Semester 1 diploma students in answering essay-based questions on circuit analysis topics in the DET10103 Electrical Circuit 1 course. Despite covering fundamental concepts such as Kirchhoff's Laws, Thevenin's and Norton's Theorems, and mesh and nodal analysis, over 60% of students scored below average in the essay sections of the final exam. Using a mixed-methods approach, including exam script analysis, student surveys, and instructor interviews. The study identifies common issues, including misapplication of laws, skipped problem-solving steps, and poor conceptual understanding. Contributing factors include weak mathematical foundations, limited exposure to analytical thinking, and passive learning habits. To address these gaps, the paper recommends integrating writing-based exercises, visual aids like flowcharts, interactive learning tools, and additional math support sessions. As a future initiative, the development of an interactive eBook focusing on Thevenin's, Norton's, and Kirchhoff's laws with guided exercises and immediate feedback is proposed. This digital resource aims to enhance self-paced learning and strengthen students' analytical writing skills. The findings emphasise the need for pedagogical innovation to improve students' ability to solve and communicate complex circuit analysis problems effectively.
Keywords: Circuit analysis; Essay-based assessment; Engineering education.

1. Introduction

Circuit analysis is a fundamental topic in electrical engineering education, laying the groundwork for more advanced courses in electrical and power systems. The DET10103 Electrical Circuit 1 course, offered to first-semester diploma students, introduces core topics such as Ohm's Law, Kirchhoff's Laws, nodal and mesh analysis. Essay-based assessments serve not only to evaluate students' theoretical comprehension but also their ability to communicate complex information logically and coherently. Despite their importance, students in DET10103 often perform poorly in essay questions, prompting a need to investigate the root causes and develop strategies to address these issues.

Observation and analysis of final exam result over the past two semesters revealed that over 60% of students scored below average in essay-based questions related to circuit analysis. These questions, which require structured analytical thinking and step-by-step problem-solving, appear to be a major challenge for first-semester students. Their inability to solve these questions effectively hampers their overall performance in the course.

First-year electrical engineering students frequently face substantial challenges in grasping the fundamental concepts of circuit analysis. Core techniques such as Kirchhoff's Voltage Law (KVL), Kirchhoff's Current Law (KCL), and nodal analysis are often difficult to master, and these difficulties tend to persist into subsequent courses (Fayyaz & Trueman, 2022). The recurring nature of these issues highlights the need for more effective instructional strategies that can strengthen students' foundational understanding.

Several pedagogical approaches have been proposed to address these learning challenges. Conceptual-based writing exercises, for example, have been found to improve comprehension, particularly among at-risk students. These exercises allow learners to articulate and reflect on key electrical engineering concepts through structured written expression, promoting deeper cognitive engagement (Becker & Hacker, 2022). In another approach, (Niebler, 2023)introduced the use of flowcharts to guide students through network analysis problems. This method provides a structured framework that supports problem-solving and reduces the confusion that students often encounter when tackling complex analytical tasks. Additionally, the use of web-based interactive platforms such as the STACK system has shown positive outcomes. These platforms enable students to practice circuit problems independently and receive immediate feedback, thereby reinforcing learning outside traditional classroom settings (Ellonen et al., 2022).

Broader studies on engineering education further confirm that students commonly struggle with foundational knowledge, mathematical reasoning, and systematic problem-solving skills in circuit analysis courses (Vesapuisto et al., 2022; Nelavai & Ramesh, 2020). In response, many universities have implemented support mechanisms, including foundation courses, personalised problem-solving sessions, and interactive learning environments. The shift to open and distance learning (ODL) during the COVID-19 pandemic introduced additional barriers, such as limited internet access and challenges in comprehending technical content remotely (Abdul Rahman et al., 2022). Despite these obstacles, asynchronous teaching approaches and the deployment of electronic toolkits helped mitigate some of the negative effects. Students reported improved understanding of course content and expressed general satisfaction with the ODL experience by the end of the semester (Abdul Rahman et al., 2022) In parallel, academic writing difficulties present another critical area of concern, particularly among engineering students who must explain complex technical concepts clearly and coherently. Moreover, misconceptions about fundamental concepts, such as those related to direct current (DC) circuits, can impede students' ability to communicate their understanding accurately in written form (Khwanda & Kriek, 2020). These issues have been observed across different educational levels and cultural contexts.

Taken together, these studies underscore the necessity of targeted interventions that support both conceptual understanding and communication skills. Strategies such as writing-to-learn exercises (Becker & Hacker, 2022), visual problem-solving tools (Niebler, 2023), adaptive learning platforms (Ellonen et al., 2022), and enhanced writing instruction (Sa'adan et al., 2024) can play a vital role in improving educational outcomes.

2. Methodology

This study employed a mixed-method design combining quantitative and qualitative approaches to investigate the challenges faced by Semester 1 diploma students in answering essay questions related to circuit analysis topics in the DET10103 Electrical Circuit 1 course at Sultan Azlan Shah Polytechnic. The Participants consisted of 292 students in semester 1 enrolled in the DET10103 course across two academic sessions: Session 1 2024/2025 and Session 2 2024/2025. These students were drawn from various diploma programs, including Diploma in Electrical Engineering (DET), Diploma in Electronic Engineering (Computer) (DTK) and Diploma in Electronic Engineering (Communication) (DEP) and carry-forward students in Session 2. A total of 3 lecturers teaching the course were also involved to provide qualitative insights.

The research was conducted in three phases:

1. Exam Script Analysis: 292 final exam scripts from two sessions were analysed based on content accuracy, logic structure, and completion of analytical steps. Final examination answer scripts from both sessions were reviewed to collect data on essay-based question

performance. Students' scores on the 20-mark essay section were recorded and categorised as either above average (≥10 marks) or below average (<10 marks).
2. Instructor Interviews: Semi-structured interviews were conducted with three experienced Electrical Circuit lecturers. The interviews explored instructors' perspectives on students' comprehension, instructional strategies used, and common mistakes observed during assessment marking.
3. Student Surveys: A questionnaire explored students' perspectives on conceptual understanding, anxiety levels, and learning behaviours. A structured questionnaire was distributed to the students involved. The survey consisted of both Likert-scale and open-ended items aimed at identifying students' learning strategies, conceptual understanding, cognitive challenges, and perceptions of difficulty regarding essay-based circuit analysis questions.

For the quantitative phase, frequency and percentage distributions were calculated to compare student performance in essay questions across two sessions. Data were stratified by program and score category (≥10 or <10). Cross-session trends were analysed to identify performance changes. Qualitative data from open-ended student responses and instructor interviews were thematically analysed using inductive coding. Key themes were extracted to triangulate quantitative findings, providing deeper insight into the cognitive and pedagogical barriers that influenced essay question performance.

3. Results and Discussion

3.1 Exam Essay Score Analysis

Analysis of student exam scripts revealed the following key issues:
- Lack of systematic application: Many students failed to apply circuit laws (KVL, KCL) in a structured manner.
- Conceptual errors: Misidentification of series and parallel elements, and incorrect transformations between Thevenin and Norton equivalents, were common.
- Procedural gaps: Students often skipped essential steps in mesh and nodal analysis, indicating a lack of understanding of problem-solving procedures.

These findings confirm earlier research by Fayyaz and Trueman (2022), who reported persistent errors in fundamental circuit analysis tasks due to weak conceptual grounding.

Table 1. Session 1 2024/2025 Essay Marks Distribution

PROGRAMME	SESSION 1 2024/2025 ESSAY MARKS 20/20		
	Number of students' marks >=10	Number of students' marks <10	Total Students
DET1A	11	17	28
DET1B	12	16	28
DET1C	21	9	30
DET1D	11	17	28
DET1E	5	19	24
DET1F	13	14	27
DTK1A	8	12	20
DTK1B	3	14	17
DEP1A	10	6	16
TOTAL	94	124	218

An analysis of student performance in essay-based questions from the final examination of Session 1 2024/2025 was conducted across nine different classes within the DET10103 Electrical Circuit 1 course. The dataset comprised 218 students, with essay questions marked

out of a total of 20 marks. Students were grouped into two categories: those scoring 10 marks or more, and those scoring below 10 marks.

The findings reveal that only 94 students (43.1%) achieved marks of 10 or above, while the majority—124 students (56.9%)—scored below 10 marks. This performance trend was consistent across most classes. For instance, in DET1E, only 5 students (20.8%) achieved scores of 10 or above, compared to 19 students (79.2%) who scored below the threshold. Similarly, DET1A and DET1D both recorded 11 students with satisfactory scores and 17 below-average performers each. Although DET1C stood out with 21 students (70%) achieving scores ≥10, it remained an exception among the groups.

The results reinforce earlier qualitative findings from surveys and interview feedback that highlighted common student difficulties, including misapplication of Kirchhoff's and Ohm's Laws, skipping procedural steps in mesh and nodal analysis, and confusion when converting between Thevenin and Norton equivalents. The data also aligns with the notion that students struggle more with higher-order cognitive tasks, such as organising structured analytical responses and justifying problem-solving steps, skills commonly assessed through essay-based formats.

The prevalence of low essay scores suggests a gap in conceptual understanding and procedural fluency, particularly among first-semester students. This may be attributed to several factors identified in earlier sections of this study, such as inadequate preparation from secondary education, passive learning behaviour, and weak mathematical foundations. Furthermore, the underperformance in essay-based questions implies that students may not be receiving sufficient guided practice in structuring and articulating technical reasoning in written form.

These findings highlight an urgent need for pedagogical strategies that emphasise conceptual clarity and writing-based problem-solving. Future interventions may include the implementation of guided writing exercises, scaffolded assignments, and the development of interactive digital tools such as eBooks with step-by-step tutorials to better support students in mastering both the theory and communication of circuit analysis.

Table 2. Session 2 2024/2025 essay marks distribution

PROGRAMME	SESSION 2 2024/2025 ESSAY MARKS 20/20		
	Number of students marks >=10	Number of students marks <10	Total Students
DET1A	0	21	21
DET1B	8	15	23
DTK1A	1	8	9
CARRY	1	20	21
TOTAL	10	64	74

The analysis of Session 2 2024/2025 results demonstrates a further decline in student performance on essay-based questions in the DET10103 Electrical Circuit 1 course. Out of a total of 74 students evaluated, only 10 students (13.5%) scored 10 marks or above, while a significant 64 students (86.5%) scored below 10 marks out of 20. This marks a notable decrease in performance compared to Session 1, where 43.1% of students achieved scores ≥10.

Performance across all groups shows a concerning trend. In DET1A, no students achieved 10 or more marks, with all 21 students (100%) scoring below 10. DET1B performed slightly better, with 8 out of 23 students (34.8%) meeting the threshold. However, DTK1A recorded

only 1 out of 9 students (11.1%) scoring satisfactorily, and the CARRY group showed particularly poor results, with only 1 out of 21 students (4.8%) passing the 10-mark threshold. These results reflect a significant drop in essay performance and reinforce the concerns raised in the previous session regarding students' inability to demonstrate structured analytical thinking, particularly when applying Kirchhoff's Laws, mesh/nodal analysis, and Thevenin/Norton equivalents. The sharp increase in low scores suggests not only persistent conceptual and procedural difficulties but also a potential lack of instructional reinforcement or intervention following Session 1's findings.

This downward trend signals an urgent need to re-evaluate existing instructional strategies, assessment preparation, and student support mechanisms. The high failure rate in the essay component indicates that students continue to struggle with communicating problem-solving steps and justifying analytical reasoning in written form. Without targeted pedagogical innovation such as interactive resources, structured writing exercises, and diagnostic formative assessments, students may continue to underperform in these critical areas of electrical engineering education.

A comparative analysis of student essay performance in the DET10103 Electrical Circuit 1 course over two consecutive sessions reveals a declining trend in analytical writing competency. In Session 1 2024/2025, out of 218 students, 94 students (43.1%) achieved satisfactory scores (≥10 out of 20) in essay-based questions, while 124 students (56.9%) scored below the benchmark. Conversely, in Session 2 2024/2025, only 10 out of 74 students (13.5%) met the satisfactory mark, with 64 students (86.5%) scoring below 10.

The overall drop in the percentage of students achieving satisfactory marks from 43.1% to 13.5% indicates a significant decline in essay performance. Particularly alarming is that certain groups, such as DET1A and the Carry students in Session 2, recorded failure rates of 100% and 95.2%, respectively. These findings suggest that students continue to face substantial difficulties in articulating analytical reasoning in written form, especially when solving problems involving Kirchhoff's Laws, mesh/nodal analysis, and Thevenin/Norton theorems.

The worsening performance trend underscores the urgency for pedagogical reform. It supports the rationale for implementing targeted instructional strategies, such as interactive digital learning tools and structured writing support, to address conceptual gaps and improve students' ability to solve and communicate complex circuit problems effectively.

The data support existing literature suggesting that students often fail to demonstrate adequate understanding of circuit analysis concepts (Fayyaz & Trueman, 2022). Several contributing factors may explain the poor outcomes, including a weak mathematical background, a lack of structured analytical training, and cognitive overload during problem-solving.

Students appeared to struggle with the multi-step nature of essay-based assessments, where demonstrating reasoning and articulating the application of laws such as Kirchhoff's or Thevenin's Theorem is essential. This is consistent with findings by Becker and Hacker (2022), who identified the lack of writing practice as a major barrier to conceptual learning.

3.2 Survey and Interview Feedback

The trend suggests that traditional lecture-based and memorisation-focused teaching methods may not effectively support learning in technically complex areas. Visual learning tools, procedural flowcharts (Niebler, 2023) and interactive platforms (Ellonen et al., 2022) offer promising alternatives. These tools allow students to practice applying theoretical knowledge in a structured, guided manner and can help alleviate performance gaps over time.

Survey results and instructor interviews revealed several trends:

- Conceptual Difficulty: 75% of students admitted difficulty in understanding concepts, even though they could often memorise formulas.
- Cognitive Anxiety: Students reported high stress levels when facing multi-step essay questions, often unsure how to begin or structure their responses.
- Passive Learning Behaviour: Lecturers noted that students were passive during tutorials and reluctant to engage in open-ended problem-solving tasks. Many depended heavily on rote memorisation and example repetition. Many students relied heavily on memorisation and were hesitant to engage in open-ended tasks.
- Lack of Procedural Knowledge: Steps in nodal or mesh analysis were often skipped or misapplied.

These findings echo the benefits of introducing procedural visual tools (Niebler, 2023) and interactive, feedback-rich environments like STACK (Ellonen et al., 2022)

3.3 Root Causes

Given that 60% to 86% of students scored poorly, this study strongly recommends the integration of conceptual-based writing tasks, step-by-step visual aids, and interactive e-learning modules tailored to circuit analysis. Providing targeted math support and embedding writing exercises within technical courses could enhance analytical writing and critical thinking—two essential skills for engineering problem-solving.

From the triangulated data, several underlying causes were identified:

Inadequate exposure to analytical thinking: Many students lacked training in logical reasoning and step-by-step analysis, skills often underdeveloped in secondary education.

Weak mathematical foundation: Difficulty with algebra and linear equations hindered their ability to manipulate and solve circuit equations.

Lack of practice: Students reported minimal exposure to application-oriented exercises, particularly those requiring explanation and justification of answers.

These root issues echo those identified by Vesapuisto et al. (2022) and Nelavai & Ramesh (2020), who emphasized the importance of pre-university preparation and foundational skill development in STEM fields.

4. Conclusion

This study confirms that a majority of Semester 1 students face significant challenges in answering essay questions related to circuit analysis. Misapplication of key laws, missing steps in problem-solving, and writing difficulties are compounded by weak mathematical foundations and passive learning approaches.

Based on the findings, the following interventions are recommended:

1. Integration of Writing-Based Exercises: Incorporating structured writing assignments can encourage students to articulate their reasoning processes, improving both conceptual clarity and communication skills.
2. eBook Use of Visual Aids and Flowcharts: Guiding students through problem-solving with step-by-step visual tools can enhance procedural understanding and reduce cognitive overload.
3. Interactive Learning Platforms: Adoption of digital tools like STACK or Moodle-based quiz systems can offer students immediate feedback and additional practice outside of class.
4. Math Support Sessions: Supplemental tutorials focused on mathematical techniques relevant to circuit analysis can address foundational weaknesses.

5. Active Learning Strategies: Group problem-solving, peer teaching, and flipped classroom models can foster deeper engagement and collaborative reasoning.

As a future direction, this paper proposes the development of an interactive eBook covering Thevenin, Norton, and Kirchhoff's laws, embedded with guided examples and instant feedback. Such tools can support students in self-paced mastery and are aligned with the digital transformation of engineering education.

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PERSEPSI PELAJAR KOLEJ KOMUNITI LEDANG TERHADAP PENGGUNAAN MEDIA SOSIAL SEBAGAI PLATFORM PEMASARAN PERNIAGAAN

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Abstrak

Kajian ini bertujuan untuk meneliti persepsi pelajar Kolej Komuniti Ledang terhadap penggunaan media sosial sebagai platform untuk memasarkan perniagaan mereka. Media sosial kini menjadi alat penting dalam era digital yang membolehkan perniagaan mengembangkan jangkauan pasaran serta membina hubungan pelanggan dengan lebih berkesan. Kajian ini menggunakan pendekatan kuantitatif dengan melibatkan 73 orang pelajar sebagai responden. Instrumen kajian adalah soal selidik berskala Likert 5 yang dibina sendiri dan telah disemak oleh pakar bagi memastikan kesahihan kandungan dan kebolehpercayaan. Analisis deskriptif digunakan untuk menilai taburan persepsi pelajar, termasuk aspek demografi dan objektif kajian. Nilai skor min dianalisis untuk menentukan tahap persepsi terhadap keberkesanan media sosial sebagai alat pemasaran. Hasil kajian menunjukkan bahawa secara keseluruhan, pelajar berada pada tahap persepsi sederhana dengan nilai skor min keseluruhan sebanyak 3.6. Ini menunjukkan bahawa walaupun pelajar menyedari potensi media sosial sebagai platform pemasaran, penggunaannya masih belum dimaksimumkan. Kajian ini memberi sumbangan penting dalam mengenal pasti keperluan latihan pemasaran digital dalam kalangan pelajar serta mencadangkan pelaksanaan intervensi yang lebih berstruktur seperti bengkel keusahawanan dan latihan pemasaran digital. Usaha ini selaras dengan agenda pembangunan Pendidikan Teknikal dan Latihan Vokasional (TVET) negara yang bertujuan memupuk semangat keusahawanan dan meningkatkan literasi digital dalam kalangan pelajar institusi pendidikan.
Kata kunci: Persepsi pelajar; Media sosial; Pemasaran perniagaan.

1. Pengenalan

Dalam era digital yang berkembang pesat, media sosial telah menjadi salah satu saluran utama dalam strategi pemasaran moden. Ia membolehkan perniagaan menjangkau khalayak yang lebih luas, termasuk pasaran antarabangsa, serta memupuk interaksi dua hala dengan pengguna secara masa nyata (Infante & Mardikaningsih, 2022; Rueda & Moralista, 2023). Ciri-ciri seperti kos rendah, kelajuan penyebaran maklumat dan keupayaan mencipta kesetiaan jenama menjadikan media sosial satu alat penting dalam mempengaruhi keputusan pembelian pelanggan (Puspaningrum, 2020; Suariedewi, 2023). Tambahan pula, kandungan yang menarik dan interaktif berupaya meningkatkan kesedaran dan imej jenama dalam kalangan pengguna (Majesta & Aruan, 2020).

Platform seperti Facebook, Instagram dan TikTok kini diiktiraf sebagai medium yang strategik untuk promosi dan pemasaran, bukan sahaja oleh syarikat besar malah juga oleh usahawan kecil dan individu (Tajpour et al., 2024). Potensi besar ini turut mendorong banyak institusi pendidikan memperkenalkan elemen pemasaran digital dalam aktiviti keusahawanan pelajar. Namun begitu, pemerhatian awal mendapati bahawa penggunaan media sosial secara strategik dalam kalangan pelajar Kolej Komuniti masih belum dimaksimumkan. Ramai pelajar

menggunakan media sosial untuk tujuan hiburan semata-mata, tanpa menyedari fungsinya sebagai alat pemasaran yang efektif. Kekurangan pendedahan, kemahiran teknikal dan panduan sistematik mungkin menjadi antara faktor penyumbang kepada perkara ini. Sehubungan itu, pelbagai aktiviti yang mengintegrasikan elemen pemasaran digital dalam keusahawanan pelajar telah dilaksanakan di kampus bagi membina kesedaran dan kemahiran yang relevan.

Kajian ini dijalankan bagi meneliti persepsi pelajar Kolej Komuniti Ledang terhadap penggunaan media sosial sebagai platform pemasaran perniagaan. Pemerhatian awal mendapati bahawa pelajar masih menggunakan media sosial lebih kepada hiburan berbanding sebagai alat pemasaran strategik. Oleh itu, objektif kajian ini adalah untuk menilai tahap persepsi pelajar terhadap keberkesanan media sosial, tahap penggunaannya, serta faktor yang mempengaruhi keberkesanan tersebut dalam konteks keusahawanan pelajar. Objektif ini dikaitkan secara langsung dengan isu kekurangan pendedahan dan kemahiran strategik dalam pemasaran digital yang dibincangkan dalam pernyataan masalah.

Pemasaran melalui platform media sosial memainkan peranan penting dalam meningkatkan kesedaran jenama, yang menjadi salah satu faktor utama mempengaruhi keputusan pembelian pengguna. Beberapa kajian telah menunjukkan bahawa aktiviti pemasaran menggunakan media sosial amat berkesan dalam merangsang kesedaran jenama dalam kalangan pengguna berpotensi. Sebagai contoh, Saputra melaporkan bahawa strategi pemasaran media sosial boleh mencetuskan minat pengguna yang kemudiannya membawa kepada pembelian. Penemuan ini turut disokong oleh Sugana dan Gunawan, yang melihat bahawa kesedaran jenama menjadi penghubung antara pemasaran media sosial dan keputusan pembelian pengguna (Saputra, 2023; Sugana & Gunawan, 2022). Sementara itu, Jitprapai et al. mendapati bahawa media sosial sesuai digunakan untuk kategori produk yang tidak memerlukan perhatian tinggi, namun masih mampu membina kesedaran jenama secara signifikan (Jitprapai et al., 2021).

Dari sudut lain, kandungan media sosial yang berkualiti juga dapat memperkukuh imej jenama dan mempengaruhi penilaian pengguna. Suariedewi mencatat bahawa interaksi yang konsisten menerusi media sosial dapat membina kepercayaan dan kesetiaan jenama. Penemuan ini selari dengan dapatan Majesta dan Aruan, yang mendapati perniagaan yang menghasilkan kandungan menarik dan relevan berpeluang mewujudkan hubungan yang kukuh antara pengguna dan jenama. Ciri interaktif media sosial pula mendorong kepada pembentukan komuniti pengguna setia serta memperkukuh kepercayaan terhadap jenama (Suariedewi, 2023; Majesta & Aruan, 2020; Cheung et al., 2020).

Kajian oleh Mikhael dan Susan turut menyokong pandangan bahawa pemasaran menerusi media sosial membantu pengguna mengenali produk dengan lebih baik, sekaligus mendorong mereka membuat keputusan pembelian (Mikhael & Susan, 2022). Dalam kajian lain, Fajri et al. merumuskan bahawa pendekatan pemasaran digital ini bukan sahaja membantu meningkatkan kesedaran jenama, tetapi turut menyokong proses membuat keputusan dalam kalangan pengguna (Fajri et al., 2021).

Seterusnya, penggunaan media sosial dilihat mampu menggantikan kaedah pengiklanan tradisional melalui pendekatan yang lebih kos efektif dalam menjangkau khalayak sasaran. Novianti dan Erdiana dalam kajian mereka menjelaskan bahawa media sosial bukan sahaja memudahkan komunikasi dua hala, malah memperkukuh keberkesanan pengiklanan dengan interaksi yang lebih langsung dan menyeluruh (Novianti & Erdiana, 2020). Hujah ini turut diperkuatkan oleh Rahardja, yang melihat platform seperti Facebook, Twitter, dan Instagram sebagai saluran pemasaran yang strategik untuk meningkatkan jualan produk (Rahardja, 2022).

Di samping itu, nilai pengiklanan dalam media sosial juga berkait rapat dengan elemen kredibiliti dan persepsi pengguna. Kajian Ojha membuktikan bahawa elemen seperti hiburan, maklumat dan kepercayaan yang ditampilkan dalam iklan mampu membentuk persepsi positif terhadap jenama (Ojha, 2022). Karunarathne pula menjelaskan bahawa nilai pengiklanan yang tinggi dalam media sosial dipengaruhi oleh pelbagai faktor yang secara langsung menyumbang kepada keberkesanannya (Karunarathne, 2022).

2. Metodologi

Kajian rintis turut dijalankan bagi menilai kefahaman dan konsistensi item dalam soal selidik. Seramai 10 orang pelajar Kolej Komuniti Ledang telah dilibatkan, dan mereka tidak termasuk dalam sampel kajian sebenar. Hasil kajian rintis menunjukkan bahawa semua item difahami dengan jelas tanpa kekeliruan dan tidak memerlukan sebarang pindaan besar.
Kebolehpercayaan instrumen diuji menggunakan pekali Cronbach's Alpha, yang mengukur sejauh mana item-item dalam instrumen berkorelasi dan konsisten. Nilai α yang diperoleh adalah 0.85, menandakan tahap kebolehpercayaan yang tinggi dan sesuai untuk skala penilaian kuantitatif (Edelsbrunner, Simonsmeier, & Schneider, 2025). Ini membuktikan bahawa instrumen soal selidik ini boleh digunakan dengan sah dan tepat dalam kajian sebenar.

Kajian ini menggunakan pendekatan kuantitatif dengan reka bentuk kajian tinjauan. Seramai 73 pelajar daripada pelbagai program di Kolej Komuniti Ledang telah dipilih secara persampelan mudah. Instrumen soal selidik berskala Likert 5 mata ini dibina berdasarkan literatur terdahulu dan disemak oleh pakar. Kajian rintis dijalankan ke atas 10 pelajar bukan sampel kajian bagi menilai kefahaman dan konsistensi item, dengan nilai kebolehpercayaan Cronbach's Alpha direkodkan pada 0.85. Data dianalisis secara deskriptif menggunakan SPSS versi 26, dan skor min ditafsir berdasarkan piawaian oleh Ngadiman et al. (2019): 1.00–1.99 (Lemah), 2.00–2.99 (Rendah), 3.00–3.99 (Sederhana), dan 4.00–5.00 (Tinggi).

Penentuan tahap berdasarkan skor min seperti yang ditunjukkan dalam Jadual 1.

Jadual 1. Tafsiran Skor Min

Skor min	Tafsiran
1.00– 1.99	Lemah
2.00– 2.99	Rendah
3.00– 3.99	Sederhana
4.00– 5.00	Tinggi

(Sumber: Ngadiman et al., 2019)

3. Dapatan dan Perbincangan

Jadual 2 menunjukkan bahawa majoriti responden terdiri daripada pelajar perempuan iaitu sebanyak 72.6% manakala pelajar lelaki mewakili 27.4% daripada keseluruhan sampel. Dari segi semester pengajian, peratusan tertinggi berada di Semester 1 (45.2%), diikuti oleh Semester 3 (34.2%), Semester 2 (13.7%) dan hanya 6.8% daripada pelajar sedang menjalani latihan industri. Dalam konteks program pengajian, lebih separuh daripada responden mengikuti program Sijil Pasti (58.9%) manakala selebihnya mengikuti Sijil Automotif (19.2%), Sijil Pengoperasian Perniagaan (17.8%) dan Sijil Teknologi Penyejukan dan Penyamanan Udara (4.1%).

Bagi tahap penggunaan media sosial, kebanyakan pelajar melaporkan tahap penggunaan yang sederhana (68.5%) manakala 31.5% berada pada tahap tinggi. Tiada responden yang melaporkan tahap penggunaan yang rendah. Dari aspek latar belakang sosioekonomi pula, majoriti responden berasal daripada kategori pendapatan B40 (79.5%) diikuti M40 (12.3%) dan T20 (5.5%). Tiada wakil daripada kategori ELITE. Ini menunjukkan sebahagian besar

pelajar datang daripada keluarga berpendapatan rendah yang mencerminkan realiti sebenar pelajar Kolej Komuniti Ledang.

Jadual 2. Latar Belakang Responden

	Item	n	%
Jantina	Lelaki	20	27.4
	Perempuan	53	72.6
Semester	1.00	33	45.2
	2.00	10	13.7
	3.00	25	34.2
	Latihan Industri	5	6.8
Program Pengajian	Sijil Pengoperasian Perniagaan	13	17.8
	Sijil Pasti	43	58.9
	Sijil Automatif	14	19.2
	Sijil Teknologi Penyejukan dan Penyamanan Udara	3	4.1
Tahap Penggunaan Media Sosial	Rendah	0	0
	Sederhana	50	68.5
	Tinggi	23	31.5
Kategori Pendapatan Ibu Bapa	B40	58	79.5
	M40	9	12.3
	T20	4	5.5
	ELITE	0	0

Corak penggunaan media sosial yang sederhana dalam kalangan pelajar ini selari dengan dapatan kajian Devisakti, Muftahu dan Xiaoling (2023) yang menyatakan bahawa jurang digital masih wujud dalam kalangan pelajar B40 terutamanya dari segi akses peranti, literasi digital dan kestabilan sambungan internet. Kajian mereka juga menunjukkan bahawa golongan ini cenderung menggunakan media sosial lebih kepada tujuan sosial dan hiburan berbanding secara strategik untuk pembelajaran atau keusahawanan. Secara keseluruhannya, data ini memberikan gambaran awal terhadap profil demografi pelajar yang terlibat dalam kajian serta menyokong kepentingan untuk menilai persepsi dan potensi penggunaan media sosial sebagai platform pemasaran dalam kalangan pelajar Kolej Komuniti Ledang.

Jadual 3. Analisis Persepsi Pelajar Terhadap Media Sosial

No.	Item Kajian	Min	Tahap
D1	Media sosial memudahkan saya memasarkan produk atau perkhidmatan kepada pelanggan.	3.74	Sederhana
D2	Saya percaya media sosial adalah platform pemasaran yang lebih efektif berbanding kaedah tradisional.	3.62	Sederhana
D3	Penggunaan media sosial menjimatkan kos pemasaran perniagaan.	3.68	Sederhana
D4	Media sosial membantu saya berinteraksi secara langsung dengan pelanggan.	3.62	Sederhana
D5	Saya mudah mencapai pelanggan yang lebih luas melalui media sosial.	3.56	Sederhana
D6	Media sosial memberikan peluang kepada saya untuk mempelajari strategi pemasaran baharu.	3.77	Sederhana
D7	Saya rasa penggunaan media sosial meningkatkan imej perniagaan saya.	3.66	Sederhana
	Purata min keseluruhan	3.56	

Jadual 3 menunjukkan bahawa tahap persepsi pelajar terhadap penggunaan media sosial sebagai platform pemasaran berada pada tahap sederhana dengan purata min keseluruhan 3.56. Ini mencerminkan bahawa walaupun pelajar menyedari manfaat asas seperti kos rendah

dan capaian pelanggan yang luas, penggunaan secara strategik masih belum dimaksimumkan. Potensi media sosial sebagai alat pemasaran masih belum diterokai sepenuhnya, terutamanya dalam aspek penyampaian kandungan dan pembinaan hubungan jenama. Dapatan ini disokong oleh kajian Diano et al. (2025) yang mendapati korelasi positif kuat antara engagement media sosial dan tingkah laku membeli dalam kalangan pelajar perniagaan. Item D6 mencatat min tertinggi (3.77), menunjukkan pelajar mengakui media sosial sebagai ruang pembelajaran strategi pemasaran baharu. Item D1 (3.74) dan D3 (3.68) pula menunjukkan kefahaman tentang kemudahan dan penjimatan kos yang ditawarkan. Namun, item D5 dan D7, masing-masing mencatat min 3.56, menunjukkan adanya keraguan terhadap keupayaan media sosial dalam memperluas jangkauan dan membina imej perniagaan yang kukuh. Oleh itu, latihan dan intervensi yang lebih tersusun diperlukan bagi memperkasakan penggunaan media sosial secara strategik dalam kalangan pelajar.

4. Kesimpulan

Kajian ini membuktikan bahawa pelajar Kolej Komuniti Ledang mempunyai persepsi yang sederhana terhadap penggunaan media sosial sebagai platform pemasaran perniagaan, dengan nilai skor min keseluruhan sebanyak 3.6. Walaupun pelajar menyedari kelebihan media sosial seperti kos yang rendah, capaian pasaran yang luas, dan kebolehan berinteraksi secara langsung dengan pelanggan, dapatan menunjukkan bahawa penggunaannya secara strategik masih belum dimaksimumkan. Hal ini mencerminkan bahawa potensi sebenar media sosial sebagai alat pemasaran masih belum diterokai sepenuhnya oleh pelajar. Berdasarkan dapatan ini, penulis mencadangkan agar pihak institusi mempergiatkan program latihan dan bengkel berkaitan pemasaran digital yang memberi penekanan kepada strategi kandungan, pengurusan jenama peribadi serta penggunaan platform seperti TikTok dan Instagram secara berkesan. Selain itu, pensyarah perlu memainkan peranan aktif sebagai fasilitator digital dalam membimbing pelajar menyesuaikan strategi pemasaran dengan keperluan industri semasa dan perkembangan teknologi. Pembangunan modul pemasaran digital secara berstruktur juga wajar diperkenalkan dalam kokurikulum keusahawanan di Kolej Komuniti bagi memastikan kemahiran ini dikuasai dengan lebih mendalam. Langkah-langkah ini bukan sahaja mampu meningkatkan tahap kecekapan pelajar dalam bidang pemasaran digital, tetapi juga menyumbang kepada pembangunan literasi digital dan semangat keusahawanan selaras dengan agenda Pendidikan Teknikal dan Latihan Vokasional (TVET) negara. Penemuan ini turut disokong oleh kajian Diano et al. (2025) yang menyatakan bahawa pemasaran media sosial memainkan peranan penting dalam mempengaruhi tingkah laku pengguna dan wajar dikuasai oleh pelajar dalam bidang perniagaan.

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EXPLORING THE MEDIATING EFFECT OF TEACHER ENGAGEMENT IN METAVERSE-ENHANCED TVET EDUCATION

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Abstract

In the rapidly evolving educational landscape, Technical and Vocational Education and Training (TVET) emerges as a cornerstone for equipping learners with the practical skills required in the modern workforce. The advent of Metaverse, an immersive digital ecosystem incorporating virtual and augmented reality, presents an unparalleled opportunity to revolutionize TVET by seamlessly integrating experiential learning with real-world applications. This study seeks to investigate the dynamics of teacher development within Metaverse-enhanced TVET education by focusing on the mediating role of teacher engagement. The research pursues two primary objectives: first, to explore the relationship between teacher development dimensions (comprising professional development, engagement with Metaverse tools, pedagogical training, and teachers' readiness) and teaching effectiveness in a Metaverse context. Second, it evaluates the mediating mechanism of teacher engagement on the nexus between teacher development dimensions and teaching effectiveness. Anchored in a quantitative research methodology, the study proposed a web-based survey for data collection and PLS-SEM for data analysis. The findings of this study are expected to significantly enrich the academic discourse on TVET education and Metaverse technologies, a domain that remains emerging globally and remarkably underexplored in Malaysia. Furthermore, the finding is expected to bridge existing knowledge gaps, offering fresh insights into how digitalization and sustainable practices can redefine educational strategies in Malaysia's TVET sector.
Keywords: TVET Education; Teacher Engagement; Professional Development.

1. Introduction

Education is considered a crucial catalyst for human intellectual advancement and socio-economic progress, as acknowledged by the United Nations. Consequently, education is recognized as a human right, as outlined in the Universal Declaration of Human Rights (UDHR) and the United Nations Sustainable Development Goals (SDGs) (Boeve-de Pauw and Halbac-Zamfir, 2020). In education, technical and vocational education and training (TVET) are crucial in equipping people with skills to get employed to help boost the economy and also increase social mobility. TVET indirectly contributes to achieving SDG#4 (quality education), SDG#8 (decent work and economic growth), and SDG#9 (industry, innovation, and infrastructure) for the development of the workforce. TVET is fast gaining global recognition, and many countries like Malaysia have enacted policies to boost its performance. In response to the industry demands, the Malaysian government has restructured its TVET system with vocational training, digital transformation, and competency-based education to prepare its graduates for a competitive job market. Despite the enacted policies to boost its performance, the challenges of teacher development within TVET education are still lacking. This includes skills mismatches, teacher competencies, and outdated curricula (Matabane et al., 2022).

TVET lacks adequate support to deliver hands-on training online, as shown during the COVID-19 pandemic in Malaysia (Yeap et al., 2021). This accelerated the trail of digital learning and new-age technology to enhance teaching efficiency. After the pandemic, post-reforms have

aimed to improve digital methods, teachers' competencies, and a standardized system of quality that ensures standardization. TVET education is being transformed by technological advancements such as AI, AR, VR, and big data, making it more engaging and personalized for learning and skill application in a virtual environment (Bakar et al., 2024). The Metaverse is becoming an excellent tool for vocational training, where students may learn without physical limitation in a virtual industrial, medical, or engineering environment. The Metaverse has potential but also challenges, such as high costs, infrastructure limitations, teacher readiness, and a lack of digital accessibility (Onu et al., 2024). Integration is effective, but it requires not only the investment to continue professional development but also the adoption of policies while collaborating with education experts from the industry. Teachers are expected to play a critical role in the Metaverse, and existing literature emphasizes that teachers should be trained in pedagogy, digital competencies, and engagement strategies. Nevertheless, there are gaps in teacher development and engagement knowledge in this emerging digital environment (Tan et al., 2021). As such, the competence of teachers, especially readiness and digital integration, largely contributes to the success or failure of TVET in producing students ready for what the future workforce demands. Improving the challenges of digital adoption and teacher development will be the key to utilizing TVET's full potential (Rokeman et al., 2024).

The Metaverse has paved the way in various education sectors, with the introduction of Metaverse as a virtual learning tool in the field of TVET (Alhumaid, 2019; Hassan et al., 2024). Onu et al. (2024) demonstrate how the Metaverse can facilitate genuine occupational experiences free from the physical constraints of facility or location. However, there are serious obstacles for TVET teachers to produce effective teaching. A crucial problem is the unequal training of teachers on how to incorporate virtual environments into their teaching (Reddy et al., 2023). According to Falloon (2022) and Zabolotska et al. (2021), these technologies require more advanced digital competencies than teachers have, often too much. Furthermore, improper resources and infrastructure adopted by most TVET institutions in terms of Metaverse-based education make it hard for teachers to fully exploit learning through Metaverse (Hassan et al., 2024). Additionally, this also limits the pedagogical strategies that can be used to develop a more effective teaching experience. While the TVET and Metaverse offer increased interest in successfully incorporating the Metaverse into the curriculum, a large research gap surrounds how teachers can be systemically supported to advance their digital competency and pedagogical competence (Mbatha, 2024). While TPACK emphasizes digital literacy, the Metaverse is neither mentioned nor are the attendant demands discussed, and there is little research into the unique demands and the skills needed to be an effective Metaverse teacher. Furthermore, teacher engagement is overlooked in adopting Metaverse in TVET, an extremely critical area. Engagement is indispensable to bridging the competence of the Metaverse and teaching effectiveness. Lindfors et al. (2021) suggest that the more highly engaged teachers are in adopting and implementing new technologies, the better pedagogical practices they achieve. Therefore, this study attempts to explore the engagement of teachers, testing their capacity to utilize Metaverse in a way that promotes students' outcomes. Existing studies (Chen et al., 2023; Onu et al., 2024) offer some first insights into Metaverse-based teaching effectiveness. However, there is limited research on teacher development and Metaverse engagement. Thus, this study sets out to fill this gap by understanding TVET teachers' behaviors and challenges within specific geographic, political, and economic parameters and, in turn, contributes to the literature on digital education developments in TVET.

Below is the proposed research objective.
RO1: To examine the teacher development dimensions that affect teaching effectiveness through Metaverse.

RO2: To examine the mediating effect of teachers' engagement between the teacher development dimension and teaching effectiveness through Metaverse.

RO3: To examine the teachers' engagement towards teaching effectiveness through Metaverse.

According to Social Cognitive Theory (SCT) developed by Bandura (1986), individual behaviors are dynamic and interact dynamically with personal factors such as behaviors and environments. Self-efficacy is a pivotal construct in SCT. It is an individual's belief about its ability to execute specific tasks, which, therefore, affects motivation, perseverance, and responses to challenges. SCT is instrumental in shedding light on how teacher engagement fosters effective learning in immersive virtual environments under a Metaverse-enhanced TVET. In Metaverse integrated settings, teacher engagement acts as behavioral modeling, which is an important SCT element. Teachers become role models through their active involvement, which influences student behavior for observational learning, as modeled by Bandura (1986). Practical skills for technical competencies and workplace readiness are encouraged by engaged teachers who show capable behaviors in VR training for healthcare or automotive repair. Badilla-Quintana and Sandoval-Henríquez (2021) research reinforces this by showing that teacher engagement mediates between immersive learning and student outcomes.

Teacher engagement also develops collaborative and participatory practices embedded in educational practice. According to Bandura (1986), modeled behaviors change learner attitudes in a positive direction. Therefore, Metaverse instructors who participate in Metaverse environments themselves are more inclined to motivate and encourage students to participate actively. For example, repeated student practice is enhanced with a virtual welding instructor who demonstrates safety and precision. The central argument of SCT is that such a reciprocal relationship exists with teacher behavior affecting student reaction and robust learning environments parallel to real-life vocational experiences. Overall, it is shown that SCT provides a solid theoretical foundation for understanding teacher engagement and as drivers of learner experiences in Metaverse-integrated TVET. These elements allow broadcasting the gap between theory and practice, which is TVET's mission to produce competent, job-ready human resources by facilitating behavioral modeling and rendering active participation. SCT concepts weaved in the integration of such technologies (i.e., Metaverse technologies) point to the fact that schools can no longer be effective in their delivery without radical changes that make it more effective, interactive, and aligned with real vocational demands.

i. Technological Pedagogical Content Knowledge (TPACK)

According to the Technological Pedagogical Content Knowledge (TPACK) Framework (Mishra & Koeleber, 2006), the unfolding of Shulman's (1986) pedagogical content knowledge is to consider technological knowledge since educational digital tools are essential in education. TPACK comprises three cores (Content, Pedagogical, and technological knowledge) and the area of expertise (i.e., Technological pedagogical, content, and pedagogical) that intersect to create a total TPACK understanding where each knowledge area has its complementary knowledge. Especially in Metaverse Enriched TVET, teachers must harmonize the teaching pedagogy, the content, and the technological tools well for the practical usage of such technology.

For building TVET with Metaverse, TPK plays a key role in creating engaging and purposeful learning experiences. Teachers who have strong TPK can choose and apply the appropriate technological tools that match their pedagogical strategies. Such teachers create highly interactive virtual classrooms, as Orozco-Rodríguez et al. (2023). An example of this would be a VR implementation of an electrical engineering instructor guiding students through a complicated wiring system, where the students get real-time feedback about how correct their answers are. This helps to increase problem-solving skills and technical skills.

Furthermore, this TCK is important to TVET because it allows content to be presented to visualize and experiential learning in areas like culinary arts and engineering. Although Mishra and Koehler (2006) prefer TCK to assist with spreading the delivery of content through technology, he favors TCK. Hence, as argued by Tan et al. (2023), AR provides teachers a way to graphically assist students in the learning of practical competence, especially when it comes to food preparation tasks, which otherwise would be much harder without the presence of virtual representations. In the vocational context, it fills the gap between the theory and practice that teachers with robust TCK bridge.

In the end, the teacher engagement in the Metaverse-enhanced TVET is strengthened by the TPACK framework. Teachers comfortable with immersive tools demonstrate appropriate behaviors using the immersive tools (collaborative, problem-solving, and skill-focused). Using the assurance, teachers can effectively employ the Metaverse to match the training to industry requirements. For example, technology and pedagogy are integrated in TPACK, which is a base from which to integrate technology and pedagogy to achieve TVET's objectives, i.e., provide relevant and practical education. With this integration, the Metaverse is taken as a tool to create innovative and adaptive vocational learning environments.

ii. Self-Determination Theory

The self-determination theory (SDT), developed by Deci and Ryan (1985), provides a very comprehensive framework for understanding human motivation in educational settings. It stresses the fulfillment of three crucial psychological needs that fuel intrinsic motivation: autonomy, relatedness, and competence. If these needs are met, learners are more engaged, and their motivation comes from internal satisfaction. SDT thus explains how teacher engagement mediates the link between psychological needs and learning outcomes in the context of TVET enhanced by Metaverse.

From the point of autonomy, SDT also suggests that Metaverse-based TVET teachers should provide instructions that are autonomy-supportive. Teachers increase motivation by providing students with opportunities to choose and take responsibility for their learning. Chiu (2021) points out that digital teaching, which is an autonomy-supportive one, helps foster learner engagement. By giving them the freedom to choose diagnostic tools in a virtual environment in an automotive mechanics course, the students will practice the industry-relevant problem-solving characteristic of the TVET's mission to produce innovative, proactive learners.

Another vital need is met by competence when students feel capable of meeting professional demands. The establishment of this self-efficacy is done through structured instruction, feedback, and immersive simulations. The studies conducted by Cheng and Tsai (2020) indicate that teacher participation in immersive environments improves students' perceived competence. As an example, a VR-based welding class where the real time instructor feedback on angles and pressure of welding skills helps students develop accurate skills per the workforce expectations, a crucial TVET objective.

Metaverse-enhanced TVET also involves the need for relatedness or the need for social connection. Unlike other online platforms of the past, the Metaverse offers shared spaces that encourage presence and collaboration. Teachers can organize such simulations or role play activities, for example, in programs such as hospitality management so that teamwork is recreated, resembling real-life teamwork, and belonging is grown. The personal skills required in industry are reinforced, and student connectedness is improved.

Overall, the SDT provides a viable theoretical base for teacher engagement that drives the influence of Metaverse-based TVET. Educators can create a dynamic, motivational learning environment by addressing learners' psychological needs. Such practices support the

institution's determination to offer graduates who are technically strong and capable of self-directed and adaptable learning behaviors, equipped for the industry.

Professional development includes a continuous learning process for educators to keep updating their skills concerning new educational technologies and methods (Fernández-Batanero et al., 2022). Unlike traditional workshops, metaverse-based professional development allows teachers to have experiential learning by immersing themselves in VR and AR-based environments (Alfaisal et al., 2024). Interactivity, adaptability, and goes into focus on engagement and comprehension (Adami et al., 2023). Attainment of the same learning outcomes can be achieved by other people both globally and in shared virtual spaces (Brand, 2020) and even with flexible, capsule-based learning so that all needs are being met. There are, however, barriers such as technology accessibility and connectivity (Kazmi, 2023). While these are thus, Metaverse development provides a great abundance of 21st-century education (Khalil and Jumani, 2024; Cheng and Qin, 2021).

The interaction with VR, AR, and XR platforms towards the transformation of conventional educational methods is termed Metaverse tools engagement (Onu et al., 2024). The benefit of experiential and collaborative learning is also enhanced with these tools. For example, VR enables biology students to grasp complex structures, and AR assists vocational training through safe simulation (Thompson et al., 2020; AlGerafi et al., 2023). AI tutors training in VR-based settings increase motivation and minimize anxiety (Rane et al., 2023; Adıgüzel et al., 2023). However, costs, access, and shortage of teaching expertise are hurdles to widespread adoption (Yaqoob et al., 2023). Nevertheless, Metaverse tools are essential for collaboration, customization, and active learning.

The pedagogical training consists of preparing for deploying pedagogical knowledge to VR and AR in immersive education (Mohan, 2019). The Metaverse fosters experiential, active learning over traditional passive methods (Heilporn et al., 2021). It includes master training of virtual classrooms and interaction with AI avatars to improve confidence and cognition (Anderson & Putman, 2020). Part is central, which allows for teachers from presented backgrounds to co-teach and co-develop pedagogical methods (Liu et al., 2020). High costs, technical demands, and teacher resistance present barriers (Meccawy, 2022). However, this training prepares educators to address learner's diverse needs in future learning.

Teacher readiness is the preparedness and confidence of educators to use VR, AR, and XR in teaching practice (Lee & Hwang, 2023). To adapt pedagogically, technological proficiency is also needed. With their proficiency, educators can design immersive lessons, such as virtual expeditions and AR demonstrations (Pramanik, 2024). Content flexibility must exist to adapt the content for the immersive platforms (Oulahyane et al., 2024). Yet, time, funding, and institutional support often hinder readiness in instances when teachers are digitally literate (Rawat & Hagos, 2024). Because of this, Metaverse integration must rely on professional development and sustained support to be effective.

Teacher engagement also implies an active commitment to designing and delivering instruction in Metaverse (Baig, 2023). VR and AR make it possible for educators to create content specifically tailored to make their students more engaged not only through immersive experiences like virtual simulation of natural phenomena (Yıldırım et al., 2020), but also to celebrate diversity and diversity of thought in a rich sensory fashion that might establish and enrich deeper connections to each other and the subject matter. Constructivist approaches towards knowledge generation involve interaction and collaboration (Cavinato et al., 2021). There are time constraints, technological demands, and limited support, however, to sustain high engagement levels (Bakkar & Ziden, 2023). However, there is an importance in creating teacher engagement to promote innovation and active, immersive student learning.

Metaverse education's teaching effectiveness is delivering immersive impactful education with VR and AR (Chafiq et al., 2024). For example, 'learning by doing' enriches engagement and retention: e.g., a history student virtually exploring past civilizations (Makransky & Mayer, 2022). They allow real-time collaboration and hence help in teamwork and learning outcomes (Qureshi et al., 2023). However, technological challenges, resource availability, and teacher training impoverish successful implementation (Wu & Hao, 2024). Even in the face of obstacles, The Metaverse presents educational transformation in immersive and collaborative experiences that are new and different from best teaching.

The variables described above have been used to form a diagrammatic view of the research framework (Figure 1) and presents the hypothesis to be tested. To predict engagement in teaching effectiveness through Metaverse, the focus is on; the dimension of the teacher development, which includes professional development, Metaverse tools engagement, pedagogical training and teachers' readiness and teacher engagement towards teaching effectiveness through Metaverse.

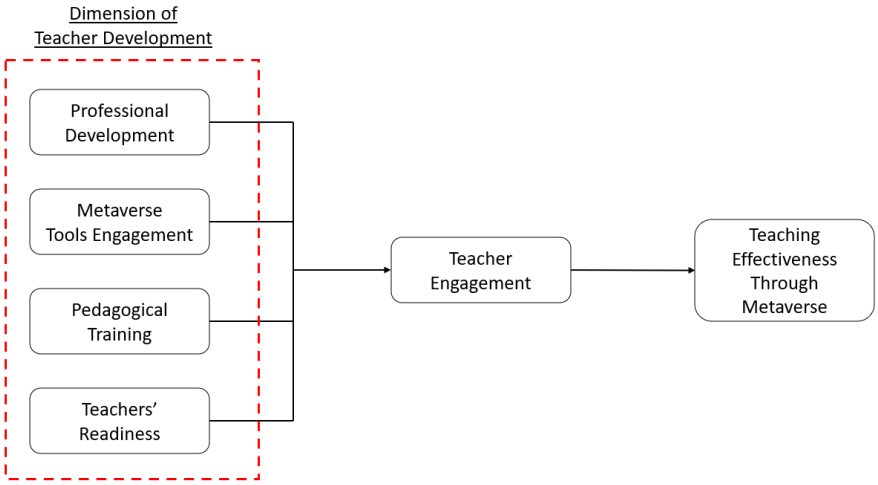

Fig. 1. Proposed Conceptual Framework

2. Proposed Methodology

It is a conceptual paper utilizing descriptive research design to focus on the mediating role of teacher engagement in Metaverse-enhanced TVET. This study is suitable for descriptive research as it allows one to explore and articulate theoretical relationships between key constructs systematically and serves as a basis for future empirical validation. The study develops a conceptual framework based on an extensive review and synthesis of relevant literature to capture how TVET education is changing with the current use of digital technologies, especially with the Metaverse.

In this conceptual paper, no empirical data collection takes place, but a potential methodological approach for future research is sketched. The suggestion is that standard data could be obtained from TVET educators who are knowledgeable with or working with Metaverse tools. The questionnaire would be packaged in a structured one using validated instruments for each construct. Existing scales used in prior studies that have operationalized variables like teacher engagement, professional development, technological self-efficacy, and teaching effectiveness can be used to operationalize variables in this study.

Inferential statistical techniques should be used to examine the proposed conceptual model for empirical future validation. Structural Equation Modelling (SEM) will be performed using Smart PLS as simply the method to analyse complex relationships between direct and indirect effects on latent variables. Moreover, preliminary analyses will include data screening,

descriptive statistics, and reliability testing, and all will be conducted using SPSS. Procedures in the Smart PLS environment, such as convergent and discriminant validity testing, will be implemented to assess the validity and internal consistency of the measurement model. Moreover, bootstrapping methods will be used to evaluate the significance of the hypothesized mediating and moderating effects. These analytical methods will be integrated to yield empirical support to the theory and meaningful insights into the ongoing debate on digital transformation in education, particularly in the context of TVET.

This conceptual paper proposes a theoretical model that puts forward the mediating role of teacher engagement in Metaverse-enhanced TVET education and contributes to the growing body of knowledge on digital transformation in education. The study integrates two well-established theories namely self-determination theory (SDT), social cognitive theory (SCT), and technological pedagogical content knowledge (TPACK) framework, to provide a holistic insight into how the professional development, pedagogical training, teacher readiness, and utilization of the Metaverse tools individually and collectively affect teachers' ability to teach effectively. This study has a key contribution in its focus on the centrality of teacher engagement as the central construct to link technological readiness and instructional outcomes. Additionally, technological self-efficacy as a moderating variable provides a nuanced perspective on how a person's confidence in technology's use could either weaken the proposed relationships. However, this conceptual framework contributes to the extension of theoretical insights and the provision of practical guidelines to policymakers, TVET leaders, and curriculum developers in implementing immersive technology in the TVET context. The study also lays the foundation for future quantitative research related to digital education based on evidence by outlining the future of an empirical validation plan.

3. Conclusion

This conceptual paper concludes by pointing out the imperative of teacher engagement in the effectiveness of Metaverse integral TVET. The study develops an understanding of these factors (professional development, pedagogical training, teacher readiness, and the role of interaction with Metaverse tools) and analyses the influence on teaching results. The proposed conceptual model puts teacher engagement into play as a middleman between technological preparedness and practical instruction. Additionally, the technological self-efficacy included as a moderating variable helps in portraying individual confidence in terms of using the technology and can add more strength or negate the proposed relationships. Further, this framework also provides practical implications for policymakers, educational leaders and curriculum developers involved in implementing immersive technologies into TVET contexts rocks. The study offers a framework for how future empirical validation could be based on evidence-based strategies for improving teaching and learning experiences in the era of digital education.

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INTEGRATING DESIGN THINKING IN FINAL YEAR PROJECTS: PERSPECTIVES OF LECTURERS AND STUDENTS IN MALAYSIAN POLYTECHNICS

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Abstract

In an era defined by rapid technological advancement and sustainability imperatives, Technical and Vocational Education and Training (TVET) institutions must equip graduates with future-ready skills that extend beyond technical proficiency. This study investigates the integration of Design Thinking (DT) into Final Year Projects (FYPs) in Malaysian polytechnics, focusing on the perspectives of both lecturers and students. DT was formally introduced into the polytechnic curriculum in Academic Session 2019/2020, yet its application in FYPs remains underexplored. Using a qualitative approach, semi-structured interviews were conducted with five participants (three lecturers and two final-year students). Data were analysed thematically using Braun and Clarke's (2013) six-phase framework, supported by *Transkriptor* software to generate codes and themes. Findings indicate that DT has been partially embedded in FYPs through workshops, supervisory practices, and curriculum briefings, providing greater structure, clarity, and user-centred orientation in student projects. Both lecturers and students recognised DT's potential to enhance creativity, problem-solving, and innovation, though challenges such as resource constraints, limited exposure, and uneven institutional support persist. Participants also expressed strong expectations of DT's long-term value in aligning FYPs with industry and community needs, while strengthening graduate employability and adaptability to Industry 4.0 and 5.0 demands. This study concludes that DT can transform FYPs into innovation-driven platforms that cultivate empathy, creativity, and sustainable problem-solving skills. It recommends structured training programmes, supportive institutional policies, and cross-disciplinary collaborations to ensure meaningful integration. These findings contribute to the growing discourse on embedding design thinking within TVET, positioning Malaysian polytechnics to nurture graduates who are both technically competent and innovation-driven.
Keywords: Design thinking; Final year projects; TVET; Innovation; Sustainability.

1. Introduction

In today's rapidly evolving global landscape, where technological advancements and sustainability imperatives redefine industry standards, Technical and Vocational Education and Training (TVET) institutions must transform their educational approaches to produce graduates equipped with future-ready competencies. Within Malaysian polytechnics, there has been a gradual shift towards not only imparting technical knowledge but also nurturing students' capacity to innovate and solve complex real-world problems. This reflects the pressing demand for graduates who are not merely technically proficient but also agile thinkers, creative problem solvers, and contributors to sustainable development.

Recognising this need, *Design Thinking* (DT) was formally introduced into the Malaysian polytechnic curriculum in Academic Session 2019/2020 as part of the broader initiative to embed 21st-century learning skills and innovation-driven pedagogy within TVET programmes. Since its introduction, DT has been integrated in selected courses, workshops, and Final Year

Projects (FYPs), offering students opportunities to apply user-centred, iterative, and creative approaches to problem-solving.
Final Year Projects (FYPs) remain a critical component of polytechnic education, providing students with opportunities to integrate knowledge and skills in addressing authentic challenges. However, traditional approaches to FYPs often emphasise procedural compliance over innovation, potentially limiting students' preparedness to navigate the demands of an unpredictable and technologically driven workforce. Embedding DT within FYPs offers a transformative framework that encourages empathy, creativity, and iterative problem-solving, enabling students to conceptualise and implement projects that are meaningful, relevant, and impactful.

Despite its potential, limited empirical research has examined how DT is currently integrated within FYPs in Malaysian polytechnics. Key issues such as stakeholders' perceptions, challenges in implementation, and the extent to which DT contributes to bridging skills, technology, and sustainability remain underexplored. Addressing this gap is essential to ensure that FYPs function not merely as academic requirements but as platforms for innovation aligned with industry demands and sustainability goals.

Therefore, this study aims to investigate the integration of DT principles into FYPs in Malaysian polytechnics by examining the experiences and perspectives of lecturers and students. Specifically, it seeks to:

i. Assess the current status and extent of DT implementation in FYP teaching and supervision.
ii. Explore perceptions, attitudes, and challenges faced by students and lecturers in integrating DT principles.
iii. Examine stakeholders' expectations regarding the potential long-term impact of DT in enhancing FYPs for innovative and sustainable problem-solving.

Through this exploration, the study contributes to strengthening TVET pathways by fostering graduates equipped with critical, creative, and sustainable innovation skills necessary for the 21st-century workforce. The landscape of education is shifting, with a growing emphasis on equipping students with skills that extend beyond traditional academic knowledge. Design thinking, a human-centered approach to innovation, offers a framework that encourages creativity, collaboration, and critical analysis. The literature review will look at the current status of FYPs in Malaysian polytechnics and the potential impact of integrating design thinking principles into these projects.

Design thinking has gained substantial traction in recent years as a human-centered approach to problem-solving. It emphasizes empathy, creativity, and iterative prototyping. Initially rooted in the field of design, design thinking has been adopted across various disciplines, including education, business, and healthcare. It serves as a means to foster innovation and address complex challenges (Adeline H., 2023).

Design thinking is typically characterized by several key principles and stages. According to Ibrahim M. N. (2019), it involves a series of iterative steps, including empathizing with end-users, defining the problem, ideating potential solutions, prototyping ideas, and testing them with users. This iterative process encourages experimentation and learning from failure, ultimately leading to the development of innovative and user-centered solutions. In the realm of education, applying design thinking principles has been shown to enhance student engagement, creativity, and critical thinking skills. According to Shah H.S (2019), design thinking fosters a mindset of "creative confidence", empowering individuals to approach problems with optimism and resilience. By encouraging students to explore multiple perspectives and iterate on their ideas, design thinking promotes a culture of experimentation and innovation within educational settings.

In the context of Final Year Projects (FYPs), there is a growing recognition of the need to move beyond traditional project management approaches and embrace more innovative and user-centered methodologies. However, research indicates that many FYPs in Malaysian polytechnics often lack real-world applicability and fail to address contemporary societal and industrial needs (Sultana et al., 2020). This highlights the importance of integrating design thinking principles into the FYP process to better prepare students for the demands of the modern workforce.

The integration of design thinking into educational practices has been shown to have several benefits for students. For example, Hasso Plattner Institute of Design at Stanford University (2017) found that students who participated in design thinking courses reported increased confidence in their ability to solve complex problems and generate creative solutions. Similarly, a study by Blikstein (2013) demonstrated that design thinking can improve students' collaboration skills and their ability to work effectively in interdisciplinary teams.

In the Malaysian context, there is a growing interest in exploring how design thinking can enhance FYPs in polytechnics. Hamdan M.I.S.B (2021) conducted a study on the implementation of design thinking in a Malaysian polytechnic and found that it led to improvements in students' problem-solving skills and their ability to develop innovative solutions. However, the study also highlighted challenges such as limited resources and resistance to change among faculty members. In Malaysian polytechnics, where the emphasis is often placed on practical skills and vocational training, integrating design thinking principles into educational practices holds the potential to enhance final-year projects (FYPs) and cultivate students' innovative problem-solving skills.

Despite the potential benefits of integrating design thinking into FYPs, there are also challenges and barriers to implementation. For example, Mandar Pandey (2020) identified factors such as time constraints, lack of faculty training, and institutional resistance as common barriers to the adoption of innovative pedagogies in higher education. Addressing these challenges will require a concerted effort from educational institutions, faculty members, and industry stakeholders to create a supportive ecosystem for design thinking in Malaysian polytechnics.

In summary, the literature suggests that design thinking offers a promising framework for enhancing Final Year Projects in Malaysian polytechnics for innovative problem solving. By integrating design thinking principles into educational practices, institutions can better prepare students for the demands of the modern workforce and foster a culture of innovation within their programs.

However, despite the growing recognition of the importance of innovation and practical problem-solving skills in Malaysian polytechnics, there remains a notable gap in the integration of design thinking principles into the planning, execution, and supervision of Final Year Projects (FYPs). While design thinking has emerged as a powerful framework for addressing complex challenges through human-centered approaches, creativity, and iterative prototyping, its application in the context of FYPs within Malaysian polytechnics has not been extensively explored. This research gap signifies a missed opportunity to equip students with the necessary skills and mindset to tackle real-world problems innovatively, thereby hindering their readiness for the dynamic demands of the modern workforce.

2. Methodology

This study employed a qualitative research design to explore participants' perspectives, experiences, and insights related to the integration of design thinking (DT) principles into Final Year Projects (FYPs) within Malaysian polytechnics. A qualitative approach was deemed

appropriate as it enabled the researcher to elicit rich, in-depth responses that capture the complexity of participants' experiences and perceptions.

Semi-structured interviews were conducted using a convenience sampling method, where subjects were selected based on accessibility and relevance to the research context. The study involved five participants in total: three lecturers (two males, one female) and two students (one male, one female) from a civil engineering programme at a Malaysian polytechnic.

While the sample size may appear small, this is consistent with the aims of qualitative inquiry, which prioritises depth over breadth. The selected participants had extensive teaching and supervisory experience (lecturers with 17–20 years in service) and were actively engaged in FYP teaching or supervision. The student participants were in their final year (Semester 4 and 5), directly involved in FYPs that integrated elements of DT. This purposeful diversity ensured that the sample could provide information-rich insights, sufficient for identifying patterns and themes relevant to the research objectives. Similar small-scale studies in design thinking and TVET contexts have adopted comparable sample sizes to generate exploratory findings (e.g., Majere, 2024; Keelson et al., 2025).

The interview protocol incorporated open-ended questions while allowing emerging issues to be explored through dialogue. Questions were designed following Carspecken's Qualitative Research Method (1996), which recommends the use of preliminary brainstorming to generate lists of key issues and questions. The semi-structured format ensured systematic coverage of the research objectives while retaining flexibility to probe participants' unique experiences. Each interview was audio-recorded with informed consent and subsequently transcribed verbatim for analysis.

Thematic analysis was conducted using Braun and Clarke's (2013) six-phase framework. Transcripts were coded iteratively, combining both deductive coding (based on the research objectives) and inductive coding (emergent themes). Coding and theme development were assisted by *Transkriptor* software, which facilitated systematic organisation of the data. Thematic categories were then refined and consolidated into three overarching areas corresponding to the study's objectives: (1) current status of DT integration, (2) perceptions and challenges, and (3) long-term expectations.

All participants were informed of the purpose of the study, their rights, and confidentiality measures. Written consent was obtained prior to participation. Pseudonyms (L1, L2, L3, S1, S2) were assigned to protect anonymity. Ethical protocols were strictly observed throughout data collection, storage, and reporting.

The small sample size and the use of convenience sampling mean that findings may not be generalisable to all Malaysian polytechnics. Nevertheless, the depth of insights generated offers valuable exploratory evidence and provides a foundation for future studies with larger participant groups.

3. Results And Discussion

Part 1 of the interview required participants to provide basic demographic information such as their name, teaching experience, current teaching responsibilities related to FYP, current semester, and students' final year project's title. Table 1 summarizes the pertinent information received from participants. All participants have at least 17 years of experience working at the institution being studied and are currently in Semester 4 and Semester 5 out of their 6th semester studying in polytechnic.

Based on the result of Part 1, it can be concluded that the years of teaching experience, the students' senior years, and their involvement in FYPs imply that the participants have adequate knowledge of design thinking principles in FYPs. Thus, though the sample size is relatively small and may weaken the effectiveness of the interview, their profound knowledge and ample experience, as proven in this part of the interview, can compensate for those weaknesses.

Table 1. Summary of information related to the participants in Polytechnic A

Participants' criteria	Lecturers (L1)	(L2)	(L3)	Students (S1)	(S2)
Gender	Male	Female	Male	Female	Male
Years of teaching experience	20	17	20	-	-
Academic background	B. Eng.	PhD.	B. Eng.	Diploma in Civil Engineering	Diploma in Civil Engineering
Current teaching responsibilities related to FYP	Design Thinking Master Trainer	FYP Supervisor	FYP1 Coordinator (Sem 4)	-	-
Current semester	-	-	-	Sem 4	Sem 5
FYP's title	-	-	-	*Kajian Penggunaan* Porous Pavement *dengan menggunakan Getah Kitar Semula*	*Pembangunan* Smart Wind Detector *untuk Amaran Angin Lintang di Lebuhraya*

Thematic analysis of the interview data generated three overarching themes, which align with the study's three objectives: i. current status and extent of design thinking (DT) integration in FYPs, ii. perceptions, attitudes, and challenges faced by students and lecturers, and iii. stakeholders' expectations of the long-term impact of DT in enhancing FYPs for innovative and sustainable problem-solving. Coding was conducted using *Transkriptor* software, with both deductive codes (guided by research objectives) and inductive codes (emerging from the data). The final themes are summarised in Tables 2 to 7, which present responses from lecturers and students across the identified categories.

Findings revealed that DT has been partially embedded into the FYP process through curriculum adjustments, supervisory practices, and student-led initiatives. Lecturers (L1 - L3) highlighted efforts such as curriculum briefings, workshops, and stakeholder involvement as strategies to familiarise students with DT principles. Students (S1, S2) demonstrated awareness of innovation in their projects, such as incorporating recycled materials and IoT elements. Although the scope of DT integration varied, both groups acknowledged that DT provided structure and clarity in problem identification and solution design.

Across both groups, perceptions of DT were largely positive. Lecturers described DT as a framework that improved student problem-solving, empathy, and user-centred thinking. Students shared that DT made projects more structured, comprehensible, and relevant to real-world applications. However, challenges were also highlighted, including limited resources, time constraints, and the need for additional training for both lecturers and students. Coding revealed recurring barriers such as "lack of resources," "time limitation," and "resistance to change," which indicate structural and cultural constraints in applying DT effectively.

Participants emphasised that DT integration has the potential to enhance the long-term quality and sustainability of FYPs. Lecturers anticipated that DT could align projects more closely with industry and community needs, while also cultivating graduates' employability and adaptability in Industry 4.0 and 5.0 contexts. Students viewed DT as a guide to improving project quality and as preparation for solving real-world problems after graduation. Codes such as "future employability," "industry relevance," and "innovation potential" illustrate the positive outlook of both groups.

The following tables (2–7) present detailed responses from lecturers and students, categorised under the three main themes. These tables illustrate how participants perceived DT's status, its benefits and challenges, as well as its long-term implications for FYPs.

Table 2. How participants perceived DT's current status (Lecturers)

Interview Transcript with Lecturers	
Interview Questions	Answers from Participants
Interview Question 1: Can you describe any initiatives or efforts that have been undertaken in our institution to incorporate design thinking principles into the teaching and supervision of final-year projects?	▪ incorporating it into the curriculum syllabus that includes providing training and guidance to both students and supervisors on how to apply design thinking in their projects (L1, L2, L3) ▪ conduct courses or briefings for students to understand the concepts of DT and its application in their projects (L1, L3) ▪ involving stakeholders and users in the design process to ensure the quality and relevance of the FYPs (L1) ▪ Supervisors play a crucial role in guiding students and aligning their understanding of design thinking principles (L2, L3) ▪ clear communication and ensuring that both supervisors and students are on the same page (L1, L2, L3) ▪ conducting thorough research and analysis at the initial stages of the projects to ensure quality outcomes (L3)
Interview Question 2: What specific strategies or methodologies have been used to integrate design thinking into the FYP process?	▪ Provide a briefing or short course to students at the beginning of the final project involving social services where students have hands-on experience with the DT concept (L1) ▪ Lecturers who have applied DT to guide the students through each step of the process (L1) ▪ Starting with problem statement identification, seeking advice to support the problem statement, and applying DT throughout the analysis and conclusion stages of the project (L2, L3) ▪ Using methods such as creative thinking, critical thinking, and various other methodologies (L3) ▪ Involves guiding students to conduct academic research, develop innovative products, and adhere to specific formats and writing styles (L3)
Interview Question 3: How do you personally engage with design thinking principles in your role as a lecturer supervising FYPs?	▪ Provide a briefing, short course, feedback, and support for students at the beginning of the projects (L1, L2, L3) ▪ Involving students in real-life situations and focusing on user needs rather than creating problems (L1) ▪ Integrating DT as part of the CDIO approach (L1) ▪ Involve stakeholders and users in the testing phase of the projects to gather feedback and make improvements (L2, L3)

Table 3. How participants perceived DT's current status (Lecturers) (Students)

Interview Transcript with Students	
Interview Questions	Answers from Participants
Interview Question 1: How do you perceive the role of innovation in the context of your final-year project?	▪ Innovation as a way to enhance existing products and make them better than before (S1) ▪ By adding innovation, the project can be improved and the product can be enhanced (S1, S2)
Interview Question 2: Have you attempted to integrate innovative solutions into your project? If so, what were the challenges you encountered?	▪ Adding recycled materials like processed rubber powder into the pavement to absorb water (S1) ▪ Integrate with IoT to enhance the product innovation (S2) ▪ The main challenge we faced was the time needed to gather information and conduct interviews with suppliers to obtain the necessary materials (S1, S2)
Interview Question 3: What specific difficulties or obstacles did you face in integrating innovative solutions, and how did you address them?	▪ Related to the process of obtaining information and conducting research (S1, S2) ▪ Required a lot of time to gather information and understand the root causes of the problem (S1, S2) ▪ The need to visit a factory and conduct detailed testing (S1) ▪ Limited resources or stock availability (S1, S2)

Table 4. Benefits and Challenges (Lecturers)

Interview Transcript with Lecturers	
Interview Questions	Answers from Participants
Interview Question 1: How do you perceive the role of design thinking principles in enhancing the teaching and supervision of final-year projects?	▪ Crucial in ensuring that projects are user-centered, relevant, and of high quality (L1, L2, L3) ▪ By applying DT, students are encouraged to address real user needs and create solutions that are effective and impactful (L1, L3) ▪ Lead to more meaningful and practical projects that can be utilized by the community or industry (L1, L3) ▪ Provide structured approach to problem-solving, fostering creativity and promoting empathy towards end-users (L1, L2) ▪ Help supervisors guide students through the project development process, fostering creativity and collaboration (L1, l2, L3)
Interview Question 2: What do you see as the potential benefits of integrating design thinking into the FYP process?	▪ Creating projects that are more user-focused and relevant (L1, l2, L3) ▪ Producing projects that are effective and usable by the community or industry (L1, L3) • DT can assist in guiding students to align their ideas with the objectives (L2) • Improving the project's quality (L1, L2, L3) • Enhancing innovation and creativity among students (L1, L3) • Facilitating user-centered design (L3) • Allowing for iterative testing and improvement of prototypes (L2, L3)
Interview Question 3 What challenges or barriers do you perceive in adopting design thinking principles in teaching and supervising FYPs?	▪ Level of understanding and acceptance (L1, L2, L3) ▪ The need for training and guidance (L1, L3) ▪ Potential resistance to change in traditional teaching methods (L1) ▪ Practical application of the principles i.e. conducting fieldwork and meeting with stakeholders may require adherence to formal procedure and protocol when interacting with external organizations or agencies (L3) ▪ Ensuring that students can effectively translate theoretical knowledge into practical skills and solutions (L1, L2, L3)

Interview Transcript with Lecturers	
Interview Questions	Answers from Participants
Interview Question 4 How do you think these challenges can be addressed or overcome?	▪ Provide more hands-on practical training in DT, rather than just theoretical lectures (L1, L3) ▪ Provide real-life examples and scenarios (L1, L2) ▪ Regular feedback and guidance from supervisors (L2) ▪ Establish proper procedure (L1, L3) ▪ Actively seek out information (L3)

Table 5. Benefits and Challenges (Students)

Interview Transcript with Students	
Interview Questions	Answers from Participants
Interview Question 1: How familiar are you with design thinking principles, and do you believe they could enhance your FYP experience?	• DT could enhance their FYP experience by providing guidance and facilitating problem-solving (S1, S2)
Interview Question 2: What do you think would be the benefits of incorporating design thinking principles into FYPs?	▪ DT makes projects easier to understand (S1, S2) ▪ clearer in terms of objective (S1) ▪ help students in problem-solving and decision-making in real-life situations (S1)
Interview Question 3: From your perspective, what barriers or challenges might lecturers face in adopting design thinking principles in teaching and supervising FYPs	▪ Understanding and implementing DT principles ▪ Adapting lecturers teaching methods to incorporate DT effectively ▪ Encounter resistance from students who are unfamiliar with DT ▪ Lack of resources ▪ Time constraint ▪ The need for additional training

Table 6. Long-term Implications for FYPs (Lecturers)

Interview Transcript with Lecturers	
Interview Questions	Answers from Participants
Interview Question 1: Do you believe that the integration of design thinking methodologies will positively impact the alignment of student projects with real-world challenges and industry needs? Why or why not?	▪ DT focuses on understanding user needs and creating solutions that are relevant and effective (L1, L2, L3) ▪ Students will be able to address actual problems faced by users and industries (L1, L3) ▪ DT encourages empathy, idea generation, prototyping, and testing which are essential elements in addressing real-world problems effectively. (L2, L3) ▪ Students will have a better understanding of how to approach and solve complex challenges (L3) ▪ Students are likely to develop a deeper understanding of real-world challenges (L1, L3)
Interview Question 2: What are your expectations regarding the long-term outcomes of integrating design thinking into FYPs?	▪ Projects will be of higher quality and more relevant to the needs of users or communities (L1, L2, L3) ▪ Students will be able to execute their projects well (L2) ▪ Students need to understand DT from the start (L2) ▪ Improved innovation (L1, L3) ▪ Better user feedback and product testing (L3) ▪ Overall enhancement of the FYP experience for students (L1, L2, L3)
Interview Question 3: How do you envision design thinking contributing to the overall quality and relevance of student projects in the future?	▪ Ensuring that the projects are based on real user needs and problems (L1, L2, L3) ▪ Students will be able to create solutions that are truly effective and impactful as they will be addressing genuine issues faced by users (L2, L3)

	▪ Providing a structured approach to problem-solving and innovation (L2, L3)

Table 7. Long-term Implications for FYPs (Students)

Interview Transcript with Students	
Interview Questions	Answers from Participants
Interview Question 1: Do you believe that integrating design thinking methodologies into FYPs will positively impact the alignment of student projects with real-world challenges and industry needs? Why or why not?	▪ Helps students understand the problem-solving process (S1, S2) ▪ Encourages innovative solutions that are practical and relevant to real-world situations (S1) ▪ Students are better equipped to address industry needs and create impactful projects (S2)
Interview Question 2: How do you envision design thinking contributing to the overall quality and relevance of FYPs in the long run?	▪ Provide a structured approach to problem-solving and innovation (S1, S2) ▪ Help students better understand the needs of users (S1) ▪ Generate creative ideas (S2) ▪ Iterate on solutions to create impactful projects (S2) ▪ Prepare students for real-world challenges (S1) ▪ Improve overall effectiveness (S1, S2)
Interview Question 3: What outcomes or changes do you hope to see as a result of incorporating design thinking into the FYP process?	▪ Hope to see improvements in the quality of projects (S1, S2) ▪ Easier understanding for students (S1) ▪ The ability to solve real-life problems more effectively (S2)

The findings of this study highlight the significance of integrating design thinking (DT) principles into Final Year Projects (FYPs) in Malaysian polytechnics. By thematically analysing the perspectives of lecturers and students, three key areas were identified: current status of DT integration (Objective 1), perceptions and challenges (Objective 2), and long-term expectations (Objective 3).

The study reveals that DT has been partially integrated into FYPs through curriculum briefings, workshops, supervisory practices, and student initiatives. This aligns with prior studies (Hamdan, 2021; Cheah, 2012) which suggest that embedding DT within academic projects enhances students' ability to approach problem-solving systematically. However, inconsistent implementation across departments and limited institutional support remain barriers, echoing the challenges highlighted by Mandar Pandey (2020) regarding adoption of innovative pedagogies in higher education.

Both lecturers and students perceived DT positively, identifying it as a framework that enhances problem-solving, empathy, and innovation. Students reported that DT provided greater clarity and structure in conducting projects, consistent with findings by Henriksen et al. (2017) that DT cultivates creativity and confidence. Nevertheless, recurring challenges included resource constraints, time limitations, and varying levels of understanding among lecturers and students. These barriers indicate the need for capacity-building initiatives and institutional support to strengthen DT application.

Participants anticipated that DT would enhance the relevance and sustainability of FYPs by aligning them more closely with industry and community needs. Lecturers expected DT to improve graduates' employability and innovation capacity, while students viewed it as preparation for tackling real-world challenges. This expectation resonates with Dell'Era et al. (2020) and Noh & Abdul Karim (2021), who argue that DT fosters adaptability and future-ready skills aligned with Industry 4.0 and 5.0 demands. The findings underscore the importance of sustaining DT integration as a long-term educational strategy in TVET.

4. Conclusion

Overall, this study demonstrates that design thinking can transform FYPs from procedural academic tasks into innovation-driven platforms. The integration of DT enhances students' creativity, critical thinking, and capacity to address authentic problems. However, its impact is limited by resource constraints, lack of structured training, and uneven adoption across institutions.

To address these challenges and maximise the benefits of DT in FYPs, several measures are recommended:

i. Structured Training Programmes - Provide continuous training for both lecturers and students to strengthen their understanding and practical application of DT.
ii. Supportive Institutional Policies - Develop policies that incentivise innovative teaching approaches and allocate resources for prototyping, workshops, and stakeholder engagement.
iii. Cross-Disciplinary and Industry Collaboration - Encourage collaborative projects that involve multiple disciplines and industry partners to enhance the real-world relevance of FYPs.
iv. Future Research - Conduct larger-scale studies to evaluate the quantitative impact of DT on employability and innovation skills, as well as longitudinal studies to track graduates' adaptability and professional growth.

By adopting these strategies, Malaysian polytechnics can ensure that FYPs not only fulfil academic requirements but also function as platforms for cultivating future-ready graduates who can drive technological advancement, innovation, and sustainable development.

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LEARNING: THE PERCEPTION, ATTITUDE, AND READINESS OF VOCATIONAL COLLEGE STUDENTS IN LEARNING SECRETARIAL SUBJECTS

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Abstract

Blended learning has been proved to bring improvement in the teaching learning process. This study's investigation of the Vocational College students' perception, attitude and their readiness to adopt blended learning in the subject of secretarial. The target population was the senior Vocational College students. Three colleges were randomly selected from the three colleges in Kelantan. Twenty students were randomly selected from each of the colleges totalling 60 in all. Questionnaires were administered to all the 60 students and the data collected was analysed using frequency counts and means(x). The findings based on the three research questions raised revealed that the student's perception towards the usefulness of blended learning was positive, the attitude was positive, and the students were ready to adopt blended learning. It was therefore recommended amongst others that seminars, workshops, in-service training and conferences should be organized for teachers for a blended learning approach to have a smooth take off.
Keywords: Learning Meeting Minutes, E-Learning.

1. Introduction

Traditionally, Teaching has been viewed as a process of delivering to students what is required without any opportunity for questioning. This means that the teacher has the monopoly of knowledge required to be imparted. However, in the modern sense teaching is an attempt to help someone acquire a change of attitude, knowledge, ideal, skills or appreciation (Adedapo, 2004). Mkpanang (2005) explained that the concept of teaching implies that a set of stimuli is initiated and regulated by an individual who has been professionally trained to do so. Ayodele (2002) opined that what is learnt by students is a function of how it is taught. Successful teaching therefore requires that the students make sense out of what they are taught. There is therefore a growing consensus among education leaders, researchers and educators around the world that teaching and learning must change to help students develop the skills they will need to succeed in the 21st century (Ananiadou & Claro, 2009).

The traditional teaching method, as good as it is, has its shortcomings. According to Lalima and Dangwal (2017), traditional teaching is failing to meet the individual needs of all the students in the class basically due to improper pupil teacher ratio and it is not adapting itself to meet the challenge of teaching physically challenged students. Moreover, children from deprived groups, from the areas that are geographically isolated, and medically unfit students are not able to gain benefit from this formal traditional mode of teaching. Courses are also not regularly revised, books are not updated, and teachers are not interested in upgrading their knowledge and professional skills.

A Comparative Analysis of Traditional Education System Vs e-Learning has pointed out some main disadvantages of teacher-centric learning. Student-centric and Teacher-centric Learning. In addition to teaching equipment and teaching formats, traditional and modern education can also be differentiated by learning focus. The traditional education method is teacher-centric learning and modern education is learner-centric learning. Teacher-centered

learning is usually a traditional lecture-style class where the teacher manages and leads students to learn (Anderson, 2022).

Olasedidun (2014) opined that to address the inadequacies of traditional teaching, innovative tools will have to be used in teaching. The use of innovative methods in educational institutions has the potential not only to improve but also to empower people, strengthen governance and galvanize the effort to achieve human development for the country. The concepts of paperless and pen less classrooms are thus emerging as an alternative to the old teaching learning method. There is now a democratization of knowledge, and the role of the teacher is changing to that of facilitator. Technology and ease with which it can be accessed have changed the way we live and work. Today's students will not only compete with students that sit next to them but also with their peers from across the globe.

Modern Teaching Methods: Being in the 21st century, there becomes an insistent need to introduce technological requirements in the education system at all levels. The education system has been changing and introducing new methods of teaching which have a completely different view and approach towards the educational teaching and learning system. Teachers teach every student as an individual recognizing that each student has his own needs, interests and way of thinking and learning. The students' needs are highly considered. Students are more active in class, the methods are based on activities which completely involve them into the process of learning. Students actively participate to gain knowledge and improve their skills and aid them face any kind of challenges in the future, in which the teacher only guides and leads them to reach their goals. (Mehta, 2019).

Effective teaching is the designed goal of every teacher. In effective teaching the teacher uses certain approaches and tools to help students learn and flourish. Students can learn better when the teacher uses effective teaching methods. (Mazarin J, 2021). The educational system at present is in a transition stage. To meet the challenges of expansion and catering to individual needs, it is trying to adopt new technologies and exploring new paths to reach the goal of quality educational opportunities for all. At the same time due to various factors like deficient budgets, lack of facilities, advantages of face-to-face interaction, it is not completely ready to leave the traditional modes of knowledge transfer (Lalima & Dangwal, 2017). The use of technology to augment teaching and learning is therefore inevitable. The increased access to technology in the classroom has improved the potential for teachers to optimize student learning through a combination of both online learning programmes and face-to-face student/teacher interaction. Blended learning is therefore an approach that is gaining increased attention from teachers and administrators to optimize the use of technology in their classrooms.

Dziuban, Hartman & Moskal (2004) defined blended learning as a pedagogical approach that combines the effectiveness and socialization opportunities of the classroom with the technologically enhanced active learning possibilities of the online environment, rather than a ratio of delivery modalities. According to Downes (2008), it is essentially traditional in-class learning supplemented by online activities and resources. In addition, Stacey & Mackey (2009) defined it as the combination of technology and traditional face to face instruction while Christensen, Horn & Stacker (2003) described it as a formal education programme in which a student learns at least in part through online learning with some element of student control over time, place, path and/or pace and at least in part at a supervised brick-and-mortar location away from home.

Blended learning is not about technology itself; it is about the shift in the instructional model to personalized, student-centered learning to ensure each student's success (Patrick, Kennedy & Powell, 2013). Adopting a blended learning approach offers the appeal of combining different learning elements using the power of ICT while retaining a human touch (Department of Education and Early Childhood Development, 2012)

Blended learning models, developed from early experimentation, place the student at the centre of the learning process, harnessing the power of technology to create more engaging, efficient and success-oriented learning environments. In these models, educators quickly identify gaps in learning and differentiate instruction to ensure that failure is not an option. The common blended-learning programmes include rotation, flex, A la Carte and enriched virtual. The rotation model has four sub-models which are station rotation, lab rotation, flipped classroom and individual rotation (Horn, Stacker & Christensen, 2014).

The advantages of blended learning as highlighted by Lalima & Dangwal (2014) are listed as:

i. As part of learning is done through ICT, online or offline mode, so teachers and students get more time in the classroom for creative and cooperative exercise.
ii. Students gain advantage of online learning and CAI without losing the social interaction element and human touch of traditional teaching.
iii. It provides more scope for communication.
iv. Students become more techno-savvy and they gain enhanced digital fluency
v. Students have more strengthened professionalism as they develop qualities like self-motivation, self-responsibility and discipline.
vi. It updates course content and so gives new life to established courses.

However, the implementation of blended learning is not an easy task. Certain fundamental preparations in all the teaching learning process elements (teacher, student, content and infrastructure) will be required. Some of the basic requirements include well trained teachers; teachers with the scientific attitude; teacher with wider outlook and positive approach toward change; complete facilities like well-furnished computer laboratory, internet connection, provision for video chatting; students having access to internet on their private computer; flexibility in the system; fully aware and agreed parents; and formative evaluation and continuous internal assessment (Lalima & Dangwal, 2017).

If blended learning will be relevant within an education context, the students' perception of the usefulness, attitude and their readiness to use it must be looked into. Anderson & Dron (2011) explained that the responsibility of a teacher is not just to define, generate or assign context, but it is to help learners build learning paths and make connections with existing and new knowledge resources.

Perception is the process by which organisms intercept and organize sensation to produce a meaningful experience of the world (Falade, 2011). Attitude is an accumulation of information about an object, person, situation or experience… a disposition to act in a positive or negative way toward some object. It is the controller of actual behaviour of an individual, consciously or unconsciously (Littlejohn 2002). Readiness means planning to do something. It is a matter of willingness from the heart. Olumoorin (2008) explained that successful integration of ICT depends not only on awareness and availability but also on the extent to which instructors are willing to use it. Hence the need for this study, perception, attitude and Vocational College students' readiness to use blended learning in teaching.

The integration of new mobile technology and online media is proving highly effective in helping schools meet the expectations of 21st century learners while addressing the challenges of limited resources and the special needs of many students. However, not everyone is happy with the term blended learning. Oliver and Tingweln (2003) in their article "Can blended learning be redeemed?" argued that blended learning is ill-defined and muddled as a description of particular forms of teaching with technology.
Moreover, there is a growing worldwide trend in initiatives that are explicit about the availability of learning anywhere, anytime. The underpinning notion is that teachers will need to be up-skilled quickly to cope with the virtual learning opportunities in the classroom. This study

therefore sought to find out Vocational College students' perception, attitude and readiness to adopt blended learning in instruction.

The purpose of this study was to investigate Vocational College students' perception, attitude and readiness to adopt blended learning. Specifically, the study sought to find out:

i. The perception of Vocational College students towards the usefulness of blended learning in the subject of secretarial.
ii. The attitude of Vocational College students towards adopting blended learning in the subject of secretarial.
iii. The readiness of Vocational College students towards adopting blended learning in the subject of secretarial.

This study attempted to answer the following questions:

i. What is the perception of Vocational College students towards the usefulness of blended learning in the subject of secretarial?
ii. What attitude do Vocational College students have towards adopting blended learning in the subject of secretarial?
iii. Are Vocational College students ready to adopt blended learning in the subject of secretarial?

2. Methodology

Descriptive survey design was adopted for the study to find out the perception, attitude and readiness of Vocational College students to adopt a blended learning approach in the subject of secretarial. The target population for the study consisted of all senior Vocational College students particularly those in Kelantan State based on their relevance to perceived usefulness, attitude and readiness to adopt a blended approach in the subject of secretarial. The questionnaire contained two major sections. Section I dealt with the students' biographical information while section II was sub-divided into three to take care of the three research questions. Each of these sub-divisions contained 5 items. The response mode for the items was likert response modes of Strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree (SD). The instrument was given to educational evaluation and computer experts for validity. The reliability of the instrument was determined section by section based on the three major variables. For perceived usefulness, the Cronbach's alpha was 0.87, attitude 0.93 and readiness, 0.89.

The researcher personally administered the copies of the questionnaire to senior Vocational College students in all the three sampled Vocational College students with the help of the vice-principals and teachers in each of the schools. The questionnaires were given to the students and with the assistance of the teachers, the researcher was able to collect back all the questionnaires in each of the colleges. The analysis and interpretation of data obtained through the questionnaire was done using descriptive statistical design. The frequencies were converted to mean (x) to answer the research questions. Section II that contained items to answer the research questions was ranked 4 for Strongly Agree, 3 for Agree, 2 for Disagree and 1 for Strongly Disagree for questionnaire items that were positively worded and vice versa for items that were negatively worded.

3. Results and Discussions

The innovative results of this study are findings from the E learning Meeting which is a case study of a group of students studying in the secretarial programs from 3 selected vocational colleges in the state of Kelantan, including Pengkalan Chepa Vocational College, Bachok and Pasir Mas. This learning innovation is done through E learning which can be accessed through the following links and attachments, https://sites.google.com/moe-dl.edu.my/kesetiausahaan pentadbiran/bahan-pdp/bkp-304-meeting/what-are-meeting-minutes (refer to attachment A).

Research Question 1: What is the perception of Vocational College students towards the usefulness of blended learning in the subject of secretarial?

Table 1. Analysis of students' perception towards the usefulness of blended learning in the subject of secretarial.

S/N	Perceived usefulness of blended learning	Mean (x)
1	Blended learning will make me finish the content of each subject early	3.40
2	The teaching learning process will be easier with the use of blended learning	3.34
3	Blended learning will reduce stress and tension inherent in classroom teaching	2.98
4	The use of blended learning will improve my academic performance	3.26
5	Blended learning will make lesson more interesting	3.29
	Grand mean (x)	3.25

Table 1 reveals that making students complete the content of each subject early was ranked highest, with a mean score of 3.40 out of 4. The lowest mean score was 2.98 (approximately 3.00) with the statement that blended learning will reduce stress and tension inherent in classroom teaching. However, the grand total mean score for perceived usefulness was found to be 3.25. Using 2.0 as the average benchmark, it can then be inferred that Vocational College students perceived the usefulness of blended learning in the subject of secretarial positively.

Research question 2: What attitude does Vocational College students have towards adopting blended learning in the subject of secretarial?

Table 2. Analysis of students' attitude does Vocational College students have towards adopting blended learning in the subject of secretarial.

S/N	Attitude towards using blended learning	Mean(x)
1	Blended learning is not adequate for Vocational College	3.06
2	I will never offer a subject that will force me to use blended learning	3.42
3	Online environments are not meant for teaching and learning	2.86
4	Blended learning will make students to become lazy	3.29
5	Many students will fail if blended learning is adopted in Vocational College the subject of secretarial	3.17
	Grand mean (x)	3.16

Table 2 reveals that students did not agree with the statement that they will never offer a subject that will force them to use blended learning, with the highest mean score of 3.42 out of 4. The lowest mean score was 2.86 with the statement that online environments are not meant for teaching and learning. However, the grand mean score for the attitude of students was found to be 3.16. Using 2.0 as the average benchmark, it can be deduced that the students have a positive attitude towards adopting blended learning in the subject of secretarial.

Research Question 3: Are Vocational College students ready to adopt blended learning in the subject of secretarial?

Table 3. Analysis of students' readiness to adopt blended learning in the subject of secretarial.

S/N	Readiness to adopt blended learning	Mean(x)
1	I wish I never have anything to do with blended learning	3.52
2	I will always prefer normal classroom learning	3.40
3	I can never be convinced to use blended learning	2.47
4	I will rather drop out from school than to adopt blended learning	3.61
5	Atrocities that people perform online will never make me adopt blended learning	3.38
	Grand mean (x)	3.48

Table 3 reveals that students will never decide to drop out from school because of the adoption of blended learning with the highest mean score of 3.61 out of 4. The lowest mean score of 3.34 was associated with the statement that the atrocities that people perform online will never make me adopt blended learning. The grand mean score for the readiness to adopt blended learning was found to be 3.48. With 2.0 as the average benchmark, it can be inferred that Vocational College students are ready to adopt blended learning in the subject of secretarial.

This study found out that:

i. The perception of Vocational College students towards the adoption of blended learning in the subject of secretarial is positive.
ii. Vocational College students have a positive attitude towards the adoption of blended learning in the subject of secretarial.
iii. Vocational Colleges students are ready to adopt blended learning in the subject of secretarial.

4. Conclusion

Through a combination of online learning and more customized face-to-face direct instruction, students will be afforded the opportunity to experience student-centered learning, teacher mentoring, as well as the opportunity to self-direct their learning. Moreover, blended learning has a very high potential to help teachers better address the needs of the students. However, teachers must be encouraged to be ready to adopt the blended learning approach to be able to achieve the benefits. Based on the findings of this study, the following recommendations were made the government should be ready to provide equipment that will make online learning possible in all vocational colleges. Seminars, conferences and workshops should be organized for the teachers who are to help in the implementation of the blended learning approach. Students should be encouraged to remain focused when online and should use the equipment strictly for academic purposes only.

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DESIGN OF INTERACTIVE 3D ANIMATION AS AN EDUCATIONAL MEDIUM FOR COMPUTER SHORTCUT KEY FUNCTIONS USING THE MULTIMEDIA DEVELOPMENT LIFE CYCLE (MDLC) METHOD

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Abstract

This study aims to design an interactive 3D animation as a learning medium to explain the functions of shortcut keys on computers. The main issue addressed is the lack of engaging and interactive visual learning media to help novice users understand keyboard shortcut functions. The method applied is the Multimedia Development Life Cycle (MDLC), which consists of six stages: concept, design, material collection, assembly, testing, and distribution. The final product is a 3D animation visualized using Blender 2.93 and edited with CapCut to produce the final video. This medium presents a simulation of commonly used shortcut keys, such as Ctrl+C, Ctrl+V, Alt+Tab, with clear and easy-to-understand visuals. Internal testing results show that this medium is feasible for use as a self-learning aid.
Keywords: 3D Animation; Keyboard Shortcuts; MDLC

1. Introduction

Keyboard shortcuts are combinations of keys on a keyboard that serve specific functions to expedite certain commands when using a computer. The use of shortcuts can significantly improve work efficiency, especially in areas such as graphic design, document processing, and programming. However, in reality, many computer users—particularly students or beginners—still do not fully understand the functions and benefits of shortcut keys. Observations indicate that many students or novice computer users struggle to remember and comprehend the existing shortcuts. This mainly happens because the available learning media are still text-based or static images. Such media are considered less interactive and insufficiently engaging to motivate users to learn. This issue is the main problem addressed in this study through the development of an interactive 3D animation-based learning medium. This is in line with Fauziah et al. (2022), who found that the use of interactive 3D animation can significantly improve students' conceptual understanding.

Several previous studies have discussed the effectiveness of interactive learning media. Farezi et al. (2025) stated that the use of keyboard shortcuts can improve time efficiency and reduce error rates in daily tasks compared to traditional methods. Similarly, Farezi et al. (2025) also demonstrated that keyboard shortcuts play a vital role in enhancing computer users' work efficiency. Tanus, Sumual, & Kumajas (2022) in their study used the Multimedia Development Life Cycle (MDLC) method to develop a 3D animation tutorial learning medium, which proved feasible and helpful in the learning process.

Moreover, Pricilia & Putri (2024) added that 3D animation as an educational medium can effectively increase enthusiasm and motivation for learning, as well as accelerate material comprehension for children in an enjoyable way. Therefore, this study introduces a different approach by combining 3D animation and interactivity to make learning more enjoyable, engaging, and easy to understand.

This research employs the Multimedia Development Life Cycle (MDLC) method, consisting of six stages: concept, design, material collection, development, testing, and distribution. According to Lisana (2022), the MDLC method comprises six stages, namely concept, design, material collection, development, testing, and distribution. This method is deemed suitable because it focuses on systematic and structured stages in multimedia product development. Consequently, the produced learning media undergoes clear evaluation at each stage. The expected outcome is an interactive learning medium in the form of 3D animation. It visually and practically explains the functions of computer shortcut keys. This medium is intended for students and the general public who wish to learn computer skills independently in an enjoyable way.

With the availability of this interactive 3D animation-based learning medium, users can directly interact with the animation objects. They can understand shortcuts through realistic simulations. This is expected to enhance users' memory and motivation in learning keyboard shortcuts. Based on the problems and explanations presented above, the researcher is interested in developing a fun and easy-to-understand learning medium through an interactive 3D animation approach. Similarly, Rinaldi et al. (2021) demonstrated that the MDLC method is effectively applied to develop interactive multimedia animation that enhances learning outcomes.

2. Methodology

The stages of this research consist of several steps: problem identification, data collection, literature study, method implementation, and conclusion drawing. The researcher identifies problems to determine the challenges faced by novice computer users. Next, data is collected through a literature study from various sources such as books, journals, and the internet. Then, the Multimedia Development Life Cycle (MDLC) method is applied to design and develop the learning medium. Finally, the researcher draws conclusions from the research results:

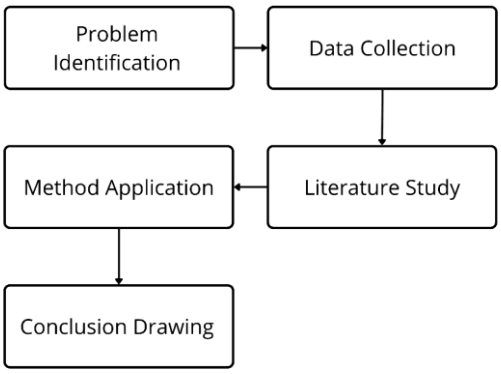

Fig. 1. Research Stages

The following is an explanation of each stage shown in Fig 1:

i. Problem Identification
   The first step is to identify the problem to be studied. In this stage, the researcher formulates the background, defines the research questions, and explains why the problem is important to address. The purpose is to ensure that the research has a clear and focused direction.
ii. Data Collection
   The second stage is data collection, which is carried out to obtain information relevant to the problem that has been identified. The methods can include observation, interviews, questionnaires, document studies, or literature reviews. In this research, data was obtained through a literature study or secondary data sources.
iii. Literature Study

At this stage, the researcher reviews literature or theories that support and are relevant to the problem being studied. The literature study helps identify theoretical foundations, compare previous studies, and enrich the knowledge base that will serve as a reference.

iv. Method Application
This stage is the core of the process, where the researcher applies the research method that has been designed. For example, using the MDLC (Multimedia Development Life Cycle) method in the development of learning media. This stage includes the design, production, testing, and refinement of the product/media.

v. Conclusion Drawing
The final stage is to draw conclusions based on the results obtained. Conclusions should address the research questions and objectives. This stage may also provide suggestions for future development or practical recommendations.

Animation is a technique for creating the illusion of motion by displaying images in sequence. In the multimedia field, animation is widely used to convey information in a more interesting and interactive way. According to Daniati, Mulyadi, & Nugroho (2021), animation is used in various fields such as education, entertainment, and promotion because of its ability to capture the audience's attention.

One rapidly developing type of animation is three-dimensional (3D) animation. 3D animation uses digital objects in three-dimensional space with height, width, and depth. 3D animation enables more realistic and dynamic object visualization (Rasiwan et al., 2023). With detailed and moving visual elements, 3D animation helps users understand abstract topics, such as keyboard shortcut functions. For example, in computer learning media, 3D animation can be used to show keys lighting up when pressed, along with sound and function information. This creates a more engaging and efficient learning experience.

A keyboard shortcut is a specific combination of keys used to speed up commands within a computer system. The use of shortcuts is highly important in the digital work environment, as it saves time and reduces dependence on the mouse.

Shortcuts are generally divided into several groups. Common shortcuts include commands for copying, pasting, and undoing actions (like Ctrl + C, Ctrl + V, Ctrl + Z). Navigation shortcuts help switch between applications, such as Alt + Tab or Ctrl + Tab for changing windows. System function shortcuts include combinations like Ctrl + Alt + Del and Windows + D for settings or quickly displaying the desktop. Standard keyboards on modern computers typically have 104 to 108 keys, depending on the model and layout. The keyboard used in this study is the standard Windows keyboard (ANSI 104-key layout), as it is the most commonly used type in desktop computers in Indonesia. Each key can be combined to form functional shortcuts, ranging from basic operations to advanced settings. Shortcuts are an essential skill for students learning computers, as they provide significant efficiency in software operation (Rahayu, Astawan, & Ambara, 2024). The following Table 1 shows examples of shortcut keys that are the focus of the learning media:

Table 1. List of Keyboard Shortcuts Used

No	Keyboard Shortcut	Action
1	Ctrl + A	Select all content or text
2	Ctrl + C (or Ctrl + Insert)	Copy selected item to clipboard
3	Ctrl + X	Cut selected item to clipboard
4	Ctrl + V	Paste content from clipboard
5	Ctrl + Z	Undo an action
6	Ctrl + Y	Redo an action

7	Ctrl + Shift + N	Reset style to normal
8	Alt + F4	Close active window; if none, shutdown menu appears
9	Ctrl + D (Del)	Delete selected item to Recycle Bin
10	Shift + Delete	Permanently delete item without Recycle Bin
11	F2	Rename selected item
12	ESC	Close current task window
13	Alt + Tab	Switch between open application windows
14	Windows key + 1	Open Settings application
15	Windows key + A	Open Action Center
16	Windows key + L	Lock the computer
17	Windows key + V	Open clipboard
18	Windows key + Shift + S	Take partial screenshot with Snip & Sketch
19	Windows key + Left	Snap window to left (split screen mode)
20	Windows key + Right	Snap window to right (split screen mode)

Multimedia learning is a teaching approach that combines text, images, audio, video, and animation. Hendra et al. (2023) state that multimedia learning helps students understand material through more than one sense, ultimately improving memory retention and interest in learning.

In general, there are two common multimedia approaches: linear multimedia and interactive multimedia. Linear multimedia delivers material sequentially without user interaction, so the user acts solely as a passive recipient of information. Meanwhile, interactive multimedia enables users to control the learning process. For example, they can select material, pause, or replay specific sections. This makes the learning process more flexible and tailored to individual needs.
In this study, an interactive approach based on 3D animation is used to introduce keyboard shortcut functions. With this approach, users can learn while directly trying out shortcut features in the displayed simulation.

The Multimedia Development Life Cycle (MDLC) method is one of the approaches used to develop multimedia products:

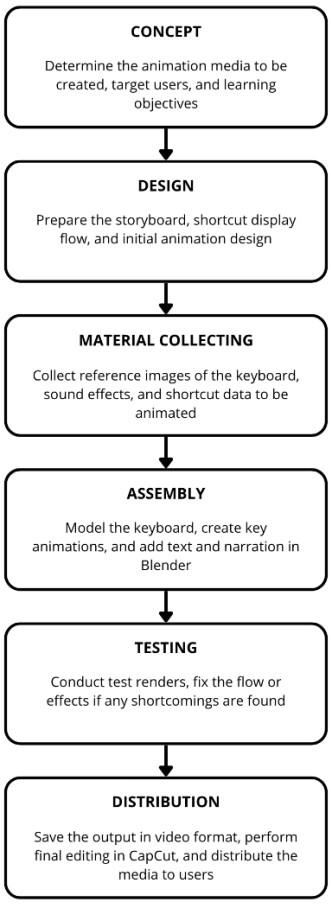

Fig. 2. MDLC Method

The following is a description of each stage shown in Fig. 2:

i. Concept: The initial stage to determine objectives, target users, and the main ideas for the multimedia to be developed.
ii. Design: Designing the user interface, interaction flow, animation storyboard, and mapping out required functions.
iii. Material Collecting: Gathering materials such as images, audio, video, and literature data to be used in the learning media.
iv. Assembly: The process of creating and combining all multimedia elements according to the design that has been made.
v. Testing: The testing stage to evaluate whether the developed media works as planned, both in terms of functionality and its effectiveness as a learning medium.
vi. Distribution: The final stage involves distributing the product to end users, whether through offline media (CD/DVD) or online (web, applications, or learning platforms).

Roedavan, Pudjoatmodjo, & Putri Sujana (2022) explain that the MDLC method is very suitable for developing learning media because it is systematic, flexible, and able to accommodate changes during the production process. In this study, all stages are carried out based on literature data since the object is keyboard shortcuts.

The type of research used in this thesis is Research and Development (R&D). According to Rangkuti (2019), research and development is a method used to produce a particular product and test the effectiveness of that product. With this approach, the researcher not only designs but also ensures that the developed product can meet user needs and is feasible to be used in the learning process. This study aims to produce a product in the form of an interactive 3D animation learning medium to explain the material on the functions of shortcut keys on a computer.

Development research is appropriate when the researcher aims not only to explain a phenomenon but also to design and produce a tangible product. This product can be directly used by users. In this context, the resulting product is multimedia-based learning media that can support self-study as well as serve as supplementary material for classroom learning. The approach used in this study is descriptive qualitative, which describes the processes, stages, and results of media development systematically and in depth without using statistical calculations. According to Prasetyo (2021), "qualitative research is a method based on the philosophy of post-positivism, used to study natural object conditions, where the researcher acts as the key instrument, data collection techniques are triangulated, data analysis is inductive/qualitative, and the research results emphasize meaning rather than generalization." In this research, this approach is used to describe the product development process through the stages of the MDLC method, starting from planning, design, material collection, to the distribution of the designed learning media.

The data collection method in this research is conducted through a literature study, which involves collecting and reviewing information from various written sources relevant to support the design process of the interactive 3D animation learning medium. Sources used include computer and multimedia textbooks, national scientific journals, online academic articles, and technical documents related to keyboard shortcuts and 3D animation.
According to Muhammad Rizal Pahleviannur et al. (2023), a literature study is a scientific approach conducted by searching, reading, and critically reviewing various reference sources. This process helps find theoretical foundations and concepts that support the research. This method is very suitable for development research, especially when it does not involve direct respondents.

The steps for data collection in this research include:

i. Determining keywords relevant to the topic (keyboard shortcuts, 3D animation, MDLC),
ii. Accessing various sources from campus repositories, national journals, and online libraries,
iii. Selecting references based on relevance, credibility, and publication year (maximum of the last five years),
iv. Analyzing and organizing the gathered information as the basis for the design and development process of the learning media.

Through this method, the researcher can gather essential information as a foundation in the design process of the MDLC-based learning media to be developed.

The data analysis technique in this research uses a descriptive qualitative approach. This technique is used to analyze data obtained from literature studies in the form of books, journals, and articles relevant to the topics of keyboard shortcuts, 3D animation, and multimedia learning.

According to Miles & Huberman (2020), qualitative data analysis consists of three interrelated activities:

i. Data Reduction
   The process of sorting, focusing, simplifying, and transforming raw data from various references into relevant information needed for product development.
ii. Data Display
   The filtered data is then organized in the form of narratives, tables, and diagrams that help visualize the process of designing the learning media.
iii. Conclusion Drawing and Verification
   The analyzed data is used to draw conclusions in the form of media design concepts, shortcut material content, and the structure of the 3D animation visualization. Verification is carried out by comparing data from several different sources to ensure accuracy.

This approach is considered the most appropriate for this type of development research. It focuses on understanding the process, meaning, and context rather than measuring numbers or statistics. In this study, the data analysis stage also includes an internal testing procedure to ensure the developed 3D animation media functions properly. This internal test involves verifying all animation scenes, text, and audio narration so that they align with the intended shortcut functions. Any minor errors found during the functional checks were corrected immediately to maintain media quality. This step-by-step validation ensures that the learning media is ready for use by both beginners and general users.

3. Results and Discussion

This section presents the tangible results of developing an interactive 3D animation-based learning medium. It also discusses its effectiveness in conveying shortcut key material to novice users. The process follows the final stages of the Multimedia Development Life Cycle (MDLC) method, namely assembly, testing, and distribution. These stages result in an animated video that has undergone visual, audio, and educational content refinement. The produced media shows simulations of shortcut key usage with 3D animation visualizing the actual position and movement of the keys. For example, when the Ctrl + C shortcut is pressed, the animation displays a finger pressing the corresponding keys, accompanied by a click sound and the word “Copy” appearing on the monitor. The animation was created using a 3D keyboard model in Blender, designed according to the standard ANSI 104-key layout, and edited using CapCut. The resulting .mp4 video was tested on various devices and by novice users.

Testing was conducted in two stages: internal testing and initial external testing. Internal testing ensured that all media elements functioned correctly — including animation playback, audio-text synchronization, and basic navigation. External testing involved target audience users, namely beginners in computer use. They were asked to watch the learning video and provide feedback on readability, material understanding, visual comfort, and animation appeal.

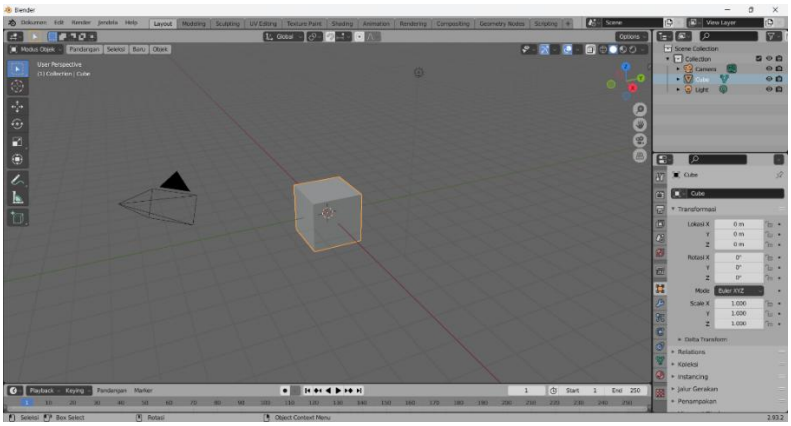

Fig. 3. Initial Display of the Learning Media

Fig. 3 shows the initial display of the developed keyboard shortcut learning media. This initial view provides the first impression for users before starting the animation simulation.

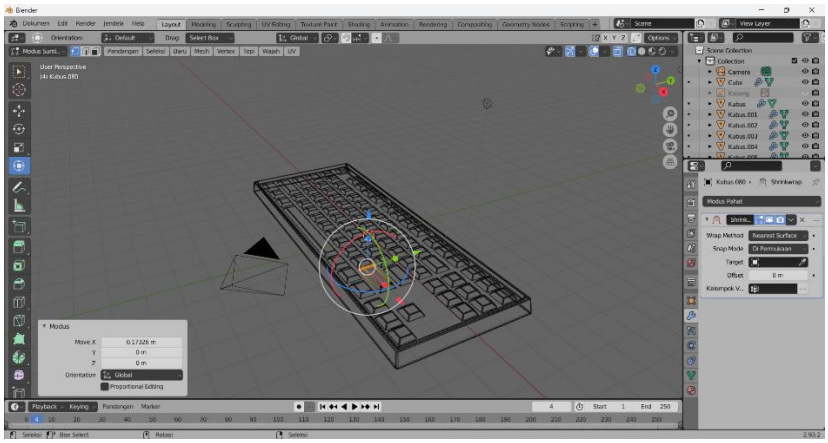

Fig. 4. Initial Keyboard Design in Blender

Fig. 4 shows the initial keyboard design created using the Blender application. This stage was carried out to create a keyboard model that resembles the actual shape.

After completing the initial design, the next step focused on testing the user experience by running the animation and gathering user reactions.

During the initial trial, users watched the entire animation with a duration of about 3 to 5 minutes. The media is structured as a linear video, allowing users to watch each shortcut simulation from start to finish without navigating themselves. Although not yet fully interactive, users can still perform basic navigation such as pausing, rewinding, or fast-forwarding certain parts. In practice, users with low digital literacy could easily follow the animation flow. They showed high enthusiasm due to its realistic visuals and supporting narration. This passive interaction proved effective for initial understanding of shortcuts, especially for those who had never learned the material before.

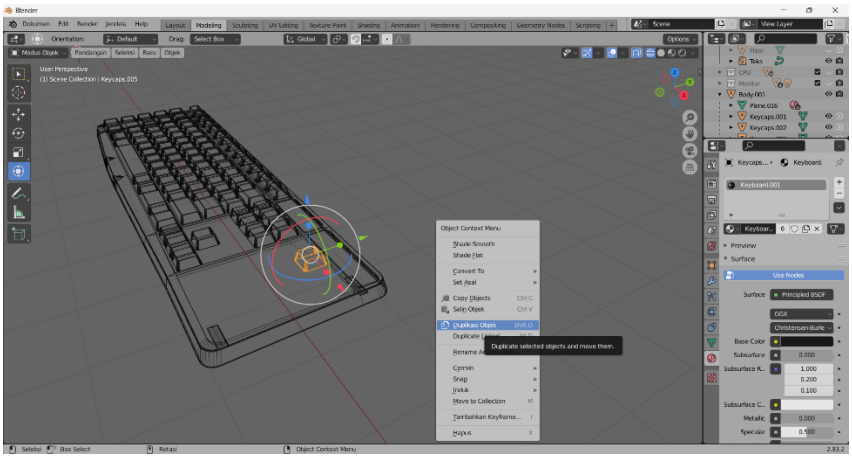

Fig. 5. Keyboard Modelling Process in Blender

Fig. 5 illustrates the detailed keyboard modelling process in Blender. This process includes shaping, placing the keys, and adjusting the proportions. This modelling process is crucial to ensure that each key matches its real-life counterpart, which helps in visualizing the shortcut functions clearly.

Functionality testing was carried out using the black-box method, where all animated shortcut keys were examined one by one to ensure that when a key is pressed, the animation shows the correct result. The results confirmed that all visualized shortcuts — such as Ctrl + C, Ctrl + V, Ctrl + Z, Ctrl + S, and Alt + Tab — functioned and displayed as planned (Teknik & Informatika, 2016).

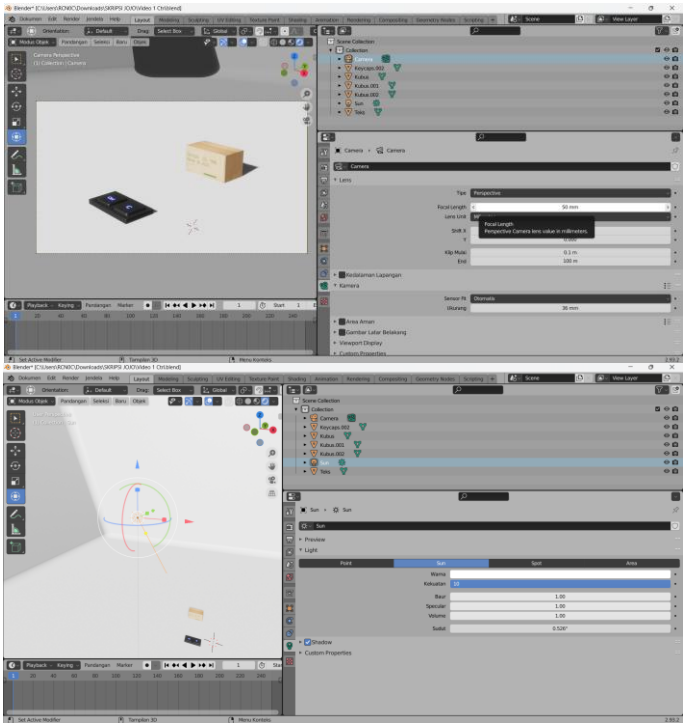

Fig. 6. Camera and Lighting Setup

Fig. 6 shows the camera and lighting setup used to ensure that the rendered animation appears realistic. Proper camera angles and lighting are essential for producing high-quality visual output. These factors make the animation more engaging for users. User perception testing yielded positive responses regarding the media's visual quality. Users commented that the 3D keyboard display looked very similar to a real keyboard. The added audio and text made explanations clearer. Most users said they could more easily remember key combinations after watching the animation compared to reading plain text. This aligns with Hendra et al. (2023), who stated that combining visuals and audio significantly enhances learning absorption.

Compared to conventional learning media such as textbooks, PowerPoint slides, or standard video tutorials, this interactive 3D animation has significant advantages. Conventional media tend to be one-way and visually less attractive, especially for younger learners or those with a visual-kinaesthetic learning style. In contrast, 3D animation allows users to see realistic simulations of key movements, action sequences, and results on screen. This approach bridges abstract concepts into easily understood forms. Farezi et al (2025) emphasized that visual and contextual material presentation is far more effective for technical learning like shortcut use, as users do not just memorize but also understand the context.

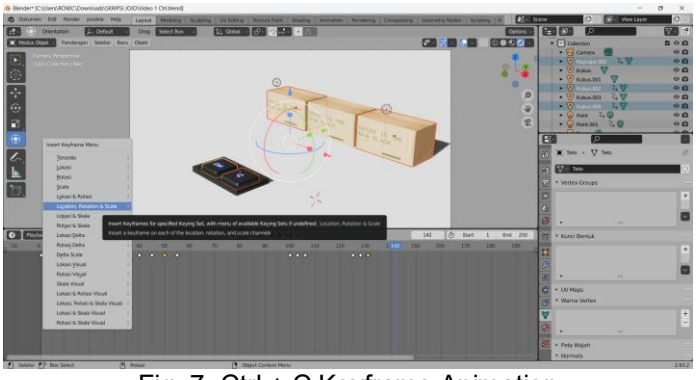

Fig. 7. Ctrl + C Keyframe Animation

Fig. 7 shows the keyframe animation for the Ctrl + C key. This stage demonstrates how the key press animation is created using keyframes on Blender's timeline. Keyframe settings define the flow of the shortcut action, ensuring smooth and accurate visual representation. This media is also highly beneficial for self-study. Compared to manuals or standard tutorials, the animation provides a more engaging learning experience through movement simulation and contextual shortcut usage. This advantage aligns with Kamil, Sindunigrum, dan Iqbal (2024), who stated that 3D animation-based media not only aids understanding but also boosts learning motivation. With a simple yet effective visual design, this media is suitable for various learning scenarios, such as basic computer training, ICT subjects in secondary schools, or self-paced courses.

Despite its benefits, some limitations should be noted. One is that the media is still a linear video. It does not yet allow users to select shortcuts interactively based on their needs. Additionally, it lacks quizzes or direct learning assessments to measure user comprehension after watching. Another limitation is its dependence on device quality: high-quality animations may not perform optimally on low-resolution screens or slow connections. However, these limitations can be addressed in future developments, for example, by creating a web-based application version or adding educational mini-game features. Final evaluation shows that this media is feasible as an alternative tool for teaching computer shortcut material. Although tested in a limited scope, user feedback provides initial evidence that interactive 3D animation has a positive impact on comprehension and learner engagement. This serves as a foundation for further development, such as adding app-based interactivity, evaluative quizzes, and integration with online learning platforms.

In addition to formal learning contexts like schools or basic computer training, this media also has great potential for other scenarios, such as employee onboarding, digital literacy content for the general public, or even as educational promotional material on social media. Given that computer shortcut mastery is now part of essential work skills, this media can help accelerate technology adaptation for new workers. It is especially useful in administration, design, or data processing fields. If developed in multiple language versions and subtitles, this media could reach a broader audience, opening opportunities for collaboration with training institutions, government agencies, or digital learning platforms to expand its national impact. Therefore, the interactive 3D animation-based keyboard shortcut learning media developed using the MDLC approach has successfully passed systematic development, technical and perception testing, and is deemed feasible for use in basic computer learning contexts. This product is expected to serve as a model or inspiration for developing similar educational media in other information technology areas.

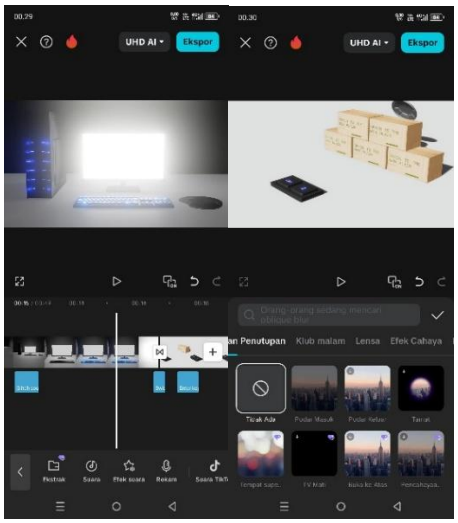

Fig. 8. Editing Process in the CapCut Application

Fig. 8 displays the editing process of the animation video in the CapCut application. This stage is used to add sound effects, text, and narration to make the animation more informative. After the editing stage, the final product was tested internally to ensure that all scenes, audio, and shortcut animations functioned properly and met the intended learning objectives. The detailed test results are shown in Table 2.

Table 2. Results of Animation Media Testing

No	Aspect Tested	Status	Notes
1	Clarity of shortcut animation	Works well	All keys are clearly visible and move according to the narration
2	Relevance of material and visuals	Appropriate	Text explanations match the movements in the animation
3	Visual and audio quality	Quite good	Animation runs smoothly, narration and text are readable
4	Animation sequence	Consistent flow	No scenes are skipped or cut off
5	User response (feedback)	Positive	Most users say the media is attractive and easy to follow

Based on the testing results, it can be concluded that the developed interactive 3D animation media works as expected and can effectively support the learning process on keyboard shortcut functions.

4. Conclusion

Based on the research results and discussion, it can be concluded that the interactive 3D animation-based learning medium developed using the Multimedia Development Life Cycle (MDLC) method is effective. It successfully conveys material about computer shortcut key functions. This medium combines a 3D keyboard visual, command simulations, and supporting audio narration. These features significantly help users, especially beginners, remember important shortcuts commonly used in daily activities. As Apriansyah (2020) stated, animation in learning can increase engagement and facilitate understanding by transforming abstract concepts into concrete visuals. Internal testing using the black-box method showed that all shortcut functions work well. User perception testing indicated improved understanding and increased interest in learning compared to conventional methods. This is also emphasized by Hendra dan Putra (2023) and Kamil, Sindunigrum, & Iqbal (2024), who discussed the effectiveness of interactive media in ICT learning. However, this media still has limitations, such as the lack of interactive evaluation features or self-assessment systems. Therefore, further development is needed. Suggestions for improvement include adding interactive navigation, evaluation quizzes, and integration with e-learning platforms. Development in multiple language formats and digital distribution could also broaden its impact. This is supported by Novita & Harahap (2020), who stated that animation-based media can positively affect motivation and learning outcomes in information technology fields. In line with this, future research should consider developing more advanced interactive features and implementing wider user testing to enhance the effectiveness and reach of this learning medium. This product is expected to serve as a model or inspiration for developing similar educational media in other information technology areas.

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KEFAHAMAN FIQH HAID DALAM KALANGAN REMAJA DEWASA : KAJIAN KES TERHADAP PELAJAR PEREMPUAN KOLEJ KOMUNITI

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Abstrak

Kajian ini dijalankan bagi menilai tahap kefahaman dan amalan pelajar perempuan Kolej Komuniti terhadap fiqh haid dan istihadhah, di samping mengenal pasti sumber ilmu yang mempengaruhi pemahaman mereka. Menggunakan kaedah soal selidik berstruktur berdasarkan skala Likert lima mata, seramai 56 orang responden bagi tiga buah Kolej Komuniti negeri Johor daripada pelbagai semester pengajian telah terlibat. Dapatan menunjukkan bahawa kefahaman asas mengenai haid berada pada tahap memuaskan, namun masih terdapat kekeliruan dalam aspek istihadhah, pengiraan tempoh suci dan haid, serta perbezaan antara jenis darah wanita. Amalan ibadah yang berkaitan pula menunjukkan tahap pematuhan yang tinggi, tetapi penggunaan teknologi seperti aplikasi untuk merekod kitaran haid masih belum meluas. Sumber ilmu yang dikenal pasti merangkumi pendidikan formal, ceramah dalam talian dan media sosial, namun tidak semua pelajar menerima bimbingan secara konsisten. Sehubungan itu, dicadangkan agar pendekatan pengajaran fiqh haid ditambah baik dengan kaedah lebih interaktif serta kurikulum yang lebih tersusun, bersesuaian dengan latar belakang teknikal pelajar Kolej Komuniti.
Kata kunci: Fiqh haid; Istihadhah; Pelajar Kolej Komuniti.

1. Pengenalan

Haid ialah darah yang keluar dari rahim wanita, bukan kerana melahirkan, dan berlaku secara kebiasaan pada waktu tertentu sebagai fitrah semula jadi wanita (Abd Karim Zaidan, 1997). Dalam satu hadis, Rasulullah S.A.W. bersabda kepada Aisyah r.a. ketika beliau didatangi haid: “Sesungguhnya ini adalah sesuatu yang telah Allah tetapkan ke atas anak-anak perempuan Adam” (al-Bukhari, no. 294; Muslim, no. 301). Dalam fiqh Islam, sifat, warna, dan masa keluarnya darah menjadi asas penting dalam menentukan hukum-hakam berkaitan ibadah seperti solat, puasa dan thaharah. Umur minimum wanita yang boleh mengalami haid adalah sekitar sembilan tahun qamariah dan warnanya hitam, panas, terasa sakit dan berbau busuk (al-Zuhaili, 1997). Tempoh haid kebiasaannya adalah 6-7 hari, dengan tempoh minimum adalah semalaman (24 jam), dan tempoh maksimumnya adalah 15 hari 15 malam (Liyana & Fatin, 2023). Dari sisi pendapat ulama’ Imam As-Syafie, warna darah haid boleh jadi hitam, merah, coklat, kuning dan keruh (al-Zuhaili, 1997). Penting disini, wanita yang sedang kedatangan haid adalah dilarang mengerjakan ibadah tertentu seperti solat, berpuasa, masuk masjid, membaca dan menyentuh al-Quran, dan mengerjakan tawaf juga melakukan hubungan suami isteri. Oleh itu, pemahaman terhadap kitaran haid amat penting dalam menentukan kesahihan ibadah seorang Muslimah.

Istihadhah merujuk kepada darah yang keluar dari pangkal rahim di luar waktu kebiasaan haid, lazimnya berpunca daripada masalah kesihatan atau gangguan pada bahagian pangkal rahim (al-Zuhaili, 1997). Ianya terjadi selepas habis tempoh maksimum haid iaitu 15 hari dan juga disebut darah penyakit. Berbeza dengan darah haid, istihadah tidak menghalang daripada melakukan ibadah seperti solat dan puasa. Hukum-hakam ibadah bagi wanita yang mengalami istihadhah adalah sama seperti wanita dalam keadaan suci, termasuk dibenarkan melakukan hubungan suami isteri (Ismail et al., 2016).

Segolongan remaja masih keliru membezakan antara darah haid dan istihadhah, serta tidak jelas mengenai pengiraan tempoh darah haid dan tempoh suci, yang akhirnya menjejaskan keyakinan mereka dalam menunaikan ibadah (Ismail et al., 2016). Kekeliruan ini lazimnya berpunca daripada kelemahan dalam memahami tanda fizikal haid, pengiraan tempoh suci, dan waktu sah ibadah. Dalam kalangan warga pendidik pula, turut dilaporkan mengalami kekeliruan dalam membezakan antara darah haid, nifas dan istihadhah, sekali gus menjejaskan keberkesanan penyampaian ilmu kepada pelajar (Khalid, Kadir, & Ahmad, 2022). Hal ini mungkin berpunca daripada kandungan silibus pendidikan formal yang terlalu umum, yang lebih menekankan aspek definisi semata-mata tanpa perincian mendalam terhadap hukum fiqh seperti pengiraan tempoh suci atau ciri darah. Kajian turut mendapati bahawa kandungan pengajaran fiqh darah wanita dalam silibus sedia ada masih terlalu ringkas dan tidak mencukupi, menyebabkan guru mencadangkan agar topik ini diajar lebih awal dengan sokongan program khas serta disediakan panduan mudah sebagai bahan rujukan pelajar (Salleh, Alqaraleh, & Kamaruddin, 2023). Oleh itu, pendekatan pendidikan yang lebih komprehensif dan interaktif sangat diperlukan bagi meningkatkan kefahaman dan keyakinan generasi muda Muslimah terhadap fiqh haid.

Dalam konteks kekeluargaan, jurang komunikasi antara ibu dan anak perempuan berkaitan isu haid sering mendorong remaja untuk mendapatkan maklumat daripada media sosial atau internet. Sumber ini tidak semestinya tepat dari sudut hukum fiqh, menyebabkan berlakunya kekeliruan dalam memahami peraturan ibadah semasa haid (Tengku Sarina Aini et al., 2024). Sementara itu, dapatan lain turut menunjukkan bahawa majoriti remaja perempuan tidak menerima pendidikan formal yang mencukupi daripada sekolah, ibu bapa, atau institusi agama. Sebaliknya, mereka lebih banyak bergantung kepada maklumat daripada rakan sebaya, media sosial atau pengalaman peribadi yang mungkin tidak lengkap dan kurang sahih (Chandra-Mouli & Patel, 2017).

Remaja khususnya pelajar perempuan Kolej Komuniti sedang melalui fasa penting dalam kehidupan yang melibatkan pembentukan identiti diri dalam masa yang sama mematuhi cara hidup bersyariat. Mereka juga berada dalam persekitaran TVET yang selalunya lebih menumpukan aspek kemahiran berbanding ilmu agama, termasuklah fiqh berkaitan wanita. Dapatan daripada penyelidikan terdahulu yang melibatkan pelajar Kolej Komuniti menunjukkan bahawa isu pengiraan haid yang tidak tetap sering menimbulkan kekeliruan dalam kalangan pelajar perempuan di institusi ini (Muhammad, Zakaria@Alias & Ibrahim, 2019). Kekurangan bimbingan formal dalam isu ini boleh menyebabkan salah faham dalam menentukan waktu sah beribadah, terutamanya ketika berlaku darah di luar waktu haid.

Kajian ini dilaksanakan bagi menilai sejauh mana pelajar perempuan di Kolej Komuniti memahami konsep haid dan istihadhah menurut perspektif hukum Islam. Di samping itu, ia bertujuan mengenal pasti sejauh mana ilmu tersebut diamalkan dalam kehidupan harian, khususnya dalam aspek pengurusan diri dan pelaksanaan ibadah semasa serta selepas haid. Turut diteliti ialah sumber-sumber utama yang dirujuk oleh para pelajar dalam memahami fiqh haid, sama ada melalui pendidikan formal, bimbingan tidak rasmi atau media. Keseluruhannya, penyelidikan ini berusaha memberikan gambaran menyeluruh terhadap tahap kefahaman, amalan rutin, dan keberkesanan sumber ilmu berkaitan hukum darah wanita dalam kalangan pelajar perempuan Kolej Komuniti. Dapatan kajian ini diharap dapat membantu membina bahan pengajaran atau pendekatan pengajaran dan pembelajaran yang perlu digunakan sesuai dengan latar belakang teknikal pelajar serta membuka ruang kepada penambahbaikan dalam kurikulum pendidikan Islam di institusi TVET.

2. Metodologi

Penyelidik telah membuat persampelan untuk kajian ke atas 100 orang pelajar siswi Kolej Komuniti di Johor. Dalam pengumpulan data penyelidik menggunakan beberapa kaedah pengumpulan data iaitu melalui borang soal selidik dan pengumpulan data

sekunder. Bagi kaedah soal selidik, penyelidik merangka soalan secara sistematik dan diberikan kepada responden. Kajian yang dilakukan ini melibatkan dua jenis sumber data iaitu data primer dan data sekunder. Data primer diperolehi daripada soal selidik yang diedarkan daripada responden, manakala data sekunder diperolehi melalui kajian perpustakaan dan pencarian data melalui internet seperti buku, jurnal dan artikel. Satu set borang soal selidik telah dibentuk berdasarkan sumber rujukan yang telah diperolehi.

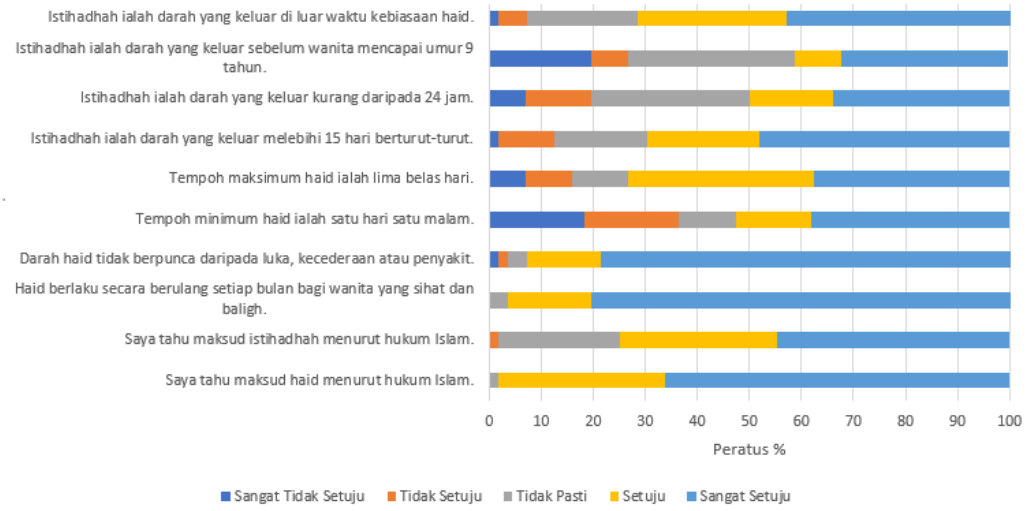
Kajian ini melibatkan seramai 56 orang pelajar perempuan daripada tiga buah Kolej Komuniti di negeri Johor yang dipilih menggunakan kaedah persampelan bertujuan (*purposive sampling*). Pemilihan responden dibuat berdasarkan kriteria pelajar perempuan beragama Islam yang telah mencapai usia baligh, sedang mengikuti pengajian di peringkat sijil, serta mempunyai latar belakang pengajian dalam subjek berkaitan Pendidikan Islam. Pengumpulan data dijalankan melalui dua kaedah utama iaitu soal selidik berstruktur dan data sekunder. Soal selidik telah dibina secara sistematik berdasarkan sorotan kajian terdahulu dan diedarkan kepada semua responden, manakala data sekunder diperoleh melalui rujukan buku, jurnal dan artikel ilmiah secara dalam talian bagi menyokong dan memperkukuh dapatan kajian.

Instrumen kajian terdiri daripada soal selidik berstruktur yang dibangunkan berdasarkan tema utama kajian. Soal selidik ini mengandungi empat bahagian utama, iaitu pengetahuan asas haid dan istihadhah, pengetahuan dan keyakinan terhadap tempoh suci dan tempoh haid, amalan fiqh berkaitan haid dalam ibadah, dan sumber ilmu dan pendidikan fiqh haid. Semua item disusun dalam bentuk skala Likert lima mata. Bagi memastikan kesahan kandungan (*content validity*), soal selidik telah disemak oleh dua orang pensyarah Pendidikan Islam. Ujian kebolehpercayaan (*reliability test*) pula telah dijalankan melalui ujian rintis ke atas pelajar luar sampel utama, dan nilai Cronbach's Alpha sebanyak 0.82 diperoleh, menunjukkan tahap kebolehpercayaan yang tinggi dan konsisten (Fraenkel, Wallen & Hyun, 2012).

3. Dapatan dan Perbincangan

Demografi menunjukkan bahawa seramai 56 orang responden terlibat dalam kajian ini, terdiri daripada pelajar perempuan Kolej Komuniti yang berada di pelbagai semester pengajian. Sebahagian besar responden merupakan pelajar semester 2 (33.9%), diikuti oleh semester 4 iaitu pelajar yang sedang menjalani latihan industri (30.4%), semester 1 (21.4%) dan semester 3 (14.3%). Taburan ini membolehkan dapatan kajian melihat kefahaman fiqh haid dari pelbagai tahap pengajian.

Dari segi pendedahan terhadap ilmu fiqh wanita, majoriti responden iaitu 64.3% menyatakan mereka pernah menghadiri kelas, kuliah atau bengkel berkaitan haid. Walau bagaimanapun, masih terdapat 35.7% yang belum pernah mendapat pendedahan secara formal dalam topik tersebut. Merujuk kepada Ini menunjukkan bahawa meskipun ada usaha untuk memberikan ilmu berkaitan fiqh wanita, pendekatan sedia ada masih belum menyeluruh. Maka, ruang untuk memperluas pendidikan fiqh haid dalam kalangan pelajar Kolej Komuniti masih perlu diberi perhatian.

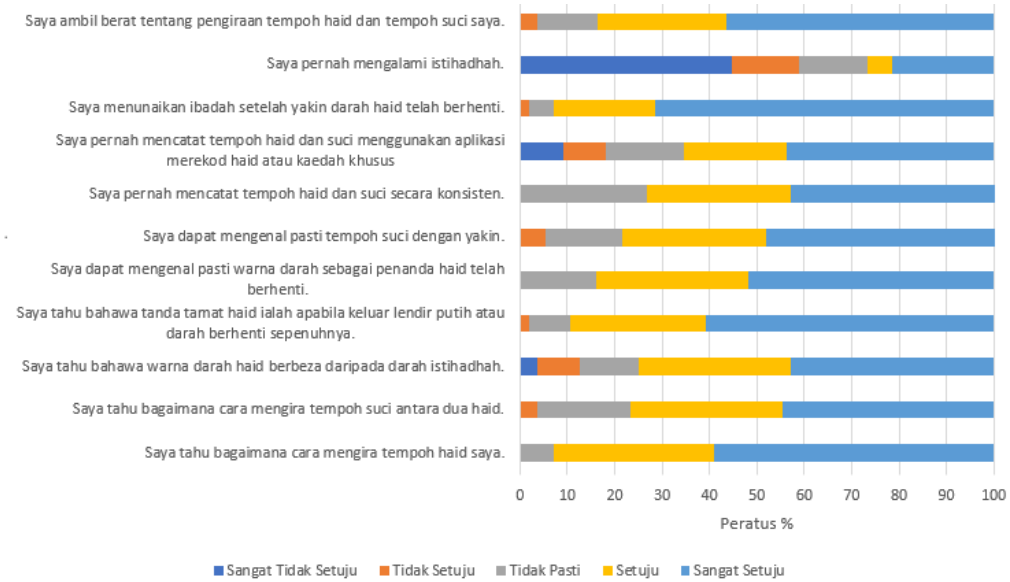


Rajah 2. Pengetahuan Asas Haid dan Istihadhah

Analisis menunjukkan bahawa pelajar mempunyai tahap kefahaman yang baik terhadap konsep asas haid, khususnya dalam aspek definisi dan kitaran. Item *"Saya tahu maksud haid menurut hukum Islam"* mencatat min 4.52, manakala *"Haid berlaku secara bulanan bagi wanita yang sihat"* mencatat min 4.47, dengan lebih 80% pelajar menjawab "Setuju" atau "Sangat Setuju". Ini menggambarkan penguasaan yang kukuh dalam memahami haid sebagai salah satu komponen asas fiqh wanita.

Namun begitu, apabila menyentuh isu berkaitan istihadhah, tahap kefahaman pelajar menurun dengan ketara. Item *"Saya tahu maksud istihadhah menurut hukum Islam"* hanya mencatat min 3.63, dan lebih 36.3% pelajar memberikan respon "Tidak Setuju" atau "Tidak Pasti". Kekeliruan ini lebih jelas dalam item seperti *"Istihadhah ialah darah yang keluar kurang daripada 24 jam"* (gabungan respon negatif 54.5%) dan *"Istihadhah berlaku apabila darah keluar melebihi 15 hari berturut-turut"* (gabungan respon negatif 50%). Statistik ini menunjukkan bahawa meskipun pelajar memahami teori asas haid, mereka masih belum benar-benar menguasai perbezaan antara darah haid dan istihadhah dimana ianya satu perkara yang memberi kesan besar terhadap pelaksanaan ibadah seperti solat dan puasa.

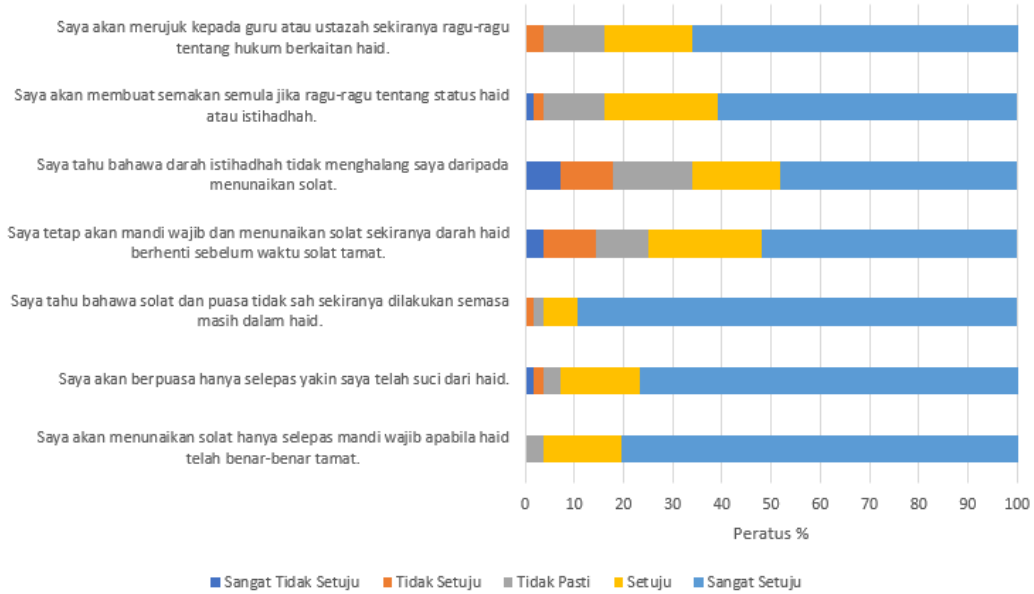
Dalam fiqh, perbezaan antara darah haid dan istihadhah amat penting kerana wanita yang mengalami istihadhah masih diwajibkan menunaikan solat dan puasa seperti biasa, dengan syarat bersuci bagi setiap waktu solat (al-Zuhaili, 1997). Kekeliruan ini turut disokong oleh dapatan kajian Ismail et al. (2016) yang menyatakan bahawa kurangnya penerangan terperinci dan bimbingan praktikal dalam pengajaran menjadi punca utama kelemahan. Maka, pengajaran fiqh wanita wajar ditambah baik melalui pendekatan lebih interaktif agar kefahaman pelajar dapat diperkukuh dengan lebih berkesan.



Rajah 2. Pengetahuan dan Keyakinan Terhadap Tempoh Suci dan Tempoh Haid

Data menunjukkan bahawa pelajar mempunyai pengetahuan yang baik terhadap asas fiqh haid, terutamanya dalam aspek pengiraan tempoh haid (min = 4.36) dan tanda-tanda fizikal tamat haid seperti keluarnya lendir putih atau darah berhenti sepenuhnya (min = 4.38). Peratusan tinggi respon “Setuju” dan “Sangat Setuju” melebihi 75% bagi item-item ini mencerminkan tahap kesedaran yang positif dan penguasaan konsep asas yang memuaskan dalam kalangan pelajar. Ini menunjukkan bahawa maklumat asas fiqh haid telah sampai dan difahami dengan baik secara umum.

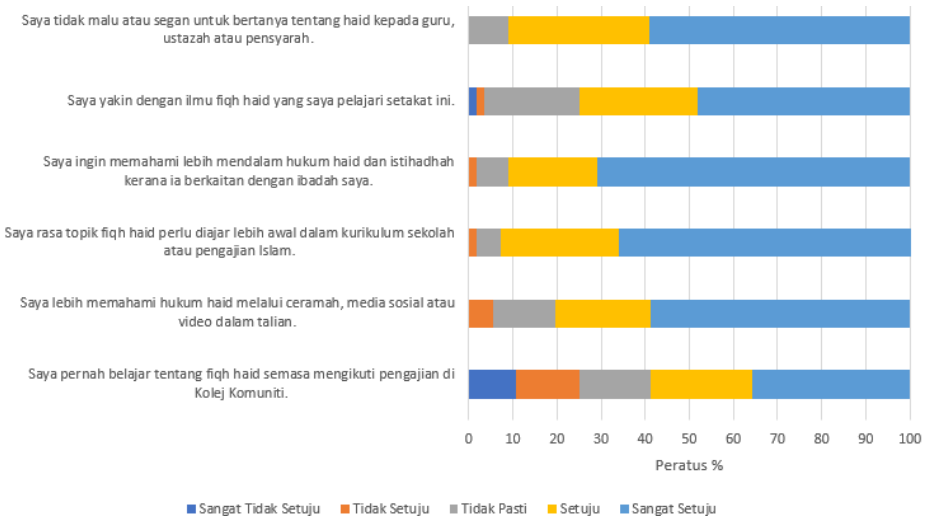
Namun begitu, tahap kepatuhan terhadap pelaksanaan amalan berkaitan seperti pencatatan tempoh haid secara konsisten atau penggunaan aplikasi rekod haid masih sederhana, dengan min sekitar 3.70 hingga 3.82 dan respon “Tidak Pasti” serta “Tidak Setuju” yang masih ketara. Kekeliruan turut dikenal pasti dalam aspek istihadhah, terutamanya dalam memahami perbezaan warna darah atau ciri-ciri darah istihadhah, yang boleh memberi kesan kepada kesahihan ibadah. Maka, pengajaran fiqh wanita disarankan agar diperkukuh dengan latihan pengiraan, panduan visual dan pendekatan interaktif agar pelajar dapat mengurus ibadah mereka dengan lebih yakin dan tepat (Ismail et al., 2016; Salleh et al., 2023).



Rajah 3. Amalan Fiqh Berkaitan Haid Dalam Ibadah

Didapati masih terdapat kekeliruan yang ketara dalam kalangan pelajar terhadap hukum darah istihadhah, khususnya berkaitan pelaksanaan solat. Item “Saya tahu bahawa darah istihadhah tidak menghalang saya daripada menunaikan solat” mencatat nilai min serendah 3.63, manakala hampir 50% responden berada pada kategori “Tidak Pasti” dan “Tidak Setuju”, menunjukkan tahap kefahaman yang lemah dalam kalangan pelajar. Ini menunjukkan bahawa separuh daripada responden masih belum jelas bahawa wanita yang mengalami istihadhah tetap diwajibkan menunaikan solat seperti biasa setelah membersihkan diri dan mengambil wuduk bagi setiap waktu solat (Liyana et al., 2023).

Kekeliruan ini memberi implikasi besar kerana ia boleh menyebabkan pelajar meninggalkan solat secara tidak sengaja akibat salah faham terhadap hukum. Keadaan ini menuntut agar aspek fiqh istihadhah diberikan penekanan lebih besar dalam pengajaran, terutamanya dengan pendekatan seperti latihan kes, panduan visual dan situasi simulasi. Pengukuhan ilmu dalam topik ini amat penting bagi memastikan pelajar dapat menunaikan ibadah dengan yakin, sah, dan tidak terbeban dengan kekeliruan hukum.



Rajah 4. Sumber Ilmu dan Pendidikan Fiqh Haid

Majoriti responden menunjukkan tahap keterbukaan dan keyakinan yang tinggi terhadap ilmu fiqh haid. Mereka tidak malu untuk bertanya kepada guru atau pensyarah, dan menunjukkan keyakinan terhadap ilmu yang telah dipelajari. Selain itu, sebahagian besar responden menyatakan keinginan untuk memahami lebih mendalam berkaitan hukum haid dan istihadhah kerana ia memberi kesan langsung terhadap kesempurnaan ibadah. Keperluan ini selaras dengan dapatan yang mencadangkan agar panduan fiqh wanita disediakan dalam bentuk yang lebih praktikal dan mudah diakses (Salleh et al., 2023).

Responden juga bersetuju bahawa topik fiqh haid wajar diperkenalkan lebih awal dalam sistem pendidikan Islam formal, agar pelajar dapat membina asas kefahaman yang kukuh sejak peringkat awal. Tambahan pula, sumber ilmu seperti ceramah, media sosial, dan video dalam talian didapati memainkan peranan penting dalam membina kefahaman mereka, namun masih terdapat sebahagian pelajar yang tidak pernah menerima pengajaran formal berkaitan topik ini di Kolej Komuniti. Keadaan ini menegaskan keperluan memperkukuh pendekatan pendidikan fiqh haid melalui pelbagai saluran dan peringkat pendidikan (Ismail et al., 2016).

4. Kesimpulan

Kajian ini menunjukkan bahawa tahap kefahaman pelajar perempuan Kolej Komuniti terhadap fiqh haid dan istihadhah masih berada pada tahap sederhana. Kefahaman berkaitan asas haid didapati lebih baik berbanding kefahaman terhadap istihadhah yang masih mengelirukan sebahagian responden. Dari segi amalan, majoriti pelajar menunjukkan pematuhan yang baik dalam ibadah berkaitan haid, namun kekeliruan tetap wujud terutama dalam aspek pengiraan tempoh haid dan suci serta perbezaan antara darah haid dan darah istihadhah, secara langsung ianya boleh menjejaskan pelaksanaan ibadah harian. Sumber rujukan ilmu yang digunakan juga pelbagai, termasuk pendidikan formal, media sosial dan ceramah dalam talian, namun tidak semua pelajar mendapat bimbingan secara sistematik dan menyeluruh.

Dapatan ini memberi implikasi penting terhadap pembangunan kurikulum Pendidikan Islam di Kolej Komuniti, khususnya dalam memastikan topik fiqh wanita disampaikan dengan lebih menyeluruh, interaktif dan bersesuaian dengan keperluan pelajar dari aliran teknikal dan vokasional. Justeru, pendekatan pengajaran perlu diperkukuh dengan elemen latihan praktikal, panduan visual, dan penggunaan teknologi yang mesra pengguna. Bagi mengukuhkan kefahaman dan keyakinan pelajar terhadap fiqh haid dan istihadhah, disarankan agar satu modul pengajaran berasaskan simulasi kehidupan sebenar dibangunkan, merangkumi aktiviti seperti latihan pengiraan tempoh haid dan istihadhah, senario interaktif berkaitan, serta penggunaan aplikasi digital pencatat kitaran haid yang disesuaikan dengan prinsip fiqh.

Sebagai cadangan lanjutan, satu kajian kuasi-eksperimen boleh dilaksanakan bagi menilai keberkesanan modul tersebut dengan membandingkan tahap kefahaman pelajar sebelum dan selepas intervensi. Selain itu, skop kajian boleh diperluaskan ke institusi TVET lain seperti politeknik dan kolej vokasional di seluruh negara bagi mendapatkan gambaran yang lebih menyeluruh. Dapatan ini berpotensi menyumbang kepada pembangunan kurikulum Pendidikan Islam yang lebih kontekstual, praktikal, dan sejajar dengan realiti serta keperluan pelajar masa kini.

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PANDANGAN PELAJAR TERHADAP KEBOLEHLAKSANAAN DAN KEPERLUAN PROGRAM TAHFIZ AL-QURAN DI POLITEKNIK PORT DICKSON: SATU KAJIAN RINTIS

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Abstrak

Kajian ini dijalankan bagi menilai pandangan pelajar terhadap kebolehlaksanaan dan keperluan pelaksanaan program Tahfiz al-Quran di Politeknik Port Dickson. Penelitian ini memberi tumpuan kepada potensi pelaksanaan program dari aspek penerimaan pelajar, kesesuaian persekitaran pembelajaran serta manfaat yang dijangka memberi impak kepada pembangunan sahsiah, pencapaian akademik dan kesejahteraan mental pelajar. Kajian ini menggunakan reka bentuk tinjauan dengan kaedah pengumpulan data melalui edaran borang soal selidik kepada pelajar sebagai responden utama. Dapatan menunjukkan majoriti pelajar menyambut baik cadangan pelaksanaan program ini kerana diyakini mampu memperkukuh jati diri dan kerohanian, membentuk disiplin diri yang tinggi serta menyumbang kepada peningkatan prestasi akademik. Walau bagaimanapun, beberapa cabaran turut dikenalpasti seperti kekangan masa, jadual akademik yang padat serta kekurangan tenaga pengajar yang berkemahiran dalam bidang hafazan. Oleh itu, kajian mencadangkan agar pendekatan strategik seperti penyesuaian jadual, penggunaan modul fleksibel, serta sokongan padu daripada pihak pengurusan institusi diterapkan bagi memastikan pelaksanaan yang berkesan. Secara keseluruhannya, kajian ini memberikan gambaran awal tentang kesediaan pelajar terhadap pelaksanaan program dan boleh dijadikan rujukan dalam perancangan serta pembangunan program tahfiz yang bersesuaian di institusi pendidikan teknikal dan vokasional. Implikasinya juga melibatkan usaha melahirkan modal insan yang seimbang dari segi ilmu pengetahuan, kemahiran dan nilai akhlak yang tinggi.
Kata kunci: Program Tahfiz; Kebolehlaksanaan; Keperluan.

1. Pengenalan

Pendidikan teknikal dan vokasional (TVET) di Malaysia telah mengalami perkembangan pesat bagi memenuhi keperluan tenaga kerja yang kompeten dalam pelbagai industri (Mustapha & Abdullah, 2020). Perubahan landskap ekonomi dan teknologi menuntut institusi TVET untuk menyediakan graduan yang bukan sahaja mahir dalam aspek teknikal tetapi juga memiliki nilai sahsiah yang tinggi (Mohamad et al., 2018). Politeknik, sebagai salah satu institusi pendidikan tinggi yang menawarkan program TVET, memainkan peranan penting dalam membangunkan modal insan yang bukan sahaja kompeten dalam kemahiran teknikal tetapi juga mempunyai keperibadian unggul serta jati diri yang kukuh (Zainal & Ismail, 2021).

Dalam era globalisasi dan cabaran semasa, pembangunan pelajar tidak boleh hanya berfokus kepada kemahiran teknikal dan akademik semata-mata. Unsur pendidikan holistik yang merangkumi aspek kerohanian dan pembentukan akhlak perlu diberi perhatian dalam sistem pendidikan (Rahman et al., 2019). Salah satu pendekatan yang boleh diterapkan dalam sistem TVET adalah dengan mengintegrasikan program tahfiz al-Quran sebagai sebahagian daripada kurikulum atau aktiviti tambahan. Pendidikan berasaskan al-Quran bukan sahaja memberi manfaat dalam aspek keagamaan tetapi juga berperanan membentuk individu yang berdisiplin, beretika, dan mempunyai daya tahan tinggi dalam menghadapi cabaran kehidupan serta kerjaya (Hamzah et al., 2022).

Pelaksanaan program tahfiz di sekolah-sekolah agama dan institusi pengajian tinggi Islam telah terbukti mampu melahirkan individu yang bukan sahaja mahir dalam penghafalan al-Quran tetapi juga cemerlang dalam bidang akademik dan profesional (Ismail & Hassan, 2020). Walau bagaimanapun, di peringkat politeknik, pelaksanaan program tahfiz masih merupakan pendekatan yang baharu dan belum diterokai secara meluas. Kesenjangan ini penting untuk dikaji kerana politeknik menekankan pendidikan teknikal, manakala integrasi program tahfiz berpotensi memperkukuh pembangunan sahsiah pelajar. Justeru, kajian ini perlu dijalankan bagi menilai tahap kesediaan, penerimaan, dan persepsi pelajar terhadap pendekatan baharu ini (Roslan et al., 2021).

Integrasi program tahfiz di politeknik berpotensi menyumbang kepada pembentukan sahsiah pelajar yang lebih holistik. Menurut Alwi dan Sulaiman (2019), amalan menghafal al-Quran dapat meningkatkan daya ingatan, ketekunan, serta memberi ketenangan jiwa kepada individu, sekali gus membantu pelajar mengurus tekanan akademik dengan lebih baik. Sementara itu, kajian oleh Zakaria dan Yusof (2023) membuktikan bahawa hafazan melatih kemahiran fokus, disiplin, dan daya tahan mental, yang boleh diaplikasikan secara langsung dalam pembelajaran teknikal dan vokasional. Manakala Ariffin et al. (2020) pula menekankan bahawa program tahfiz memberikan peluang kepada pelajar untuk mengukuhkan kefahaman agama sambil mempersiapkan diri menghadapi cabaran dunia pekerjaan.

Selain itu, nilai-nilai Islam yang diterapkan melalui program tahfiz dapat menjadi panduan pelajar dalam membuat keputusan yang beretika dan bertanggungjawab (Rahman & Aziz, 2019), serta membantu membentuk budaya kerja positif dan harmoni (Yahya et al., 2022). Walaupun pelaksanaan program tahfiz al-Quran telah terbukti memberi impak positif terhadap pembentukan sahsiah, prestasi akademik, dan kesejahteraan mental pelajar (Ismail & Hassan, 2020; Alwi & Sulaiman, 2019), pelaksanaannya di politeknik masih baharu. Kajian oleh Ariffin dan Sulaiman (2022) menunjukkan bahawa integrasi tahfiz dalam pendidikan vokasional dapat mengukuhkan disiplin diri, fokus pembelajaran, dan motivasi pelajar. Namun, sebelum dapat dilaksanakan secara menyeluruh, beberapa cabaran perlu ditangani, termasuk kesesuaian jadual akademik dan latihan industri dengan waktu hafazan (Salleh & Omar, 2021), kekurangan tenaga pengajar berkelayakan (Zakaria, 2021), serta perbezaan tahap penerimaan pelajar mengikut latar belakang akademik (Mahmud & Zulkifli, 2021). Tambahan pula, Iskandar et al. (2020) mendapati bahawa kekangan masa dan beban akademik tinggi sering menjadi penghalang penglibatan pelajar dalam aktiviti kerohanian.

Oleh itu, kajian ini dijalankan untuk menilai kebolehlaksanaan dan keperluan program tahfiz di Politeknik Port Dickson dengan meneliti pandangan pelajar terhadap manfaat serta cabaran pelaksanaannya. Penelitian ini diharapkan dapat memberikan gambaran terperinci tentang kesesuaian program tahfiz dalam sistem pendidikan politeknik, strategi pelaksanaan terbaik, dan peranannya dalam melahirkan graduan TVET yang seimbang dari segi kemahiran teknikal, kekuatan spiritual, sahsiah yang tinggi, nilai keagamaan kukuh, serta keupayaan menjadi tenaga kerja berkualiti dalam industri dan masyarakat (Ibrahim et al., 2023; Kamaruddin & Hashim, 2020).

2. Metodologi

Kajian ini menggunakan pendekatan kuantitatif dengan kaedah tinjauan bagi mendapatkan maklumat mengenai tahap penerimaan pelajar terhadap kebolehlaksanaan dan keperluan program tahfiz al-Quran di Politeknik Port Dickson. Pendekatan ini dipilih kerana ia membolehkan pengumpulan data secara sistematik dan objektif, sekali gus menghasilkan dapatan yang boleh digeneralisasikan kepada populasi sasaran (Creswell, 2014).

Data dikumpulkan menggunakan borang soal selidik yang dibangunkan khas bagi memenuhi objektif kajian, merangkumi bahagian demografi, kebolehlaksanaan program, keperluan dan

manfaat, serta cabaran pelaksanaan. Data yang diperoleh dianalisis menggunakan perisian *Statistical Package for the Social Sciences* (SPSS) melalui analisis deskriptif seperti kekerapan, peratusan, dan skor min bagi mengenal pasti tahap penerimaan dan persepsi pelajar terhadap program tahfiz.

Populasi kajian terdiri daripada pelajar aktif di Politeknik Port Dickson yang mempunyai latar belakang dan pengalaman mengikuti pendidikan tahfiz. Kriteria ini dipilih bagi memastikan responden mempunyai pengetahuan asas hafazan dan kefahaman berkaitan al-Quran.

Sampel kajian dipilih menggunakan teknik persampelan bertujuan (*purposive sampling*), iaitu hanya melibatkan pelajar yang memenuhi kriteria latar belakang tersebut. Seramai 11 orang pelajar telah dikenal pasti dan dipilih sebagai responden kajian ini, mewakili pelbagai program pengajian di politeknik.

3. Dapatan dan Perbincangan

Bahagian A: Demografi responden
Kajian rintis ini dijalankan bagi meninjau pandangan pelajar terhadap kebolehlaksanaan dan keperluan pelaksanaan program Tahfiz al-Quran di Politeknik Port Dickson. Analisis berdasarkan data demografi dan latar belakang akademik responden dalam Jadual 1 memberikan gambaran awal yang signifikan terhadap potensi pelaksanaan program ini dalam institusi berasaskan pendidikan teknikal dan vokasional (TVET).

Daripada keseluruhan 11 responden, majoriti ialah pelajar lelaki, seramai 8 orang (72.7%), manakala pelajar perempuan seramai 3 orang (27.3%). Komposisi ini sejajar dengan trend penglibatan pelajar lelaki yang lebih tinggi dalam program kejuruteraan di politeknik. Justeru, pelaksanaan awal program tahfiz boleh memberi tumpuan kepada kumpulan pelajar lelaki tanpa mengabaikan penyertaan pelajar perempuan pada fasa seterusnya.

Kajian mendapati sebahagian besar responden (81.8%) berada dalam lingkungan umur 18 hingga 20 tahun, manakala selebihnya (18.2%) berumur antara 21 hingga 23 tahun. Tiada responden melebihi umur 23 tahun. Dapatan ini menunjukkan bahawa majoriti peserta merupakan pelajar semester awal yang masih berada dalam fasa penyesuaian diri dengan suasana pengajian tinggi. Oleh itu, memperkenalkan program pembinaan sahsiah dan spiritual seperti tahfiz al-Quran pada peringkat ini dianggap sesuai.

Responden terdiri daripada pelbagai program pengajian, terutamanya dalam bidang kejuruteraan seperti Diploma Kejuruteraan Awam (18.2%), Diploma Kejuruteraan Elektrik (18.2%) dan Diploma Kejuruteraan Elektrik (Tenaga Hijau & Kecekapan Tenaga) (27.3%). Selain itu, terdapat penyertaan daripada pelajar dalam bidang bukan teknikal seperti Diploma Sains Kesetiausahaan (27.3%). Hal ini menunjukkan bahawa minat terhadap penghafalan al-Quran merentasi bidang pengajian, sekali gus memperlihatkan potensi pelaksanaan program ini secara merentas jabatan.

Selain itu, majoriti responden (90.9%) berada di Semester 2, manakala hanya seorang responden (9.1%) berada di Semester 4. Tiada responden dari semester akhir atau latihan industri. Keadaan ini memperlihatkan bahawa pelajar semester awal lebih terbuka kepada penglibatan dalam aktiviti kokurikulum dan program pembentukan sahsiah. Maka, pelaksanaan program tahfiz di peringkat awal pengajian dianggap strategik dari segi masa dan kesediaan mental pelajar.

Kesemua responden (100%) mempunyai pengalaman menghafal al-Quran sebelum ini. Dapatan ini signifikan kerana ia membuktikan kewujudan kumpulan pelajar yang mempunyai asas kukuh dalam penghafalan al-Quran, dan mereka berpotensi untuk meneruskan atau menyempurnakan hafalan sedia ada. Keadaan ini menyokong keperluan institusi

menyediakan program khusus bagi menyambung kesinambungan minat dan amalan spiritual tersebut. Secara keseluruhannya, dapatan kajian rintis ini menunjukkan bahawa program tahfiz al-Quran mempunyai asas kukuh untuk dilaksanakan di Politeknik Port Dickson. Walaupun bilangan responden masih terhad, kesemua mereka menunjukkan minat, pengalaman, dan kesediaan untuk terlibat. Pelaksanaan program ini berpotensi memupuk kecemerlangan spiritual dalam kalangan pelajar TVET serta menyumbang kepada pembangunan sahsiah holistik selaras dengan aspirasi Falsafah Pendidikan Kebangsaan.

Bahagian B: Analisis Kebolehlaksanaan Program Tahfiz

Bahagian ini menilai persepsi pelajar terhadap kebolehlaksanaan pelaksanaan program Tahfiz al-Quran di Politeknik Port Dickson berdasarkan lima pernyataan utama di Jadual 2. Analisis dibuat menggunakan min, sisihan piawai (SP) dan tahap persepsi pelajar terhadap setiap pernyataan.

Bagi pernyataan “Program tahfiz boleh dilaksanakan di politeknik” memperoleh skor min 4.36 dan sisihan piawai (SP) 0.67, tahap tinggi. Sebanyak 45.5% responden bersetuju dan sangat bersetuju dengan kenyataan ini, menunjukkan keyakinan pelajar bahawa persekitaran politeknik sesuai untuk pelaksanaan program tahfiz. Ini juga mencerminkan kesediaan institusi dari segi budaya kampus serta keupayaan menyediakan sokongan logistik asas seperti ruang, peralatan, dan kemudahan pembelajaran yang sesuai.

Item “Program tahfiz tidak mengganggu jadual akademik saya” menerima skor min 3.73 dengan sisihan piawai (SP) 0.65 dan berada pada tahap sederhana. Walaupun majoriti responden (63.6%) bersetuju atau sangat bersetuju, terdapat 36.4% yang hanya kurang bersetuju. Kebimbangan ini mencerminkan keperluan kepada sesi dialog bersama pelajar untuk menjelaskan struktur program, penyesuaian jadual aktiviti, serta strategi pengurusan masa yang sesuai agar tidak menjejaskan prestasi akademik. Oleh itu, perancangan program perlulah mempertimbangkan jadual fleksibel atau pelaksanaan luar waktu kuliah.

Item “Program tahfiz perlu dijalankan secara fleksibel” mencatatkan min tertinggi iaitu 4.45 dengan sisihan piawai (SP) 0.52 dan berada pada tahap tinggi. Semua responden bersetuju atau sangat bersetuju bahawa fleksibiliti adalah aspek penting dalam pelaksanaan program tahfiz. Ini memberi isyarat jelas bahawa pendekatan program mesti adaptif, contohnya dengan menggunakan pendekatan modular, sesi dalam talian, atau waktu selepas kuliah.

Seterusnya, politeknik dilihat mempunyai tenaga pengajar yang mencukupi. Item ini memperoleh min 3.91 dan sisihan piawai (SP) 0.83, berada pada tahap sederhana. Walaupun majoriti (72.8%) memberikan maklum balas positif, kewujudan peratusan sederhana yang tidak begitu yakin (27.3%) menunjukkan bahawa masih ada keraguan tentang keupayaan institusi menyediakan tenaga pengajar mahir dalam bidang tahfiz. Justeru, kerjasama dengan institusi luar seperti pusat tahfiz atau Jabatan Agama Islam Negeri mungkin diperlukan.

Bagi pernyataan “Saya berminat untuk menyertai program tahfiz ini” menerima min 4.00 dan sisihan piawai (SP) 0.77, juga berada pada tahap tinggi. Dapatan ini menunjukkan minat yang kukuh dalam kalangan pelajar untuk menyertai program tahfiz sekiranya ia diperkenalkan. Minat ini merupakan petunjuk awal yang penting dalam memastikan penglibatan dan kelestarian program.

Jadual 1. Demografi Responden

		Kategori	Jumlah	Peratusan
1	Jantina	Lelaki	8	72.7%
		Perempuan	3	27.3%
2	Umur	18 Hingga 20 Tahun	9	81.8%
		21 Hingga 23 Tahun	2	18.2%
		24 Hingga 26 Tahun	0	0%
		27 Tahun Ke Atas	0	0%
3	Program Pengajian	Diploma Kejuruteraan Awam	2	18.2%
		Diploma Kejuruteraan Elektrik (Kecekapan Tenaga)	2	18.2%
		Diploma Kejuruteraan Elektrik (Tenaga Hijau)	1	9.1%
		Diploma Kejuruteraan Elektronik (Komputer)	2	18.2%
		Diploma Kejuruteraan Elektronik (Komunikasi)	0	0%
		Diploma Kejuruteraan Mekanikal	1	9.1%
		Diploma Kejuruteraan Mekanikal (Automotif)	0	0%
		Diploma Kejuruteraan Mekanikal (Pembuatan)	0	0%
		Diploma Kejuruteraan Mekatronik	0	0%
		Diploma Pemasaran	0	0%
		Diploma Perakaunan	0	0%
		Diploma Sains Kesetiausahaan	3	27.3%
		Diploma Seni Bina	0	0%
4	Semester Pengajian	Semester 1	0	0%
		Semester 2	10	90.9%
		Semester 3	0	0%
		Semester 4	1	9.1%
		Semester 5	0	0%
		Semester 6 (Latihan Industri)	0	0%
5	Adakah Anda Pernah Menghafal al-Quran Sebelum Ini?	Ya	11	100%
		Tidak	0	0%

Min keseluruhan bagi bahagian ini ialah 4.09 dengan sisihan piawai (SP) 0.69, menunjukkan tahap tinggi dari segi kebolehlaksanaan program tahfiz menurut perspektif pelajar. Pelaksanaan secara berskala kecil juga memberi ruang kepada pentadbiran institusi menilai impak awal terhadap pelajar, mengenal pasti cabaran pelaksanaan, serta membuat penambahbaikan sebelum program diperluaskan. Hasil ini menyokong cadangan bahawa program tahfiz boleh dimulakan secara berskala kecil dengan pendekatan yang fleksibel dan adaptif terhadap keperluan pelajar TVET. Pelaksanaan program tahfiz yang tidak rigid, menggunakan masa lapang, dan melibatkan fasilitator berpengalaman akan meningkatkan kadar keberhasilan serta penerimaan pelajar.

Jadual 2. Analisis Kebolehlaksanaan Program Tahfiz

BIL	PERNYATAAN	SKALA					MIN	SD	TAHAP
		1 STS	2 TS	3 KS	4 S	5 SS			
1	Program tahfiz boleh dilaksanakan di politeknik.	0% (0)	0% (0)	9.1% (1)	45.5% (5)	45.5% (5)	4.36	0.67	Tinggi
2	Program tahfiz tidak mengganggu jadual akademik saya.	0% (0)	0% (0)	36.4% (4)	54.5% (6)	9.1% (1)	3.73	0.65	Sederhana
3	Program tahfiz perlu dijalankan secara fleksibel	0% (0)	0% (0)	0% (0)	54.5% (6)	45.5% (5)	4.45	0.52	Tinggi
4	Politeknik mempunyai tenaga pengajar yang mencukupi.	0% (0)	9.1% (1)	18.2% (2)	45.5% (5)	27.3% (3)	3.91	0.83	Sederhana
5	Saya berminat untuk menyertai program tahfiz ini.	0% (0)	0% (0)	36.4% (4)	27.3% (3)	36.4% (4)	4.00	0.77	Tinggi
						Min Keseluruhan	4.09	0.69	Tinggi

Sts: Sangat Tidak Setuju, Ts : Tidak Setuju, Ks : Kurang Setuju, S : Setuju, Ss : Sangat Setuju

Bahagian C: Keperluan Dan Manfaat Program Tahfiz

Dapatan kajian kuantitatif bagi Bahagian C memperlihatkan gambaran yang jelas tentang penerimaan dan keyakinan pelajar terhadap keperluan serta manfaat pelaksanaan program tahfiz di Politeknik Port Dickson. Secara keseluruhan, skor min bagi lima item utama dalam bahagian ini ialah 4.46 dengan sisihan piawai (SP) 0.64, yang menunjukkan tahap persepsi yang tinggi dalam kalangan pelajar. Data ini membuktikan bahawa majoriti pelajar bukan sahaja menyokong pelaksanaan program tahfiz, malah menganggapnya sebagai satu keperluan yang wajar diberi perhatian oleh pihak institusi.

Bagi item pertama, “Program tahfiz boleh membantu meningkatkan disiplin pelajar”, kesemua responden memberikan maklum balas positif dengan skor min 4.55 (SP = 0.52) dan tahap tinggi. Dapatan ini menunjukkan bahawa pelajar yakin penglibatan dalam program tahfiz dapat memupuk disiplin diri, selari dengan matlamat pembentukan sahsiah pelajar.

Item kedua, “Hafazan al-Quran membantu meningkatkan daya ingatan”, memperoleh skor min tertinggi iaitu 4.73 (SP = 0.47) pada tahap tinggi. Hal ini membuktikan bahawa pelajar mengiktiraf manfaat kognitif hafazan al-Quran, khususnya dalam meningkatkan fokus dan keupayaan mengingat.

Bagi item ketiga, “Program ini dapat membantu mengurangkan tekanan akademik”, skor min dicatatkan pada 3.82 (SP = 1.17) dengan tahap tinggi tetapi sisihan piawai yang besar. Ini menunjukkan wujudnya variasi pandangan dalam kalangan pelajar, di mana sebahagian

besar percaya program ini mampu memberikan ketenangan dan keseimbangan emosi, namun terdapat juga pelajar yang kurang pasti akan keberkesanannya dalam aspek ini.

Item keempat, “Program ini membantu saya membentuk sahsiah dan nilai moral yang lebih baik”, memperoleh skor min 4.64 (SP = 0.50) dan berada pada tahap tinggi. Dapatan ini menegaskan keyakinan pelajar bahawa program tahfiz mampu menyumbang kepada pembangunan akhlak dan nilai moral yang positif.

Akhir sekali, item kelima, “Program tahfiz boleh memberi nilai tambah dalam kerjaya saya”, mencatatkan skor min 4.55 (SP = 0.52) pada tahap tinggi. Ini menggambarkan bahawa pelajar melihat program tahfiz bukan sahaja bermanfaat dari sudut kerohanian dan akademik, tetapi juga berpotensi meningkatkan imej profesional dan peluang kerjaya mereka.

Secara keseluruhannya, dapatan ini memperlihatkan corak yang konsisten dalam menyatakan keperluan terhadap program tahfiz serta keyakinan pelajar terhadap keberkesanannya. Keupayaan institusi untuk menyediakan persekitaran yang menyokong, tenaga pengajar yang kompeten, dan pendekatan pelaksanaan yang fleksibel adalah faktor utama yang akan menentukan kejayaan program ini. Implikasinya, pihak pengurusan institusi wajar meneliti dapatan ini sebagai asas merangka pelan tindakan yang komprehensif, merangkumi perancangan kurikulum, struktur penyampaian, latihan tenaga pengajar, dan penyesuaian masa pelaksanaan agar manfaat program ini dapat dimaksimumkan.

Jadual 3. Keperluan Dan Manfaat Program Tahfiz

BIL	PERNYATAAN	SKALA					MIN	SD	TAHAP
		1 STS	2 TS	3 KS	4 S	5 SS			
1	Program tahfiz boleh membantu meningkatkan disiplin pelajar.	0% (0)	0% (0)	0% (0)	45.5% (5)	54.5% (6)	4.55	0.52	Tinggi
2	Hafazan al-Quran membantu meningkatkan daya ingatan.	0% (0)	0% (0)	0% (0)	27.3% (3)	72.7% (8)	4.73	0.47	Tinggi
3	Program ini dapat membantu mengurangkan tekanan akademik.	0% (0)	9.1% (1)	36.4% (4)	18.2% (2)	36.4% (4)	3.82	1.17	Tinggi
4	Program ini membantu saya membentuk sahsiah dan nilai moral yang lebih baik.	0% (0)	0% (0)	0% (0)	36.4% (4)	63.6% (7)	4.64	0.50	Tinggi
5	Program tahfiz boleh memberi nilai tambah dalam kerjaya saya.	0% (0)	0% (0)	0% (0)	45.5% (5)	54.5% (6)	4.55	0.52	Tinggi
					Min Keseluruhan		4.46	0.64	Tinggi

Sts: Sangat Tidak Setuju, Ts: Tidak Setuju, Ks: Kurang Setuju, S: Setuju, Ss: Sangat Setuju

Bahagian D: Cabaran Dan Penambahbaikkan

Bahagian D kajian ini meneliti persepsi pelajar terhadap cabaran dan cadangan penambahbaikan bagi pelaksanaan program tahfiz di Politeknik Port Dickson. Secara keseluruhan, min bagi bahagian ini adalah 4.03 dengan sisihan piawai (SP) 0.90, menunjukkan tahap persepsi yang tinggi. Walaupun skor keseluruhan ini mencerminkan penerimaan positif, beberapa cabaran utama tetap dikenal pasti berdasarkan analisis item individu.

Bagi item pertama, “Kekangan masa adalah cabaran utama untuk mengikuti program ini”, skor min adalah 4.45 (SP = 0.69) pada tahap tinggi. Dapatan ini menunjukkan bahawa

sebahagian besar pelajar merasakan kekangan masa merupakan isu paling ketara yang boleh menjejaskan penglibatan dalam program tahfiz.

Item kedua, “Jadual akademik yang padat menyukarkan penyertaan dalam program tahfiz”, turut mencatatkan skor min 4.45 (SP = 0.69) pada tahap tinggi. Ini membuktikan bahawa selain kekangan masa, jadual pembelajaran yang padat turut menjadi faktor yang menghalang penyertaan pelajar.

Bagi item ketiga, “Kemudahan untuk program tahfiz di politeknik masih kurang mencukupi”, skor min yang direkodkan ialah 3.82 (SP = 1.17) pada tahap tinggi. Walaupun majoriti pelajar bersetuju, nilai sisihan piawai yang besar menunjukkan terdapat perbezaan pandangan dalam kalangan responden, menandakan sebahagian pelajar mungkin berpuas hati dengan kemudahan sedia ada, manakala sebahagian lain merasakan ia masih belum memadai.

Item keempat, “Program tahfiz perlu dijalankan secara dalam talian untuk lebih fleksibiliti”, memperoleh skor min 3.09 (SP = 1.29) pada tahap sederhana. Dapatan ini menunjukkan pandangan bercampur-campur, dengan sebahagian pelajar bersetuju bahawa pendekatan dalam talian boleh memberikan fleksibiliti, namun sebahagian lain mungkin lebih mengutamakan sesi fizikal.

Akhir sekali, item kelima, “Saya memerlukan sokongan pihak ibu bapa, guru dan rakan politeknik untuk menyertai program ini”, mencatatkan skor min 4.36 (SP = 0.67) pada tahap tinggi. Hal ini menggambarkan bahawa sokongan moral dan galakan daripada pihak terdekat adalah faktor penting yang mempengaruhi komitmen pelajar dalam menyertai program tahfiz.

Secara keseluruhannya, walaupun pelajar menunjukkan sokongan terhadap pelaksanaan program tahfiz, cabaran utama yang dikenal pasti merangkumi kekangan masa, jadual akademik yang padat, serta kekurangan kemudahan khusus. Di samping itu, pelaksanaan dalam talian dilihat sebagai satu alternatif yang mendapat sokongan sederhana. Oleh itu, pihak institusi perlu mempertimbangkan strategi penambahbaikan seperti penyusunan jadual yang lebih fleksibel, peningkatan kemudahan pembelajaran, serta penyediaan sokongan berterusan daripada komuniti kampus dan ibu bapa. Pendekatan strategik ini diharap dapat memastikan kelestarian dan keberkesanan program tahfiz di politeknik.

Jadual 4. Cabaran Dan Penambahbaikkan

BIL	PERNYATAAN	SKALA					MIN	SD	TAHAP
		1 STS	2 TS	3 KS	4 S	5 SS			
1	Kekangan masa adalah cabaran utama untuk mengikuti program ini.	0% (0)	0% (0)	9.1% (1)	36.4% (4)	54.5% (6)	4.45	0.69	Tinggi
2	Jadual akademik yang padat menyukarkan penyertaan dalam program tahfiz.	0% (0)	0% (0)	9.1% (1)	36.4% (4)	54.5% (6)	4.45	0.69	Tinggi
3	Kemudahan untuk program tahfiz di politeknik masih kurang mencukupi	9.1% (1)	9.1% (1)	0% (0)	54.5% (6)	27.3% (3)	3.82	1.17	Tinggi
4	Program tahfiz perlu dijalankan secara dalam talian untuk lebih fleksibiliti.	18.2% (2)	9.1% (1)	36.4% (4)	18.2% (2)	18.2% (2)	3.09	1.29	Sederhana
5	Saya memerlukan sokongan pihak	0% (0)	0% (0)	9.1% (1)	45.5% (5)	45.5% (5)	4.36	0.67	Tinggi

	ibubapa, guru dan rakan politeknik untuk menyertai program ini.			
		Min Keseluruhan	4.03	0.90	Tinggi

Sts: Sangat Tidak Setuju, Ts: Tidak Setuju, Ks: Kurang Setuju, S: Setuju, Ss: Sangat Setuju

Bagi mendapatkan gambaran yang lebih menyeluruh terhadap keberkesanan dan kebolehlaksanaan program tahfiz sebagai aktiviti kokurikulum di Politeknik, kajian ini turut merangkumkan maklum balas pelajar melalui soalan terbuka. Analisis terhadap respons tersebut telah menghasilkan dua tema utama yang mencerminkan aspirasi serta cadangan konstruktif daripada para responden. Cadangan Penambahbaikan bagi Menjamin Kejayaan Program Tahfiz:

a. Pelaksanaan secara percubaan (pilot)

Sebilangan besar responden mencadangkan agar program tahfiz dimulakan secara rintis sebagai ujian lapangan. Pendekatan ini dilihat strategik untuk menilai tahap penerimaan pelajar serta menyesuaikan mekanisme pelaksanaan sebelum program diperluaskan secara menyeluruh.

b. Penjadualan yang sesuai dan fleksibel

Isu penjadualan menjadi antara kebimbangan utama pelajar. Cadangan penjadualan secara fleksibel seperti pelaksanaan pada waktu pagi, malam, atau hujung minggu dikemukakan agar pelajar tidak tertekan atau berkompromi dengan prestasi akademik. Penyesuaian masa ini dilihat sebagai faktor penentu kejayaan jangka panjang program.

c. Penyediaan tenaga pengajar dan bimbingan menyeluruh

Responden menekankan keperluan kepada tenaga pengajar berkelayakan daripada kedua-dua jantina, serta bimbingan khusus kepada pelajar yang tiada asas hafazan. Pendekatan ini bukan sahaja bersifat inklusif, malah mampu menyokong pelajar baharu untuk menyesuaikan diri dengan keperluan program.

d. Pengurusan masa pelajar

Kemahiran pengurusan masa dalam kalangan pelajar turut dikenalpasti sebagai elemen kritikal. Program tahfiz hanya dapat dihayati sepenuhnya jika pelajar mampu mengimbangi komitmen akademik dan aktiviti kokurikulum secara berkesan.

e. Nilai tambah dan pengiktirafan sahsiah

Program ini dilihat sebagai wadah untuk meningkatkan jati diri pelajar, memperkukuh nilai-nilai Islamik, dan memupuk identiti sebagai hafiz/hafizah dalam kalangan pelajar institusi teknikal. Justeru, pengiktirafan terhadap penyertaan dan pencapaian dalam program ini dianggap penting sebagai insentif moral dan motivasi pelajar.

Apabila diajukan persoalan mengenai kesesuaian program tahfiz dijadikan aktiviti kokurikulum bermula dari semester dua dan ke atas, majoriti responden menunjukkan sokongan yang sangat positif.

a. Peluang mengulang dan memulakan semula hafazan

Program ini dilihat sebagai peluang berharga untuk pelajar menyambung kembali hafazan yang pernah dimulakan atau mengulang semula hafazan yang telah dipelajari sebelum ini.

b. Integrasi pelajar aliran TVET dan latar belakang tahfiz

Cadangan ini disambut baik oleh pelajar yang mempunyai latar belakang tahfiz dan pada masa sama mengikuti bidang teknikal. Inisiatif ini dilihat sebagai bentuk integrasi holistik yang menggabungkan kompetensi duniawi dan ukhrawi.

c. Manfaat kerohanian dan disiplin diri

Program tahfiz juga diyakini mampu memberi impak positif terhadap pembentukan sahsiah pelajar. Antara manfaat yang dinyatakan termasuk pengisian masa lapang dengan aktiviti berfaedah, pengurangan tekanan akademik, peningkatan disiplin serta pembinaan peribadi seimbang dari segi intelek dan spiritual.

d. Tanggungjawab menjaga hafazan al-Quran

Responden menzahirkan rasa tanggungjawab untuk terus menjaga dan memelihara hafazan mereka sebagai satu amanah ilahi. Program tahfiz di politeknik dianggap sebagai platform signifikan untuk memenuhi tuntutan ini.

e. Cabaran: kekangan masa akademik

Walaupun sokongan adalah tinggi, terdapat segelintir responden yang menyuarakan kebimbangan berkenaan kesesuaian masa pelaksanaan, terutamanya bagi pelajar semester dua dan ke atas yang terikat dengan beban akademik yang semakin bertambah.

4. Kesimpulan

Kajian rintis ini memberikan gambaran awal yang jelas tentang potensi pelaksanaan program Tahfiz al-Quran di Politeknik Port Dickson. Dapatan menunjukkan bahawa wujudnya kumpulan pelajar yang mempunyai latar belakang, pengalaman, dan minat terhadap hafazan al-Quran, walaupun mereka sedang mengikuti pengajian dalam bidang TVET. Secara umum, kesemua responden menyatakan program ini boleh dilaksanakan di politeknik berdasarkan beberapa faktor, antaranya kesediaan pihak pengurusan, kemampuan pensyarah membimbing, kesesuaian jadual, dan keupayaan pelajar mengurus masa. Selain itu, majoriti responden berpandangan bahawa program ini perlu dilaksanakan kerana ia berpotensi membentuk sahsiah pelajar, menghidupkan budaya ilmu al-Quran, serta menyokong agenda pembangunan pelajar seimbang dari sudut intelek dan spiritual. Responden juga menyedari manfaat program ini termasuk membantu menambah hafalan, memelihara hafalan sedia ada, serta menyediakan platform penghayatan al-Quran dalam kalangan pelajar. Namun begitu, beberapa cabaran utama turut dikenalpasti, seperti kesukaran membahagikan masa antara akademik dan hafazan, kekangan jadual kuliah, dan kekurangan bimbingan khusus. Hal ini perlu diberi perhatian dalam merangka struktur program agar lebih fleksibel, relevan dengan persekitaran politeknik, dan mampu menarik minat serta komitmen pelajar. Secara keseluruhannya, dapatan kajian rintis ini menyokong bahawa pelaksanaan program Tahfiz al-Quran di politeknik adalah sesuatu yang realistik dan diperlukan, asalkan ia dirancang secara strategik dengan mengambil kira keperluan pelajar, sumber institusi, dan sinergi antara pendidikan teknikal dan pendidikan spiritual.

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DIGITAL MARKETING STRATEGY ON FACEBOOK AND SERVICE QUALITY TOWARDS PRODUCT SALES AT PT INGCO TEKNIKA INDONESIA: CH STORE

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Abstract

This study aims to evaluate the impact of digital marketing strategies through the Facebook platform and service quality on product sales at PT Ingco Teknika Indonesia. Facebook, as one of the main social media platforms, is utilized to reach consumers more efficiently. A quantitative approach was used in this study, employing a survey method using questionnaires distributed to consumers who had interacted with the company via Facebook. The analysis results show that both digital marketing strategies and service quality have a positive and significant effect on increasing sales. Factors such as targeted advertising, engaging content presentation, quick responses, and professional complaint handling have proven to encourage consumers in making purchasing decisions. These findings provide strategic contributions for PT Ingco Teknika Indonesia in optimizing the use of Facebook and improving service quality to achieve targeted sales.
Keywords: Digital marketing; Facebook; Service quality.

1. Introduction

Digital marketing has become one of the most powerful strategies in modern business, allowing companies to connect with consumers through social media platforms. Among them, Facebook stands out as a key channel due to its vast user base and interactive features. Previous studies have demonstrated that social media marketing positively influences consumer purchasing decisions (Saragih, 2021). Moreover, service quality remains an essential determinant of customer satisfaction and loyalty (Putri & Nugroho, 2020). Wahyuni (2019) also emphasized that creative and informative social media content improves brand awareness and boosts sales. However, despite the growing use of Facebook for promotional purposes, research on how digital marketing and service quality jointly affect sales performance in Indonesian retail settings is limited. Therefore, this study investigates the influence of Facebook-based digital marketing strategies and service quality on product sales at PT Ingco Teknika Indonesia.

2. Methodology

This study used two types of data: primary data and secondary data. Primary data were collected directly from respondents through questionnaires and observations at the CH Store. Secondary data were gathered from internal sources, such as sales reports and company Facebook activity logs. The research employed a field research method, which involved researchers directly visiting the study location to collect data and gain a real-world understanding.

The primary data collection method was a questionnaire, which used a Likert scale to measure respondents' attitudes and perceptions. The scale ranged from 1 (Strongly Disagree) to 5 (Strongly Agree).The sample was determined using accidental sampling, which involved selecting 50 respondents based on random encounters with customers over a three-month period. The sample size was validated using Slovin's formula with a standard error of 10%. The final sample size was found to be 50 from a population of 100. The data analysis methods

included validity and reliability tests, descriptive statistics, multiple linear regression analysis, t-tests and F-tests, and the coefficient of determination (R2).

3. Results and Discussion

Based on previous studies, there is a consistent finding that digital marketing strategies through social media particularly Facebook and service quality have a positive impact on consumer purchasing decisions. Saragih (2021) emphasized the importance of targeted advertising and active communication, which aligns with the findings of this study regarding Facebook's effectiveness in reaching consumers. Similarly, Putri and Nugroho (2020) supported the notion that quick responsiveness and effective complaint handling are crucial in enhancing customer loyalty and driving sales. These findings reinforce the argument that digital marketing strategies cannot stand alone without being supported by high-quality service. Therefore, the integration of effective digital promotion and professional customer service is essential for boosting sales in the current digital era, as demonstrated by the case of PT Ingco Teknika Indonesia.

3.1 Respondent Classification by Gender

This table presents a breakdown of the study's respondents based on gender. Out of the total of 50 participants, 33 are male and 17 are female. This distribution is logical, as the products sold at PT Ingco Teknika Indonesia, which primarily consist of tools and equipment, typically attract a higher proportion of male customers.

Table 1. Respondent Classification by Gender

No	Gender	Amount
	Man	33
	Woman	17
	Total	50

The table provides a clear view of the demographic composition of the sample, which is useful for understanding the context of the purchasing decisions being analyzed.

3.2 Respondent Classification by Age

This table shows the age distribution of the 50 respondents. The majority of respondents, specifically 41 individuals, are between the ages of 20 and 25. This is a noteworthy finding because this age group often comprises individuals who are starting careers or businesses in fields such as carpentry or automotive repair.

Table 2. Respondent Classification by Age

No	Age	Amount
1	20 - 25 year	41
2	26 - 35 year	4
3	36- 40 year	5
4	46 - 55 year	0
5	> 55 year	0
	Total	50

The data also indicates a small number of respondents in the 26-35 and 36-40 age brackets, and none in the older age groups. This shows that the company's Facebook marketing and services are predominantly reaching a younger professional demographic.

3.3 Validity and Reliability Tests

The Validity and Reliability test results confirm that the questionnaire used in the study is a sound and trustworthy instrument for collecting data. Validity ensures that the questions accurately measure the intended concepts, while reliability ensures that the instrument produces consistent results. For this study, an instrument is considered valid if its calculated r-value is greater than or equal to 0.2542. All of the test items for Facebook marketing, service quality, and product sales were found to have r-values above this threshold, confirming their validity.

Table 3. Reliability test

Cronbach's Alpha	N of items
0.953	15

Cronbach's Alpha = 0.953 (N = 15) → Reliable

Reliability is confirmed when the Cronbach's Alpha value is greater than 0.6. The study's instrument achieved a Cronbach's Alpha of 0.953, indicating that it is highly reliable and the responses are consistent.

3.3 Multiple Linear Regression

The multiple linear regression results show the relationship between the independent variables (Facebook Digital Marketing and Service Quality) and the dependent variable (Product Sales). The regression equation, Y=2.198+0.335X1+0.592X2, indicates that both digital marketing and service quality have a positive effect on sales.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	2.198	1.342		1.637	.108
	x1	.335	.074	.386	4.557	.000
	x2	.592	.083	.601	7.099	.000

a. Dependent Variable: y

Fig. 1. Multiple linear regression

Regression equation: $Y = 2.198 + 0.335\ X_1 + 0.592\ X_2$
Where:
Y = Product Sales
X_1 = Facebook Digital Marketing
X_2 = Service Quality

The coefficients for both variables are positive, which means that as digital marketing efforts and service quality improve, product sales are expected to increase.

3.4 Simultaneous Test (F-test)

The F-test assesses whether the independent variables, as a group, have a significant effect on the dependent variable. The results of this test are crucial for determining the overall significance of the model. The calculated F-value is 193.192, which is significantly greater than the F-table value of 3.16. The test's significance level is 0.000, which is below the 0.05 threshold.

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	734.353	2	367.176	193.192	.000[b]
	Residual	89.327	47	1.901		
	Total	823.680	49			

a. Dependent Variable: y

b. Predictors: (Constant), x2, x1

Fig. 2. Simultaneous test

This means that the null hypothesis (H0) is rejected, and it can be concluded that Facebook digital marketing and service quality, when considered together, have a significant effect on product sales.

3.5 Partial Test (t-test)

The t-test evaluates the individual contribution of each independent variable to the dependent variable. The results show that both digital marketing (X1) and service quality (X2) are significant predictors of sales.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	2.198	1.342		1.637	.108
	x1	.335	.074	.386	4.557	.000
	x2	.592	.083	.601	7.099	.000

a. Dependent Variable: y

Fig. 3. Partial test

The t-value for digital marketing is 4.557 with a significance of 0.000, while the t-value for service quality is 7.099 with a significance of 0.000. Since both significance values are below 0.05, it is confirmed that each variable individually has a significant impact on product sales.

The study's findings on digital marketing align with previous research by Saragih (2021) and Wahyuni (2019). The use of Facebook is effective in reaching consumers through targeted advertising and engaging content. This study found that a better customer experience from digital marketing leads to greater customer loyalty. This is consistent with the finding that visually appealing and informative content on Facebook can significantly improve consumer engagement and encourage purchasing behavior.

The results confirm that service quality has a positive and significant effect on sales, with a more dominant impact than digital marketing. This is supported by the findings of Putri and Nugroho (2020), which emphasized that quick responsiveness and effective complaint handling are crucial for enhancing customer satisfaction and sales. Customers who are satisfied with the service and have an emotional brand attachment are more likely to be loyal, leading to repeat purchases and product recommendations.

The findings highlight that digital marketing strategies and high-quality service cannot stand alone. The successful case of PT Ingco Teknika Indonesia demonstrates that integrating effective digital promotion with professional customer service is essential for boosting sales in

the current digital era. Both factors together explain a substantial 89.2% of the variation in product sales, with service quality having a more dominant influence.

4. Conclusion

Based on the research findings, it can be concluded that Facebook digital marketing has a positive and significant effect on product sales at PT Ingco Teknika Indonesia. Likewise, service quality also contributes positively and significantly to sales growth. When considered simultaneously, both Facebook digital marketing and service quality have a significant positive effect on sales. These variables combined explain 98% of the variation in customer purchases, with service quality having a more dominant impact.

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TAHAP PENGAMALAN AJARAN ISLAM DALAM KALANGAN PELAJAR POLITEKNIK MERLIMAU MELAKA DARI ASPEK IBADAH

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Abstrak

Pengamalan ajaran Islam adalah satu perkara yang amat penting dalam agama. Kemenjadian seorang manusia dilihat kepada kesempurnaan pengamalan ajaran Islam dari aspek aqidah, ibadah dan akhlak. Melalui pelaksanaan kursus-kursus Pendidikan Islam yang ditawarkan di PMM ianya perlu sentiasa dinilai agar sentiasa mencapai matlamatnya. Oleh itu, pengamalan ajaran Islam dalam kalangan pelajar di PMM perlu dikaji kerana ia relevan dengan pelaksanaan kursus-kursus Pendidikan Islam di institusi berkenaan. Kajian ini adalah bertujuan untuk mengkaji tahap pengamalan ajaran Islam dalam kalangan pelajar PMM dari sudut ibadah. Metodologi kajian yang digunakan ialah kajian lapangan yang menggunakan sepenuhnya kaedah pengumpulan data iaitu borang kaji selidik. Data yang diperolehi daripada borang kaji selidik dianalisis menggunakan perisian SPSS dan dapatan kajian dihuraikan dengan menggunakan kaedah statistik deskriptif dan inferensi. Hasil kajian mendapati tahap pengamalan ajaran Islam dalam kalangan responden dalam aspek yang dikaji iaitu ibadah = 4.21, berada pada tahap yang tinggi. Ini menunjukkan bahawa kursus-kursus Pendidikan Islam berjaya mempengaruhi tahap pengamalan ajaran Islam dalam kalangan pelajar PMM. Kesimpulannya, dapatan kajian ini menunjukkan bahawa tahap pengamalan ajaran Islam dalam kalangan pelajar di PMM dalam aspek ibadah adalah baik.
Katakunci: Pengamalan ajaran Islam; ibadah; Pendidikan Islam.

1. Pengenalan

Amalan ibadah merupakan perkara penting dalam kehidupan seorang mukmin. Ia lambang kesetian seorang hamba terhadap penciptanya. Ibadah meliputi segala aspek yang meliputi makna kepatuhan kepada segala perintah Allah S.W.T. dan meninggalkan segala laranganNya (al-Ghazali, 1994). Ibadah dapat menghubungkan terus seorang hamba dengan penciptanya, malah ia juga dapat mengembalikan manusia kepada tujuan asal kejadian nya di muka bumi iaitu untuk beribadah kepada Allah S.W.T. (al-Ghazali, 2000) sebagaimana dinyatakan dalam firmanNya:

وَمَا خَلَقْتُ الْجِنَّ وَالإِنْسَ إِلا لِيَعْبُدُونِ

Maksud: “Dan (ingatlah) Aku tidak menciptakan jin dan manusia melainkan untuk mereka menyembah dan beribadat kepadaKu”

(Surah al Zariyat,51:56)

Ibadah bukan sahaja melambangkan kepatuhan seorang hamba kepada penciptanya, tetapi dapat memberikan banyak manfaat dalam kehidupan manusia. Selain dapat memberikan ketengan jiwa, menyedarkan tentang hakikat diri dan menginsafi kelemahan diri, ibadah juga dapat memainkan peranan dalam menyelesaikan masalah yang dihadapi dalam kehidupan seharian mereka. Hal ini berlaku kerna ibadah yang dilaksanakan dengan khusyuk dan tawaduk dapat mendekatkan seseorang kepada Allah S.W.T:

وَمَنْ يَتَّقِ اللَّهَ يَجْعَلْ لَهُ مَخْرَجًا

Maksud: “Dan sesipa yang bertaqwa kepada Allah S.W.T. (dengan mengerjakan suruhanNya dan meninggalkan laranganNya) nescaya Allah akan mengadakan baginya jalan keluar (dari segala perkara yang menyusahkannya)”

(Surah al-Talaq, 65:2)

Justeru itu pengkaji melihat pengamalan ibadah adalah pengamalan hidup beragama yang berbentuk penerapan asas agama yang mengutamakan aplikasi dan penghayatan agama itu sendiri. Dalam konteks agama Islam, kehidupan beragama ini disinonimkan dengan menjadikan Islam sebagai *al-Din* atau sebuah cara hidup yang mana secara automatiknya menuntut penganutnya menghayati dan mengamalkan ajaran Islam secara menyeluruh baik dari aspek akidah, ibadah mahupun akhlak.

Agama Islam ialah sebuah agama yang lengkap dan sempurna. Selain dari memberi penekanan terhadap unsur-unsur akhirat, agama Islam turut menitikberatkan urusan-urusan keduaniaan yang merangkumi setiap aspek kehidupan manusia. Matlamatnya adalah untuk membentuk seorang manusia yang mengamalkan cara hidup seperti yang terkandung dalam ajaran Islam. Menurut Sidek Baba (2006) ilmu dalam Islam terbentuk dalam acuan yang sepadu. Ilmu-ilmu seperti akidah, akhlak dan ibadah adalah tunjang yang selaras dengan ilmu sains dan teknologi serta ilmu-ilmu yang lain. Ilmu dalam Islam merangkumi keseluruhan dengan meletakkan fakta dan data yang laras dengan teori sains. Kesemuanya bertujuan untuk mengenali dan mengagumi kekuasaan dan kebesaran Allah S.W.T.

Ghazali Darussalam berpendapat bahawa pendidikan Islam adalah segala bentuk pengajaran dan pendidikan yang diterima oleh umat Islam yang berlandaskan al-Quran dan al-Sunnah. Beliau menafikan bahawa pendidikan selain yang dinyatakan tersebut adalah pendidikan asing (Ghazali Darussalam, 2004). Fathi Yakan (1997), pula menyatakan bahawa pendidikan Islam ialah proses membina individu dan masyarakat berdasarkan paksi Islam sama ada dalam aspek pegangan, pemikiran mahupun perbuatan.
Menurut Abdullah Nasih (1988), Pendidikan Islam yang ideal ialah meliputi aspek-aspek pendidikan keimanan, akhlak, jasmani, akal, psikologi, sosial dan seks. Penekanan ini diperkukuhkan lagi dengan hadis yang menjelaskan tentang kepentingan akhlak dan sahsiah dalam kehidupan seorang muslim. Sabda Rasulullah S.A.W.

"إِنَّمَا بُعِثْتُ لِأُتَمِّمَ مَكَارِمَ الْأَخْلَاقِ"

Ertinya: "Sesungguhnya aku diutus hanya untuk menyempurnakan kemuliaan akhlak."

(Riwayat Al-Baihaqi)

Melalui penjelasan ini dapatlah difahami bahawa Pendidikan Islam bertujuan mencapai pertumbuhan yang seimbang dalam keseluruhan pembentukan sahsiah manusia melalui latihan jasmani, emosi, rohani dan intelek manusia. Oleh kerana itu Pendidikan Islam mampu membentuk pelajar yang soleh dan berakhlak mulia.

Daripada hasil kajian Siti Mariam Samat (2002) ke atas salah sebuah politeknik mendapati bahawa pihak pengurusan politeknik tersebut telah melakukan pengawalan yang tinggi bagi menangani masalah sosial, namun masalah sosial ini tetap berterusan walaupun ia tidak kritikal disebabkan faktor-faktor di luar kawalan pihak pengurusan. Sikap sebahagian pihak pentadbiran institusi-institusi pendidikan dan juga pengajar-pengajar yang hanya mementingkan kepada kecemerlangan akademik semata-mata haruslah diperbetulkan di mana aspek pembangunan insan dan penerapan nilai harus diberikan perhatian yang menyeluruh bagi melahirkan pelajar yang cemerlang dan bersahsiah tinggi. Sehubungan itu Ab. Halim Tamuri (2000) mendapati bahawa masih ramai guru yang tidak dapat menerapkan nilai-nilai murni semasa proses pengajaran dan pembelajaran (PdP) berlangsung.

Terdapat beberapa buah kajian yang berkaitan dengan kajian ini antaranya kajian yang dilakukan oleh Seri Kartini Jurami (2013), yang mendapati tahap pengamalan ajaran Islam dalam kalangan pelajar Politeknik Ungku Omar dalam aspek akidah, ibadah dan akhlak berada pada tahap yang tinggi. Menurut kajian Asmahan (2009), mendapati tahap pengamalan ajaran Islam dalam kalangan responden kajian dari aspek akidah, ibadah dan akhlak berada pada tahap tinggi. Begitu

juga dengan kajian Nor Hayati Fatmi Talib et al. (2018), mendapati tahap akidah, syariat dan muamalat berada pada tahap yang tinggi. Ditambah lagi kajian Mohd Khairi Shafie (2016), mendapati tahap pengamalan ajaran Islam meliputi akhlak juga berada pada tahap tinggi. Begitu juga dengan kajian Zainuddin, M. Z., dan Razak, K. A. (2021), juga menunjukkan tahap amalan ibadah adalah tinggi dengan nilai min 3.94.

Manakala kajian Alias (2010) bertajuk *Penilaian Pelaksanaan Kurikulum Pendidikan Islam Politeknik Kementerian Pengajian Tinggi Malaysia*, mendapati tingkah laku pelajar politeknik dari aspek akhlak berada pada tahap tinggi, manakala tingkah laku ibadah dan akhlak berada pada tahap sederhana. Ini menunjukkan keberkesanan Pendidikan Islam yang dilaksanakan di politeknik masih belum mencapai tahap keberkesanan yang tinggi dalam aspek pengamalan.

Pengkaji mendapati dua permasalahan yang dikenalpasti. Pertama, pelajar tidak mengamalkan pelajaran yang dipelajari dalam Pendidikan Islam dalam kehidupan seharian. Kedua, tahap pengamalan ajaran Islam dalam kalangan pelajar di politeknik masih belum mencapai tahap pengamalan yang tinggi.Sehubungan itu, timbul persoalan sejauhmanakah pula tahap pengamalan ibadah dalam kalangan pelajar di Politeknik Merlimau, Melaka (PMM). Justeru itu, satu kajian perlu dijalankan untuk mengkaji tahap pengamalan ibadah dan adakah ia berbeza daripada faktor jantina dalam kalangan pelajar Politeknik Merlimau, Melaka. Objektif kajian ini adalah :

- Mengukur tahap pengamalan ajaran Islam dalam kalangan pelajar Politeknik Merlimau Melaka dalam aspek ibadah
- Membandingkan perbezaan persepsi pelajar terhadap pengamalan ajaran Islam dalam aspek ibadah berdasarkan jantina

2. Metodologi

Dalam kajian ini, pengkaji menggunakan dua lapangan penyelidikan iaitu kajian perpustakaan dan kajian lapangan bagi membantu penulis untuk memahami permasalahan yang dikaji dengan lebih mudah. Bagi kajian ini, penulis telah menggunakan dua metode utama iaitu Metode Pengumpulan Data dan Metode Analisis Data. Kaedah ini sesuai digunakan untuk mengkaji populasi yang ramai (Islam et al., 2022, Noor et al., 2024, & Mohd Najib A. Ghafar, 1998). Sebanyak 381 kertas soal selidik diedarkan kepada sampel kajian yang terdiri dari 5000 orang populasi. Jumlah sampel adalah bersesuaian dengan Jadual Penentuan Saiz Sampel seperti yang dikemukakan oleh Krejcie dan Morgan (1970), (Noor et al., 2024).

Soalan kaji selidik ini dibentuk oleh penyelidik sendiri yang diadaptasi daripada soal selidik yang digunapakai oleh pengkaji terdahulu iaitu Seri Kartini Jurami (2013), Jamil et al., (2024) dan Asni et al., (2024) bertujuan untuk mengukur tahap pengamalan ajaran Islam dalam kalangan pelajar Politeknik Merlimau dalam aspek ibadah.

Kertas soal selidik dibahagikan kepada dua bahagian utama. Bahagian pertama mengandungi soalan mengenai latar belakang responden iaitu umur, jabatan pengajian, program pengajian serta penginapan pelajar semasa pengajian. Bahagian kedua pula mengandungi soalan berkenaan tahap pengamalan ajaran Islam dalam kalangan pelajar Politeknik Merlimau dalam aspek ibadah.

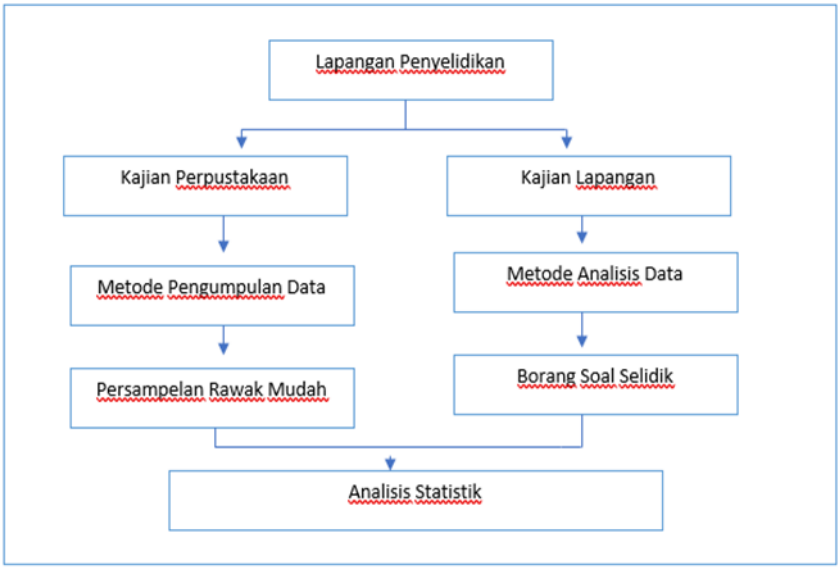
Dalam kajian ini kaedah sampel rawak mudah digunakan bagi tujuan memilih sampel yang diperlukan dalam kajian. Dengan menggunakan kaedah jenis ini, setiap individu mempunyai peluang yang sama untuk dipilih (Cornesse et al., 2020). Penyelidik mengedar sendiri kertas soal selidik ke setiap bilik kuliah dengan kerjasama pensyarah Kursus Pendidikan Islam di Politeknik Merlimau Melaka. Sebelum kertas soal selidik diedarkan, satu penerangan ringkas diberikan agar responden memahami objektif kajian yang ingin diperolehi. Dengan cara ini

penyelidik dapat mengawasi responden agar menjawab persoalan yang dikemukakan berdasarkan situasi dan cara hidup mereka serta tidak terpengaruh oleh jawapan rakan-rakan. Selain itu, kaedah ini digunakan kerana dengan cara ini kertas soal selidik dapat diperolehi dengan cepat dan kadar pulangannya yang tinggi.

Kajian ini adalah berbentuk kajian tinjauan kerana ia menerangkan fenomena dengan menganalisis data yang diperolehi daripada soal selidik. Semua maklumat yang diperolehi akan diklasifikasikan mengikut aspek yang telah ditentukan dan ditafsirkan secara kuantitatif. Dalam melaksanakan kajian ini, penyelidik telah menjalankannya melalui dua kaedah penyelidikan iaitu melalui kajian tinjauan dan kajian kepustakaan.

Alat atau instrumen yang digunakan dalam kajian tinjauan adalah berbentuk borang soal selidik yang diedarkan kepada responden. Manakala kajian kepustakaan pula bertujuan untuk mencari dan mengumpul bahan serta maklumat berkaitan kajian. Perpustakaan yang menjadi rujukan penyelidik ialah Perpustakaan Politeknik Merlimau Melaka.
Kajian ini dijalankan hanya tertumpu di Politeknik Merlimau, Melaka. Rasional pemilihan kerana pelajarnya melebihi 5 ribu orang dan mudah untuk dilihat kebolehpercayaan tahap amalan ajaran Islam dalam kalangan pelajar Politeknik Merlimau Melaka dalam aspek ibadah (Noor et al., 2024).

Penyerahan borang soal selidik ini dilakukan sendiri oleh penyelidik bagi memastikan tujuan kajian dapat diterangkan dengan lebih terperinci kepada sampel-sampel yang terlibat. Tempoh masa tertentu diberikan kepada responden untuk menjawab borang soal selidik. Setelah borang soal selidik dikumpulkan, pengkaji mula menganalisis data-data yang terdapat pada borang soal selidik tersebut. Sebelum itu, pengkaji telah mengasingkan borang soal selidik mengikut semester pengajian pelajar-pelajar Politeknik Merlimau bagi memudahkan data-data dimasukkan dan dianalisis secara sistematik. Data-data juga akan dianalisis bersumberkan dokumen daripada jurnal-jurnal, prosiding-prosiding, kertas kerja seminar dan buku-buku yang berkaitan. Data-data yang diperoleh tadi dianalisis dan direkodkan sebelum kesimpulan berkaitan dengannya dilakukan.
Data-data yang dikumpulkan dianalisis dengan menggunakan program *Statistical For Social Science (SPSS)* iaitu suatu perisian komputer bagi menganalisis data peratusan dan min. Bentuk laporan statistik deskriptif berdasarkan min, kekerapan dan peratusan serta statistik referensi.



Rajah 1. Aliran proses kajian

3. Dapatan dan Perbincangan

Kajian ini melibatkan seramai 381 orang pelajar Politeknik Merlimau Melaka dengan latar belakang seperti jantina dan jabatan. Jumlah sampel adalah bersesuaian dengan Jadual Penentuan Saiz Sampel seperti yang dikemukakan oleh Krejcie dan Morgan, 1970 (Noor et al., 2024). Huraian profil demografi kajian dipaparkan seperti Jadual 1 berikut:

Jadual 1. Profil demografi kajian

Demografi	Kekerapan	Peratusan
Jantina		
Lelaki	154	44.3%
Perempuan	194	55.7%
Jabatan		
Jabatan Pelancongan dan Hospitaliti (JPH)	78	22.4%
Jabatan Perdagangan (JP)	61	17.5%
Jabatan Kejuruteraan Awam (JKA)	64	18.4%
Jabatan Kejuruteraan Elektrik (JKE)	66	19.0%
Jabatan Kejuruteraan Mekanikal (JKM)	79	22.7%

Jadual 1 di atas menunjukkan bahawa berdasarkan jantina, seramai 154 orang (44.3%) pelajar lelaki dan seramai 194 orang (55.7%) pelajar perempuan. Seterusnya berdasrkan jabatan menunjukkan seramai 78 orang (22.4%) pelajar Jabatan Pelancongan dan Hospitaliti (JPH), seramai 61 orang (17.5%) pelajar Jabatan Perdagangan (JP), seramai 64 orang (18.4%) pelajar Jabatan Kejuruteraan Awam (JKA), seramai 66 orang (19.0%) pelajar Jabatan Kejuruteraan Elektrik (JKE) dan seramai 79 orang (22.7%) pelajar Jabatan Kejuruteraan Mekanikal (JKM).

Jadual 2. Tahap ibadah dalam kalangan pelajar Politeknik Merlimau Melaka

Bil.	Ibadah pelajar	STS	TS	KS	S	SS	Min	SP	Interp.
	Setelah saya mempelajari Pendidikan Islam……								
1	Saya menunaikan solat fardhu lima waktu setiap hari	2 (0.6%)	8 (2.3%)	128 (36.8%)	128 (36.8%)	82 (23.6%)	3.80	0.84	Tinggi
2	Saya menunaikan solat lima waktu di mana sahaja saya berada	2 (0.6%)	26 (7.5%)	130 (37.4%)	128 (36.8%)	62 17.8%)	3.64	0.88	Tinggi
3	Saya mengerjakan solat fardhu di awal waktu	2 (0.6%)	22 (6.3%)	188 (54.0%)	96 (27.6%)	40 (11.5%)	3.43	0.80	Tinggi
4	Saya menunaikan sembahyang fardhu walaupun kesuntukan waktu untuk menghadiri kelas	2 (0.6%)	32 (9.2%)	140 (40.2%)	90 25.9%)	84 (24.1%)	3.64	0.97	Tinggi
5	Saya berpuasa di bulan Ramadhan	-	2 (0.6%)	12 (3.4%)	80 (23.0%)	254 (73.0%)	4.68	0.57	Sangat Tinggi
6	Saya akan memastikan zakat fitrah saya dibayar	2 (0.6%)	-	22 (6.3%)	92 (26.4%)	232 (66.7%)	4.59	0.66	Sangat Tinggi
7	Saya akan mandi wajib bila keluar tanda-tanda hadas besar	-	-	14 (4.0%)	74 (21.3%)	260 (74.7%)	4.71	0.54	Sangat Tinggi
8	Saya akan berdoa kepada Allah setiap kali selepas solat	2 (0.6%)	-	10 (2.9%)	88 (25.3%)	248 (71.3%)	4.67	0.59	Sangat Tinggi
9	Saya selalu melakukan perkara-perkara sunat yang boleh memberi pahala kepada saya. (cth: berzikir)	-	6 (1.7%)	86 (24.7%)	122 (35.1%)	134 (38.5%)	4.10	0.83	Sangat Tinggi
10	Saya sentiasa memastikan makanan yang saya makan adalah halal	-	-	20 (5.7%)	74 (21.3%)	254 (73.0%)	4.67	0.58	Sangat Tinggi
11	Saya sentiasa menutup aurat sebagaimana yang diwajibkan di mana sahaja saya berada	-	10 (2.9%)	58 (16.7%)	136 (39.1%)	144 (41.4%)	4.19	0.81	Sangat Tinggi

12	Saya tidak suka melihat rancangan televisyen yang mendedahkan aurat	14 (4.0%)	24 (6.9%)	138 (39.7%)	108 (31.0%)	64 (18.4%)	3.53	1.00	Tinggi
13	Saya membaca 'Bismillah' sebelum saya makan	-	-	14 (4.0%)	70 (20.1%)	264 (75.9%)	4.72	0.53	Sangat Tinggi
14	Saya membaca ‘Alhamdulillah’ selepas saya makan	2 (0.6%)	4 (1.1%)	40 (11.5%)	86 (24.7%)	216 (62.1%)	4.47	0.79	Sangat Tinggi
15	Saya berusaha untuk mendalami hukum-hakam Islam dengan lebih baik	-	6 (1.7%)	42 (12.1%)	136 (39.1%)	164 (47.1%)	4.32	0.75	Sangat Tinggi
	Keseluruhan						4.21	0.46	Sangat Tinggi

Jadual 2 di atas menunjukkan bahawa setiap item ibadah dalam kalangan pelajar Politeknik Merlimau Melaka berada pada 2 tahap sahaja iaitu tahap sangat tinggi dan tinggi. Item-item ibadah dikategorikan kepada solat lima waktu, zakat, mandi wajib, adab ibadah dan hukum syariat Islam. Item yang mempunyai min yang paling tinggi ialah kategori adab ibadah iaitu saya membaca 'Bismillah' sebelum saya makan (min = 4.72 dan sp = 0.53) berada pada tahap sangat tinggi. Dari segi kekerapan dan peratusan menunjukkan bahawa seramai 264 orang (75.9%) pelajar menyatakan sangat setuju, seramai 70 orang (20.1%) pelajar menyatakan setuju dan seramai 14 orang (4.0%) pelajar menyatakan kurang setuju. Manakala item yang mempunyai min yang paling rendah ialah kategori solat iaitu item saya mengerjakan solat fardhu di awal waktu (min = 3.43 dan sp = 0.80) berada pada tahap tinggi. Dari segi kekerapan dan peratusan menunjukkan bahawa seramai 188 orang (54.0%) pelajar menyatakan kurang setuju, seramai 96 orang (27.6%) pelajar menyatakan setuju, seramai 40 orang (11.5%) pelajar menyatakan sangat setuju, seramai 22 orang (6.3%) pelajar menyatakan tidak setuju dan seramai 2 orang (0.6%) pelajar menyatakan sangat tidak setuju. Secara keseluruhannya menunjukkan bahawa ibadah dalam kalangan pelajar Politeknik Merlimau Melaka berada pada tahap sangat tinggi (min = 4.21 dan sp = 0.46).

Jadual 3. Tahap ibadah dalam kalangan pelajar Politeknik Merlimau Melaka Mengikut Kategori

Bil	Kategori	Tahap	Turutan
1	Adab ibadah (memulai makan dengan bacaan Bismillah	Sangat tinggi	Tinggi
2	Zakat	Sangat tinggi	
3	Mandi wajib	Sangat tinggi	Sederhana
4	Hukum syariat Islam	Sangat tinggi	
5	Rancangan televisyen	Tinggi	
6	Solat	Tinggi	Rendah

Jadual 4. Tahap pengamalan ajaran Islam dari aspek ibadah dalam kalangan pelajar Politeknik Merlimau Melaka

No	Pengamalan ajaran Islam	Min	Sisihan Piawai	Interpretasi
1	Ibadah	4.21	0.46	Sangat tinggi

Jadual 4 menunjukkan bahawa pengamalan ajaran Islam dalam kalangan pelajar dari aspek ibadah (min = 4.21 dan sp = 0.46). Ini menunjukkan bahawa pengamalan ajaran Islam dari aspek ibadah dalam kalangan pelajar berada pada tahap sangat tinggi (min = 4.21 dan sp = 0.46).

Persoalan kajian: Adakah terdapat perbezaan pengamalan ajaran Islam dari aspek ibadah dalam kalangan pelajar Politeknik Merlimau Melaka berdasarkan jantina?

Ho1.1 : Tidak terdapat perbezaan yang signifikan ibadah dalam kalangan pelajar Politeknik Merlimau Melaka berdasarkan jantina

Analisis MANOVA dijalankan bagi melihat perbezaan pengamalan ajaran Islam dalam kalangan pelajar Politeknik Merlimau Melaka berdasarkan jantina. Sebelum analisis MANOVA dijalankan, pengkaji terlebih dahulu menjalankan ujian bagi menentukan matrik kehomogenan varian-kovarian (*homogenity of the varians-covariance matrics*) dengan menggunakan ujian Box's M (*Box's M test*). Analisis ujian Box'M dapat dilihat seperti dalam Jadual 5 berikut.

Jadual 5. Box'M perbezaan pengamalan ajaran Islam dalam kalangan pelajar Politeknik Merlimau Melaka berdasarkan jantina

Box's M	Nilai-F	df1	df2	Sig.
33.776	5.576	6	756553.811	0.000

Jadual 5 di atas menunjukkan terdapat perbezaan *varian-covarian* yang signifikan dalam kalangan pemboleh ubah bersandar untuk semua aras pemboleh ubah bebas dengan nilai Box's M = 33.776 dan sig = 0.000 ($p<0.001$). Ini bermakna, varian-covarian pemboleh ubah bersandar adalah tidak homogenus merentasi pemboleh ubah bebas. Analisis Manova kekal digunakan bagi melihat perbezaan pengamalan ajaran Islam dalam kalangan pelajar Politeknik Merlimau Melaka berdasarkan jantina kerana bilangan sampel yang dilibatkan dalam kajian dalam jumlah yang banyak (Pallant 2007). Hasil analisis Manova dapat dilihat seperti Jadual 6 berikut:

Jadual 6. Manova perbezaan pengamalan ajaran Islam dalam kalangan pelajar Politeknik Merlimau Melaka berdasarkan jantina

Pengamalan ajaran Islam	Jantina	N	Min	Sisihan piawai	Type III Sum of Squares	Df	Jumlah kuasa dua	F	Sig.
Ibadah	Lelaki	154	4.30	0.49	0.121	1	0.121	0.612	0.435
	Perempuan	194	4.26	0.41					

Tidak terdapat perbezaan yang signifikan ibadah dalam kalangan pelajar Politeknik Merlimau Melaka berdasarkan jantina dengan nilai F = 0.612 dan sig = 0.435 ($p>0.05$). Dari segi min menunjukkan bahawa pelajar lelaki (min = 4.30 dan sp = 0.49) mempunyai ibadah yang lebih tinggi berbanding dengan pelajar perempuan (min = 4.26 dan sp = 0.41). Namun, perbezaan tersebut tidak signifikan. Ini menunjukkan hipotesis nol (Ho1.1) adalah diterima.

Hasil kajian, pengkaji mendapati secara keseluruhan pengamalan ajaran Islam dalam aspek ibadah adalah sangat tinggi. Kategori adab dalam ibadah iaitu memulai makan dengan bacaan Bismillah adalah paling tinggi dan boleh dipuji. Kategori zakat, mandi wajib, hukum syariat Islam dan menonton rancangan televisyen berada pada tahap sederhana. Aspek solat diawal waktu berada pada tahap paling rendah. Bacaan ini adalah berdasarkan kategori dalam aspek ibadah. Namun secara keseluruhannya tahap pengamalan ajaran Islam dalam aspek ibadah juga berada pada tahap yang tinggi dan harus dipuji.

Dengan melazimi amalan kebaikan, seseorang itu akan terbiasa dengan perkara tersebut. Begitu juga dengan melaksanakan solat di awal waktu. Secara tidak langsung pelaziman mengamalkan solat diawal waktu akan membiasakan pelaksanannya. Justeru itu membiasakan diri dengan kebaikan akan mengarahkan seseorang itu melakukan perkara - perkara kebaikan dan akhirnya akan membentuk akhlak dan keperibadian seseorang. Bertepatan dengan teori Imam al-Ghazali yang menyatakan dengan melazimi melakukan amalan baik seseorang itu boleh menjadi seorang yang berakhlak. Selain itu dengan *muraqabatullah* atau pengawasan diri terhadap Allah SWT juga mampu membentuk seseorang menjadi insan soleh serta mampu mengawal dirinya dari melakukan perkara-perkara yang dilarang oleh Allah SWT. Sebagaimana dinyatakan dalam firmanNya:

يَٰٓأَيُّهَا ٱلَّذِينَ ءَامَنُواْ ٱتَّقُواْ ٱللَّهَ وَٱبۡتَغُوٓاْ إِلَيۡهِ ٱلۡوَسِيلَةَ وَجَٰهِدُواْ فِي سَبِيلِهِۦ لَعَلَّكُمۡ تُفۡلِحُون

"Wahai orang-orang yang beriman! Bertaqwalah kepada Allah dan carilah jalan yang mendekatkan diri kepada-Nya, dan berjihadlah pada jalan-Nya, supaya kamu mendapat keberuntungan."

(Ayat QS. Al-Ma'idah 35)

Dapatan kajian mendapati tidak terdapat perbezaan yang signifikan ibadah dalam kalangan pelajar Politeknik Merlimau Melaka berdasarkan jantina dengan nilai F = 0.612 dan sig = 0.435 (p>0.05). Dari segi min menunjukkan bahawa pelajar lelaki (min = 4.30 dan sp = 0.49) mempunyai ibadah yang lebih tinggi berbanding dengan pelajar perempuan (min = 4.26 dan sp = 0.41). Namun, perbezaan tersebut tidak signifikan. Ini menunjukkan hipotesis nol (Ho1.1) adalah diterima.

4. Kesimpulan

Secara keseluruhannya, dapatan kajian menunjukkan Pendidikan Islam yang dilaksanakan di PMM telah berjaya membimbing pelajar mengamalkan ajaran Islam dalam kehidupan seharian. Kajian ini diharapkan boleh dijadikan rujukan dan garis panduan untuk merancang dasar bagi penambahbaikan kursus tersebut dari masa ke semasa dan seterusnya memperkasakan lagi kursus Pendidikan Islam yang dilaksanakan khususnya di PMM.

Selari dengan teori Imam al-Ghazali, metodologi pendidikan dan pembentukan akhlak baginya haruslah bersifat teoritikal dan praktikal. Bagi beliau, kaedah pendidikan akhlak manusia haruslah bermula daripada peringkat bayi dan seterusnya berkembang hingga ke peringkat remaja, dewasa, dan lanjut usia (Suhid, 2009). Sebagaimana yang dinyatakan dalam hadith Nabi Muhammad SAW:

أَكْمَلُ الْمُؤْمِنِينَ إِيمَانًا أَحْسَنُهُمْ خُلُقًا

"Orang yang sempurna imannya ialah mereka yang paling baik akhlaknya"

(Riwayat Abu Daud)

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GAMIFYING DATABASE LEARNING: ENHANCING ENGAGEMENT AND MASTERY THROUGH INTERACTIVE PLAY

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Abstract

Incorporating gamification into education has shown promising results in increasing student engagement and improving learning outcomes. This paper explores the application of gamification strategies in teaching database subjects, focusing on how interactive play can enhance student motivation, comprehension and retention. By integrating game elements such as points, badges, leaderboards and problem-based challenges, students can develop a deeper understanding of complex database concepts. This study examines different gamification models, their effectiveness in database education and potential challenges in implementation. Through case studies and empirical research, this study highlights best practices for designing gamified learning experiences that foster critical thinking, problem solving and collaboration.
Keywords: Gamification; Database Learning; Educational Strategies

1. Introduction

In today's evolving educational landscape, traditional pedagogical approaches are increasingly being supplemented with digital innovations to meet the expectations and learning preferences of modern students. One such innovation is gamification, the use of game elements such as points, levels, leader boards and rewards in non-game contexts to motivate and engage learners. Numerous studies have reported that gamification can improve student engagement, motivation and knowledge retention, particularly in courses that involve abstract reasoning and complex problem-solving (Hakulinen & Auvinen, 2014).

However, many educational settings still rely heavily on passive, lecture-based methods especially in technically demanding subjects. One such subject is database fundamentals which forms a foundational component in computer science, data science and information technology curricula. Topics such as normalization, query optimization, indexing and relational schema design are essential but often perceived as abstract and difficult by students. As a result, learners may experience low motivation, disengagement and difficulty applying knowledge in real-world scenarios (Murray & Guimaraes, 2009; Connolly & Begg, 2007). Additionally, repetitive and non-interactive teaching approaches often lead to boredom and cognitive overload further hampering meaningful learning outcomes (Zainun Amirah Zainudin & Norehan Zulkiply, 2023).

Emerging research emphasizes the importance of adopting innovative instructional techniques that promote interactivity and real-world relevance. With advancements in educational technology, educators are better positioned to deliver engaging learning experiences through tools such as gamified learning platforms (Razali et al., 2020). While gamification has been successfully applied in general programming or computing education, its application in database education remains underexplored. Most existing studies do not tailor gamification to the specific cognitive and conceptual challenges inherent in database

learning. Furthermore, although database courses are typically introduced early in computing programs and are essential for foundational knowledge, they often lack the active learning components needed to reinforce theoretical understanding (Shang, 2016).

This study addresses this research gap by investigating how gamification can be effectively integrated into database instruction. It aims to explore the impact of gamified learning environments on student engagement, motivation and mastery of database concepts. By incorporating strategies such as level-based progression, problem-based scenarios, interactive SQL challenges and adaptive feedback mechanisms, the research proposes a gamified model tailored to the demands of database education.

The significance of this study lies in its contribution to both academic and instructional practices. It provides a structured framework for implementing gamification in database courses and offers empirical evidence on how game-based learning can enhance student comprehension, retention and application of knowledge. Ultimately, this research advocates for a pedagogical shift toward more interactive and personalized learning experiences that better align with the demands of 21st century technical education.

2. Methodology

This study employed a quantitative research design to examine the impact of gamification on student engagement and content mastery in database learning. A structured questionnaire served as the primary data collection instrument, consisting of closed-ended items developed in alignment with the research objectives. To ensure the reliability and validity of the instrument, it underwent expert review by academic professionals with experience in instructional design and educational technology. To assess internal consistency and transparency, a pilot study was conducted with a subset of the target group. The instrument was refined based on the feedback received.

The population for this study comprised 148 Semester 2 students from the Department of Information Technology and Communication (JTMK) at Politeknik Sultan Idris Shah, all of whom were enrolled in database related courses. According to Krejcie and Morgan's (1970) sample size determination table, the recommended sample size for this population is between 103 and 108 participants. A total of 106 students from three classes were selected through purposive sampling, ensuring that all respondents had participated in the gamified learning experience. The questionnaire was administered during class sessions by the course lecturer via Google Forms, providing a time-efficient and cost-effective means of data collection.

The gamified learning intervention was embedded within the database course and included features such as quest challenges, leader boards, achievement badges and timed missions. These elements were designed to encourage active participation and enhance student motivation and conceptual understanding. Upon completion of the intervention, responses were collected and analysed using IBM SPSS Statistics. Descriptive statistical methods including measures of central tendency and frequency distributions were employed to summarize the data.

3. Results and Discussion

The reliability of the instrument used in this study was evaluated using Cronbach's Alpha. The 20-items questionnaire focused on student's perceptions of gamification in database learning. The analysis yielded a Cronbach's Alpha of 0.984 indicating excellent internal consistency in Table 1.

Table 1. Reliability Statistics

Cronbach's Alpha	Number of Items
0.984	20

A total of 106 students completed the questionnaire. Descriptive statistics revealed that all 20 items recorded mean scores exceeding 4.0 on a 5-point Likert scale, indicating a high level of agreement among respondents. The highest rated item was Item 20 (M=4.38, SD=0.82), followed by Item 14 (M=4.34, SD=0.78). Standard deviations for all items ranged from 0.75 to 0.95, suggesting strong agreement and response consistency in Table 2.

Table 2. Summary of Student Perceptions Toward Gamification in Database Learning

No.	Items	Mean	Std. Deviation	Level
1	The gamified approach made learning database concepts more engaging.	4.23	0.95	High
2	Gamification increased motivation to study database-related topics.	4.23	0.84	High
3	Interactive play elements encouraged active participation in learning activities.	4.33	0.78	High
4	It was easier to stay focused when learning databases through gamification.	4.20	0.83	High
5	Gamification helped with understanding and retaining database concepts.	4.21	0.81	High
6	The use of game mechanics enhanced the learning experience.	4.30	0.81	High
7	The gamified learning experience-built confidence in applying database concepts.	4.22	0.80	High
8	Learning databases through gamification improved problem-solving and critical-thinking skills.	4.27	0.75	High
9	Gamified activities improved understanding of SQL queries	4.23	0.80	High
10	Learning database normalization through interactive challenges made the topic easier to grasp.	4.23	0.82	High
11	Gamification enhanced the ability to comprehend indexing and its importance.	4.21	0.80	High
12	Database transactions and concurrency control were easier to understand through gamified exercises.	4.15	0.84	High
13	The combination of storytelling, simulations, and challenges enhanced learning of database concepts.	4.20	0.79	High
14	Receiving instant feedback in gamified activities helped identify and correct mistakes.	4.34	0.78	High
15	Competitive elements encouraged improvement of database skills.	4.24	0.81	High
16	A structured gamified learning model improved long-term retention of database concepts.	4.17	0.87	High
17	Adaptive learning techniques enhanced the database learning experience.	4.21	0.81	High
18	Integration of interactive tutorials and hands-on challenges helps reinforce database knowledge.	4.23	0.81	High
19	A well-structured gamified system included progressive difficulty levels for database topics.	4.22	0.79	High
20	Gamified learning models for database subjects were recommended to future students.	4.38	0.82	High

A Pearson correlation analysis was conducted to examine the relationship between student engagement and mastery of database concepts. The results indicated a significant positive correlation, $r(104) = 0.74$, $p < 0.001$ suggesting that higher engagement levels were

associated with stronger perceptions of content mastery. Additionally, a one-way ANOVA was performed to assess whether perceptions of gamified learning differed across class sections (Class A, B and C). The analysis found no statistically significant differences, $F(2, 103) = 1.21$, $p=0.302$ indicating that the gamified approach was consistently effective across all groups.

The findings of this study support the effectiveness of gamification as a pedagogical strategy in database education. The high internal consistency of the questionnaire reinforces the validity of the instrument in capturing student's perceptions. The uniformly high mean scores across all items suggest that students responded positively to the gamified learning experience. These results align with existing literature indicating that gamification enhances motivation, engagement, and learning outcomes (Deterding et al., 2011; Hamari et al., 2014).

Students valued the interactive elements such as real-time feedback, achievement systems and challenge-based learning which likely contributed to increased focus and interest in complex database topics like SQL and normalization. The strong correlation between engagement and content mastery confirms that higher levels of interaction and enjoyment are linked with better perceived understanding and skill development. This supports cognitive theories that emphasize the role of emotional and motivational factors in effective learning (Deci & Ryan, 1985).

The absence of significant differences between class groups implies that the intervention was robust across varied classroom dynamics. This suggests that gamified strategies can be scaled or adapted across different student cohorts without compromising their effectiveness. While the results are promising some limitations should be acknowledged. The study relied on self-reported perceptions which may not fully reflect actual learning gains. Future research could incorporate objective assessments of knowledge retention or performance-based evaluations. Additionally, longitudinal studies could examine whether the positive effects of gamification persist over time.

4. Conclusion

This study substantiates the efficacy of gamification as a transformative pedagogical approach in database education. By integrating elements such as real-time feedback, progressive challenges and interactive problem-solving, the gamified model significantly enhanced student engagement, motivation and understanding of complex database topics including SQL, normalization and indexing. The high mean scores across all survey items along with student's strong endorsement of the approach, underscore its positive reception and practical value.

Statistical analysis revealed a strong positive correlation between engagement and content mastery ($r = 0.74$, $p < 0.001$) suggesting that gamified learning not only promotes active participation but also facilitates deeper cognitive processing and retention. The absence of significant differences across class groups further indicates the model's adaptability and effectiveness across diverse student cohorts.

In summary, this research contributes valuable insights into the pedagogical potential of gamification in technical education. It demonstrates that gamification can transform learning environments into more engaging and impactful experiences. Future work should investigate long term learning outcomes, explore integration with AI powered adaptive learning systems and examine its application across other academic and professional training contexts. The success of this model also opens promising pathways for commercialization as a scalable, modular platform or Learning Management System (LMS) integrated tool.

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IMPAK PENDEDAHAN AWAL PERISIAN BIM DAN AUTOCAD TERHADAP KESEDIAAN KERJAYA PELAJAR TVET

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Abstrak

Kajian ini bertujuan untuk menilai impak pendedahan awal terhadap perisian Building Information Modeling (BIM) dan AutoCAD terhadap kebolehpasaran serta kesiapsiagaan kerjaya pelajar Pendidikan dan Latihan Teknikal dan Vokasional (TVET) di Malaysia. Perkembangan pesat dalam industri kejuruteraan menuntut kemahiran digital yang relevan, namun tahap pendedahan pelajar terhadap teknologi ini masih rendah. Dengan menggunakan pendekatan kuantitatif, seramai 120 pelajar TVET dalam bidang kejuruteraan telah dipilih sebagai responden bagi menilai hubungan antara pengalaman penggunaan perisian dengan kemahiran teknikal dan kebolehpasaran. Dapatan kajian menunjukkan bahawa terdapat hubungan positif yang signifikan antara penggunaan perisian BIM dan AutoCAD dengan kesiapsiagaan kerjaya pelajar. Analisis regresi linear berganda mengesahkan bahawa kemahiran perisian merupakan faktor yang paling dominan dalam menentukan tahap kebolehpasaran pelajar. Kajian ini menyokong Teori Pembelajaran Konstruktivisme yang menekankan pengalaman pembelajaran autentik dalam konteks dunia sebenar. Implikasinya, institusi TVET disarankan agar memperkukuh integrasi perisian berasaskan industri dalam kurikulum serta menyediakan latihan komprehensif kepada pensyarah. Kajian ini juga mencadangkan polisi pendidikan TVET yang lebih progresif selaras dengan kehendak Revolusi Industri 4.0. Secara keseluruhan, pendedahan awal terhadap BIM dan AutoCAD terbukti memberi impak positif dalam mempertingkatkan daya saing graduan TVET di pasaran kerja yang semakin mencabar.
Kata kunci : BIM; AutoCAD; TVET.

1. Pengenalan

Dalam dunia yang semakin global, teknologi semakin memainkan peranan yang penting dalam semua sektor industri, terutamanya dalam sektor kejuruteraan dan pembinaan. Penggunaan perisian canggih seperti Building Information Modeling (BIM) dan AutoCAD kini menjadi keperluan asas dalam proses perancangan, rekabentuk, dan pelaksanaan projek. BIM, sebagai perisian untuk merekabentuk, merancang, dan menguruskan maklumat bangunan, telah membolehkan pengurusan projek yang lebih efisien, manakala AutoCAD, yang lebih dikenali dalam lukisan teknik dan reka bentuk, memainkan peranan penting dalam menyokong keperluan projek kejuruteraan yang memerlukan ketepatan dan ketelitian.

Bagaimanapun, pendedahan terhadap teknologi ini di kalangan pelajar TVET (*Technical and Vocational Education and Training*) di Malaysia masih terhad. Walaupun terdapat usaha-usaha untuk mengintegrasikan penggunaan perisian tersebut dalam kurikulum pendidikan, jurang antara pengetahuan akademik dan keperluan industri masih wujud. Kebanyakan pelajar TVET tidak memiliki pengalaman praktikal dengan penggunaan perisian ini semasa mereka mengikuti kursus mereka, yang seterusnya memberi kesan terhadap kesiapsiagaan mereka untuk memasuki pasaran pekerjaan.

Perkembangan pesat dalam teknologi digital ini menuntut agar pelajar TVET dilengkapi dengan kemahiran yang sesuai untuk memenuhi tuntutan pasaran kerja yang semakin

kompetitif. Oleh itu, pendedahan awal terhadap perisian BIM dan AutoCAD dianggap penting dalam mempersiapkan graduan TVET untuk menghadapi cabaran ini. Kajian ini akan menilai impak pendedahan awal perisian BIM dan AutoCAD terhadap kesiapsiagaan kerjaya pelajar TVET, dengan fokus khusus kepada pelajar dalam bidang kejuruteraan.

Berdasarkan kajian yang ada, masih terdapat kekurangan pendedahan terhadap perisian BIM dan AutoCAD di kalangan pelajar TVET, khususnya dalam konteks pendidikan di Malaysia. Walaupun terdapat beberapa inisiatif untuk mengintegrasikan teknologi ini dalam kurikulum pendidikan, kajian yang mendalam mengenai hubungan antara pendedahan perisian ini dan kebolehpasaran pelajar masih terhad. Selain itu, terdapat keperluan mendesak untuk mengenal pasti sejauh mana pendedahan awal ini memberi kesan terhadap kemahiran teknikal pelajar dan bagaimana ia mempengaruhi kesiapsiagaan mereka untuk memasuki dunia pekerjaan. Pendedahan yang rendah terhadap perisian ini boleh menyebabkan pelajar kekurangan kemahiran yang diperlukan untuk bersaing dalam industri, yang mana banyak syarikat dan organisasi memerlukan graduan yang mahir dalam penggunaan perisian teknologi tinggi. Oleh itu, kajian ini bertujuan untuk mengisi jurang pengetahuan ini dan memberikan gambaran yang lebih jelas mengenai kesan pendedahan awal terhadap perisian BIM dan AutoCAD terhadap kesiapsiagaan kerjaya pelajar TVET.

Kajian ini bertujuan untuk menilai impak pendedahan awal terhadap perisian BIM dan AutoCAD terhadap kebolehpasaran dan kesiapsiagaan kerjaya pelajar TVET. Objektif khusus kajian ini adalah seperti berikut:

- Menganalisis tahap pendedahan pelajar TVET terhadap perisian BIM dan AutoCAD serta hubungan antara pengalaman penggunaan perisian ini dengan kebolehpasaran pelajar.
- Menilai pengaruh pendedahan terhadap kemahiran teknikal dan kebolehpasaran pelajar dalam sektor kejuruteraan.
- Mengkaji perbezaan antara pendedahan terhadap perisian BIM dan AutoCAD terhadap kesiapsiagaan kerjaya pelajar dalam industri.

Berdasarkan objektif yang telah dinyatakan, beberapa persoalan kajian yang akan dijawab adalah:

- Apakah kesan pendedahan awal terhadap perisian BIM dan AutoCAD terhadap kemahiran teknikal pelajar TVET?
- Bagaimanakah pendedahan terhadap perisian ini mempengaruhi kebolehpasaran pelajar dalam industri kejuruteraan?
- Apakah perbezaan yang wujud antara pengalaman penggunaan BIM dan AutoCAD terhadap kesiapsiagaan kerjaya pelajar TVET?

Kajian ini menggunakan pendekatan kuantitatif untuk menguji beberapa hipotesis berkaitan dengan hubungan antara pendedahan perisian dan kebolehpasaran pelajar. Hipotesis yang dicadangkan adalah seperti berikut:

- Hipotesis 1: Terdapat hubungan positif yang signifikan antara pengalaman penggunaan perisian BIM dengan kebolehpasaran pelajar TVET.
- Hipotesis 2: Terdapat hubungan positif yang signifikan antara pengalaman penggunaan perisian AutoCAD dengan kebolehpasaran pelajar TVET.
- Hipotesis 3: Pendedahan awal terhadap perisian BIM dan AutoCAD memberi kesan yang signifikan terhadap kesiapsiagaan kerjaya pelajar dalam industri kejuruteraan.

Kajian ini memberi sumbangan kepada teori dan amalan dalam bidang pendidikan teknikal, terutamanya dalam konteks TVET. Secara teorinya, kajian ini menyokong Teori Pembelajaran Konstruktivisme, yang menekankan bahawa pembelajaran lebih berkesan apabila pelajar terlibat dalam pengalaman yang relevan dengan dunia sebenar, seperti menggunakan perisian BIM dan AutoCAD.

Dari segi praktikal, kajian ini memberi implikasi besar kepada institusi pendidikan dan pembuat dasar, terutamanya dalam mengembangkan kurikulum yang lebih sesuai dengan keperluan industri. Keputusan kajian ini juga akan memberi panduan kepada pihak pengurusan pendidikan untuk merancang strategi yang lebih berkesan dalam meningkatkan kebolehpasaran pelajar TVET.

Kajian ini tertumpu kepada pelajar TVET di Malaysia, khususnya dalam bidang kejuruteraan. Skop kajian meliputi pengalaman penggunaan perisian BIM dan AutoCAD, serta penilaiannya terhadap kebolehpasaran dan kesiapsiagaan kerjaya. Batasan kajian ini termasuk hanya melibatkan pelajar yang mengikuti kursus TVET di institusi pendidikan terpilih di Malaysia, dan tidak melibatkan pelajar dari sektor lain atau negara luar. Definisi Operasional

- BIM (Building Information Modeling): Perisian yang digunakan untuk merancang, membina, dan menguruskan maklumat tentang struktur dan infrastruktur secara digital.
- AutoCAD: Perisian reka bentuk berkomputer yang digunakan untuk menghasilkan lukisan teknik dan reka bentuk 2D dan 3D.
- TVET: Pendidikan dan latihan yang memberi tumpuan kepada kemahiran teknikal dalam pelbagai bidang industri untuk menyediakan tenaga kerja yang mahir.
- Kebolehpasaran: Keupayaan graduan untuk mendapatkan pekerjaan dalam industri berkaitan dengan kemahiran yang mereka pelajari.

2. Metodologi

Kajian ini menggunakan pendekatan kuantitatif kerana objektif utamanya adalah untuk mengukur hubungan dan kesan pendedahan awal kepada perisian BIM dan AutoCAD terhadap tahap kesediaan kerjaya pelajar TVET. Pendekatan ini sesuai kerana ia membolehkan pengumpulan data dalam bentuk numerik yang boleh dianalisis secara statistik untuk menguji hipotesis dan mengenal pasti corak serta hubungan yang signifikan secara empirik. Pendekatan ini juga memberikan kebolehpercayaan yang tinggi melalui penggunaan instrumen yang dinilai dari aspek kesahan dan kebolehpercayaan. Reka bentuk kajian ini ialah kajian tinjauan (*survey research*). Kajian tinjauan dipilih kerana ia membolehkan penyelidik mendapatkan data secara menyeluruh daripada sejumlah besar responden dalam jangka masa yang singkat. Reka bentuk ini membolehkan penilaian terhadap tahap pendedahan teknologi dan tahap kesediaan kerjaya secara deskriptif dan inferensi.

Populasi kajian terdiri daripada pelajar awal tahun program TVET dalam bidang kejuruteraan awam, seni bina dan mekanikal di tiga institusi latihan vokasional di Malaysia yang telah terdedah kepada latihan menggunakan perisian BIM dan AutoCAD.Sampel kajian melibatkan seramai 120 pelajar yang dipilih menggunakan teknik pensampelan bertujuan (purposive sampling). Teknik ini dipilih kerana hanya pelajar yang mempunyai pengalaman langsung dalam penggunaan perisian BIM dan AutoCAD layak untuk memberikan maklumat yang relevan dengan objektif kajian. Syarat penyertaan termasuk pengalaman sekurang-kurangnya satu semester dengan perisian berkenaan dan pernah menyertai latihan praktikal industri. Instrumen utama dalam kajian ini ialah soal selidik berstruktur yang dibangunkan berdasarkan literatur terdahulu dan disesuaikan dengan konteks pelajar TVET Malaysia. Soal selidik ini mengandungi tiga bahagian:

- Demografi pelajar (umur, kursus, institusi, pengalaman BIM/AutoCAD)
- Tahap pendedahan kepada perisian BIM dan AutoCAD
- Tahap kesediaan kerjaya (merangkumi dimensi kemahiran teknikal, komunikasi, pemikiran kritikal, dan kebolehpasaran)

Instrumen ini diuji kesahan kandungan (content validity) melalui semakan oleh tiga orang pakar dalam bidang TVET dan pendidikan kejuruteraan. Ujian kebolehpercayaan (reliability test) dijalankan melalui ujian rintis (pilot study) ke atas 30 responden. Nilai Cronbach's Alpha

bagi setiap konstruk berada dalam julat 0.78 hingga 0.89, menunjukkan tahap kebolehpercayaan yang tinggi. Data dianalisis menggunakan perisian SPSS versi 25. Analisis merangkumi:

- Statistik deskriptif: min, sisihan piawai, peratusan – bagi menggambarkan latar belakang responden dan tahap pendedahan/persepsi mereka.
- Ujian korelasi Pearson: untuk menguji hubungan antara pendedahan awal kepada perisian dengan tahap kesediaan kerjaya.
- Ujian regresi linear berganda: untuk menilai sejauh mana faktor pendedahan terhadap BIM dan AutoCAD boleh meramalkan kesediaan kerjaya pelajar.

Pemilihan SPSS adalah berdasarkan keupayaannya untuk mengendalikan data kuantitatif secara efisien dan memberikan hasil yang mudah ditafsirkan dalam bentuk statistik inferensi dan deskriptif yang relevan untuk kajian berskala sederhana seperti ini. Berdasarkan tinjauan literatur ini, satu model kerangka konseptual dicadangkan untuk mengkaji hubungan antara pendedahan awal terhadap perisian BIM dan AutoCAD dengan kebolehpasaran pelajar TVET rajah 1. Model ini mencadangkan bahawa pendedahan terhadap kedua-dua perisian ini akan memberi kesan langsung terhadap kemahiran teknikal pelajar. Kemahiran teknikal yang diperoleh melalui penggunaan perisian ini kemudiannya mempengaruhi kesiapsiagaan kerjaya pelajar, yang seterusnya meningkatkan kebolehpasaran mereka di pasaran kerja.

Dalam model ini, terdapat beberapa pemboleh ubah yang akan diuji, termasuk pengalaman penggunaan perisian, kemahiran teknikal yang diperoleh, dan tahap kesiapsiagaan kerjaya pelajar. Model ini diharapkan dapat memberikan gambaran yang lebih jelas tentang bagaimana pendedahan awal terhadap perisian ini berhubung dengan kebolehpasaran pelajar dalam industri kejuruteraan dan pembinaan.

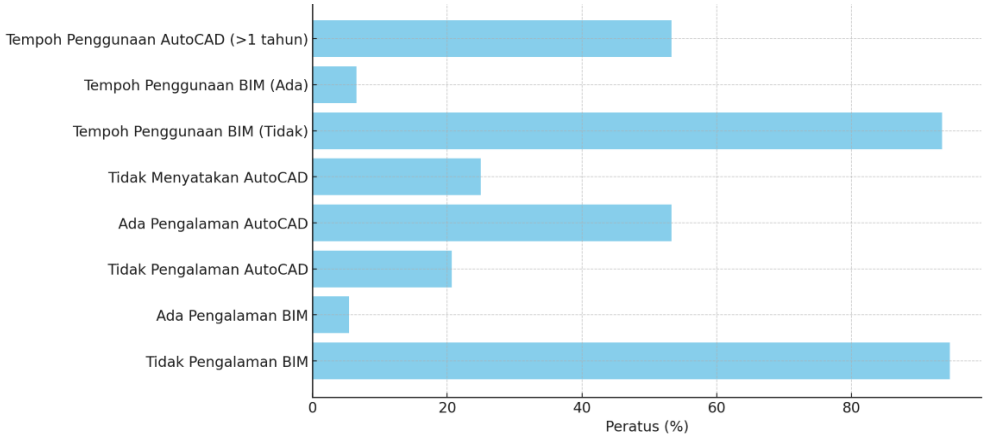
Rajah 1. Model Kerangka Konseptual pendedahan perisian

3. Dapatan dan Perbincangan

Bahagian ini akan membentangkan dapatan utama yang diperoleh melalui analisis data mengenai pendedahan awal terhadap perisian BIM dan AutoCAD, serta kesannya terhadap kebolehpasaran dan kesiapsiagaan kerjaya pelajar TVET. Analisis statistik deskriptif dijalankan bagi menggambarkan profil responden kajian, termasuklah latar belakang demografik mereka seperti umur, jantina, dan pengalaman dalam penggunaan perisian BIM dan AutoCAD.

Sebanyak 92 responden telah terlibat dalam kajian ini, terdiri daripada pelajar TVET dalam bidang kejuruteraan dari beberapa institusi pengajian tinggi di Malaysia. Dari segi jantina, 60%

responden adalah lelaki dan 40% adalah wanita. Umur responden pula adalah antara 18 hingga 25 tahun, dengan purata umur 21 tahun. Menurut data yang diperoleh, sebanyak 94.6% responden melaporkan bahawa mereka tidak mempunyai pengalaman dengan perisian BIM, sementara 5.4% lagi mempunyai pengalaman dengan perisian ini. Sebaliknya, untuk perisian AutoCAD, 53.3% pelajar melaporkan mempunyai pengalaman dengan perisian ini, sementara 20.7% tidak mempunyai pengalaman dan 25% lagi tidak memberikan sebarang jawapan rajah 2. Data ini menunjukkan bahawa walaupun penggunaan AutoCAD lebih meluas, perisian BIM masih kurang dikenali dan digunakan dalam kalangan pelajar TVET, yang menunjukkan kekurangan pendedahan terhadap teknologi yang lebih baru dalam industri kejuruteraan. Selain itu, majoriti pelajar yang mempunyai pengalaman dengan AutoCAD melaporkan telah menggunakan perisian tersebut lebih dari setahun, manakala untuk BIM, majoriti pelajar yang terlibat dalam kajian ini tidak mempunyai pengalaman langsung dengan perisian tersebut.



Rajah 2. Perbandingan pengalaman perisian BIM dan Autocad

Setelah menjalankan ujian statistik deskriptif, langkah seterusnya adalah untuk menilai hubungan antara pendedahan terhadap perisian BIM dan AutoCAD dengan kesediaan kerjaya pelajar melalui ujian inferensi. Ujian korelasi Pearson digunakan untuk menilai hubungan antara pemboleh ubah-pemboleh ubah utama, iaitu pengalaman penggunaan perisian dan tahap kesiapsiagaan pelajar untuk memasuki dunia pekerjaan. Dapatan ujian korelasi menunjukkan bahawa terdapat hubungan positif yang signifikan antara pendedahan terhadap perisian BIM dengan kesiapsiagaan kerjaya pelajar. Nilai korelasi antara pengalaman menggunakan BIM (B1) dan kesiapsiagaan kerjaya (C1) adalah r = 0.409 dengan nilai p 0.000. Ini menunjukkan bahawa semakin tinggi pengalaman penggunaan perisian BIM, semakin tinggi pula tahap kesiapsiagaan kerjaya pelajar untuk memasuki pasaran pekerjaan. Begitu juga dengan perisian AutoCAD, terdapat hubungan positif yang signifikan dengan kesiapsiagaan kerjaya, dengan nilai korelasi r = 0.316 dan p 0.002. Kajian ini juga menunjukkan bahawa kemahiran dalam perisian, seperti yang diwakili oleh pemboleh ubah B6 (kemahiran perisian), mempunyai korelasi yang sangat kuat dengan kesiapsiagaan kerjaya pelajar (C7). Nilai korelasi yang diperoleh adalah r = 0.435 dan p 0.000, yang menunjukkan bahawa penguasaan kemahiran dalam perisian sangat mempengaruhi kebolehpasaran dan kesiapsiagaan pelajar untuk memasuki dunia pekerjaan.

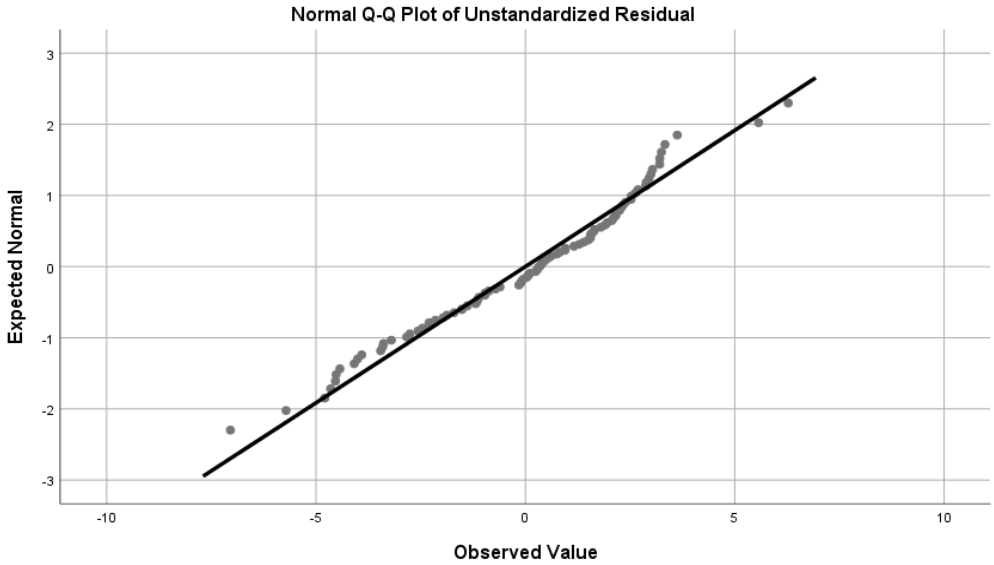
Setelah menilai hubungan antara pemboleh ubah-pemboleh ubah melalui korelasi, analisis regresi linear berganda dilakukan untuk mengenal pasti pemboleh ubah yang paling mempengaruhi kebolehpasaran pelajar. Model regresi ini menunjukkan bahawa sebanyak 41.4% variasi dalam kebolehpasaran pelajar (JUMC) dapat dijelaskan oleh pendedahan terhadap perisian BIM dan AutoCAD, yang diwakili oleh model dengan nilai $R^2 = 0.414$. Dalam model regresi ini, kemahiran perisian (B6) menunjukkan kesan yang paling besar terhadap kebolehpasaran pelajar dengan koefisien beta 0.435 dan nilai p <0.001 rujuk Jadual 1. Ini menunjukkan bahawa kemahiran dalam menggunakan perisian adalah faktor yang sangat

penting dalam meningkatkan kebolehpasaran pelajar. Dapatan ini menunjukkan bahawa pelajar yang lebih mahir dalam menggunakan perisian BIM dan AutoCAD lebih bersedia untuk memasuki dunia pekerjaan berbanding pelajar yang tidak mempunyai kemahiran ini.

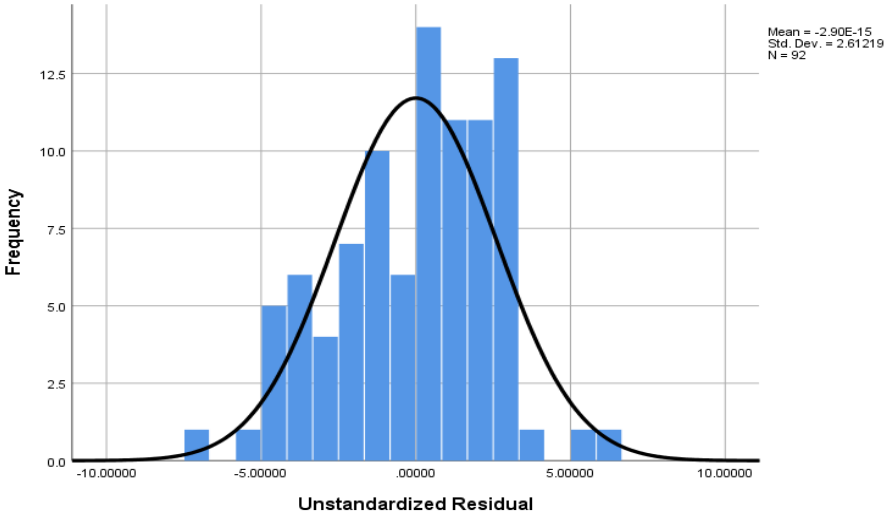
Jadual 1. Analisis regresi linear berganda antara Pendedahan Perisian (B1-B6) dengan kesediaan Kerjaya (JUMC)

Pemboleh Ubah Bebas	B (Unstandardized)	Std. Error	Beta (Standardized)	t	Sig.
(Konstan)	13.654	2.601	–	5.249	0
B1	0.639	0.408	0.153	1.566	0.121
B2	0.149	0.404	0.036	0.369	0.713
B3	0.728	0.381	0.18	1.908	0.06
B4	0.554	0.386	0.125	1.433	0.155
B5	-0.003	0.395	-0.001	-0.007	0.994
B6	1.681	0.364	0.435	4.613	0

Keputusan daripada kedua-dua Q-Q Plot rajah 3 dan Histogram menunjukkan bahawa data residual mengikuti taburan normal rajah 4. Ini mengesahkan bahawa andaian asas untuk regresi linear dipenuhi dan model yang dibina adalah sah. Kedua-dua ujian ini penting kerana ia memastikan bahawa analisis yang digunakan untuk menilai hubungan antara pendedahan pelajar terhadap perisian BIM dan AutoCAD dengan kebolehpasaran mereka adalah tepat dan boleh dipercayai.



Rajah 3. Normal Q-Q plot dengan kefahaman residual



Rajah 4. Histogram data resedual mengikuti taburan normal

Bagi memastikan kesahihan model regresi yang dibina, ujian normaliti dilakukan dengan menggunakan ujian Kolmogorov-Smirnov. Keputusan ujian menunjukkan nilai p 0.098, yang lebih besar daripada paras signifikan 0.05, menandakan bahawa residual daripada model regresi adalah normal. Ini menunjukkan bahawa model regresi yang digunakan adalah sah dan dapat diterima untuk analisis lebih lanjut. Selain itu, ujian kebolehpercayaan menggunakan Cronbach's Alpha dijalankan ke atas instrumen kajian untuk memastikan keandalan soal selidik yang digunakan. Nilai Cronbach's Alpha yang diperoleh adalah 0.777, yang menunjukkan bahawa instrumen kajian ini mempunyai kebolehpercayaan yang baik dan sesuai digunakan untuk kajian ini. Berdasarkan analisis heatmap rujuk rajah 5 korelasi antara item kesediaan kerjaya (C1–C7) dan pendedahan perisian (B1–B6), didapati bahawa hubungan antara kedua-dua pembolehubah adalah secara umumnya lemah dan tidak konsisten. Beberapa item menunjukkan hubungan positif lemah seperti antara C1 dan B1 (r = 0.23), C4 dan B4 (r = 0.29), serta C2 dan B6 (r = 0.28), manakala satu hubungan negatif sederhana dikesan antara C1 dan B4 (r = -0.41). Dapatan ini mencadangkan bahawa terdapat pengaruh yang minimum antara tahap pendedahan kepada perisian dengan kesediaan kerjaya pelajar. Justeru, kajian lanjutan disarankan untuk menilai faktor-faktor lain yang mungkin lebih dominan mempengaruhi kesediaan kerjaya, serta memahami konteks hubungan negatif yang dikesan secara lebih mendalam.

Rajah 5. *Heatmap* Kolerasi antara item kesediaan kerjaya dan pendedahan Perisian

Secara keseluruhan, hasil kajian ini menunjukkan bahawa pendedahan awal terhadap perisian BIM dan AutoCAD mempunyai impak yang signifikan terhadap kebolehpasaran dan kesiapsiagaan kerjaya pelajar TVET. Penemuan ini selari dengan kajian yang dijalankan oleh Garousi et al. (2018) yang menekankan bahawa penguasaan perisian BIM sangat relevan dalam meningkatkan peluang pekerjaan graduan dalam bidang kejuruteraan. Penguasaan perisian ini bukan sahaja membantu pelajar dalam meningkatkan kemahiran teknikal, tetapi juga mempersiapkan mereka untuk menghadapi cabaran industri yang semakin berteknologi tinggi. Oleh itu, kajian ini menyarankan agar institusi pendidikan TVET di Malaysia memperkenalkan dan memperluaskan penggunaan perisian ini dalam kurikulum mereka untuk memastikan graduan lebih bersedia untuk memasuki pasaran pekerjaan.

4. Kesimpulan

Kajian ini bertujuan menilai impak pendedahan awal terhadap perisian Building Information Modeling (BIM) dan AutoCAD terhadap kebolehpasaran serta kesiapsiagaan kerjaya pelajar TVET. Dapatan utama menunjukkan wujud hubungan signifikan antara pendedahan kepada perisian ini dengan tahap kesiapsiagaan pelajar memasuki pasaran kerja. Analisis deskriptif mendapati AutoCAD lebih meluas digunakan berbanding BIM, namun penggunaan BIM masih rendah dalam kalangan pelajar TVET. Walau demikian, pengalaman menggunakan kedua-dua perisian terbukti memberi kesan langsung terhadap kemahiran teknikal pelajar, sekali gus meningkatkan kebolehpasaran mereka. Ujian korelasi Pearson mendapati hubungan positif signifikan antara pengalaman menggunakan BIM dan AutoCAD dengan kesiapsiagaan kerjaya pelajar. Hasil ini selari dengan kajian Garousi et al. (2018) yang menekankan pentingnya kemahiran teknikal dalam meningkatkan peluang pekerjaan graduan kejuruteraan. Analisis regresi linear berganda juga menunjukkan bahawa penguasaan perisian merupakan pemboleh ubah paling mempengaruhi kebolehpasaran, dengan koefisien beta yang tinggi.

Dari sudut teori, dapatan ini menyokong Teori Pembelajaran Konstruktivisme yang menegaskan pengalaman praktikal sebagai asas pembelajaran berkesan. Pendedahan kepada perisian BIM dan AutoCAD membolehkan pelajar mengaplikasikan pengetahuan dalam konteks sebenar, sekali gus meningkatkan kemahiran teknikal dan kesiapsiagaan kerjaya. Mohammed dan Kinyo (2020) turut menekankan bahawa penglibatan aktif dalam pembelajaran praktikal bukan sahaja memperkukuh pemahaman pelajar, malah mempersiapkan mereka menghadapi cabaran dunia pekerjaan. Pendedahan kepada teknologi moden seperti BIM juga memberi kelebihan kepada pelajar TVET dalam menyesuaikan diri dengan industri pembinaan yang semakin canggih. Garousi et al. (2018) menegaskan bahawa penguasaan BIM adalah kritikal untuk memastikan graduan mempunyai kemahiran relevan, manakala Mesaros et al. (2020) menunjukkan BIM membantu meningkatkan kualiti projek pembinaan serta mempercepatkan proses kerja. Namun, kajian ini turut mendapati jurang penggunaan antara AutoCAD dan BIM. AutoCAD lebih popular, tetapi BIM dilihat lebih canggih serta relevan dengan kehendak industri. Oleh itu, pendidikan TVET perlu menambah baik pengajaran agar pelajar lebih terdedah kepada teknologi moden ini. Dapatan ini menyokong teori konstruktivisme bahawa pembelajaran berasaskan pengalaman teknologi dapat meningkatkan keberkesanan pendidikan teknikal.

Implikasinya, institusi pendidikan perlu mengintegrasikan lebih banyak latihan praktikal menggunakan perisian terkini. Latihan industri yang memberi peluang pelajar mengaplikasikan pengetahuan dalam situasi sebenar wajar diperluas. Pensyarah juga perlu diberi latihan berkala agar lebih efektif dalam pengajaran (Hassan et al., 2021). Bagi pembuat dasar, dapatan ini menyoroti keperluan mengemas kini dasar pendidikan TVET agar lebih menekankan teknologi terkini. Kerajaan perlu menyediakan dana untuk melengkapkan institusi dengan perisian moden serta melatih tenaga pengajar. Sebagai cadangan, peningkatan akses kepada perisian perlu diperkasa melalui kerjasama dengan syarikat teknologi untuk menyediakan lesen perisian percuma atau bersubsidi. Selain itu, kajian lanjutan boleh meneroka perisian lain seperti Revit atau SketchUp, serta melibatkan institusi

pendidikan berbeza untuk gambaran menyeluruh. Kesimpulannya, pendedahan awal kepada BIM dan AutoCAD memberi impak positif terhadap kebolehpasaran dan kesiapsiagaan kerjaya pelajar TVET. Pendidikan teknikal perlu terus mengadaptasi teknologi terkini bagi memastikan graduan lebih kompetitif dalam pasaran pekerjaan.

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PERSEPSI PENSYARAH TERHADAP PENGGUBALAN SOALAN PENTAKSIRAN BERTERUSAN: SATU KAJIAN DI KOLEJ KOMUNITI SEBERANG JAYA

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Abstrak

Kajian ini bertujuan untuk mengenal pasti persepsi pensyarah terhadap proses penggubalan soalan pentaksiran berterusan di Kolej Komuniti Seberang Jaya, meliputi tiga aspek utama iaitu tahap kefahaman, cabaran yang dihadapi, serta sokongan yang diperlukan. Seramai 29 orang pensyarah terlibat sebagai responden kajian melalui borang soal selidik yang dibina berdasarkan skala Likert lima mata. Dapatan menunjukkan bahawa tahap kefahaman pensyarah terhadap proses penggubalan soalan berada pada tahap tinggi dimana min berada di antara 4.07 hingga 4.31, manakala pelbagai cabaran turut dikenal pasti seperti kekangan masa, kekurangan rujukan rasmi, dan keperluan semakan rakan sebaya dengan min antara 4.07 hingga 4.52. Selain itu, pensyarah menyatakan keperluan terhadap pelbagai bentuk sokongan seperti latihan berkala, panduan rasmi, contoh soalan berkualiti dan penubuhan kumpulan pakar min antara 4.34 hingga 4.52. Kajian ini mencadangkan agar pihak pengurusan menyediakan sokongan berstruktur bagi memastikan keberkesanan dan kualiti penggubalan soalan pentaksiran berterusan yang sejajar dengan hasil pembelajaran kursus.
Kata kunci: Persepsi pensyarah; Penggubalan soalan; Pentaksiran berterusan.

1. Pengenalan

Pentaksiran berterusan merupakan komponen penting dalam sistem pendidikan tinggi yang berperanan untuk menilai kefahaman, kecekapan dan pencapaian pelajar secara berperingkat sepanjang tempoh pembelajaran (Ahmad et al., 2021). Di Kolej Komuniti, termasuk Kolej Komuniti Seberang Jaya, pendekatan ini selari dengan falsafah pendidikan berteraskan kemahiran dan kompetensi, di mana proses penilaian perlu mencerminkan perkembangan holistik pelajar secara berterusan, bukan semata-mata pada akhir kursus. Penggubalan soalan pentaksiran berterusan yang berkualiti bukan sekadar memenuhi keperluan kurikulum, tetapi turut mencerminkan pemahaman pensyarah terhadap hasil pembelajaran kursus (CLO), taksonomi aras kognitif, dan kehendak standard penilaian seperti yang digariskan oleh Agensi Kelayakan Malaysia (MQA, 2019). Keberkesanan soalan yang digubal amat bergantung kepada keupayaan pensyarah untuk menyesuaikan item penilaian dengan aras kemahiran pelajar serta hasil pembelajaran yang ingin dicapai (Rahman & Samad, 2020). Justeru, penggubalan yang sistematik dan berpandukan prinsip penilaian yang sahih sangat diperlukan.

Walau bagaimanapun, dalam amalan sebenar, pensyarah sering berdepan dengan pelbagai cabaran seperti kekangan masa, kekurangan rujukan atau latihan, serta ketidakpastian terhadap format dan kriteria penilaian (Zulkifli & Jamaludin, 2022). Kajian lepas menunjukkan bahawa masih wujud jurang antara pengetahuan teori tentang pentaksiran dengan pelaksanaan praktikal dalam bilik darjah, terutamanya dalam kalangan pensyarah pendidikan teknikal dan vokasional (TVET) (Ahmad et al., 2021). Bagi Kolej Komuniti Seberang Jaya, usaha ke arah penambahbaikan kualiti penggubalan soalan amat kritikal, lebih-lebih lagi

dalam memastikan keseragaman dan kebolehpercayaan pentaksiran antara kursus dan jabatan. Kelemahan dalam aspek ini boleh memberi kesan langsung kepada integriti akademik serta pencapaian pelajar secara keseluruhan. Oleh itu, kajian ini dijalankan untuk mengenal pasti persepsi pensyarah terhadap tahap pemahaman, cabaran, serta keperluan penambahbaikan berkaitan proses penggubalan soalan pentaksiran berterusan. Dapatan kajian dijangka dapat memberi input bermakna kepada Unit Peperiksaan Kolej Komuniti Seberang Jaya dalam merancang strategi sokongan yang lebih berkesan dan bersasar.

Penggubalan soalan pentaksiran berterusan yang berkualiti merupakan aspek kritikal dalam menjamin keberkesanan sistem penilaian akademik di institusi pendidikan tinggi, termasuk Kolej Komuniti. Di Kolej Komuniti Seberang Jaya, pensyarah memainkan peranan utama dalam merancang, menggubal dan melaksanakan pentaksiran yang seharusnya sejajar dengan keperluan kurikulum, hasil pembelajaran kursus (CLO), dan aras kognitif pelajar. Namun begitu, terdapat petunjuk awal bahawa tahap pemahaman dalam kalangan pensyarah berkaitan prinsip dan garis panduan penggubalan soalan masih belum seragam dan menyeluruh. Kajian terdahulu (Ahmad et al., 2021; Rahman & Samad, 2020) menunjukkan bahawa pensyarah institusi TVET sering menghadapi cabaran seperti kekangan masa, kurang latihan khusus, kekeliruan terhadap format dan ketidaktentuan aras soalan yang sesuai. Situasi ini turut dilaporkan berlaku di institusi Kolej Komuniti, termasuk di Seberang Jaya, yang menimbulkan persoalan tentang tahap kesediaan dan kefahaman sebenar pensyarah dalam menggubal instrumen pentaksiran yang sahih dan boleh dipercayai. Lebih membimbangkan, ketiadaan mekanisme semakan rakan sebaya atau sokongan sistematik daripada Unit Peperiksaan boleh membawa kepada ketidakseimbangan kualiti soalan antara kursus dan jabatan. Sekiranya isu ini tidak ditangani secara menyeluruh, ia boleh menjejaskan integriti akademik, keadilan penilaian pelajar dan akhirnya menurunkan reputasi institusi. Justeru, kajian ini dijalankan bagi mengenal pasti tahap pemahaman pensyarah, mengenal pasti cabaran sebenar yang dihadapi, serta meneroka keperluan penambahbaikan yang boleh dilaksanakan oleh pihak pengurusan peperiksaan di Kolej Komuniti Seberang Jaya. Dapatan kajian dijangka mampu menyokong pembangunan sistem pentaksiran yang lebih mantap, sistematik dan berkesan pada masa hadapan.

Kajian ini dihasilkan bagi mencapai tiga objektif yang berikut:

- Mengenal pasti tahap pemahaman pensyarah terhadap proses penggubalan soalan pentaksiran berterusan di Kolej Komuniti Seberang Jaya.
- Mengenal pasti cabaran yang dihadapi oleh pensyarah dalam proses penggubalan soalan pentaksiran berterusan.
- Mengenal pasti keperluan penambahbaikan dalam proses pengurusan dan sokongan oleh Unit Peperiksaan bagi meningkatkan kualiti penggubalan soalan pentaksiran.

Pentaksiran berterusan adalah alat penting dalam pendidikan tinggi untuk menilai kemajuan pelajar sepanjang kursus. Di Kolej Komuniti Seberang Jaya, ia memainkan peranan besar dalam memastikan pelajar menguasai bukan sahaja teori, tetapi juga kemahiran praktikal yang diperlukan dalam dunia industri (Ahmad et al., 2021). Dalam konteks ini, pensyarah perlu menggubal soalan yang mencabar dan selaras dengan hasil pembelajaran kursus menggunakan taksonomi Bloom (Rahman & Samad, 2020). Namun, kajian menunjukkan bahawa pensyarah sering menghadapi cabaran dalam menggubal soalan pentaksiran yang berkesan. Abdullah dan Razak (2018) menjelaskan bahawa banyak pensyarah TVET belum sepenuhnya menguasai prinsip penggubalan soalan beraras tinggi, yang menyebabkan ketidakseimbangan dalam penilaian. Zulkifli dan Jamaludin (2022) juga mendapati bahawa kekurangan latihan rasmi menyukarkan pensyarah untuk menghasilkan soalan yang berkualiti dan sesuai dengan hasil pembelajaran.

Cabaran lain termasuk kekangan masa, beban kerja yang tinggi, dan kurangnya sokongan daripada pihak pengurusan akademik. Pensyarah memerlukan sokongan yang lebih baik

dalam bentuk latihan berterusan dan semakan soalan (Noraini et al., 2022). Latihan yang lebih sistematik dan penggunaan teknologi dalam pembangunan soalan boleh membantu pensyarah menghasilkan pentaksiran yang lebih efektif dan konsisten. Secara keseluruhannya, literatur menunjukkan bahawa walaupun pentaksiran berterusan penting di Kolej Komuniti, ia masih berdepan dengan beberapa cabaran yang perlu ditangani untuk meningkatkan kualiti penilaian.

Kajian ini dijalankan dengan matlamat untuk memberikan sumbangan yang signifikan kepada peningkatan mutu pentaksiran berterusan di Kolej Komuniti, khususnya dari sudut penggubalan soalan oleh pensyarah. Terdapat tiga pihak utama yang akan menerima manfaat langsung daripada dapatan kajian ini:

- Kajian ini membantu pensyarah mengenal pasti tahap kefahaman dan amalan mereka dalam penggubalan soalan pentaksiran berterusan. Ia membuka ruang kepada peningkatan profesional melalui latihan, semakan rakan sebaya, dan pemantapan penggunaan taksonomi Bloom secara efektif.
- Kajian ini menyediakan maklumat penting untuk Unit Peperiksaan dalam menilai keperluan latihan, menyediakan garis panduan penggubalan soalan yang standard, dan menambah baik proses semakan serta kualiti pentaksiran di peringkat kolej.
- Kajian ini juga memberi impak pada peringkat sistemik dengan menyediakan data empirikal yang boleh dijadikan rujukan oleh Bahagian Peperiksaan dan Penilaian JPPKK dalam merangka dasar, modul latihan, dan intervensi peningkatan kualiti pentaksiran. Penemuan kajian ini boleh dijadikan asas kepada pembentukan kerangka penilaian nasional yang lebih mampan, sejajar dengan keperluan TVET masa kini yang menekankan pembelajaran berasaskan hasil (OBE).

2. Metodologi

Kajian ini menggunakan pendekatan kuantitatif dengan reka bentuk tinjauan deskriptif bagi meneliti persepsi pensyarah terhadap penggubalan soalan pentaksiran berterusan di Kolej Komuniti Seberang Jaya. Pendekatan ini dipilih kerana ia membolehkan penyelidik mengumpulkan data secara sistematik daripada kumpulan responden yang spesifik, seterusnya membuat penilaian berdasarkan pola dan kecenderungan yang diperoleh (Creswell, 2014). Reka bentuk tinjauan ini amat sesuai digunakan dalam kajian yang melibatkan penerokaan tahap kefahaman, cabaran yang dihadapi serta keperluan atau sokongan yang diperlukan dalam kalangan pensyarah. Populasi kajian terdiri daripada semua pensyarah yang sedang berkhidmat di Kolej Komuniti Seberang Jaya, khususnya mereka yang terlibat secara langsung dalam penggubalan soalan bagi pentaksiran berterusan. Pensampelan dilakukan secara bertujuan bagi memastikan hanya pensyarah yang relevan dan mempunyai pengalaman dalam penggubalan soalan dinilai. Dijangkakan seramai 29 orang pensyarah akan menjadi responden dalam kajian ini. Instrumen utama kajian ialah borang soal selidik yang dibina berdasarkan tiga objektif utama kajian. Soal selidik ini terbahagi kepada empat bahagian, iaitu Bahagian A yang mengumpul maklumat demografi, Bahagian B yang menilai tahap kefahaman pensyarah terhadap penggubalan soalan pentaksiran, Bahagian C yang meneliti cabaran yang dihadapi oleh pensyarah, dan Bahagian D yang mengenal pasti bentuk sokongan yang diperlukan untuk mempertingkat proses penggubalan. Item-item dalam Bahagian B hingga D menggunakan skala Likert lima mata bagi membolehkan responden menyatakan tahap persetujuan mereka secara lebih terperinci (Joshi et al., 2015).

Pengumpulan data akan dilaksanakan secara atas talian menggunakan platform Google Form. Soal selidik akan diedarkan kepada responden melalui aplikasi Telegram dan e-mel rasmi institusi dengan tempoh respon selama satu minggu. Peringatan berkala akan dihantar bagi memastikan kadar respons yang memuaskan. Keselamatan dan kerahsiaan data responden akan dijaga sepenuhnya sepanjang tempoh kajian ini dijalankan. Data yang

diperoleh akan dianalisis menggunakan perisian IBM Statistical Package for the Social Sciences (SPSS) versi 27.0. Kaedah analisis yang digunakan ialah statistik deskriptif, termasuk pengiraan min, peratusan dan sisihan piawai bagi setiap bahagian utama soal selidik. Kaedah ini dipilih kerana ia bersesuaian dengan objektif kajian yang bersifat penerokaan dan penilaian umum terhadap persepsi, cabaran serta keperluan sokongan. Bagi memastikan kesahan dan kebolehpercayaan instrumen soal selidik, ujian kebolehpercayaan (reliability test) akan dijalankan melalui pengiraan pekali Alpha Cronbach, dengan nilai $\alpha \geq 0.7$ diterima sebagai tahap kebolehpercayaan yang memuaskan. Kajian ini akan dilaksanakan dengan mematuhi prinsip etika penyelidikan, termasuk mendapatkan persetujuan dimaklumkan daripada semua responden, menjaga kerahsiaan maklumat, dan memastikan data digunakan hanya untuk tujuan akademik dan penyelidikan semata-mata.

3. Dapatan dan Perbincangan

Seramai 29 orang pensyarah Kolej Komuniti Seberang Jaya telah terlibat sebagai responden dalam kajian ini. Daripada jumlah tersebut, 58.6% adalah lelaki dan 41.4% adalah perempuan. Dari segi umur, majoriti responden berada dalam lingkungan umur 41 hingga 50 tahun (86.2%), manakala selebihnya berumur antara 31 hingga 40 tahun (10.3%) dan 51 tahun ke atas (3.4%). Berdasarkan program pengajaran, hampir separuh daripada responden mengajar dalam program Sijil Teknologi Elektrik (48.3%), diikuti oleh Sijil Teknologi Maklumat (20.7%), Diploma in Electronics (Instrumentation) (17.2%) dan Pengajian Umum (13.8%). Kesemua responden mempunyai pengalaman mengajar lebih daripada 10 tahun, menunjukkan bahawa dapatan kajian diperoleh daripada pensyarah yang berpengalaman luas. Selain itu, 93.1% daripada mereka pernah menghadiri bengkel penggubalan soalan, manakala hanya 6.9% tidak pernah mengikutinya. Jadual 1 dibawah menunjukkan kekerapan dan peratusan responden yang terlibat dalam kajian ini.

Jadual 1. Profil Responden

Demografi	Kategori Respondan	Kekerapan	Peratusan
Jantina	Lelaki	17	58.60%
	Perempuan	12	41.40%
Umur	31 – 40 tahun	3	10.30%
	41 – 50 tahun	25	86.20%
	51 tahun ke atas	1	3.40%
Program	Sijil Teknologi Elektrik	14	48.30%
	Diploma in Electronics (Instrumentation)	5	17.20%
	Sijil Teknologi Maklumat	6	20.70%
	Pengajian Umum	4	13.80%
Pengalaman Mengajar	Lebih 10 tahun	29	100%
Pernah Menghadiri bengkel penggubalan soalan	ya	27	93.1%
	Tidak	2	6.9%

Ujian kebolehpercayaan telah dijalankan bagi menentukan sejauh mana konsistensi dalaman item-item soal selidik yang dibina. Nilai pekali Alpha Cronbach digunakan sebagai petunjuk utama, di mana nilai $\alpha \geq 0.70$ dianggap menunjukkan tahap kebolehpercayaan yang memuaskan dan boleh diterima (Sekaran & Bougie, 2016). Instrumen ini terdiri daripada tiga konstruk utama selaras dengan objektif kajian seperti Jadual 2 dibawah:

Jadual 2. Analisa kebolehpercayaan

Objektif	Bil. Item	Alpha Cronbach (α)	Tahap Kebolehpercayaan
Kefahaman tentang penggubalan soalan	10	0.804	Tinggi
Cabaran dalam penggubalan soalan	10	0.760	Memuaskan
Keperluan penambahbaikan dan sokongan	10	0.805	Tinggi

Kesemua nilai Alpha Cronbach melebihi nilai minimum 0.70, sekali gus menunjukkan bahawa item-item dalam setiap konstruk mempunyai konsistensi dalaman yang baik. Maka, instrumen ini dianggap sah dari segi kebolehpercayaan dan sesuai digunakan untuk tujuan kajian ini. Bagi mencapai objektif ini, sebanyak 10 item soal selidik telah digunakan untuk menilai tahap kefahaman pensyarah terhadap aspek-aspek utama dalam penggubalan soalan pentaksiran berterusan. Nilai min ≥ 3.68 dianggap sebagai tahap tinggi (Mohd Majid Konting, 2005) dijadikan sebagai rujukan didalam kajian ini bagi menentukan interpretasi terhadap soalan kajian. Jadual 3 menunjukkan nilai min dan sisihan piawai tahap kefahaman pensyarah Kolej Komuniti Seberang Jaya terhadapat penggubalan soalan.

Jadual 3. Tahap Kefahaman Terhadap Penggubalan Soalan

Bil	Item	Min	Sisihan Piawai (SP)	Interpretasi
1	Saya memahami konsep pentaksiran berterusan.	4.17	0.38	Tinggi
2	Saya jelas tentang keperluan menggubal soalan mengikut hasil pembelajaran kursus (CLO).	4.14	0.44	Tinggi
3	Saya faham tentang penggunaan aras Taksonomi Bloom dalam penggubalan soalan.	4.10	0.67	Tinggi
4	Saya mampu membezakan soalan aras rendah, sederhana dan tinggi.	4.21	0.41	Tinggi
5	Saya boleh menggubal soalan yang sah dan boleh dipercayai.	4.14	0.35	Tinggi
6	Saya mempunyai pengetahuan mencukupi untuk membina rubrik pemarkahan.	4.21	0.49	Tinggi
7	Saya sentiasa merujuk panduan rasmi dalam menggubal soalan.	4.07	0.45	Tinggi
8	Saya memahami konsep kesukaran dan keberkesanan soalan.	4.31	0.66	Tinggi
9	Saya mengetahui perbezaan antara soalan formatif dan sumatif.	4.14	0.35	Tinggi
10	Saya yakin dengan kemahiran penggubalan saya.	4.17	0.46	Tinggi

Dapatan menunjukkan bahawa tahap kefahaman pensyarah terhadap proses penggubalan soalan adalah tinggi, dengan semua item mencatatkan nilai min melebihi 4.00. Ini mencerminkan tahap kesedaran dan penguasaan yang baik dalam kalangan pensyarah terhadap prinsip asas penggubalan soalan. Item yang memperoleh nilai min tertinggi ialah *"Saya memahami konsep kesukaran dan keberkesanan soalan"* (Min = 4.31, SP = 0.66), menunjukkan bahawa pensyarah mempunyai kefahaman yang kukuh terhadap aspek penilaian kesukaran dan keberkesanan item soalan yang digubal. Selain itu, dua item lain yang mencatatkan nilai min yang tinggi ialah *"Saya mampu membezakan soalan aras rendah, sederhana dan tinggi"* (Min = 4.21, SP = 0.41) dan *"Saya mempunyai pengetahuan mencukupi untuk membina rubrik pemarkahan"* (Min = 4.21, SP = 0.49). Ini menunjukkan bahawa pensyarah bukan sahaja memahami taksonomi penilaian, malah bersedia membina instrumen pemarkahan yang sesuai. Namun, item *"Saya sentiasa merujuk panduan rasmi dalam menggubal soalan"* mencatatkan nilai min paling rendah (Min = 4.07, SP = 0.45). Walaupun nilai ini masih berada dalam kategori tinggi, ia menunjukkan bahawa amalan merujuk dokumen panduan mungkin tidak dilakukan secara konsisten oleh semua pensyarah.

Ini merupakan satu aspek yang wajar diberi perhatian oleh pihak pengurusan dalam bentuk pengukuhan garis panduan atau penyediaan sumber rujukan yang lebih mudah diakses.
Analisis deskriptif keseluruhan menunjukkan nilai min keseluruhan ialah 4.16 dengan sisihan piawai 0.28. Nilai ini menunjukkan tahap kefahaman yang tinggi dikalangan pensyarah. Skor minimum direkodkan pada 3.70 manakala maksimum ialah 4.90, dengan taburan yang konsisten dan sisihan piawai yang rendah, menunjukkan keseragaman tahap pemahaman pensyarah. Secara keseluruhannya, hasil ini menunjukkan bahawa pensyarah mempunyai pemahaman yang baik dalam proses penggubalan soalan. Walau bagaimanapun, pelaksanaan latihan berterusan dan bimbingan teknikal masih diperlukan bagi meningkatkan kualiti dan ketepatan penggubalan soalan selaras dengan kehendak kurikulum dan memenuhi piawaian.

Objektif kedua ini adalah untuk mengenal pasti tahap cabaran yang dihadapi oleh pensyarah dalam proses penggubalan soalan pentaksiran berterusan. Sebanyak sepuluh item telah digunakan bagi mengukur persepsi responden terhadap aspek cabaran tersebut. Analisis deskriptif menunjukkan bahawa kesemua item memperoleh min melebihi 4.00, yang menunjukkan tahap persepsi yang tinggi terhadap semua cabaran yang diukur. Jadual 4 dibawah menunjukkan cabaran yang dihadapi oleh pensyarah Kolej Komuniti Seberang Jaya dalam proses penggubalan soalan.

Jadual 4. Cabaran Terhadap Proses Penggubalan Soalan

No	Pernyataan	Min	Sisihan Piawai	Interpretasi
1	Saya mempunyai masa yang mencukupi untuk menggubal soalan berkualiti.	4.34	0.55	Tinggi
2	Saya mempunyai akses kepada bahan rujukan rasmi semasa menggubal soalan.	4.52	0.50	Tinggi
3	Saya dapat memastikan soalan yang saya gubal selaras dengan hasil pembelajaran.	4.41	0.50	Tinggi
4	Saya sentiasa menerima semakan rakan sebaya secara konsisten.	4.48	0.50	Tinggi
5	Saya telah menerima latihan khusus berkaitan penggubalan soalan.	4.34	0.48	Tinggi
6	Saya jelas tentang format piawai yang perlu digunakan.	4.07	0.37	Tinggi
7	Saya berupaya menggubal soalan aras tinggi.	4.10	0.40	Tinggi
8	Saya mendapat bimbingan dan sokongan yang mencukupi daripada pihak pengurusan.	4.28	0.45	Tinggi
9	Saya mempunyai akses kepada bank soalan terdahulu.	4.41	0.50	Tinggi
10	Saya terlibat secara aktif dalam proses pemurnian atau penjaminan kualiti.	4.34	0.48	Tinggi

Item yang mencatatkan skor min tertinggi ialah *"Saya mempunyai akses kepada bahan rujukan rasmi semasa menggubal soalan"* dengan min 4.52, menunjukkan bahawa kemudahan bahan rujukan sangat membantu pensyarah dalam penggubalan soalan. Manakala item dengan skor min paling rendah ialah *"Saya jelas tentang format piawai yang perlu digunakan"* dengan min 4.07, yang menunjukkan keperluan untuk penjelasan atau garis panduan yang lebih jelas mengenai format standard yang perlu dipatuhi.
Dapatan ini menunjukkan bahawa walaupun cabaran dalam proses penggubalan soalan adalah tinggi, kebanyakan pensyarah telah dilengkapi dengan sokongan dan sumber yang diperlukan. Walau bagaimanapun, aspek pemahaman terhadap format piawai dan keupayaan menggubal soalan aras tinggi masih boleh dipertingkatkan melalui latihan dan bimbingan teknikal berterusan. Secara keseluruhan, nilai min bagi aspek cabaran yang dikaji adalah 4.33 dengan sisihan piawai 0.27, menunjukkan tahap persepsi yang tinggi dan konsisten dalam kalangan pensyarah terhadap cabaran yang dihadapi dalam penggubalan soalan pentaksiran berterusan.

Objektif ketiga dalam kajian ini menumpukan kepada keperluan penambahbaikan dan sokongan yang diperlukan oleh pensyarah dalam melaksanakan proses penggubalan soalan dengan berkesan. Terdapat sepuluh item yang digunakan untuk menilai objektif ini. Kesemua skor min bagi pernyataan yang dikaji adalah melebihi 4.30, menunjukkan tahap keperluan dan sokongan yang diperlukan adalah tinggi dalam proses penggubalan soalan.

Jadual 5. Tahap Keperluan Sokongan dalam Proses Penggubalan Soalan

No	Pernyataan	Min	Sisihan Piawai	Interpretasi
1	Saya memerlukan latihan berkala dalam penggubalan soalan.	4.41	0.50	Tinggi
2	Saya perlukan garis panduan rasmi daripada Unit Peperiksaan.	4.45	0.57	Tinggi
3	Saya perlukan templat atau format rasmi untuk penggubalan soalan.	4.48	0.50	Tinggi
4	Saya ingin akses kepada contoh soalan berkualiti tinggi.	4.48	0.57	Tinggi
5	Saya menyokong pelaksanaan semakan rakan sebaya secara berkala.	4.48	0.50	Tinggi
6	Saya perlukan bengkel teknikal berkaitan taksonomi Bloom.	4.38	0.49	Tinggi
7	Saya mencadangkan penubuhan kumpulan pakar mata pelajaran (SME).	4.45	0.50	Tinggi
8	Saya sokong pemantapan sistem audit dalaman kualiti soalan.	4.38	0.49	Tinggi
9	Saya ingin adanya saluran sokongan atau mentoring penggubalan.	4.34	0.48	Tinggi
10	Saya harap JPPKK menyediakan latihan/kursus penggubalan soalan.	4.52	0.50	Tinggi

Hasil dari dapatan yang diperoleh, min tertinggi direkodkan ialah pada item *"Saya harap JPPKK menyediakan latihan penggubalan soalan"* (min = 4.52), menggambarkan harapan besar pensyarah terhadap peranan pihak atasan dalam menyediakan latihan atau kursus berkaitan penggubalan soalan secara lebih berkala. Begitu juga, pernyataan berkaitan keperluan kepada garis panduan, format rasmi, contoh soalan dan semakan rakan sebaya turut menunjukkan min yang tinggi (4.45 ke atas). Berdasarkan analisis deskriptif, nilai min keseluruhan yang diperoleh adalah 4.43 dengan sisihan piawai 0.31. Ini menunjukkan bahawa tahap sokongan yang dirasakan oleh pensyarah berada pada paras yang tinggi dan agak konsisten merentas responden. Keputusan ini menunjukkan bahawa pensyarah amat memerlukan ekosistem sokongan yang menyeluruh merangkumi latihan, garis panduan, teknikal, dan penyeliaan bagi memastikan kualiti penggubalan soalan berada pada tahap optimum. Penubuhan kumpulan pakar mata pelajaran dan sistem audit dalaman juga dilihat sebagai antara keperluan penting dalam meningkatkan kualiti pentaksiran.

4. Kesimpulan

Kajian ini telah mengenal pasti tahap pengetahuan, cabaran yang dihadapi, dan bentuk sokongan yang diperlukan oleh pensyarah dalam proses penggubalan soalan bagi pentaksiran berterusan di Kolej Komuniti Seberang Jaya. Dapatan menunjukkan bahawa secara keseluruhannya, pensyarah memiliki tahap pengetahuan yang tinggi terhadap aspek asas penggubalan soalan, terutamanya berkaitan pemahaman format dan keperluan selarasan dengan hasil pembelajaran.

Namun begitu, kajian turut mendedahkan bahawa terdapat cabaran signifikan yang dihadapi, antaranya adalah kekangan masa, kekurangan bahan rujukan rasmi, serta keperluan kepada bimbingan dan semakan yang lebih sistematik. Walaupun tahap persepsi terhadap cabaran ini adalah tinggi, ia tidak menggambarkan kelemahan mutlak pensyarah, sebaliknya mencerminkan keperluan terhadap persekitaran sokongan yang lebih kukuh.

Seterusnya, analisis terhadap objektif ketiga menunjukkan bahawa pensyarah mempunyai keperluan tinggi terhadap pelbagai bentuk sokongan termasuk latihan berkala, garis panduan rasmi, akses kepada soalan contoh, dan penubuhan kumpulan pakar mata pelajaran (SME). Sokongan teknikal seperti bengkel taksonomi Bloom, saluran mentoring dan sistem audit dalaman turut dikenalpasti sebagai aspek penting bagi meningkatkan mutu soalan yang dibangunkan. Secara keseluruhan, kajian ini menegaskan pentingnya peranan pihak pengurusan institusi dalam menyediakan sokongan berstruktur dan berterusan kepada pensyarah. Penemuan ini boleh dijadikan asas dalam merangka strategi peningkatan kualiti penggubalan soalan pentaksiran yang lebih efektif, sekaligus memastikan keberkesanan proses pembelajaran dan penilaian di peringkat Kolej Komuniti.

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REKA BENTUK KIT PEMBELAJARAN MODEL IBS SEBAGAI ALAT BANTU MENGAJAR DI INSTITUSI TVET

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Abstrak

Kajian ini menggunakan pendekatan reka bentuk pembangunan *(design and development research),* yang dilaksanakan dalam beberapa peringkat utama. Setelah dapatan daripada kajian awal diperoleh melalui pemerhatian dan maklum balas pelajar terhadap prototaip awal, proses reka bentuk model dimulakan. Model-model struktur modular *(Industrilised Building Services)* IBS direka bentuk semula berdasarkan input awal bagi meningkatkan kefungsian, kebolehfahaman, dan kesesuaian dalam konteks pembelajaran bilik darjah. Seterusnya, komponen-komponen model dicetak menggunakan teknologi pencetakan 3D, mengikut spesifikasi reka bentuk yang telah dimuktamadkan. Bahan cetakan dipilih berdasarkan ciri mesra pengguna, ringan, dan tahan lama agar sesuai digunakan oleh pelajar di pelbagai peringkat. Model akhir kemudian digunakan dalam sesi pembelajaran sebenar, di mana pelajar diberi peluang untuk meneroka komponen IBS secara interaktif dan *hands-on*. Aktiviti ini bertujuan untuk mengukuhkan kefahaman pelajar melalui pendekatan visual dan manipulatif berbanding kaedah teori semata-mata. Bagi memudahkan penggunaan di dalam dan luar bilik darjah, semua komponen model ini akhirnya disusun dan ditempatkan dalam satu kit khusus agar mudah dibawa oleh tenaga pengajar dan pelajar. Dapatan menunjukkan bahawa majoriti responden menunjukkan peningkatan kefahaman terhadap komponen struktur, reka bentuk dan aplikasi praktikal sistem IBS selepas menggunakan kit ini. Nilai min keseluruhan adalah 2.9, menunjukkan tahap penerimaan sederhana tetapi positif. Kit ini berpotensi sebagai alat bantu pembelajaran berkesan dalam bilik darjah, dengan penekanan kepada pendekatan secara *hands-on* dan visual. Kajian ini mencadangkan penggunaan meluas kit seumpama ini dalam kurikulum TVET untuk meningkatkan pemahaman pelajar terhadap sistem binaan moden.
Kata kunci: Modular; IBS; Kit.

1. Pengenalan

Zaman era globalisasi dan perkembangan pesat industri pembinaan, pendekatan pengajaran dan pembelajaran dalam bidang teknikal perlu disesuaikan agar lebih berkesan serta relevan dengan keperluan semasa. Sistem Binaan Berindustri atau *Industrialized Building System* (IBS) merupakan salah satu pendekatan pembinaan moden yang semakin mendapat perhatian dalam industri pembinaan Malaysia. Oleh itu, pendedahan awal terhadap konsep IBS dalam institusi Pendidikan Teknikal dan Latihan Vokasional (TVET) adalah sangat penting bagi melahirkan tenaga kerja yang kompeten dan bersedia menghadapi kehendak industri (CIDB, 2020).

Walaupun konsep IBS sering diajar secara teori, Lam et al. (2024) menyarankan bahawa elemen seperti video pembelajaran yang efektif dan sistem model pembelajaran interaktif adalah faktor kejayaan utama yang sangat relevan dalam memperkukuh kefahaman pelajar melalui visualisasi dan aplikasi praktikal. Oleh itu, inovasi dalam bentuk alat bantu mengajar yang lebih interaktif dan berfokus kepada pendekatan amali amat diperlukan di dalam kelas.

Sebagai respon terhadap keperluan tersebut, satu kit pembelajaran inovatif yang dinamakan *Modular Assemble Learning Kit* (MoAL Kit) telah dibangunkan. Kit ini direka bentuk bagi membantu pelajar memahami konsep IBS secara lebih mendalam melalui pengalaman pembelajaran yang lebih visual, fizikal dan berstruktur. Kajian ini bertujuan untuk mereka bentuk serta menilai keberkesanan awal penggunaan MoAL Kit sebagai alat bantu mengajar di institusi TVET. Melalui pendekatan kajian kes, kit ini diuji terhadap sekumpulan kecil responden bagi menilai kefahaman terhadap konsep IBS selepas menggunakan kit tersebut.

Menurut Gloria Ajit et al. (n.d.), perubahan dalam kemajuan teknologi dan daya saing pasaran kerja telah membawa kepada perubahan dalam sistem pendidikan, bagi membolehkan generasi muda memperoleh pengetahuan dan kemahiran yang diperlukan untuk berjaya dalam ekonomi global masa kini. Rahman et al. meneliti penggunaan bahan bantu mengajar teknologi dalam kelas Elektronik di Kolej Vokasional Malaysia. Walaupun banyak guru menggunakan projek, komputer dan projektor, penggunaan bahan bantu dalam talian masih di tahap sederhana atau rendah. Kajian mencadangkan peningkatan bahan yang interaktif dan menarik bagi meningkatkan pemahaman pelajar dan motivasi pembelajaran. Oleh itu, kajian ini dijalankan bagi membangunkan satu kit pembelajaran IBS yang lebih sesuai dan boleh digunakan secara efektif dalam bilik darjah di sekolah menengah vokasional.

2. Metodologi

2.1 Rekabentuk Kajian

Kajian ini menggunakan pendekatan kajian tindakan yang melibatkan pembangunan dan penilaian awal terhadap inovasi Moal KIT sebagai bahan bantu mengajar. Pendekatan ini dipilih bagi membolehkan inovasi dinilai secara langsung dalam konteks pengajaran dan pembelajaran. Selain itu, kajian turut melibatkan pemerhatian awal terhadap penggunaannya dalam kalangan pelajar sekolah menengah sebagai satu langkah permulaan untuk menilai potensi kit tersebut dalam menarik minat pelajar terhadap bidang pembinaan.

a. Prosedur Kajian

Moal KIT dibangunkan berdasarkan pendekatan *design thinking*, yang merangkumi lima peringkat iaitu: *empathize, k*enal pasti masalah sebenar melalui temu bual dengan pelajar. Kedua ialah *define*, rumuskan keperluan pembelajaran yang dilihat. Ketiga ialah *Ideate*, menghasilkan idea reka bentuk kit berasaskan bahan interaktif dan berskala kecil berbanding dengan saiz asal. Keempat ialah *prototype:* mencipta versi awal kit menggunakan skala rekabentuk yang telah ditetapkan. Peringkat terakhir ialah *test*: menguji kit bersama pelajar sasaran dan mengumpul maklum balas responden.

b. Prototaip

Setelah reka bentuk konsep dikenalpasti dalam fasa *Ideate*, langkah seterusnya adalah membina prototaip awal kit. Prototaip ini direka bentuk dengan mengambil kira kebolehannya untuk diubah suai mengikut kehendak pereka serta mampu menghasilkan bentuk yang menyerupai komponen asal. Bahan-bahan yang digunakan adalah mudah didapati, selamat, ringan dan mudah alih. Selain itu, pembinaan prototaip turut melibatkan penggunaan pencetak 3D serta elemen interaktif seperti kod QR yang dipautkan kepada animasi ringkas atau video panduan. Reka bentuk kit ini merangkumi model miniatur IBS yang modular, yang dibangunkan berdasarkan elemen utama dalam sistem binaan seperti panel dinding, tiang, dan sambungan struktur bagunan.

Pembangunan prototaip ini bertujuan untuk menghasilkan gambaran sebenar bagaimana kit akan berfungsi dalam sesi pengajaran dan pembelajaran. Semasa fasa ini, beberapa semakan dalaman dilakukan bersama tenaga pengajar untuk memastikan reka bentuk, susun

atur, dan kandungan kit sejajar dengan sukatan pelajaran serta tahap kognitif pelajar yang disasarkan.

2.4 Pengujian Kit

Kajian ini dilaksanakan dalam dua fasa utama, iaitu Fasa Pembangunan Kit dan Fasa Ujian Rintis (*Pilot Test*). Peringkat fasa pembangunan, kajian literatur telah dijalankan terlebih dahulu bagi mengenal pasti keperluan pedagogi serta konsep asas berkaitan *Industrialized Building System* (IBS). Hasil daripada kajian ini menjadi asas kepada reka bentuk kit pembelajaran yang dinamakan *Modular Assemble Learning Kit* (MoAL Kit).

Seterusnya, dalam fasa ujian rintis (*Pilot Test*), kit ini diuji bersama sekumpulan kecil pelajar sekolah menengah yang berada di aliran teknikal, terdiri daripada lebih 30 orang. Aktiviti pengujian dijalankan dalam suasana pembelajaran sebenar, di mana pelajar diberi tugasan menggunakan kit tersebut untuk membina model IBS secara berperingkat. Pemerhatian secara langsung dilakukan untuk menilai interaksi dan tahap kefahaman pelajar terhadap komponen IBS yang dipelajari. Selain itu, temu bual pendek dan maklum balas lisan turut dikumpulkan bagi mendapatkan pandangan pelajar berkaitan kebolehgunaan, kefahaman, dan keberkesanan kit sebagai alat bantu mengajar.

2.5 Kaedah Pengumpulan Data

Bagi tujuan pengumpulan data, dua kaedah utama telah digunakan iaitu pemerhatian langsung dan maklum balas lisan. Pemerhatian langsung dilaksanakan bagi melihat bagaimana pelajar berinteraksi dengan MoAL Kit semasa aktiviti pembelajaran dijalankan. Melalui kaedah ini, penyelidik dapat mengenal pasti tahap kefahaman pelajar terhadap komponen IBS yang dibina serta cara mereka menyusun dan memasang kit tersebut secara praktikal. Selain itu, borang maklum balas ringkas dan sesi temu bual tidak formal turut dijalankan bagi mendapatkan komen, cadangan dan pengalaman pelajar sepanjang menggunakan kit. Maklumat yang diperoleh ini membantu dalam penilaian awal keberkesanan kit dari sudut kefahaman konsep serta kesesuaian reka bentuknya untuk digunakan dalam kalangan pelajar sekolah.

2.6 Kaedah Analisis Data

Data yang dikumpulkan daripada borang maklum balas dan pemerhatian dianalisis secara deskriptif menggunakan perisian Microsoft Excel. Analisis ini melibatkan pengiraan kekerapan, peratusan dan purata bagi menilai tahap kefahaman pelajar serta keberkesanan awal penggunaan MoAL Kit dalam aktiviti pembelajaran. Selain itu, maklum balas terbuka yang diterima dianalisis secara kualitatif melalui pengecaman tema utama yang berulang bagi mendapatkan gambaran umum terhadap persepsi dan pengalaman pelajar menggunakan kit ini.

3. Dapatan dan Perbincangan

Bab ini membentangkan hasil dapatan kajian yang diperoleh melalui data yang telah dikumpul daripada responden yang terlibat. Analisis data ini merangkumi analisis demografi serta analisis ke atas maklum balas berkaitan keberkesanan dan kefungsian kit yang dibangunkan. Hasil analisis ini akan menjadi asas kepada penilaian dan cadangan penambahbaikan terhadap kit pembelajaran agar lebih sesuai digunakan dalam konteks pendidikan TVET.

Jadual 1. Dapatan demografi responden

Perkara		Bilangan	Peratus %
Jantina	Lelaki	22	61
	Perempuan	14	39
Umur	12-14 tahun	5	14
	15-17 tahun	17	47
	18-20 tahun	11	31
	21-23 tahun	0	0
	24-26 tahun	0	0
	>26 tahun	3	8
Status	Sekolah Menengah	22	61
	Kolej Vokasional	11	31
	Bekerja	3	8

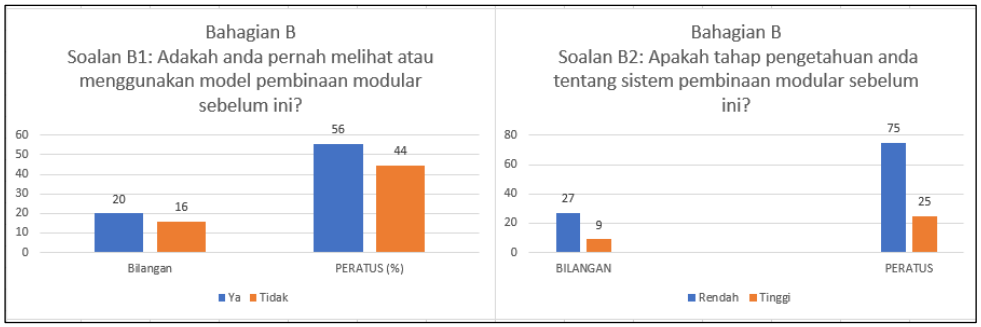
Berdasarkan analisis demografi dari Jadual 1., majoriti responden terdiri daripada pelajar lelaki iaitu seramai 22 orang (61%) berbanding 14 orang perempuan (39%). Dari segi umur, kumpulan terbesar adalah dalam lingkungan 15 hingga 17 tahun (47%), diikuti oleh 18 hingga 20 tahun (31%) dan 12 hingga 14 tahun (14%), manakala selebihnya (8%) berumur melebihi 26 tahun. Dari aspek status, kebanyakan responden merupakan pelajar sekolah menengah (61%), diikuti oleh pelajar kolej vokasional (31%) dan selebihnya bekerja (8%). Dapatan ini menunjukkan bahawa kajian ini lebih tertumpu kepada pelajar di peringkat sekolah menengah dan vokasional, sejajar dengan sasaran utama pembangunan kit pembelajaran yang dinilai.

Jadual 2. Interpretasi Skor Min Skala Likert Empat Mata

Skor Min	Interpretasi Min
1.00 - 1.50	Sangat Rendah
1.51 - 2.50	Rendah
2.51 - 3.50	Sederhana
3.51 - 4.00	Tinggi

Mohd Asri Harun et al., 2016

Menurut Mohd Asri Harun et al., 2016, penggunaan skala empat mata fleksibel dan jelas dimana skala ini memaksa responden memilih sama ada berada di pihak positif atau negatif tanpa pilihan neutral; responden perlu "ambil pendirian". Ini menjadikan data lebih bermakna dalam konteks pengukuran sikap atau persepsi secara jelas. Dalam kajian ini, skala likert ini digunakan untuk menilai tahap persetujuan responden terhadap item-item yang dikemukakan. Skor min bagi setiap item dianalisis bagi menentukan tahap penerimaan atau persepsi responden terhadap kit pembelajaran dan model yang dibangunkan. Skor min antara 1.00 hingga 1.50 ditafsirkan sebagai sangat rendah, 1.51 hingga 2.50 sebagai rendah, 2.51 hingga 3.50 sebagai sederhana, dan 3.51 hingga 4.00 sebagai tinggi. Panduan ini digunakan untuk menganalisis dan mentafsir tahap penerimaan responden terhadap setiap item dalam Bahagian B dan C.



Rajah 1. Dapatan item bahagian B

Berdasarkan dapatan B1 di Rajah 1., sebanyak 56% responden (20 orang) menyatakan bahawa mereka pernah melihat atau menggunakan model pembinaan modular, manakala 44% (16 orang) menyatakan sebaliknya. Ini menggambarkan bahawa konsep modular bukanlah sesuatu yang asing sepenuhnya dalam kalangan responden, namun masih terdapat sebilangan besar (hampir separuh) yang belum terdedah kepada model ini. Bagi soalan B2 pula, sebanyak 75% responden (27 orang) mengakui bahawa tahap pengetahuan mereka terhadap sistem pembinaan modular adalah rendah, manakala hanya 25% (9 orang) yang menyatakan tahap pengetahuan mereka tinggi. Dapatan ini menekankan keperluan untuk menyediakan bahan pembelajaran dan latihan yang sesuai untuk meningkatkan kefahaman serta pengetahuan teknikal berkaitan sistem ini. Nilai min bagi bahagian B ialah sebanyak 2.7.

Jadual 3. Item Bahagian C

Item / Soalan	Tahap	Bilangan	Peratus	Min
1. Aspek Struktur Bangunan				
Soalan 6: Saya faham fungsi elemen struktur asas dalam sesebuah bangunan modular.	Tidak Setuju	9	25	2.8
	Setuju	27	75	
Soalan 7: Saya boleh mengenal pasti komponen utama struktur dalam model pembinaan modular.	Tidak Setuju	15	42	2.7
	Setuju	21	58	
Soalan 8: Saya tahu bagaimana elemen struktur disambung antara satu sama lain dalam sistem modular.	Tidak Setuju	13	36	2.8
	Setuju	23	64	
2. Aspek Rekabentuk				
Soalan 9: Saya faham bagaimana rekabentuk modular dapat disesuaikan dengan keperluan pengguna.	Tidak Setuju	14	39	2.7
	Setuju	22	61	
Soalan 10: Saya boleh membezakan rekabentuk modular dengan rekabentuk konvensional.	Tidak Setuju	13	36	2.8
	Setuju	23	64	
Soalan 11: Saya tahu bagaimana rekabentuk mempengaruhi proses pemasangan modular.	Tidak Setuju	12	33	2.8
	Setuju	24	67	

Item / Soalan	Tahap	Bilangan	Peratus	Min
3. Aspek Kesesuaiaan/ Praktikaliti				
Soalan 12:	Tidak Setuju	8	22	3.1
Model prototaip ini membantu saya memahami konsep pembinaan modular dengan lebih jelas.	Setuju	28	78	
Soalan 13:	Tidak Setuju	5	14	3.2
Saya berpendapat model ini sesuai digunakan untuk tujuan pendidikan/ pemahaman asas sistem bangunan.	Setuju	31	86	
Soalan 14:	Tidak Setuju	11	31	3.1
Saya dapat bayangkan bagaimana model ini diaplikasikan dalam projek sebenar.	Setuju	25	69	

Jadual 4. Purata min bahagian C

Aspek Item	Soalan	Min	Min Keseluruhan
Struktur Bangunan	S6	2.8	2.9
	S7	2.7	
	S8	2.8	
Rekabentuk	S9	2.7	
	S10	2.8	
	S11	2.8	
Kesesuaian Model/ Praktikaliti	S12	3.1	
	S13	3.3	
	S14	3.1	

Berdasarkan dapatan dalam Bahagian C, nilai min aspek struktur bangunan (2.8), reka bentuk (2.7) dan kesesuaian/praktikaliti (2.8) menunjukkan tahap penilaian yang berada di skala sederhana. Ini selari dengan beberapa kajian terdahulu yang memberi justifikasi teori atas pembinaan model dan penilaian reka bentuk secara seimbang.

Berdasarkan kajian oleh Schwarz et al. (2009) dan Berland et al. (2016), kriteria utama untuk penilaian model termasuklah kejelasan struktur, fungsi komunikasi reka bentuk, serta kesesuaian model dengan tujuan berorientasikan kefahaman dan penggunaan praktikal dalam konteks pendidikan. Ini menyokong dapatan nilai min yang mencerminkan persepsi sederhana terhadap struktur, reka bentuk dan kegunaan model anda.

Selain itu, Pluta et al. (2011) menemui bahawa ciri-ciri seperti kejelasan representasi visual, kebolehfahaman reka bentuk, dan fungsi penerangan model merupakan penilaian kritikal yang sering diberi perhatian dalam penilaian model secara kuantitatif. Nilai min yang didapati melalui tinjauan ini mendekati tahap sederhana, ini mencerminkan bahawa model dibangunkan memenuhi kebanyakan kriteria asas tetapi masih berpotensi ditingkatkan dari aspek kejelasan atau keperincian.

Dalam konteks reka bentuk binaan sebenar, kajian mengenai *atribut buildability* semasa fasa reka bentuk juga menggunakan skala Likert (1–5) untuk menilai aspek struktur, reka bentuk, dan kebolehpraktisan binaan dan mendapati nilai purata sekitar 3 (*moderately important* / sederhana penting), menunjukkan persepsi yang serupa terhadap kebolehsesuaian dan praktikaliti reka bentuk bangunan.

4. Kesimpulan

Kajian ini telah berjaya membangunkan dan menilai secara awal satu alat bantu mengajar inovatif yang dinamakan *Modular Assemble Learning Kit (MoAL Kit)* bagi tujuan mempertingkatkan kefahaman pelajar terhadap konsep dan komponen dalam Sistem Binaan Berindustri (IBS). Berdasarkan analisis data yang diperoleh daripada kumpulan responden yang terdiri daripada pelajar sekolah menengah dan kolej vokasional, didapati bahawa majoriti pelajar mempunyai pendedahan yang terhad terhadap model pembinaan modular, dan tahap pengetahuan mereka terhadap sistem IBS adalah rendah.

Walau bagaimanapun, hasil dapatan selepas penggunaan MoAL Kit menunjukkan peningkatan tahap kefahaman pelajar terhadap struktur bangunan, reka bentuk modular, serta kesesuaian model untuk aplikasi pembelajaran. Nilai min keseluruhan bagi ketiga-tiga aspek utama yang dinilai (struktur bangunan, reka bentuk, dan praktikaliti model) adalah pada tahap sederhana (min = 2.9). Ini menunjukkan bahawa kit pembelajaran ini mempunyai potensi yang baik sebagai alat bantu mengajar yang boleh ditambah baik dari semasa ke semasa.

Penggunaan MoAL Kit telah membantu meningkatkan pemahaman pelajar melalui pendekatan visual dan *hands-on* yang lebih interaktif, sekaligus menjawab keperluan terhadap kaedah pengajaran yang lebih praktikal dalam pendidikan TVET. Dapatan kajian ini turut menyokong pandangan bahawa inovasi dalam bahan bantu mengajar amat penting dalam meningkatkan minat dan pemahaman pelajar dalam bidang teknikal.

Sebagai kesimpulan, pembangunan MoAL Kit ini dilihat sebagai satu pendekatan yang relevan dan berkesan dalam menyokong pembelajaran IBS di peringkat sekolah menengah vokasional. Kajian lanjutan disarankan untuk menilai keberkesanan kit ini dalam skala yang lebih besar serta meneroka potensi integrasi teknologi seperti Augmented Reality (AR) atau elemen digital interaktif dalam kit pembelajaran teknikal masa hadapan.

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TAHAP KOMPETENSI DAN KEMAHIRAN *SOFTSKILLS* GRADUAN JABATAN PERDAGANGAN POLITEKNIK TUANKU SULTANAH BAHIYAH (PTSB)

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Abstrak

Pasaran kerja yang kompetitif memerlukan graduan yang kompeten dan sentiasa melengkapkan diri dengan kemahiran *softskills* yang sesuai bagi menjadikan mereka lebih berdaya saing dan selari dengan kehendak pasaran. Objektif kajian ini adalah untuk mengukur tahap kompetensi dan kemahiran *softskills* di kalangan graduan Jabatan Perdagangan PTSB. Pengukuran tahap kompetensi dan kemahiran *softskills* dibuat berdasarkan pernyataan *Programme Educational Objective (PEO)* yang dibangunkan oleh pihak Jabatan Pendidikan Politeknik Dan Kolej Komuniti (JPPKK). PEO ini menggariskan 4 elemen penting iaitu kompetensi dan kemahiran *softskills* seperti kemahiran komunikasi, penyelesaian masalah dan keusahawanan. Instrumen kajian yang digunakan adalah borang soal selidik berbentuk *google form*. Responden bagi soal selidik ini melibatkan seramai 126 orang graduan yang telah menamatkan pengajian antara 3 hingga 5 tahun. Responden mewakili 3 program Jabatan Perdagangan; Diploma Akauntansi (DAT), Diploma Pengajian Perniagaan (DPM) dan Diploma Pemasaran (DPR). Data dianalisis menggunakan SPSS 26.0. Hasil dapatan keseluruhan menunjukkan skor min adalah tinggi dan sangat tinggi bagi semua elemen yang dinilai. Skor min tertinggi bagi semua program ditunjukkan melalui kemahiran komunikasi iaitu 4.32 dan skor min terendah ditunjukkan melalui kompetensi dan kemahiran keusahawanan iaitu 4.05. Walaupun dapatan bagi kesemua elemen yang dinilai adalah tinggi, namun ruang penambahbaikan boleh dilaksanakan oleh pihak institusi bagi meningkatkan tahap kompetensi dan kemahiran keusahawanan graduan melalui pelaksanaan pelbagai aktiviti peningkatan kemahiran dan penambahbaikan kaedah pelaksanaan Pengajaran dan Pembelajaran (PdP) serta kurikulum bagi setiap program.

Kata kunci: Kompetensi; Softskills; Programme Educational Objectives (PEO).

1. Pengenalan

Cabaran hebat dalam dunia pekerjaan masa kini memerlukan pihak institusi dan graduan khususnya sentiasa peka dalam memenuhi kehendak pasaran pekerjaan. Pihak institusi memainkan peranan penting dalam melahirkan graduan yang bersifat holistik yakni lengkap dari segi kompetensi dan kemahiran *softskills* yang sesuai. Ini selari dengan lonjakan yang terkandung dalam Pelan Pembangunan Pendidikan Malaysia 2015-2025 (Pendidikan Tinggi) iaitu melahirkan graduan yang holistik, berciri keusahawanan dan seimbang. Namun begitu, masih terdapat graduan yang hanya mementingkan ilmu dan kemahiran sahaja dan mengabaikan kemahiran *softskills* yang sepatutnya menjadi nilai tambah dalam diri mereka. Dan sebaliknya terdapat juga graduan yang hanya mementingkan kemahiran *softskills* namun tiada pengetahuan dan kemahiran dalam bidang yang diceburi. Jika situasi ini berterusan, graduan yang belum mendapat pekerjaan akan sukar mendapat tempat di pasaran manakala graduan yang telah bekerja mungkin sukar untuk bertahan dalam bidang masing-masing. Menurut Othman & Husin (2019), keperluan industri negara semakin sukar dipenuhi berikutan graduan yang dihasilkan kini kurang berkemahiran dari aspek teknikal dan *softskills* terutama dalam mendepani dunia yang semakin mencabar. Ini disokong oleh Ali et. al (2021) yang menyatakan antara cabaran kepada graduan adalah melengkapkan diri dengan pengetahuan dan kemahiran yang lebih baik agar dapat bekerja dan mengatasi rintangan dalam pasaran

yang semakin mencabar. Graduan perlu bijak mengambil peluang dalam keadaan semasa dengan kebolehan yang ada pada mereka untuk mencipta kelebihan kepada mereka kerana mereka telah dibekalkan dengan kemahiran softskills dan kompetensi yang secukupnya semasa berada di institusi pengajian (Ahmad Mokhtar & Lakman, 2021). Oleh itu, setiap institusi perlu mempunyai alat pengukuran yang sesuai bagi mengukur pencapaian pelajar atau graduan semasa dan selepas mereka menamatkan pengajian. Justeru itu, rekabentuk kurikulum berasaskan *Outcome Based Education (OBE)* yang digunapakai di institusi pendidikan telah memperincikan hasil pembelajaran yang diharapkan yang perlu dicapai oleh pelajar dalam program pendidikan. Salah satu dari komponen pengukuran hasil pembelajaran pelajar adalah melalui *Programme Educational Objectives (PEO)*. Pengukuran hasil pembelajaran bukan sahaja perlu dalam tempoh pengajian sahaja, tetapi ianya juga perlu diukur selepas graduan menamatkan pengajian. PEO merupakan pernyataan umum yang memerihalkan pencapaian kerjaya dan profesional graduan dalam tempoh 5 tahun selepas menamatkan pengajian (Garis Panduan Amalan Baik MQA: Penilaian Pelajar, 2014).

Jabatan Perdagangan Politeknik Tuanku Sultanah Bahiyah (PTSB) menawarkan 3 program pengajian iaitu Diploma Akauntansi (DAT), Diploma Pengajian Perniagaan (DPM) dan Diploma Pemasaran (DPR). Setiap program mempunyai PEO masing-masing yang terdiri daripada 4 elemen penting iaitu kompetensi dan kemahiran *softskills* seperti kemahiran komunikasi, penyelesaian masalah dan keusahawanan. PEO yang dibangunkan oleh Jabatan Pendidikan Politeknik Dan Kolej Komuniti (JPPKK) adalah selari dengan visi dan misi Politeknik. Kajian ini adalah berdasarkan persepsi graduan terhadap pencapaian mereka terhadap PEO selepas mereka meninggalkan institusi. Pengukuran berasaskan PEO ini merupakan petunjuk kepada institusi samada graduan yang dilahirkan kompeten dan mampu menerapkan kemahiran *softskills* dalam diri mereka ataupun tidak. Justeru itu, objektif kajian ini adalah untuk mengukur tahap kompetensi dan kemahiran *softskills* di kalangan graduan Jabatan Perdagangan PTSB. Kajian ini akan mengenalpasti tahap kompetensi dan kemahiran *softskills* mengikut program pengajian. Selain itu juga, kajian ini akan mengenalpasti penguasaan graduan bagi setiap elemen kompetensi dan kemahiran *softskills* yang diukur. Pengukuran PEO ini adalah penting kerana ianya menunjukkan keberhasilan graduan dan sumbangan graduan kepada industri dan masyarakat. Ianya juga dapat memastikan kurikulum dan program yang ditawarkan sentiasa ditambahbaik serta kekal relevan sesuai dengan peredaran masa.

Terdapat banyak kajian lepas yang membincangkan berkaitan kepentingan kompetensi dan kemahiran *softskills*. Keupayaan graduan menyesuaikan diri dengan dunia pekerjaan bergantung kepada tahap kompetensi dan kemahiran *softskills* yang ada dalam diri mereka. Majikan memerlukan pekerja yang mempunyai pelbagai kemahiran *softskills* bagi meningkatkan produktiviti mereka dan kompetensi juga penting bagi memenuhi keperluan pelanggan. Kompetensi adalah ciri dasar seseorang individu yang melibatkan pengetahuan, kemahiran dan kebolehan mereka serta membolehkan mereka menjalankan sesuatu tugasan atau peranan yang diberikan dengan penuh makna dan pengertian (Garis Panduan Amalan Baik MQA : Penilaian Pelajar, 2014).). Hasil pembelajaran bukan sahaja menekankan aspek akademik, malahan juga kemahiran tambahan yang perlu bagi memastikan graduan yang berkualiti dapat dihasilkan. Selain dari kecemerlangan akademik, kaedah pengajaran dan pembelajaran di Institusi Pengajian Tinggi (IPT) turut menekankan penguasaan pelajar terhadap *softskills* bagi memastikan graduan bukan sahaja cemerlang dari segi akademik, tetapi juga dapat menguasai pelbagai kemahiran yang diperlukan oleh industri (Suradi & Rosli, 2020). Kemahiran *softskills* merupakan kemahiran yang boleh dikuasai oleh graduan sebelum memasuki alam pekerjaan. Graduan yang memiliki kemahiran ini mempunyai nilai tambah dan dapat memasarkan diri mereka kepada majikan berbanding graduan lain yang tidak dapat menguasai kemahiran *softskills* (Ramzy Rameshan & Hamzah , 2022).

Antara kemahiran *softskills* yang menjadi keutamaan kepada majikan adalah kemahiran komunikasi. Menurut Suradi & Rosli (2020), kemahiran komunikasi tidak dapat dikuasai oleh

seseorang dalam sekelip mata sahaja tetapi ianya melibatkan aktiviti yang berterusan dalam proses pengajaran dan pembelajaran yang dilaksanakan sepanjang tempoh pengajian di IPT. Ini selaras dengan kajian oleh Bassah & Mohd Noor (2023) yang menyatakan kemahiran kebolehpasaran yang diperlukan untuk graduan *Technical and Vocational Education and Training (TVET)* di Malaysia termasuk kemahiran sosial dan komunikasi. Pakar industri berpendapat bahawa graduan TVET mesti mempunyai kemahiran sosial dan komunikasi yang baik. Kemahiran ini mesti dipelajari secara langsung dan tidak langsung di peringkat kampus. Kemahiran ini penting bagi membolehkan mereka mudah berinteraksi dan bersaing untuk mendapat tempat di hati majikan atau industri. Ini disokong oleh Roslan et.al (2023) yang mengatakan majikan beranggapan seharusnya pekerja mempunyai kemahiran berkomunikasi yang baik dan merasa bertanggungjawab terhadap pekerjaan mereka agar kualiti kerja yang dihasilkan menjadi lebih baik. Menurut Norman et. al (2017), kemahiran komunikasi dan kemahiran interpersonal menunjukkan jurang prestasi yang paling besar yang ditemui di dalam kajian yang dilakukan ke atas graduan semasa yang sedang bekerja. Selain itu, penguasaan kemahiran komunikasi yang lemah akan memberi kesan kepada kurangnya kredibiliti graduan untuk berdaya saing di peringkat global (Awaludin & Ali, 2024). Dapatan ini selaras dengan penyelidikan yang dijalankan oleh Krishnan et al. (2019) yang menyatakan bahawa kemahiran komunikasi yang lemah dalam kalangan graduan TVET akan menjejaskan prestasi mereka dalam berurusan dengan pelanggan.

Menurut Arizan et.al (2023), graduan masa kini perlu lebih mempunyai kemahiran berfikir secara kreatif, menganalisis, berimaginasi, menerokai, mempelopori, mengenalpasti dan menyelesaikan masalah. Majikan tidak berminat untuk mengambil bakal pekerja yang tidak mempunyai kemahiran penyelesaian masalah, walaupun graduan itu mempunyai kelayakan yang cemerlang dan kebolehan luar biasa (Beleina, Rene, 2018). Ini disokong oleh Rahmat et.al (2018) yang menyatakan kemahiran berfikir secara kritis dan penyelesaian masalah merupakan kemahiran yang penting dalam pasaran pekerjaan. Jelaslah bahawa kemahiran menyelesaikan masalah adalah penting kepada graduan dalam menempuhi alam pekerjaan. Dasar Ekonomi Baru (DEB) yang telah dibentuk membuktikan komitmen kerajaan untuk memperbanyakkan usahawan di Malaysia. Pembangunan ke arah melahirkan budaya keusahawanan dilaksanakan di IPT termasuklah Politeknik. Ini disokong oleh objektif yang terkandung dalam Pelan Pembangunan Pendidikan Malaysia 2015-2025 (Pendidikan Tinggi) iaitu untuk melahirkan graduan yang mempunyai minda keusahawanan dan mewujudkan sistem pendidikan yang melahirkan graduan yang berciri keusahawanan dan bukan hanya mencari kerja. Menurut Bakar (2020), graduan mempunyai persepsi positif terhadap kemahiran keusahawanan. Namun, graduan tidak menjadi usahawan kerana kurang peluang dalam bidang keusahawanan. Ini selaras dengan kajian oleh Ngoo et. al (2015), antara kemahiran *softskills* yang dikaji, hanya kemahiran usahawan sahaja yang tidak ketara dalam bidang perakaunan dari persepsi graduan dan majikan. Justeru, dalam usaha untuk menyediakan graduan dengan kemahiran keusahawanan, pihak politeknik telah menyediakan kursus keusahawanan dan pelajar-pelajar dijangka akan memperolehi asas ilmu keusahawanan dan kompetensi yang relevan dalam bidang keusahawanan apabila tamat pengajian (Bakar R, 2020).

2. Metodologi

Kajian ini melibatkan responden dari kalangan graduan tahun 2021 bagi program DAT, DPM dan DPR Jabatan Perdagangan, PTSB. Data dikumpulkan melalui soal selidik yang diedarkan melalui *google form.* Bilangan responden adalah seramai 126 orang. Maklum balas yang diperoleh dianalisis untuk menilai pencapaian dan kemahiran yang diperoleh oleh graduan sepanjang pengajian dan pengalaman kerja selepas tamat belajar. Data telah dianalisis secara deskriptif dengan melibatkan penggunaan frekuensi, peratusan dan min. Item-item dalam soal selidik tersebut adalah berdasarkan kepada penyataan dalam PEO bagi setiap program yang dapat ditunjukkan seperti berikut:

Jadual 2.1. Senarai Objektif Pendidikan Program (PEO) bagi Program DAT

	Keterangan PEO
PEO 1	Graduan berpengetahuan dan mempunyai kompeten dalam bidang perakaunan seiring dengan keperluan industri.
PEO 2	Graduan secara efektifnya dapat berkomunikasi secara sosial, bertanggungjawab dan menunjukkan kualiti kepimpinan yang baik dalam organisasi.
PEO 3	Graduan mahir menyelesaikan masalah dalam perniagaan secara inovatif, kreatif dan beretika melalui pendekatan yang mampan.
PEO 4	Graduan mampu menunjukkan kemahiran keusahawanan dan mengenalpasti keperluan pembelajaran sepanjang hayat untuk perkembangan kerjaya.

Jadual 2.2. Senarai Objektif Pendidikan Program (PEO) bagi Program DPM

	Keterangan PEO
PEO 1	Graduan berpengetahuan dan mempunyai kemahiran teknikal dalam bidang perniagaan seiring dengan keperluan industri.
PEO 2	Graduan secara efektifnya dapat berkomunikasi secara sosial, bertanggungjawab dan menunjukkan kualiti kepimpinan yang baik di dalam organisasi.
PEO 3	Mampu menyelesaikan masalah dalam situasi perniagaan secara inovatif, kreatif dan etika melalui pendekatan yang mampan.
PEO 4	Graduan mampu menunjukkan kemahiran keusahawanan dan mengenalpasti keperluan pembelajaran sepanjang hayat untuk perkembangan kerjaya.

Jadual 2.3. Senarai Objektif Pendidikan Program (PEO) bagi Program DPR

	Keterangan PEO
PEO 1	Graduan yang berpengetahuan dan mempunyai kemahiran teknikal dalam bidang perniagaan seiring dengan keperluan industri.
PEO 2	Graduan yang secara efektifnya dapat berkomunikasi secara sosial, bertanggungjawab dan menunjukkan kualiti kepimpinan yang baik dalam organisasi.
PEO 3	Graduan yang mampu untuk menyelesaikan masalah dalam perniagaan secara inovatif, kreatif dan beretika menerusi pendekatan yang mampan.
PEO 4	Graduan yang mampu menunjukkan kemahiran keusahawanan dan mengenalpasti keperluan pembelajaran sepanjang hayat untuk perkembangan kerjaya.

Kesimpulannya, penyataan PEO bagi ketiga-tiga program ini merumuskan 4 elemen penting yang perlu dikuasai oleh graduan; kompetensi, kemahiran komunikasi, penyelesaian masalah dan keusahawanan. Untuk menilai instrumen yang terdiri daripada 17 item, analisis kebolehpercayaan menggunakan Alpha Cronbach telah dilakukan melibatkan 10 sampel yang sah bagi soal selidik program DAT, DPM dan DPR. Nilai pekali Alpha Cronbach bagi soal selidik program DAT ialah 0.988, bagi program DPM menunjukkan nilai 0.979, manakala bagi program DPR pula menunjukkan nilai 0.975. Hasil ini membolehkan penggunaan instrumen yang meluas untuk pengukuran seterusnya tanpa kebimbangan tentang ketekalan.

3. Dapatan dan Perbincangan

Data-data yang diperolehi daripada borang soal selidik telah dianalisis dengan menggunakan perisian SPSS versi 26.0. Hasil analisis dapatan kajian dapat ditunjukkan secara terperinci seperti berikut. Daripada Jadual 3.1, profil demografi menunjukkan daripada 126 orang responden, 66 orang (52.4%) merupakan graduan daripada program Diploma Akauntansi (DAT), 16 orang (12.7%) adalah pelajar program Diploma Pengajian Perniagaan (DPM) dan 44 orang (34.9%) merupakan pelajar daripada program Diploma Pemasaran (DPR). Seramai 95 orang (75.4%) adalah responden dari kalangan graduan perempuan dan 31 orang (24.6%)

responden adalah graduan lelaki. Dari segi bangsa pula, majoriti responden adalah dari kalangan orang Melayu iaitu seramai 97 orang (77.0%), responden berbangsa India adalah seramai 24 orang (19.0%) dan diikuti seramai 5 orang (4.0%) adalah responden berbangsa Cina.

Jadual 3.1. Profil Demografi Responden

Demografi	Kekerapan	Peratusan
Program:		
Diploma Akauntansi (DAT)	66	52.4 %
Diploma Pengajian Perniagaan (DPM)	16	12.7 %
Diploma Pemasaran (DPR)	44	34.9 %
Jantina:		
Lelaki	31	24.6 %
Perempuan	95	75.4 %
Bangsa:		
Melayu	97	77.0 %
Cina	5	4.0 %
India	24	19.0 %

Jadual 3.2 menunjukkan taburan responden mengikut program, jantina dan bangsa. Daripada jumlah 126 orang responden, seramai 31 orang adalah graduan lelaki iaitu 16 orang (12.7%) pelajar DAT, 2 orang (1.6%) graduan DPM dan 13 orang (10.3%) adalah graduan DPR. Jumlah responden yang paling ramai adalah dari kalangan graduan perempuan iaitu seramai 95 orang. Daripada jumlah itu, 50 orang (39.7%) adalah pelajar DAT, 14 orang (11.1%) adalah pelajar DPM dan pelajar DPR adalah seramai 31 orang (24.6%).

Dalam pada itu, seramai 97 orang adalah pelajar adalah berbangsa Melayu iaitu seramai 54 orang (42.9%) adalah graduan DAT, 14 orang (11.1%) adalah graduan DPM dan 31 orang (24.6%) adalah graduan DPR. Graduan yang berbangsa Cina hanyalah seramai 5 orang iaitu 4 orang (3.2%) adalah graduan DAT dan seorang (0.8%) adalah graduan DPR. Manakala bagi responden yang berbangsa India adalah seramai 24 orang (19.0%). Daripada jumlah itu, 8 orang (6.3%) adalah graduan DAT, 3 orang (2.4%) bagi graduan DPM dan seramai 13 orang (10.3%) adalah graduan DPR.

Jadual 3.2. Taburan Responden Mengikut Program, Jantina Dan Bangsa

	Jantina				Bangsa					
	L	%	P	%	M	%	C	%	I	%
DAT	16	12.7	50	39.7	54	42.9	4	3.2	8	6.3
DPM	2	1.6	14	11.1	13	10.3	0	0.0	3	2.4
DPR	13	10.3	31	24.6	30	23.8	1	0.8	13	10.3
Total	31	24.6	95	75.4	97	77.0	5	4.0	24	19.0

Menggunakan maklumat daripada soal selidik yang diberikan kepada responden kajian, analisis deskriptif diterangkan dalam bahagian ini. Interpretasi skor min Moidunny (2021) digunakan sebagai rujukan klasifikasi untuk tahap yang digunakan. Tahap dibahagikan kepada kategori rendah, sederhana dan tinggi berdasarkan purata skor min ini.

Jadual 3.3. Interpretasi Skor Min

Tahap	Min purata
Sangat rendah	1.00 - 1.80
Rendah	1.81 – 2.60
Sederhana	2.61 - 3.20
Tinggi	3.21 - 4.20
Sangat tinggi	4.21 – 5.00

Berdasarkan Jadual 3.4, skor min kemahiran kompetensi yang tertinggi telah dicapai oleh graduan DPM iaitu 4.25 dengan memperoleh tahap yang sangat tinggi bagi item graduan 'berkebolehan mengaplikasikan ilmu asas secara berkesan dalam perniagaan dan mengikut keperluan industri'. Dunia perniagaan pada masa sekarang banyak memerlukan graduan mengaplikasikan pengetahuan teori ke dalam situasi praktikal dunia kerja sesuai dengan tuntutan industri. Pasaran kerja yang berdaya saing memerlukan kerjasama dan kolaborasi antara industri dan IPT (Ngoo, et al, 2015). Manakala item graduan 'mampu menggunakan *softskills* yang kompeten telah dicapai dengan skor min paling rendah, 3.88 oleh graduan DAT. Perkara ini menuntut graduan untuk menggunakan kemahiran bukan teknikal untuk berinteraksi, berkolaborasi dan mengurus diri secara profesional.

Jadual 3.4. Skor Min Kemahiran Kompetensi bagi Graduan JP

Kemahiran kompetensi	Program (Skor min)		
	DAT	DPM	DPR
Mampu menggunakan pengetahuan asas perakaunan / perniagaan / pemasaran yang kompeten.	3.92	4.19	4.14
Mampu menggunakan 'soft skills' yang kompeten.	3.88	4.13	4.02
Berkebolehan mengaplikasikan ilmu asas perakaunan /pengurusan/pemasaran secara berkesan dalam perniagaan dan mengikut keperluan industri.	3.92	4.25	4.02
Purata min	3.91	4.19	4.06

Jadual 3.5 menunjukkan graduan bagi program DPM telah mencapai tahap sangat tinggi bagi kemahiran komunikasi dengan memperoleh skor min tertinggi sebanyak 4.50. Item yang terlibat adalah graduan 'mampu membuat keputusan yang rasional dan efektif'. Kemahiran berkomunikasi banyak diasah apabila mereka banyak terdedah dengan pelbagai program dan penilaian di bilik kuliah berbentuk pembentangan. Situasi sebegini telah meningkatkan keyakinan diri di samping boleh berkomunikasi di mana ianya akan terus dibawa apabila berada di alam pekerjaan dan perniagaan. Manakala graduan DAT telah mencapai skor min terendah sebanyak 4.11 bagi item graduan 'mampu mengamalkan kepimpinan yang berkesan'. Walaupun ianya adalah pada tahap yang tinggi, namun graduan DAT masih memerlukan program peningkatan khusus untuk latihan kepimpinan agar boleh membuat keputusan yang strategik dan memotivasikan orang lain.

Jadual 3.5. Skor Min Kemahiran Komunikasi bagi Graduan JP

Kemahiran komunikasi	Program (Skor min)		
	DAT	DPM	DPR
Mampu berkomunikasi secara efektif dengan rakan sekerja, komuniti dan ahli profesional.	4.18	4.38	4.32
Mampu untuk melaksanakan tanggungjawab sosial dan nilai-nilai kemanusiaan yang berkesan.	4.23	4.31	4.45
Mampu mengamalkan kepimpinan yang berkesan.	4.11	4.25	4.36
Mampu mengamalkan tanggungjawab kerja berpasukan.	4.30	4.44	4.48
Mampu membuat keputusan yang rasional dan efektif.	4.14	4.50	4.36
Purata min	4.19	4.38	4.39

Jadual 3.6 memaparkan skor min bagi kemahiran menyelesaikan masalah di kalangan graduan JP. Dapatan menunjukkan graduan DPM memperoleh skor min tertinggi iaitu 4.25 dengan tahap yang sangat tinggi bagi item graduan 'mampu melakukan tanggungjawab sosial

secara profesional dan beretika selari dengan keperluan kerja seharian' dan item graduan 'mampu mematuhi kod etika profesional dalam persekitaran pekerjaan'. Manakala, skor min terendah telah dicapai oleh graduan DAT sebanyak 3.95 bagi item graduan 'mampu menentukan maklumat dan kemahiran pemikiran kritikal untuk menyelesaikan masalah dalam skop pekerjaan'. Walaupun skor min ini adalah yang terendah, namun ia mencapai tahap yang tinggi juga. Ini menunjukkan graduan JP mampu menentukan maklumat dan kemahiran dalam menyelesaikan masalah dengan menggunakan nilai dan etika dalam pekerjaan. Graduan juga sangat mampu melaksanakan tanggungjawab sosial dan mematuhi kod etika profesional. Ketika di Politeknik, kemahiran menyelesaikan masalah telah dipraktis oleh graduan ketika mereka berada di dalam dan luar bilik kuliah melalui penilaian berterusan dan program-program yang dikendalikan.

Jadual 3.6. Skor Min Kemahiran Menyelesaikan Masalah Bagi Graduan JP

Kemahiran menyelesaikan masalah	Program (Skor min)		
	DAT	DPM	DPR
Mampu menentukan maklumat dan kemahiran pemikiran kritikal untuk menyelesaikan masalah dalam skop pekerjaan.	3.95	4.19	4.14
Mampu menentukan maklumat dan menggunakan kemahiran menyelesaikan masalah dalam proses membuat keputusan.	4.00	4.19	4.18
Mampu menggunakan nilai, etika dan moral untuk menyelesaikan masalah dalam pekerjaan.	4.17	4.19	4.00
Mampu melakukan tanggungjawab sosial secara profesional dan beretika selari dengan keperluan kerja seharian.	4.18	4.25	4.20
Mampu mematuhi kod etika profesional dalam persekitaran pekerjaan.	4.21	4.25	4.18
Purata min	4.10	4.21	4.14

Analisis skor min kemahiran keusahawanan bagi graduan JP ditunjukkan dalam Jadual 3.7. Daripada ketiga-tiga program, graduan DPR telah mencapai skor min tertinggi dengan tahap yang tinggi bagi item graduan 'mempunyai kemahiran teknologi maklumat ke arah pembelajaran berterusan'. Kurikulum Politeknik telah menjadikan kursus Keusahawanan dan Keusahawanan Digital sebagai kursus wajib bagi pelajar DPM dan DPR. Manakala, skor min terendah sebanyak 3.79 dengan tahap yang tinggi juga adalah melibatkan graduan DAT bagi item graduan 'berminat untuk melibatkan diri dalam keusahawanan untuk pembangunan profesional dan kerjaya'.

Jadual 3.7. Skor Min Kemahiran Keusahawanan Bagi Graduan JP

Kemahiran keusahawanan	Program (Skor min)		
	DAT	DPM	DPR
Mempunyai kemahiran teknologi maklumat ke arah pembelajaran berterusan.	3.82	4.13	4.23
Mampu menggunakan kemahiran pengurusan dan keusahawanan.	3.86	4.13	4.14
Berminat untuk melibatkan diri dalam keusahawanan untuk pembangunan profesional dan kerjaya.	3.79	4.19	4.20
Purata min	3.82	4.15	4.19

Jadual 3.8 menunjukkan purata skor min keseluruhan bagi tahap kempetensi dan kemahiran *softskills* graduan JP. Dapatan mendapati kemahiran komunikasi memperoleh purata skor min

keseluruhan tertinggi iaitu 4.32 dan menunjukkan telah mencapai tahap yang sangat tinggi. Manakala, kompetensi dan kemahiran keusahawanan mencapai purata skor min keseluruhan terendah iaitu 4.05 tetapi masih menunjukkan pencapaian pada tahap yang tinggi. Ini menunjukkan bahawa graduan mempunyai kemahiran komunikasi yang sangat baik yang dapat ditunjukkan kepada rakan sekerja, majikan, komuniti dan ahli profesional. Graduan bagi program DPM dan DPR banyak didedahkan dengan aktiviti penilaian secara berkumpulan yang berfokuskan kepada pembentangan seperti *Business Project, Marketing Plan* dan *Marketing Project.* Pelajar perlu melibatkan diri dengan industri luar bagi memastikan produk yang dihasilkan sentiasa menepati kehendak semasa. Ini bertepatan dengan pendapat yang diberikan oleh Ngoo et.al (2015) yang menyatakan, pasaran kerja yang berdaya saing memerlukan kerjasama dan kolaborasi antara industri dan IPT. Sesi soal jawab semasa sesi pembentangan projek dapat membantu meningkatkan keyakinan diri dalam diri pelajar di samping membantu mereka membuat keputusan dengan bijak. Graduan bagi program DAT pula, banyak dilibatkan dengan aktiviti penilaian yang berbentuk *problem base* dan *case study*. Aktiviti ini juga memerlukan mereka bekerja dalam kumpulan dan ianya dapat meningkatkan kemahiran komunikasi dan kemahiran berfikir secara kritis. Graduan juga dapat mengamalkan kerja secara berpasukan, bertanggungjawab sosial, mempunyai sifat kepemimpinan yang baik dan boleh membuat keputusan yang efektif apabila mereka mempunyai kemahiran komunikasi yang sangat baik. Selain itu penawaran kursus *Communicative English* bagi semua program turut membantu menyumbang kepada peningkatan dalam kemahiran komunikasi graduan. Para pensyarah perlu bertindak untuk mengintegrasikan elemen-elemen kemahiran kebolehpasaran yang perlu dikuasai oleh graduan semasa sesi PdP dijalankan (Mohd Azri et.al, 2019).

Jadual 3.8. Purata Skor Min Setiap Kemahiran Graduan JP

Kemahiran	Program (Purata skor min)			Keseluruhan	
	DAT	DPM	DPR	Purata	Tahap
Kompetensi	3.91	4.19	4.06	4.05	Tinggi
Komunikasi	4.19	4.38	4.39	4.32	Sangat tinggi
Penyelesaian masalah	4.10	4.21	4.14	4.15	Tinggi
Keusahawanan	3.82	4.15	4.19	4.05	Tinggi

Selain itu, graduan JP juga mempunyai kemahiran menyelesaikan masalah, kompetensi dan keusahawanan yang baik. Melalui kompetensi, kesemua graduan dapat menggunakan pengetahuan asas dan mengaplikasikan ilmu mengikut bidang masing-masing dalam kerjaya yang diceburi. Graduan juga menunjukkan minat dalam keusahawanan serta boleh menggunakan kemahiran pengurusan dan teknologi maklumat ke arah pembelajaran berkesan. Penglibatan graduan semasa di Politeknik dalam program-program keusahawanan dapat membantu mereka untuk menerapkan ciri-ciri keusahawanan dalam diri di samping menarik minat mereka untuk menceburi bidang keusahawanan. Oleh itu, hasil pencapaian PEO juga dapat menjadi indikator bagi membuktikan graduan memenuhi jangkaan industri (Kasiran et.al, 2022).

4. Kesimpulan

Kompetensi dan kemahiran *softskills* merupakan elemen penting yang dapat meningkatkan kebolehpasaran graduan. Memiliki pekerja yang mempunyai kedua-dua elemen ini merupakan satu bonus kepada majikan. Dapatan kajian menunjukkan kemahiran komunikasi merupakan kemahiran yang tertinggi yang dicapai oleh semua graduan program di JP PTSB. Manakala pencapaian yang terendah bagi program DAT dan DPM adalah kemahiran keusahawanan dan bagi program DPR adalah kompetensi. Secara keseluruhannya, persepsi graduan terhadap pencapaian tahap kompetensi dan kemahiran *softskills* seperti kemahiran

komunikasi, penyelesaian masalah dan keusahawanan adalah berada pada tahap yang tinggi. Namun begitu, penambahbaikan boleh dilakukan terhadap pencapaian tahap kompetensi dan kemahiran keusahawanan yang merupakan pencapaian yang terendah bagi graduan. Dapatan kajian ini boleh memberi input kepada pihak Politeknik bagi membolehkan penambahbaikan dibuat terhadap beberapa aspek yang berkait dengan keberhasilan graduan. Penambahbaikan kurikulum boleh dilakukan melalui menambahbaik penyataan PEO dengan memasukkan elemen-elemen kemahiran *softskills* yang lebih terkini dengan pasaran kerja semasa. Justeru itu, tenaga pengajar perlu menggunapakai kaedah PdP alaf 21 bagi menyesuaikan dengan keperluan pasaran kerja yang lebih bersifat digital. Graduan juga perlu sentiasa mengikuti program peningkatan kemahiran bagi memastikan mereka kekal relevan dan bertahan di pasaran. Penyertaan mereka dalam program ini dapat memberi peluang mereka mendapat kemahiran tambahan yang diiktiraf oleh industri. Kajian ini hanya dijalankan di Jabatan Perdagangan sahaja maka dapatan kajian tidak memberikan gambaran sebenar tentang keseluruhan Politeknik. Dicadangkan pada masa hadapan, bilangan responden kajian dapat ditingkatkan dan diperluaskan kepada graduan dari program kejuruteraan. Kajian lanjut juga boleh dijalankan untuk melihat persepsi majikan terhadap pencapaian PEO graduan.

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SCIENTIFIC ARTICLE WRITING TRAINING AS AN EFFORT TO IMPROVE STUDENTS' PUBLICATION SKILLS AT AKADEMI KEUANGAN PERBANKAN NUSANTARA

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Abstract

The ability to write scientific articles is an essential skill for university students as future academics and professionals. However, low academic literacy and lack of writing experience often hinder students from producing publishable scholarly works. This community service program aimed to enhance students' scientific writing skills through a structured and practical training model. The training was conducted in several stages, including delivery of fundamental materials, writing practice, and intensive mentoring. The methods used were interactive lectures, group discussions, case studies, and hands-on writing practice based on students' research findings. The participants came from various study programs and showed improved understanding of article structure, academic language usage, and proper citation and referencing techniques. Evaluation results indicated that most participants were able to produce draft articles that met the basic standards for publication. This activity made a positive contribution to promoting a writing culture and encouraging students to actively publish their academic works. such training should be conducted regularly, adapted to the participants' needs and readiness to face the increasingly competitive academic landscape.
Keywords: Scientific writing; Publication skills; Academic training; University students.

1. Introduction

In the era of globalization, characterized by the rapid advancement of science and technology, higher education is expected not only to produce graduates who are theoretically competent but also capable of actualizing their knowledge through systematic and argumentative academic writing. In this context, scientific writing skills have become an essential competence that every student must possess. Scientific writing is not merely a medium of academic communication; it also reflects an individual's ability to think critically, logically, and systematically (Arifin, 2017). Through the process of academic writing, students are guided to develop ideas based on valid theories and data, and are trained to construct structured arguments that are academically accountable. This ability is crucial not only for the development of scientific knowledge but also as a foundation for contributing to the resolution of social issues through evidence-based approaches (Sugiyono, 2019). Furthermore, scientific writing skills are highly relevant in professional fields, particularly in education, research, and public policy-making. Academic outputs such as research reports, journal articles, theses, and dissertations are manifestations of refined scientific literacy developed through methodological and conceptual rigor (BSNP, 2010).

However, various studies show that students often lack a deep understanding of scientific writing. Common challenges include difficulties in selecting relevant topics, weak understanding of writing structures, and the inability to formulate logical, data-based arguments (Sari & Nurhadi, 2021). In some cases, students are unable to distinguish between subjective opinions and academically referenced arguments, which ultimately affects the quality of the scientific papers they produce. Fitriani (2020) emphasizes that limited academic

literacy and a lack of technical writing training are major factors behind students' poor scientific writing skills. This situation is exacerbated by curricula that do not yet place sufficient emphasis on the continuous development of writing competence. As stated by Nugraheni and Nisa (2022), scientific writing skills are not only technical but also conceptual and reflective, and must be nurtured early in higher education as part of core graduate competencies. This issue is also apparent at the Akademi Keuangan Perbankan Nusantara, where many students still struggle to grasp the fundamental concepts of scientific writing, organize their work systematically, and express ideas in an academic manner.

Based on these issues, it is evident that the existing scientific writing training approaches are not yet comprehensive or contextual enough, particularly in vocational higher education institutions like Akademi Keuangan Perbankan Nusantara. Although several training models have been developed, most still focus only on technical aspects such as writing structure or referencing, without integrating deeper conceptual elements and strengthening students' critical and analytical thinking skills. In addition, there is still a lack of studies that specifically evaluate the effectiveness of scientific writing training in improving students' publication capabilities in vocational institutions, indicating a significant research gap. Therefore, a more holistic training model is needed that addresses the real needs of vocational students so that their scientific writing skills improve not only procedurally, but also substantially and competitively (Zamzami, 2023); Nugraheni & Nisa, 2022). To respond to this situation, the author has initiated a program entitled "Scientific Article Writing Training as an Effort to Improve Students' Publication Skills at Akademi Keuangan Perbankan Nusantara." This program is designed as a response to the low scientific writing proficiency among students. The training, which is structured systematically and comprehensively, aims to equip students with critical, analytical, and logical thinking skills—essential foundations for constructing arguments and presenting data in a structured and academically accountable manner. These abilities are fundamental for producing scientific papers that not only meet academic standards but also contribute meaningfully to knowledge development and the enhancement of student publication quality in higher education (Fitriani, 2020; Nugraheni & Nisa, 2022). As such, this training is expected to offer a practical solution that enhances students' scientific writing competence while also fostering a sustainable culture of academic literacy within the Akademi Keuangan Perbankan Nusantara.

2. Methodology

This study employed a quantitative descriptive approach using a pre-experimental design in the form of a one-group pretest-posttest design. This approach was selected to measure the effectiveness of scientific article writing training in improving students' publication skills by comparing the results before and after the training. The subjects were final-year students at the Akademi Keuangan Perbankan Nusantara who had completed the Research Methodology course. A total of 25 students were purposively selected based on their active involvement in academic activities and their interest in scientific publication. The research process began with administering a pretest to assess the students' initial abilities in writing scientific articles. This was followed by a three-day training program focused on scientific article writing, which covered the structure of scientific writing, logical idea development, proper referencing, and journal publication techniques. After the training, students were assigned to write a scientific article as their final task, and a posttest was administered to evaluate the improvement in their skills. The activity schedule is presented in the following table.

The instruments used in this study included: A scientific writing test (pretest and posttest) that had been validated by experts; A scientific article assessment rubric measuring aspects such as structure, language use, originality, and argumentation; A training evaluation questionnaire to gather students' feedback on the effectiveness and quality of the training. The training materials covered the following topics: (1) Introduction to scientific writing and the importance of academic publication, (2) Structure of scientific articles, (3) Techniques for writing the

introduction, method, results, and discussion sections (IMRAD), (4) Citation management and referencing using tools such as Mendeley, (5) Hands-on practice in writing articles based on each student's chosen topic. The data were analyzed using the paired sample t-test with the help of SPSS software to determine whether there was a significant difference between the pretest and posttest scores. In addition, qualitative data from the questionnaires were analyzed descriptively to examine students' responses and perceptions regarding the training process. The flow of activities is illustrated in the following implementation diagram.

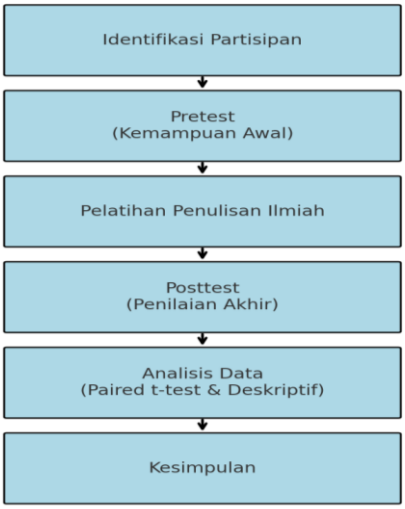

Fig. 1. The flow of activities is illustrated

3. Results and Discussion

This study involved 25 final-semester students from the Akademi Keuangan Perbankan Nusantara as participants. They were purposively selected based on their active involvement in academic activities and their lack of prior experience in scientific publication. Before the training began, the participants took a pretest to assess their initial scientific writing skills. The results indicated the following: Average pretest score: 62.45 out of a maximum score of 100, Skill category: low to moderate, Main weaknesses: article structure, citation errors, and weak logical argumentation. These findings confirm that the majority of students did not yet have a strong foundation in academic scientific writing (Wahyuni, 2021). Following the pretest, all participants participated in a three-day intensive training program that included both theoretical and practical sessions. The training content covered basic concepts of scientific writing, topic selection, article outlining, the use of APA referencing style, and techniques for writing abstracts and conclusions. The training was designed to be interactive, incorporating article assessment simulations and direct feedback from academic facilitators.

Table 1. Implementation of the Training Activities

Day & Date	Training Theme	Activity Details
Day 1 / 14 April 2025	Fundamentals of Scientific Writing	- Introduction to scientific writing and its purposes - General structure of a scientific article - Academic ethics and plagiarism
Day 2/ 15 April 2025	Idea Structuring and Reference Usage	- Techniques for formulating ideas and research focus - Writing argumentative paragraphs - Using references with APA Style
Day 3/ 16 April 2025	Publication Techniques and Writing Simulation	- Strategies for selecting appropriate journals - Article submission and peer-review process - Writing practice and article review by participants

After completing all training sessions, participants took a posttest using the same instrument as in the pretest. The posttest results showed a significant improvement.

Fig. 2. The Training of Scientific Writing

Three-Day Training Narrative General Theme: Fundamentals of Scientific Writing Over the course of three days, participants received comprehensive guidance on scientific writing. The training was divided into three core sessions, each aligned with a specific daily theme, as outlined in Table 1. Day One: Introduction to Scientific Writing. This session introduced the fundamental concepts of academic writing, including its purposes, the general structure of a scientific article, academic ethics, and strategies for avoiding plagiarism. It aimed to establish a solid foundation for high-quality and ethical writing practices. Day Two: Idea Structuring and Reference Usage The second session focused on techniques for formulating ideas and research focus, composing argumentative paragraphs, and applying APA Style in referencing. The objective was to develop the participants' ability to organize ideas logically and cite sources appropriately. Day Three: Publication Techniques and Writing Simulation. Participants were guided through strategies for selecting appropriate academic journals, the manuscript submission process, and the peer review system. The session included practical writing exercises and concluded with peer-review activities to provide constructive feedback and improve manuscript quality. The results of the Paired Sample t-Test between the pretest and posttest scores are as follows:

Table 2. Pretest dan Postest.

Types of Tests	N	Maen	Standar Deviasi	t	Sig. (2-tailed)
Pretest	25	62,45	7,12		
Posttest	25	82,30	6,88	11,452	0,000

The significance level was set at α = 0.05. Source: Ningsih & Harahap (2020). After completing the training, participants took a posttest using the same instrument as the pretest. The posttest results revealed a significant improvement in writing quality. The average score increased to 82.30, with the most notable enhancements observed in article structure (30%), use of academic language (25%), and the ability to formulate logical, data-driven arguments (28%).

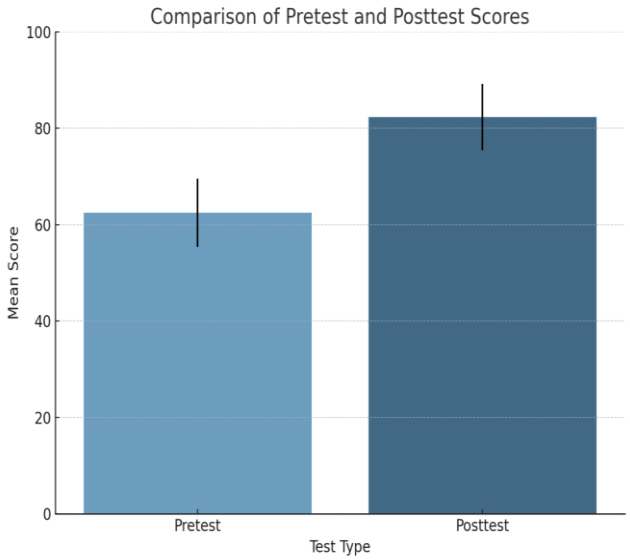

Fig. 3. Comparison of Pretest and Posttest

The analysis graph illustrates a notable increase in students' average scores, rising from 62.45 on the pretest to 82.30 on the posttest. This visual representation clearly reflects the effectiveness of the training in enhancing students' understanding of scientific article writing. The standard deviations, which remained relatively stable at 7.12 for the pretest and 6.88 for the posttest, further support the consistency of the participants' performance. The three-day training program was attended by 25 university students, aimed at improving their academic writing proficiency in a structured and scholarly manner. To assess the impact of the intervention, a paired sample *t*-test was conducted comparing the pretest and posttest scores. The statistical results revealed a *t*-value of 11.452 with a significance level (*Sig. 2-tailed*) of 0.000 ($p < 0.05$), indicating a statistically significant difference between pretest and posttest outcomes. This finding confirms that the training had a meaningful positive effect on students' academic writing skills, particularly in composing scientific articles in line with formal academic standards. These results align with Ningsih and Harahap (2020), who assert that structured and targeted training programs can effectively enhance students' scientific publication competencies. The applied approach of this training bridged the gap between students' initial capabilities and the demands of academic publishing. In addition to quantitative evidence, non-participant observation during the training noted a significant rise in student motivation and engagement in the learning process. Peer-review sessions and interactive discussions provided opportunities for critical reflection and a deeper conceptual grasp of the structure, purpose, and ethical considerations of academic writing (Putra, 2023). Such interventions not only improve technical skills but also foster a scholarly mindset among students throughout the writing process.

The three-day scientific article writing training demonstrated a significant improvement in students' academic writing abilities. Prior to the training, the average pretest score of the participants (N = 25) was 62.45, indicating a limited understanding of scientific writing structure, citation practices, and the formulation of logical arguments. Following the intensive sessions—which covered the IMRAD structure, argument development, APA referencing, and publication simulations—the posttest score rose to 82.30. Statistical analysis using a paired sample t-test yielded a t-value of 11.452 with a significance level of $p = 0.000$ ($p < 0.05$), confirming that the training had a statistically significant effect on enhancing students' scientific writing skills. These findings align with existing literature on the effectiveness of scientific writing training in improving academic literacy and self-efficacy in scholarly communication (Wahyuni, 2021; Dimyati et al., 2019; Ningsih & Harahap, 2020; Wefes et al., 2018).
Qualitative observations revealed that students' active participation in interactive discussions, peer-review sessions, and collaborative writing tasks contributed to increased motivation and

a deeper understanding of academic concepts. This outcome is consistent with the principles of experiential learning (Putra, 2023) and collaborative writing, both of which have been shown to effectively support the development of scientific writing skills (Hartati & Rasyid, 2017). Although a small number of participants encountered challenges in using citation management tools and formal academic language, these patterns highlight the need for continuous guidance and repeated training opportunities beyond a single intensive intervention. The validity of a sustained approach is supported by research on long-term training strategies and iterative learning interventions (Gabber & Ali, 2022); Ibda & Wahyuningsih, 2017); Wefes et al., 2018).

Therefore, structured, contextual, and recurring interventions in scientific literacy training have proven effective in improving students' publication competencies within vocational education settings. Future recommendations include the development of ongoing academic literacy programs, the integration of adaptive technologies (Cheng et al., 2023), and follow-up assessments to monitor medium- and long-term progress (Murugesan, 2012). To holistically prepare students in completing their academic tasks and to make a significant contribution to the world of research and the development of scientific knowledge (aufa, Maknuni, 2024) Based on Results and Discussion above, this study provides students with a deeper understanding of the importance of scientific writing in academic settings. It highlights that the ability to produce structured, evidence-based, and logically argued scientific articles is not only essential for academic success but also contributes to the development of critical thinking, scholarly communication, and professional competence in higher education.

4. Conclusion

The three-day scientific article writing training proved effective in enhancing the academic writing skills of students at the Akademi Keuangan Perbankan Nusantara. This was evidenced by a significant increase in the average score from 62.45 on the pretest to 82.30 on the posttest, as confirmed by the results of the paired sample t-test ($t = 11.452$; $p < 0.05$). The training, which covered understanding the structure of scientific articles, organizing ideas logically, applying APA referencing style, and simulating the publication process, made a substantial contribution to students' mastery of scientific writing skills. These findings emphasize that training based on a systematic, contextual, and practice-oriented (experiential learning) approach not only improves the technical aspects of writing but also fosters students' critical and analytical thinking. Therefore, similar programs should be institutionalized as ongoing initiatives within higher education, especially in vocational settings, to strengthen academic culture and increase students' productivity in scientific publication.

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THE INFLUENCE OF PROMOTION AND PRICE ON PURCHASING DECISIONS IN E-COMMERCE SHOPEE THROUGH BRAND IMAGE AS AN INTERVENING VARIABLE

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Abstract

This study aims to determine the effect of promotion and price on purchasing decisions through brand image on the e-commerce platform Shopee. The subject of this study consisted of students from Cendana Polytechnic in Medan. The sample in this study consisted of 97 respondents, selected using purposive sampling. Data collection techniques included questionnaires, documentation, and observation, using a quantitative research method. The results of this study indicate that brand image influences purchasing decisions on Shopee. Price affects the brand image of Shopee's e-commerce platform but does not influence purchasing decisions directly. However, promotion influences purchasing decisions. Price also affects purchasing decisions indirectly through brand image as an intervening variable.
Keywords: Promotion; Price; Purchasing decision; Brand image; Shopee.

1. Introduction

The rapid development of information technology has brought significant changes in various aspects of life, including in the world of commerce. E-commerce or e-commerce has become one of the top choices for consumers to shop due to its ease of access, wide selection of products, and flexibility of time. In Indonesia, Shopee has emerged as one of the most popular e-commerce platforms, widely used by consumers from diverse backgrounds.

Shopee is an online shopping platform that can only be accessed using the internet. The app was launched in 2015. According to CNN Indonesia (2023), Data.ai noted that Shopee is the most in-demand online shopping platform in Indonesia, with the highest total downloads on both the Google Play Store and App Store. The total number of Shopee users and visitors continues to increase every month. Currently, Shopee remains the number one e-commerce platform in Indonesia. According to Similarweb data, Shopee currently leads the Indonesian e-commerce marketplace in terms of visitors. In September 2023, the Shopee website recorded approximately 237 million visits, representing a 38% increase compared to the start of the year (*year-to-date*/ytd).

In the increasingly fierce competition in the e-commerce industry, businesspeople must be able to attract the attention of consumers and maintain their loyalty. Some of the factors that influence consumer purchase decisions on e-commerce platforms include promotions, prices, and brand image. These three factors play an important role in shaping consumer perception and influencing their decision to purchase a product or service.

Promotion is one of the effective marketing tools to attract consumers' attention. In the company's modern marketing activities, it is related to the planning and development of good products and determining attractive prices for customers. Promotion is a one-way flow of information or persuasion created to direct a person or organization to actions that create exchange in marketing, according to Kotler and Keller (2016), promotion is a way for companies to inform, persuade, and remind consumers about the products and brands they

sell. Through promotions, companies can provide information about products, offer discounts, cashback, and various other incentives that can encourage consumers to make purchases. Attractive, targeted promotions can increase consumer buying interest and speed up purchasing decisions. The factor that can affect customer decisions in determining purchase decisions for customers is price. Price has a very important role in influencing customer decisions in determining purchases on Shopee E-Commerce so that it greatly determines the success of the promotion.

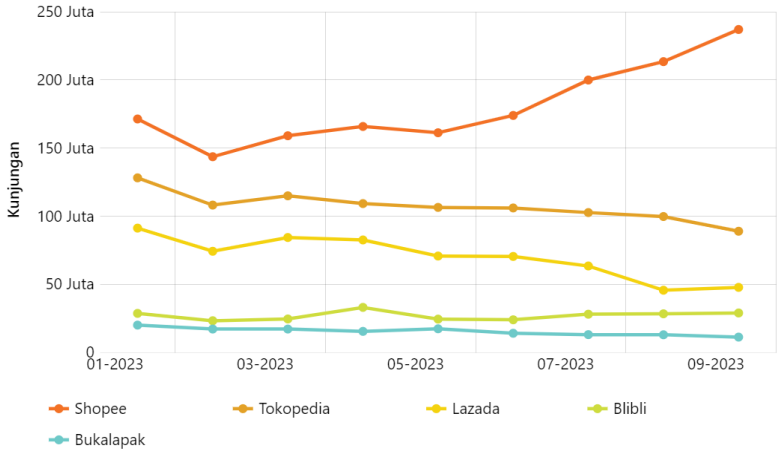

Fig.1. Similarweb data

2. Methodology

In this study, the population consists of two types, namely the general population and the target population. The general population in this study refers to all Shopee consumers, the exact number of whom is unknown. The target population, from which the research sample is drawn, consists of Cendan Polytechnic students who have made at least two purchases. Because the number of the target population is unknown, the Margin of error formula, according to Sugiyono (2017) is used as follows:

$$n = \frac{Z^2}{4\,(Moe)^2} \tag{1}$$

Information:
n = Number of Samples
Z = Sample discovery required confidence level 95%
(Z = 1.96)
Moe = *Margin of error,* i.e. maximum allowable error, and
Determined 10%
Account:

$$n = \frac{Z^2}{4\,(Moe)^2} \tag{2}$$

$$n = \frac{1{,}96^2}{4\,(10\%)^2}$$

$$n = \frac{3{,}8416}{0{,}04} = 96{,}04$$

According to the calculation results, the number of samples in this study was rounded to 97 respondents, as the variable is discrete and rounding is necessary.

Table 1. Description of the characteristics of the research subject by gender

Yes	Gender	Sum	Percentage
1.	Men	64	67%
2.	Woman	32	33%
	Total	97	100%

Based on the results in Table 1, male students dominate the respondents, with 67% of participants being male and 33% female. This may be because the majority of students at Medan Cendana Polytechnic are male. However, the gender composition could also reflect the response tendency of male students to participate in this research.

Table 2. Validity Test Results

Variable	Indicator	Outer Loading	(Average Variance Extracted)	Information
Promotion	PROMOTION 1	0.699	0.526	Valid
	PROMOTION 2	0.771		Valid
	PROMOTION 3	0.723		Valid
	PROMOTION 4	0.644		Valid
	PROMOTION 5	0.811		Valid
	PROMOTION 6	0.700		Valid
	PROMOTION 7	0.757		Valid
	PROMOTION 8	0.782		Valid
	PROMOTION 9	0.759		Valid
	PROMOTION 10	0.746		Valid
Price	PRICE 1	0.762	0.502	Valid
	PRICE 2	0.615		Valid
	PRICE 3	0.729		Valid
	PRICE 4	0.679		Valid
	PRICE 5	0.679		Valid
	PRICE 6	0.625		Valid
	PRICE 7	0.657		Valid
Brand Image	IMAGE 1	0.681	0.518	Valid
	IMAGE 2	0.740		Valid
	IMAGE 3	0.751		Valid
	IMAGE 4	0.641		Valid
	IMAGE 5	0.751		Valid
	IMAGE 6	0.779		Valid
Purchase Decision	KP 1	0.732	0.549	Valid
	KP 2	0.658		Valid
	KP 3	0.784		Valid
	KP 4	0.712		Valid
	KP 5	0.749		Valid
	KP 6	0.676		Valid
	KP 7	0.676		Valid
	KP 8	0.754		Valid
	KP 9	0.732		Valid
	KP 10	0.722		Valid

Table 2 shows that all indicators are eligible. In addition to examining the value of outer loading, the researcher also needs to consider the value of AVE *(Average Variance Extracted).* Based on Table 42, it is known that all indicators already have an AVE value greater than 0.50. This indicates that all indicators have met the validity test standards.

Table 3. Reliability Test Results

Variable	Composite Reliability	Cronbach's Alpha	Information
Brand Image	0.819	0.828	Reliable
Price	0.808	0.811	Reliable
Purchase Decision	0.883	0.886	Reliable
Promotion	0.909	0.921	Reliable

Based on Table 3, it is evident that the composite reliability value for the respondents exceeds 0.70, indicating that the data can be considered reliable. In the instrument test, reliability is

evident from the Cronbach's Alpha value, which shows that all indicators have a value of more than 0.50. Therefore, the data is considered reliable.

Table 4. Results Goodness of fit model

	Saturated model	Estimated model
Standardized Root Mean	0.100	0.102
Square Euclidean Distance	5.329	5.507
Geodesic Distance	1.945	1.938
Chi-square	902.762	905.879
Normed Fit Index	0.587	0.586

Based on Table 4, the Normed Fit Index criteria are greater than 0.5, indicating a good model. The Normed Fit Index criterion of 0.634 > 0.5 indicates a good fit.

Table 5. Determination Coefficient Results

	R Square	*R Square Adjusted*
Brand Image	0.348	0.341
Purchase Decision	0.650	0.639

The Adjusted R Square value of 0.341 for the dependent variables of purchase decisions can be explained by the variables of promotion, brand image, and price of 63.9% while 36.1% is explained by other variables that were not examined in the study. Regarding the R-squared adjusted value, the intervening variable, namely brand image, can be explained by the promotion variable, with price accounting for 34.1%, while 65.9% is explained by other variables not examined in this study.

Table 6. Direct Impact Test Results

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Brand Image -> Purchase Decision	0.677	0.679	0.078	8.657	0.000
Price -> Brand Image	0.590	0.606	0.070	8.425	0.000
Price -> Purchase Decision	-0.123	-0.121	0.135	0.913	0.362
Promotion -> Purchase Decision	0.372	0.371	0.112	3.314	0.001

Based on Table 6, it shows that the majority have *a p-value* of <0.05, meaning that they have a significant influence of exogenous variables on endogenous variables. In the data above, it can also be seen that there is a non-significant influence, namely on the ease of access to buying interest and the ease of access to purchase decisions that have *a p-value* of >0.05, meaning that it is not significant or the hypothesis is not supported. As for the other variables, they have *green p-values*, which means that the hypothesis is accepted.

Table 7. Indirect effect test results

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Price -> Brand Image -> Purchase Decision	0.399	0.413	0.076	5.236	0.000

Table 7 shows that the *p-values* show that the majority have *a p-value* of <0.05, meaning that there is a significant influence between exogenous variables and endogenous variables. However, there is an insignificant variable, namely ease of access to purchase decisions through buying interest, which serves as an intervening variable with a p-value of > 0.05, indicating that it is not significant and the hypothesis is not supported.

Table 8. Result of the research hypothesis

Hypothesis	Influence	T-Statistics	p-values	Information
H1	Brand Image -> Purchase Decision	8.657	0.000	Hypothesis Accepted
H2	Price -> Brand Image	8.425	0.000	Hypothesis Accepted
H3	Price -> Purchase Decision	0.913	0.362	Hypothesis Rejected
H4	Promotion -> Purchase Decision	3.314	0.001	Hypothesis Accepted
H5	Price -> Brand Image -> Purchase Decision	5.236	0.000	Hypothesis Accepted

Table 8 shows that several hypothetical results are not accepted. This hypothesis includes the second hypothesis, namely that ease of access has no effect on purchase decisions. The fifth hypothesis is that ease of access has no effect on buying interest, and the eighth hypothesis is that ease of access has no effect on purchasing decisions through buying interest as an *intervening variable.* The results of the other hypothesis were declared accepted because they met the requirements with *p-values < 0.05.*

4. Conclusion

Based on the discussion, analysis and testing, the conclusions drawn are as follows: The results of this study state that brand image variables affect purchase decisions on Shopee, price variables affect the brand image of Shopee, price variables have no effect on purchase decisions on Shopee e-commerce, promotion has an effect on purchasing decisions, the price variable affects the purchase decision through brand image as an intervening variable.

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EXPLORING SPORTS PARTICIPATION AND ATTITUDES AMONG UNIVERSITY FOUNDATION STUDENTS: IMPLICATIONS FOR HOLISTIC STUDENT DEVELOPMENT

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Abstract

Sports play a crucial role in promoting a healthy and balanced lifestyle, particularly among university students navigating academic challenges. This study explores the participation levels and attitudes toward sports among Foundation Studies students at Universiti Utara Malaysia. Using an exploratory approach, primary data were collected via a structured Google Forms survey involving 171 respondents. The study examined students' demographic profiles, past and current participation in sports, types of sports engaged in, and the reasons influencing both participation and non-participation. Findings revealed that while the majority had prior involvement in sports during school years, current participation dropped significantly, with only 26% actively engaging in any sport. Badminton emerged as the most popular sport, while lack of time, motivation, and perceived priority were cited as key barriers. Despite recognizing the physical and mental health benefits of sports, students demonstrated a gap between awareness and action. The results underscore the need for institutional initiatives to promote sports participation as part of students' daily routines. This study provides valuable insights for university administrators and educators to develop strategies that integrate sports into the broader agenda of student well-being, productivity, and holistic development, aligning with the goals of Technical and Vocational Education and Training (TVET) and higher education institutions.

Keywords: Sports participation; Student attitude; Foundation studies.

1. Introduction

Sports play a crucial role in promoting health, productivity, and overall well-being across all stages of life (Jariono & Subekti, 2020; Wibowo, 2019). Individuals can engage in various types of sports activities depending on their interests, skills, and motivation. The importance of physical activity becomes even more apparent when considering the health challenges faced by populations today. According to the World Health Organization (WHO), coronary heart disease remains one of the leading causes of death in Malaysia, accounting for approximately 29,363 fatalities annually (WHO, 2019; Khaw & Yong, 2024). This condition is primarily caused by plaque build-up along the arterial walls, which restricts blood flow to the heart (Thakur *et al.*, 2018). Unhealthy dietary habits, particularly the consumption of foods high in cholesterol and saturated fats, contribute significantly to this problem (Al-Jawaldeh & Abbass, 2022; Gomez *et al.*, 2021). Other major health issues in Malaysia include stroke, influenza and pneumonia, chronic lung diseases, and diabetes, all of which rank among the country's top medical concerns (WHO, 2019). In addition, the prevalence of obesity and overweight individuals in Malaysia has been steadily rising. A 2020 study by the Ministry of Health (MOH) revealed that more than half of the adult population is affected by these

conditions (Yong *et al*., 2020). These trends highlight the pressing need for preventive measures, among which regular engagement in sports and physical activity is a critical component.

Among the key factors contributing to these health concerns is the general lack of involvement in physical activities. A sedentary lifestyle significantly increases the risk of developing chronic diseases, while active participation in sports contributes to improved physical and mental health. Sports engagement occurs across all segments of society, including youth, working adults, and students in higher education. University and college students, as a vital subset of the population, engage in sports for various reasons—ranging from personal interest and skill development to utilizing available campus facilities. Additionally, sports serve as a recreational outlet that allows students to spend their leisure time in a meaningful way, promoting enjoyment, stress relief, and social interaction. Given this context, the present study seeks to examine the patterns of sports participation and attitudes among Foundation Studies students. The findings aim to inform institutional strategies to enhance student engagement in physical activities, thereby contributing to healthier lifestyle habits within the university community.

2. Methodology

This study employed an exploratory research design to investigate the levels of participation and attitudes toward sports among students in Foundation Studies. The objective was to gain insights into students' personal opinions, behavioral motivations, and the social or institutional factors influencing their engagement with sports, as perceived both individually and through peer interactions. Primary data were collected through a self-administered online survey distributed via Google Forms to students enrolled in the Foundation Studies programme. The data are classified as primary because they were collected firsthand by the researchers using a systematic approach targeted specifically at the study's population of interest. All respondents were Foundation Studies students at Universiti Utara Malaysia. Before distribution, the survey instrument underwent pilot testing to ensure the clarity, reliability, and relevance of the items. Feedback from the pilot phase was used to refine the questionnaire, enhancing its validity and improving respondent comprehension. Once finalized, the questionnaire was disseminated online, allowing for efficient and broad data collection.

The data collection process followed several key stages: (1) development of the questionnaire, (2) pilot testing and refinement, (3) official distribution of the survey, (4) response monitoring, and (5) data cleaning and preparation for analysis. These steps were crucial in ensuring the overall quality and integrity of the data. The questionnaire included a combination of question types. Students were asked to provide basic demographic information, including their full name, matriculation number, and gender. The survey also featured binary questions (e.g., 'yes' or 'no'), with the addition of a 'sometimes' option to capture more nuanced responses and reduce bias. This design was intended to offer respondents the flexibility to select the most accurate options that reflected their personal experiences. In addition, Likert-scale items were included to assess students' attitudes toward sports participation, ranging from 1 (strongly disagree) to 5 (strongly agree). All responses were treated with strict confidentiality and used solely for research purposes. Participation was voluntary, and no personal identifiable information was disclosed in the presentation of findings.

3. Results and Discussion

Figure 1 presents the gender distribution of respondents in the survey on sports participation and attitudes among Foundation Studies students. The data indicate that the majority of respondents were female, comprising 141 out of 171 participants, which represents approximately 82% of the total sample. In contrast, only 30 male students responded, accounting for 18% of the sample. Thus, the mode of the gender distribution is female.

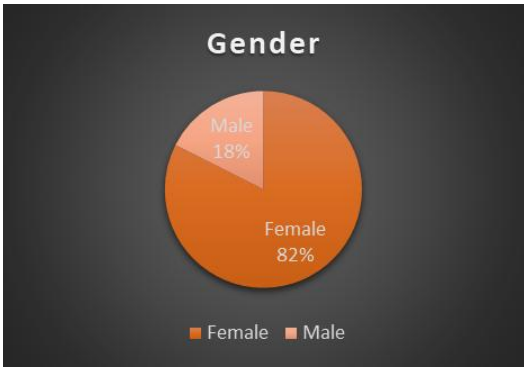

Fig. 1. Students Gender in Foundation Programme

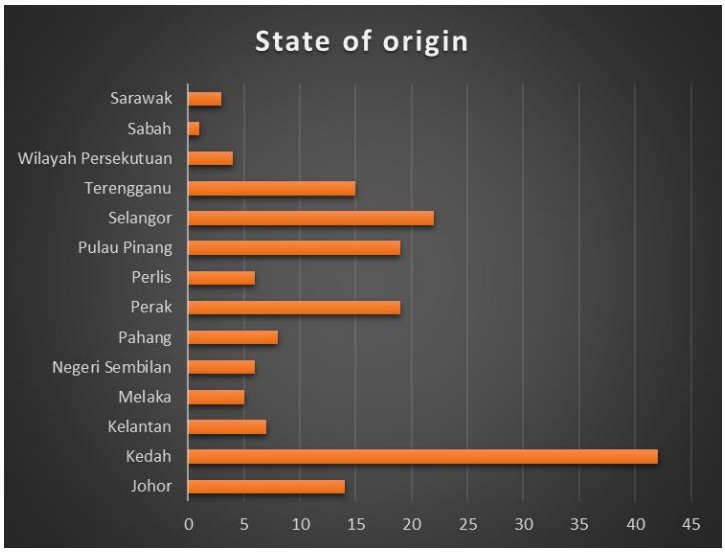

Fig. 2. Number of Students from Each State

Figure 2 illustrates the state of origin of the Foundation Studies students. The horizontal bar chart indicates that the most common state of origin is Kedah, with 42 out of 171 respondents (24.56%). This is followed by Selangor, accounting for 12.87% of the students. Both Pulau Pinang and Pahang have the same number of respondents, with 19 students each. The smallest representation is from Sabah, with only one student (0.585%) participating in the survey.

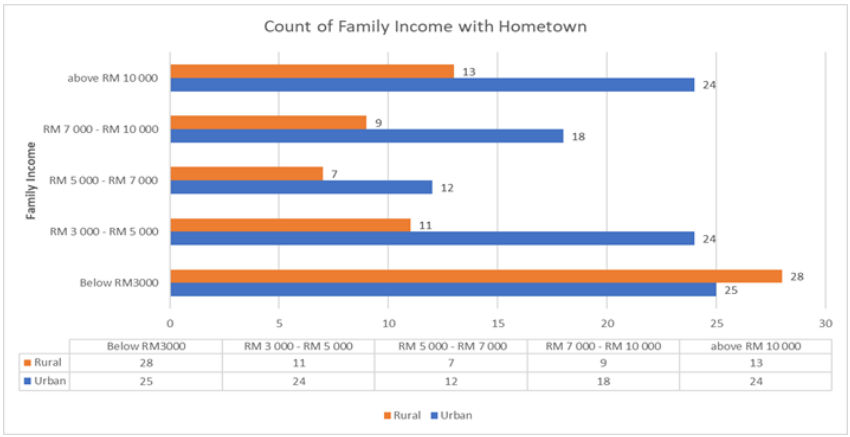

Fig. 3. Number of Students from Each State

Figure 3 compares the income distribution between students residing in urban and rural areas. The data show that students from urban areas have a higher median income of 81.6, compared to 53.9 for those from rural areas. The median is used as the preferred measure of

central tendency due to its robustness against outliers. In terms of variability, the interquartile range (IQR) for urban respondents is 42.8, while the rural group has a lower IQR of 28.2. These findings suggest that students from urban backgrounds generally report higher income levels than their rural counterparts.

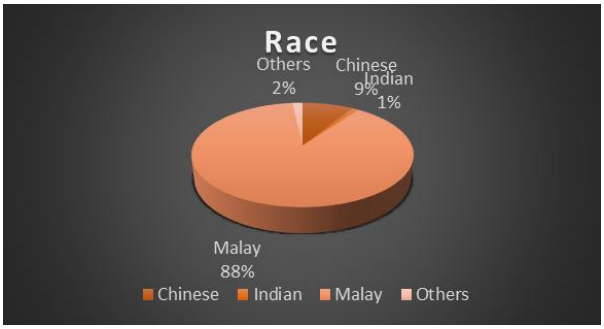

Fig. 4. Pie Students' Races

Figure 4 presents the racial composition of Foundation Studies students. The majority of respondents are Malay, comprising 151 students, which represents 88% of the total. Chinese students make up 9%, with 15 respondents, while students of other races account for 2%, represented by 3 students. The Indian student group is the smallest, with only 2 students, making up 1% of the overall population. Figure 5 indicates that the majority of students had participated in sports during their school years. A total of 133 respondents, or 72% of the sample, reported previous involvement in sports. In contrast, 38 students (28%) stated that they had not engaged in any sports activities during their time in school.

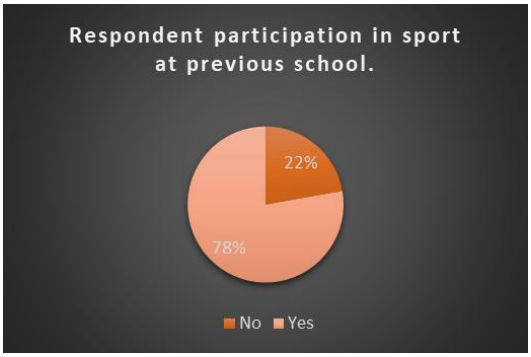

Fig. 5 Respondent participation in sport at previous school

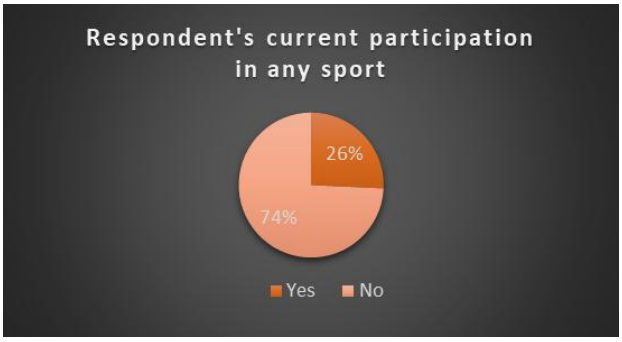

Fig. 6. Respondent current participation in any sport

Figure 6 shows the current level of sports participation among Foundation Studies students. Only 44 respondents (26%) reported that they are currently engaged in sports activities, while the majority—127 students (74%)—indicated that they are not participating in any sports.

These findings suggest that interest in sports has declined among university students, with only a small proportion actively participating in physical activities.
The pie chart in Figure 7 illustrates the types of sports currently played by Foundation Studies students. The most popular sport is badminton, with 40% of students indicating they play it regularly during their spare time, making it the mode of the dataset. Other sports reported include volleyball, basketball, netball, football, futsal, tennis, and golf. Among these, golf has the lowest participation rate, with only 1% of students engaging in it. This low participation may be attributed to the relatively high cost and limited accessibility associated with the sport.

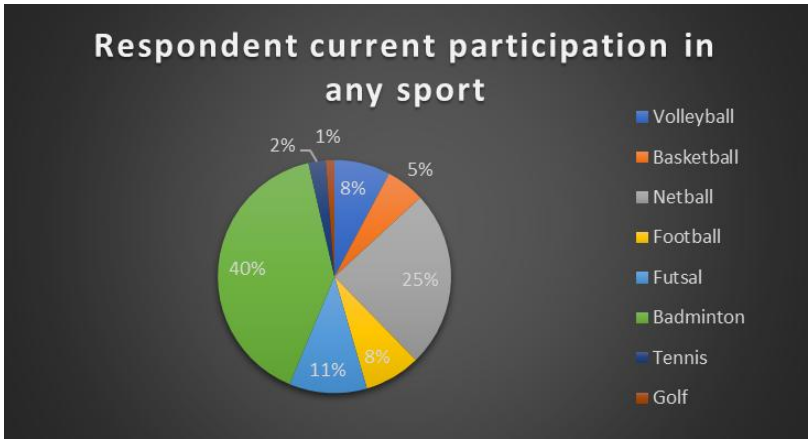

Fig. 7. Respondent current participation in any sport

Table 1. Range of Mean Score based on the Agreement of Statement About Reasons for Participating in Sport

Question	1	2	3	4	5	6	Mean
1	1	2	14	44	60	50	4.8129
2	0	3	14	30	57	67	5.0000
3	0	1	3	23	58	86	5.3158
4	0	1	4	26	55	85	5.2807
5	1	2	11	35	63	59	4.9532
6	0	8	22	47	45	49	4.6140
7	3	11	31	56	39	31	4.2281
8	7	12	43	47	38	24	3.9883
9	3	12	22	57	37	40	4.3626
10	1	2	15	36	49	68	4.9532
11	5	17	38	58	32	21	3.9240
12	1	4	16	55	54	41	4.6374
13	9	19	27	38	39	39	4.1462
14	9	18	31	42	40	31	4.0468

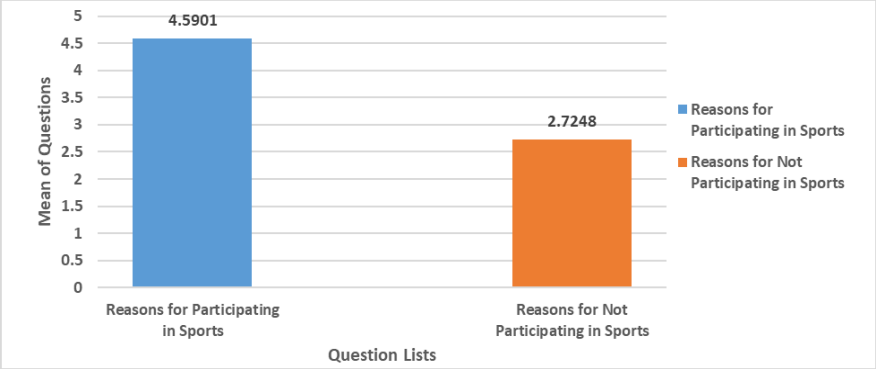

Fig. 8. Mean for Mean Score of Different Types of Statements

Table 2. Range of Mean Score based on the Agreement of Statement About Reasons for Not Participating in Sports

Question	1	2	3	4	5	6	Mean
2	30	17	44	34	29	17	3.3860
3	21	30	40	44	21	15	3.3450
4	27	31	45	43	14	11	3.1111
5	120	35	7	3	5	1	1.4854
6	96	44	13	9	6	3	1.7953
7	117	36	10	3	3	2	1.5088
8	77	35	22	22	7	8	2.2456
9	120	32	10	4	4	1	1.4971
10	79	39	17	12	19	5	2.2281
11	23	30	42	43	28	5	3.2222
12	44	34	36	27	21	9	2.8480
13	36	32	54	33	11	5	2.8012
14	33	34	51	35	12	6	2.8655
15	6	13	41	60	31	20	3.9181
16	10	14	37	43	35	32	4.0234

Table 1 and Figure 8 illustrate the level of agreement among Foundation Studies students regarding the reasons for participating in sports. The Likert scale used ranged from 1 (strongly disagree) to 6 (strongly agree). Students were asked to rate 14 statements related to their motivations for participating in sports. The analysis shows a mean score of 4.590, indicating that most students expressed high levels of agreement with the positive reasons provided. This reflects a generally favorable attitude toward engaging in sports activities. Conversely, Table 2 and Figure 8 present the level of agreement for the reason's students choose not to participate in sports, based on statements numbered 15 to 30. The overall mean score for these statements is 2.7248, suggesting that most respondents leaned toward disagreement with the listed negative reasons. This implies that, while barriers to participation exist, they may not be strongly endorsed by most of the students. Notably, the mean for reasons supporting participation is considerably higher than that for non-participation, reinforcing the conclusion that students recognize the benefits of sports even if participation rates remain low.

4. Conclusion

This study examined the participation and attitudes toward sports among Foundation Studies students at Universiti Utara Malaysia. While a majority of students reported engaging in sports

during their school years, the level of current participation at the university is considerably lower. Although students generally expressed strong agreement with statements affirming the benefits of sports, such as enhancing physical health, reducing stress, and promoting social interaction, this positive perception has not fully translated into consistent engagement in sports activities. Badminton emerged as the most popular sport, while participation in sports like golf was minimal, largely due to accessibility and cost constraints. Barriers such as academic workload, limited time, and low personal motivation were among the key factors hindering participation. However, relatively low agreement with these negative factors suggests that many students remain open to participating in sports, provided that the right conditions and support systems are in place.

The findings have important implications for student development. Engaging in sports can significantly contribute to students' physical well-being, emotional resilience, and social connectedness—factors that are essential in fostering a holistic university experience. For Foundation Studies students in particular, who are at a transitional stage in both academic and personal development, active participation in sports can promote discipline, teamwork, time management, and coping skills that support long-term success in higher education and beyond. From a practical institutional perspective, universities play a critical role in shaping a culture that values and supports physical activity. Institutions should consider integrating sports more intentionally into student development programmes, including merit-based systems and co-curricular requirements. Improving access to facilities, offering diverse and inclusive sports options, and addressing logistical and motivational barriers can encourage more students to adopt active lifestyles. Awareness campaigns and peer-driven initiatives may also enhance participation by normalizing sports as a beneficial and routine part of campus life. In line with the broader goals of higher education and Technical and Vocational Education and Training (TVET), these efforts can foster a more balanced, health-conscious, and productive student population. Ultimately, this study highlights the importance of a proactive, student-centered approach to promoting sports engagement as a vital component of comprehensive education.

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KERJAYA SELEPAS BERGRADUAT: KAJIAN PASARAN PEKERJAAN BAGI PEMEGANG DIPLOMA PENGAJIAN VIDEO DAN FILEM POLITEKNIK METRO TASEK GELUGOR

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Abstrak

Industri kreatif di Malaysia, khususnya dalam bidang video dan filem, semakin berkembang pesat selari dengan pertumbuhan permintaan terhadap kandungan digital. Kerajaan telah menyediakan pelbagai program sokongan untuk graduan seni kreatif khususnya program Diploma Pengajian Video dan Filem yang ditawarkan di Politeknik METrO Tasek Gelugor (PMTG), namun masih berdepan cabaran seperti ketidakpadanan kemahiran, kekurangan peluang pekerjaan stabil, dan persaingan tinggi dalam pasaran kerja. Kajian ini bertujuan meninjau pasaran pekerjaan bagi graduan dalam bidang ini, dengan fokus kepada jenis pekerjaan, keperluan industri, dan keberkesanan kurikulum semasa. Seramai 45 orang responden, graduan daripada Politeknik METrO Tasek Gelugor telah terlibat melalui soal selidik yang dilaksanakan secara dalam talian bagi tiga (3) sesi pengajian. Hasil kajian menunjukkan graduan memiliki potensi tinggi dalam jawatan seperti editor, pereka grafik, jurugambar dan videografer, dan peningkatan minat terhadap pekerjaan bebas. Kajian mencadangkan penambahbaikan kurikulum, penyediaan kursus digital tambahan serta penubuhan *platform freelancer* untuk meningkatkan kebolehpasaran graduan dalam industri kreatif.
Kata kunci: Industri kreatif; Pasaran pekerjaan; Kebolehpasaran graduan.

1. Pengenalan

Industri kreatif di Malaysia, terutamanya dalam bidang pengajian video dan filem, semakin berkembang pesat seiring dengan peningkatan permintaan terhadap kandungan digital, animasi, dan produksi filem. Kerajaan Malaysia, melalui program seperti Rangka Tindakan Ekosistem Kandungan Digital (DICE) dan inisiatif oleh *Malaysia Digital Economy Corporation* (MDEC), telah memberikan sokongan yang signifikan kepada sektor ini (Gobind Singh Deo, 2024). Walaupun industri ini menawarkan peluang yang banyak, terdapat cabaran besar bagi graduan Diploma Pengajian Video dan Filem dalam memperoleh pekerjaan yang stabil dan relevan dengan kemahiran yang mereka pelajari. Kajian ini bertujuan untuk meninjau pasaran pekerjaan bagi pemegang Diploma Pengajian Video dan Filem di Malaysia, serta untuk mengenal pasti peluang kerjaya yang wujud selepas graduasi. Dengan perkembangan teknologi dan media digital yang semakin pesat, terdapat perubahan dinamik dalam keperluan tenaga kerja, dengan syarikat-syarikat mencari bakat yang bukan sahaja memiliki kemahiran teknikal yang kukuh, tetapi juga kebolehan kreatif dan adaptif dalam industri yang sangat kompetitif.

Menurut Zainol (2017), isu kebolehpasaran graduan dalam bidang filem masih menjadi cabaran utama, terutamanya apabila graduan sukar mendapatkan pekerjaan yang bersesuaian dengan kelayakan mereka selepas tamat pengajian di institusi pengajian tinggi awam (IPTA). Kajian tersebut menekankan keperluan bagi penyelarasan antara kurikulum

akademik dan keperluan sebenar industri bagi memastikan graduan lebih bersedia untuk menghadapi pasaran kerja yang kompetitif. Menurut kajian oleh Jabatan Perangkaan Malaysia (2022), industri kreatif di negara ini dijangka terus berkembang, tetapi graduan dalam bidang ini perlu menghadapi realiti pasaran yang mencabar, termasuk keperluan untuk bekerja dalam pelbagai bentuk pekerjaan—termasuk sebagai pekerja bebas/*freelancer*, berbanding jawatan tetap. Melalui kajian ini, penulis bertujuan untuk mendapatkan gambaran yang lebih jelas mengenai cabaran dan peluang yang dihadapi oleh graduan dalam mencari pekerjaan, serta sejauh mana penyediaan pendidikan dalam pengajian video dan filem bersedia untuk memenuhi kehendak industri.

Dengan mengenal pasti aspek-aspek penting dalam perjalanan kerjaya mereka, kajian ini diharapkan dapat memberikan saranan yang berharga untuk meningkatkan lagi persediaan akademik dan latihan praktikal untuk graduan dalam bidang ini, sekaligus memperbaiki hubungan antara pendidikan dan industri kreatif. Kajian mengenai pasaran pekerjaan bagi pemegang Diploma Pengajian Video dan Filem di PMTG berfokus kepada beberapa masalah utama: Ketidakpadanan Kemahiran dengan Keperluan Industri: Graduan sering kali menghadapi kesukaran kerana kemahiran mereka tidak sepenuhnya memenuhi kehendak industri kreatif yang lebih mengutamakan kemahiran praktikal dan adaptasi dalam persekitaran yang berubah-ubah (Jabatan Perangkaan Malaysia, 2022). Kekurangan Peluang Pekerjaan Stabil: Banyak graduan mendapati peluang pekerjaan lebih bersifat kontrak atau freelance, yang menyukarkan mereka merancang kerjaya jangka panjang dan kestabilan kewangan (Goh & Tan, 2023). Persaingan Tinggi dalam Industri: Pertumbuhan pesat industri kreatif menyebabkan graduan bersaing dengan pekerja berpengalaman untuk jawatan yang terhad, menjadikan pasaran kerja lebih kompetitif (Gobind Singh Deo, 2024). Keterbatasan Pengalaman Industri: Keterbatasan pengalaman industri semasa pengajian menyebabkan graduan kurang berdaya saing dan kurang bersedia menghadapi tuntutan pasaran (MDEC, 2022).

Hesmondhalgh dan Baker (2020) menegaskan bahawa pekerjaan dalam industri kreatif sering dicirikan oleh ketidakstabilan, ketidakpastian, dan struktur kerja yang fleksibel, termasuk kerja kontrak dan bebas (*freelance*). Dalam konteks graduan bidang video dan filem, situasi ini mewujudkan cabaran dalam mendapatkan pekerjaan tetap dan merancang kerjaya jangka panjang, walaupun wujud permintaan tinggi terhadap kandungan media. Mereka juga menekankan bahawa kejayaan dalam industri ini sering bergantung kepada rangkaian sosial, pengalaman praktikal, dan keupayaan untuk menyesuaikan diri dengan kehendak industri yang sentiasa berubah.

Menurut Watson dan Ward (2021), peralihan daripada alam pengajian ke dunia kerja dalam industri kreatif merupakan satu proses yang mencabar bagi graduan media. Mereka mendapati bahawa ramai graduan menghadapi ketidakpastian berkaitan kerjaya, kekurangan bimbingan profesional, dan tekanan untuk membina rangkaian industri sejak awal. Kajian ini turut menunjukkan bahawa kejayaan awal kerjaya sering kali lebih dipengaruhi oleh pengalaman praktikal dan hubungan industri berbanding pencapaian akademik semata-mata. Oleh itu, penyedia pendidikan perlu memainkan peranan penting dalam memperkukuh hubungan industri dan menyediakan pendedahan dunia sebenar kepada pelajar. Kajian ini bertujuan untuk menilai pasaran pekerjaan bagi pemegang Diploma Pengajian Video dan Filem di PMTG dengan fokus kepada beberapa objektif utama:

a) Mengenal pasti jenis pekerjaan yang disandang oleh graduan dalam bidang video dan filem selepas menamatkan pengajian di peringkat diploma.
b) Mengenal pasti kemahiran yang diperlukan oleh industri yang mungkin tidak dipenuhi oleh kurikulum semasa bagi program Diploma pengajian Video dan Filem.
c) Menyediakan Cadangan Penambahbaikan: Memberikan cadangan yang konstruktif bagi meningkatkan hubungan antara pendidikan dan industri kreatif, termasuk penambahbaikan dalam program latihan industri dan kurikulum bagi meningkatkan kebolehpasaran graduan.

Responden kajian ini adalah seramai orang 45 pelajar yang telah bergraduat daripada program Diploma Pengajian Video dan Filem, di Jabatan Rekabentuk dan Komunikasi Visual, Politeknik METrO Tasek Gelugor. Graduan yang telah tamat belajar pada Sesi II 2021/2022 Sesi 1 2022/2023 dan Sesi II 2023/2024. Jadual di bawah menunjukkan maklumat demografi responden kajian ini yang terdiri 51 orang graduan atau alumni daripada program Diploma Pengajian Video dan Filem (DDV), di Jabatan Rekabentuk dan Komunikasi Visual 9JRKV), Politeknik METrO Tasek Gelugor (PMTG). Graduan yang telah tamat belajar pada Sesi 1 2021/2022, Sesi 2 2021/2022 Sesi 1 2022/2023, Sesi 2 2023/2024 dan Sesi 1 2024/2025.

Jadual 1. Maklumat demo grafik responden

Jantina	Frekuensi (f)	Peratusan (%)
Lelaki	30	66.7
Perempuan	15	33.3

Umur	Frekuensi (f)	Peratusan (%)
20-25	45	100

Asal	Frekuensi (f)	Peratusan (%)
Johor	3	6.7
Melaka	1	2.2
Negeri Sembilan	2	4.4
Selangor	10	22.7
Perak	11	22.7
Terengganu	1	2.2
Kelantan	1	2.2
Pulau Pinang	10	22.2
Sabah	1	2.2
WP KL	1	2.2
Kedah	4	8.9

HPNM	Frekuensi (f)	Peratusan (%)
>3.67	22	48.9
<3.67	17	37.8
>3.00	6	13.3

2. Metodologi

Kajian yang dijalankan adalah secara kuantitatif iaitu menggunakan borang soal selidik secara atas talian sebagai kaedah pengumpulan data. Soal Selidik (*Survey Questionnaire*). Objektif: Untuk mengumpul data daripada graduan yang telah menamatkan pengajian dalam bidang Video dan Filem mengenai pengalaman mereka dalam mencari pekerjaan dan persepsi mereka terhadap pasaran pekerjaan. Soalan: Soalan boleh meliputi topik seperti jenis pekerjaan yang dimasuki selepas graduasi dan pendapat mengenai kesiapsiagaan latihan yang diterima di institusi yang menawarkan latihan secara *Work Based Learning* (WBL).

Borang soal selidik dengan skala likert “Sangat Tidak Setuju” (1) hingga “Sangat Setuju” (5) diedarkan kepada pelajar bagi mendapatkan maklumat berkaitan kajian. Soal selidik yang diedarkan terdiri daripada 2 konstruk iaitu penilaian program dan penilaian keberkesanan program. Respon yang diambil digabungkan bagi memudahkan analisis data dimana jawapan bagi penyataan “Sangat Setuju” digabungkan dengan “Setuju” bagi mendapatkan satu respon positif iaitu setuju, manakala skala likert respon “Sangat Tidak Setuju” dan “Tidak Setuju” menunjukkan pendapat yang negatif dan tidak berkesan terhadap item kajian.

Rujukan Pengalaman Kerja Praktikal WBL turut digunakan di dalam penulisan kajian ini tujuannya adalah untuk mengkaji keberkesanan program latihan WBL dan pengaruhnya terhadap kebolehan graduan mendapatkan pekerjaan. Sebelum menjalankan kajian utama,

penulis telah menjalankan kajian rintis dengan menggunakan sampel kecil untuk menguji kesesuaian instrumen yang digunakan. Ini memberi peluang untuk mengubah suai soal selidik, memastikan soalan yang diajukan jelas, serta menilai masa yang diperlukan untuk melengkapkan kajian. Instrumen ini akan memberi gambaran menyeluruh mengenai pilihan kerjaya graduan dalam industri video dan filem selepas tamat pengajian. Ia membantu untuk merangka cadangan yang lebih tepat untuk memperbaiki sistem pendidikan dan sokongan pasaran kerja bagi pelajar lepasan diploma pengajian video dan filem di Politeknik Malaysia. Hasil dapatan kajian akan diterangkan menggunakan statistik deskriptif (peratusan) dan carta/graf.

3. Dapatan dan Perbincangan

Hasil analisis soal selidik responden bagi konstruksi jawatan responden seperti di Jadual 2. Maklumat jawatan responden:

Jadual 2. Maklumat jawatan responden

Kategori	Jawatan/ Fungsi	Bilangan	Peratusan (%)
Production	*Photographer*	5	11.1
	Videographer	5	11.1
	Crew Production, Operator Switcher, Technical Production	5	11.1
	Editor	4	8.9
	Freelance Photographer	2	4.4
	Cinematographer, Operator Camera, Operator Drone,	2	4.4
	Graphic Designer	1	2.2
Social media practitioner	*Creative Management*	4	8.9
	Social Media Manager + Videographer + Host Live	3	6.6
	Kerani/ *Clerk/ Administrative officer/ Management Staff*	3	6.6
	Intern Degree	2	4.4
Administration	*Health & Wealth Advisor*	1	2.2
	Purchasing Department	1	2.2
	Customer Assistant	1	2.2
	Pekerja Biasa	1	2.2
	Pembantu Penyelia UIDM	1	2.2
	HR dan *Production Manager*	1	2.2
	Rintis *Project* (TNB)	1	2.2
Entrepreneur	CEO, Produksi Sendiri (Noite Elevé)	2	4.4
	Jumlah	45	100

Berikut adalah analisis data pekerjaan berdasarkan jumlah peratusan yang diberikan:

Photographer dan Videographer (22%) merupakan peranan dengan keutamaan tertinggi, menggambarkan permintaan yang tinggi untuk kemahiran video dan fotografi memandangkan peningkatan kandungan digital, media sosial, dan siaran langsung. *Editor, Graphic Designer, Cinematographer* (15.5%) menunjukkan keperluan besar untuk bakat kreatif visual. *Crew Production, Operator Switcher, Technical Production (11%)* menunjukkan keperluan terhadap kemahiran teknikal dan operasi di produksi.

Pengurusan kreatif dan social media menunjukkan frekuensi (15.5%), ini mengindikasikan peranan yang semakin meluas tetapi bersifat umum, di mana wujudnya pelbagai platform pengurusan kandungan dan alat automasi yang memudahkan tugas tanpa memerlukan kepakaran mendalam. Graduan turut memilih kerjaya di bidang pentadbiran pejabat atau pengkeranian (6.6%). Ada graduan yang menyambung pengajian di peringkat ijazah (4.4%). Sebahagian besar pekerjaan yang disenaraikan (9 jenis) berada pada 2.2%, menunjukkan pembahagian yang sama rata antara pelbagai bidang kerja.

Graduan PMTG turut menjadi usahawan dalam bidang penerbitan visual kreatif (4.4%), jumlah ini agak kecil kerana bidang ini memerlukan modal permulaan yang agak tinggi untuk peralatan seperti kamera profesional, komputer berkuasa tinggi, dan perisian penyuntingan, selain kemahiran teknikal dan pengalaman yang mantap. Tambahan pula, persaingan dalam industri ini sangat sengit dan bergantung kuat kepada rangkaian pelanggan, kredibiliti jenama, serta pemasaran yang konsisten.

Jadual 3. Maklumat Kerjaya Responden

Gaji	Frekuensi (f)	Peratusan (%)
RM		
3500 dan ke atas	5	11.1
3500.00-2500.00	9	20
2500.00-1500.00	15	33.3
900.00-1500.00	16	35.6
Bidang kerjaya selari dengan program pengajian	**Frekuensi (f)**	**Peratusan (%)**
Ya	36	80
Tidak	9	20
Pengalaman belajar di PMTG banyak membantu kerjaya saya sekarang	**Frekuensi (f)**	**Peratusan (%)**
Ya	32	71.1
Tidak	5	11.1
Tidak Pasti	8	17.8
Memperolehi peluang pekerjaan ini melalui	**Frekuensi (f)**	**Peratusan (%)**
Iklan Jawatan Kosong	14	31.1
Temuduga Terbuka	10	22.2
Dicadangkan oleh rakan/ahli keluarga	12	26.7
Memohon melalui surat/ media sosial	9	20

Skala Likert 5 (Sangat Setuju hingga 1 (Sangat tidak setuju)

Tahap Kepuasan kerjaya	Frekuensi (f)	Peratusan (%)
5	17	37.8
4	16	35.6
3	11	24.4
2	1	2.2
Pengetahuan & Kemahiran Video	**Frekuensi (f)**	**Peratusan (%)**
5	19	42.2
4	12	26.7
3	7	15.6
2	5	11.1
1	2	4.4
Kemahiran mengggunakan peralatan dan teknik yang betul mengikut fasa penghasilan	**Frekuensi (f)**	**Peratusan (%)**
5	17	37.8
4	15	33.3
3	10	22.2
2	1	2.2
Kemahiran komunikasi berkesan dan sikap positif	**Frekuensi (f)**	**Peratusan (%)**

5	26	57.8
4	13	28.9
3	6	13.3
Kemahiran berfikir kritis dan berkesan	Frekuensi (f)	Peratusan (%)
5	25	55.6
4	13	28.9
3	7	15.6
Menghargai perubahan persekitaran dan sosial, teknologi, legenda tempatan dan warisan budaya yang memberi inspirasi kepada pembangunan produksi video	Frekuensi (f)	Peratusan (%)
5	16	35.6
4	19	42.2
3	8	17.8
2	1	2.2
Menambah baik kemahiran pembelajaran sepanjang hayat dan kemahiran pengurusan maklumat	Frekuensi (f)	Peratusan (%)
5	23	51.1
4	14	31.1
3	7	15.6
2	1	2.2

4. Kesimpulan

Berdasarkan kepada hasil dapatan kajian, jelas menunjukkan bahawa program Diploma Pengajian Video dan Filem yang dijalankan di PMTG menghasilkan graduan yang yang mahir di industri media kreatif. Jawatan seperti *Editor, Graphic Designer, Photographer*, dan peranan videografi mendominasi senarai, menonjolkan permintaan tinggi dalam sektor ini. "*Freelance*" dan variasinya mencerminkan minat terhadap pekerjaan yang tidak terikat dengan institusi secara rasmi, masa dan lokasi yang terhad. Pelbagai jawatan pada tahap 2.2% menunjukkan permintaan untuk kemahiran berkaitan industri kreatif, seperti teknikal, pemasaran, dan pengurusan. Industri kreatif dan media seperti *Editor, Graphic Designer, Photographer*, dan *Videographer* menunjukkan permintaan yang signifikan. Ia didorong oleh latihan industri berformatkan *Work-Based Learning* (WBL) yang telah dipraktiskan di PMTG. Pekerjaan bebas dan variasinya seperti *Freelance Photographer* serta peranan kreatif lain menunjukkan minat terhadap fleksibiliti pekerjaan. Cadangan penulis agar diadakan satu *Platform* khas untuk Pekerja Bebas Tempatan graduan TVET POLYCC dalam bidang kreatif untuk menghubungkan pekerja bebas *(freelancer)* dengan majikan tempatan. Bagi meningkatkan lagi kualiti dan kemahiran media sosial dan digital berikutan peningkatan minat dan keperluan bagi kerjaya ini, silibus di politeknik perlu dimurnikan dengan memberi latihan dan kemahiran berasaskan latihan media sosial dengan menyediakan kursus pendek tentang strategi pemasaran digital, penghasilan kandungan, dan analitik media sosial. Bantuan Perniagaan dan sokongan seperti bantuan cukai, pembiayaan mikro, atau panduan perniagaan kepada *freelancer* atau pekerja bebas amat diperlukan terutamanya bagi memulakan kerjaya mereka.

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KAJIAN TAHAP KEPUASAN PELAJAR TERHADAP KEMUDAHAN DAN PERKHIDMATAN DI POLITEKNIK TUANKU SULTANAH BAHIYAH (PTSB)

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Abstrak

Kemudahan dan perkhidmatan yang berkualiti dalam sesebuah organisasi pendidikan adalah penting bagi memenuhi keperluan dan memberi kepuasan kepada setiap pengguna. Kajian ini dijalankan untuk mengkaji tahap kepuasan pelajar terhadap kemudahan perkhidmatan sukan & rekreasi, kantin/kafeteria dan perpustakaan yang disediakan di Politeknik Tuanku Sultanah Bahiyah (PTSB) bagi sesi sesi 1:2024/2025. Kajian ini melibatkan seramai 1624 responden yang terdiri dari empat jabatan utama iaitu Jabatan Awam, Jabatan Elektrik, Jabatan Mekanikal dan Jabatan Perdagangan. Borang soal selidik digunakan sebagai instrumen utama dan diedarkan kepada semua responden dalam kajian ini. Data dianalisis dengan menggunakan perisian *Statistical Packages for Social Sciences Version* 20.0 (SPSS). Hasil dari analisis data yang diperolehi menunjukkan tahap kepuasan pelajar PTSB terhadap kemudahan perkhidmatan sukan & rekreasi dan perpustakaan yang disediakan di PTSB pada sesi 1:2024/2025 adalah tinggi. Walau bagaimanapun dapatan bagi perkhidmatan kantin/ kafeteria menunjukkan tahap yang sederhana iaitu 83.84%. Penambahbaikan perlu dilaksanakan bagi menjamin kualiti perkhidmatan terutama di kantin/ kafeteria PTSB terutama dari segi pemilihan pengusaha kantin/ kafeteria .
Kata kunci: Kepuasan; Kemudahan; Perkhidmatan.

1. Pengenalan

Kemudahan ditakrifkan sebagai elemen yang disediakan untuk menyokong keselesaan dan kemudahan oleh setiap pengguna. Dalam konteks Pelan Pembangunan Pendidikan 2001–2010, Kementerian Pelajaran Malaysia menekankan bahawa setiap institusi pendidikan perlu dilengkapi dengan kemudahan infrastruktur yang mencukupi, berkualiti dan berkesan bagi menyokong pelaksanaan kurikulum secara optimum. Menurut kenyataan Timbalan Perdana Menteri ketika itu, Tan Sri Muhyiddin Yassin (Berita Harian, 2007), kerajaan telah memperuntukkan pelbagai kelengkapan dan kemudahan bagi menjayakan inisiatif Satu Murid, Satu Kerusi, Satu Meja dan Satu Set Buku Teks demi memastikan keselesaan murid di sekolah terjamin dan memuaskan. Sesebuah institusi pendidikan akan menyediakan pelbagai kemudahan sepert bilik kuliah, perpustakaan, kafeteria, asrama pelajar, sukan & rekreasi, internet dan sebagainya bagi memastikan keselesaan pelajar.

Kajian yang dilaksanakan oleh Nurulhuda, Chai dan Fazli (2009), perpustakaan memainkan peranan yang amat penting sebagai pusat inovasi, pengetahuan dan kebudayaan dalam sesebuah institusi pendidikan. Perpustakaan menjadi medium utama untuk memupuk keterampilan kendiri pelajar dalam mengakses maklumat secara berkesan dan berdikari. Perpustakaan juga berfungsi mengumpul, memilih, menyusun dan menyebarkan bahan

pengajaran dan pembelajaran dalam pelbagai format, termasuk bahan bercetak seperti buku, jurnal dan laporan; serta bahan bukan bercetak seperti sumber digital, cakera padat, video pendidikan, dan pangkalan data dalam talian (Ismail & Zawiyah, 2011). Suasana ruang yang tenang, tersusun dan dilengkapi kemudahan asas seperti meja belajar, sokongan internet, pencahayaan yang baik serta perkhidmatan kakitangan mesra pelanggan merupakan antara faktor yang meningkatkan kepuasan pengguna (Kassim, 2010). Kajian ini perlu untuk memastikan tahap kemudahan perkhidmatan perpustakaan moden juga semakin bergerak ke arah digitalisasi, sekali gus memberi kemudahan kepada pelajar untuk mengakses maklumat di luar waktu operasi fizikal.

Keperluan terhadap makanan merupakan suatu aspek asas dalam kehidupan manusia yang tidak boleh dinafikan. Pengambilan makanan yang tidak mencukupi dan seimbang, akan mengakibatkan fungsi tubuh badan akan terjejas, seterusnya mengganggu keupayaan individu untuk menjalani kehidupan harian dengan efektif. Menurut Abdul Wahid dan Mazilah (2011), cara pemakanan yang baik dan teratur diperlukan bagi memastikan pertumbuhan yang normal serta sokongan kepada aktiviti harian yang mencabar dalam kehidupan moden masa kini. Justeru, isu pemakanan perlu diberi perhatian serius dalam setiap lapisan masyarakat, terutamanya dalam kalangan institusi pendidikan dan organisasi yang menjaga kebajikan warganya.

Menurut Kamus Pelajar Edisi Kedua (2007), kafeteria didefinisikan sebagai sejenis restoran di mana pelanggan perlu mengambil sendiri makanan atau minuman yang diingini dan membuat pembayaran sebelum makan. Kemudahan kafeteria yang lengkap dan menarik memainkan peranan penting dalam menyokong keperluan harian pelajar, terutamanya dari segi pemakanan yang seimbang. Sebuah kafeteria perlu dilengkapi dengan keperluan asas seperti meja, kerusi, kipas atau sistem pengudaraan yang baik. Tahap kebersihan perlu diutamakan bagi menjamin keselesaan dan kesihatan pelanggan. Oleh itu, pengurusan institusi perlu bertanggungjawab bagi memastikan kualiti makanan yang disediakan serta penyelenggaraan kemudahan fizikal di kafeteria berada pada tahap yang memuaskan.

Penyediaan kemudahan sukan di setiap institusi pendidikan adalah penting bagi menggalakkan pelajar bergiat aktif dalam aktiviti fizikal. Akses kepada kemudahan sukan yang berkualiti boleh menjadi faktor utama dalam keupayaan untuk memenuhi permintaan semasa dan melahirkan pelajar-pelajar yang berpotensi dalam sukan. Sukan biasakan akan merujuk kepada aktiviti fizikal yang dilakukan samada untuk pertandingan atau aktiviti harian. Oqundairo (2010), telah mengenal pasti peralatan adalah salah satu perkara yang penting dalam meningkatkan kemahiran sukan atau permainan. Dengan peralatan yang lengkap akan dapat merangsang minat pengguna dan dapat meningkatkan lagi kemahiran. Kekurangan peralatan atau kemudahan sukan & rekreasi akan mengurangkan minat pelajar sekaligus mengurangkan penyertaan pelajar dalam satu-satu pertandingan.

Menurut Maquire & Pearton (2000), penyediaan kemudahan dan perkhidmatan sukan & rekreasi akan meningkatkan lagi motivasi pelajar bagi penyertaan dalam pertandingan/permainan. Dalam kajian Conant (2017) menyatakan bahawa pengurusan dan penyenggaraan yang sistematik bagi setiap kemudahan dan perkhidmatan sukan & rekreasi akan dapat memanjangkan jangka ayat peralatan. Ini perlu bagi memastikan peralatan sentiasa berfungsi setiap kali pelajar ingin menggunakan kemudahan tersebut. Rintaugu (2013) dalam kajian beliau telah mendapati bahawa kemudahan peralatan sukan adalah satu fasiliti yang paling penting dalam sesebuah institusi pendidikan bagi memastikan pelajar-pelajar dapat menjalankan aktiviti fizikal dan bersukan dengan baik mengikut kemampuan mereka dan sekaligus dapat menyertai berbagai pertandingan yang dianjurkan. Pelajar yang bergiat aktif dalam sukan dan aktiviti fizikal akan dapat membantu pelajar dari segi aspek pembelajaran yang berkesan dan sekaligus akan meningkatkan prestasi pengajaran guru terutama dalam pelaksanaan kerja kursus dan aktiviti pengajaran yang lebih berkualiti,

(Lockwood & Wohl, 2012; Ding & Sugiyama, 2017; Bazelais & Doleck, 2018; Barney & Leavitt, 2021).

Kajian ini juga turut menyokong tahap kepuasan atau ketidakpuasan seseorang pekerja yang mempunyai kaitan dengan penilaian tentang kualiti sesuatu perkhidmatan (Parasuranam et al., 1988). Alias dan Nasurdin (2011) mendapati bahawa kemudahan tempat kerja yang lengkap dan perkhidmatan sokongan yang efisien menyumbang kepada tahap kepuasan kerja yang tinggi di kalangan pekerja. Manakala, kajian oleh Azman et al. (2019) ke atas institusi pendidikan mendapati bahawa faktor seperti kebersihan, capaian internet, keselamatan, dan layanan pentadbiran memainkan peranan penting dalam persepsi staf terhadap persekitaran kerja mereka. Kajian ini dijalankan bagi menilai tahap kepuasan pelajar terhadap kemudahan dan perkhidmatan sukan & rekreasi, perpustakaan dan kantin/ kafeteria di Politeknik Tuanku Sultanah Bahiyah disamping megenalpasti aspek-aspek yang tidak mencapai aras Petunjuk Prestasi Utama (KPI) 85%.

2. Metodologi

Kajian ini menggunakan pendekatan kuantitatif dengan reka bentuk tinjauan yang melibatkan 1,624 orang pelajar PTSB daripada empat jabatan iaitu Awam, Elektrik, Mekanikal dan Perdagangan. Instrumen kajian adalah borang soal selidik yang dibina khusus untuk menilai tahap kepuasan pelajar terhadap kemudahan dan perkhidmatan di PTSB. Dengan merujuk Jadual 1, carta menunjukkan saiz sampel minimum yang diperlukan bagi mewakili populasi pelajar semasa PTSB berjumlah 3027 pelajar. Jumlah pelajar yang telah menjawab soal selidik adalah 1624 pelajar dan telah melebihi bilangan sampel minimum yang diperlukan.

Jadual 1. Jadual Saiz Sampel (Krejcia & Morgan, 1970)

N	*S*	*N*	*S*	*N*	*S*
10	10	220	140	1200	291
15	14	230	144	1300	297
20	19	240	148	1400	302
25	24	250	152	1500	306
30	28	260	155	1600	310
35	32	270	159	1700	313
40	36	280	162	1800	317
45	40	290	165	1900	320
50	44	300	169	2000	322
55	48	320	175	2200	327
60	52	340	181	2400	331
65	56	360	186	2600	335
70	59	380	191	2800	338
75	63	400	196	3000	341
80	66	420	201	3500	346
85	70	440	205	4000	351
90	73	460	210	4500	354
95	76	480	214	5000	357
100	80	500	217	6000	361
110	86	550	226	7000	364
120	92	600	234	8000	367
130	97	650	242	9000	368
140	103	700	248	10000	370
150	108	750	254	15000	375
160	113	800	260	20000	377
170	118	850	265	30000	379
180	123	900	269	40000	380
190	127	950	274	50000	381
200	132	1000	278	75000	382
210	136	1100	285	1000000	384

Note.—*N* is population size. *S* is sample size.

Kajian dijalankan secara deskriptif, dan soal selidik tersebut terbahagi kepada empat bahagian iaitu Bahagian A merangkumi maklumat demografi (umur, jantina, kaum, jabatan dan program), manakala Bahagian B, C dan D menilai tahap kepuasan terhadap kemudahan sukan/ rekreasi, kantin/ kafeteria dan perpustakaan. Skala pengukuran yang digunakan ialah skala Likert bagi membolehkan responden menyatakan tahap persetujuan terhadap setiap item. Pecahan bahagian soal selidik diringkaskan dalam Jadual 2.

Jadual 2. Bilangan Item Soal Selidik

Bahagian		Item
B	B1	Kemudahan asas sukan dan rekreasi mencukupi
	B2	Kemudahan asas sukan dan rekreasi mudah diperolehi
	B3	Kemudahan asas sukan dan rekreasi berfungsi dengan baik
	B4	Tempat dan persekitaran sesuai untuk aktiviti sukan
	B5	Layanan pegawai adalah baik dan mesra
C	C1	Kemudahan asas di kantin/kafeteria mencukupi
	C2	Tahap kebersihan di kantin/kafetria adalah baik
	C3	Kualiti makanan dan minuman adalah memuaskan
	C4	Harga makanan/minuman/adalah berpatutan
	C5	Layanan kaunter adalah baik dan mesra
D	D1	Persekitaran dan ruang belajar perpustakaan adalah kondusif
	D2	Sumber/bahan rujukan terkini
	D3	Sumber/bahan rujukan mencukupi
	D4	Perkhidmatan wifi adalah memuaskan
	D5	Layanan pegawai perpustakaan adalah baik

Nilai Alpha Cronbach digunakan bagi menguji tahap kebolehpercayaan dalam kajian ini yang mempunyai julat antara 0.00 – 1.00. Tahap kebolehpercayaan akan berada pada tahap yang baik dan berkesan apabila nilai julat menghampiri 1.0. Sekiranya nilai julat menghampiri 0.00, ia menunjukkan tahap kebolehpercayaan yang rendah dan kurang berkesan (Yusof, 2004). Jadual 3 menunjukkan panduan dalam menganalisis data kajian.

Jadual 3. Jadual Interprestasi Skor Alpha Cronbach (Bond & Fox, 2015)

Skor Alpha Cronbach	Tahap Kebolehpercayaan
0.8 hingga 1.0	Sangat baik dan efektif dan tahap konsistensi yang tinggi
0.7 hingga 0.8	Baik dan boleh diterima
0.6 hingga 0.7	Boleh diterima
< 0.6	Item perlu dibaiki
< 0.5	Item perlu digugurkan

3. Keputusan dan Perbincangan

a. Analisis Latar Belakang Responden

Berdasarkan Jadual 4, analisis taburan jantina menunjukkan bahawa seramai 53.39% daripada jumlah keseluruhan responden adalah terdiri daripada pelajar perempuan, manakala baki 46.61% pula merupakan pelajar lelaki. Secara lebih terperinci, jumlah pelajar perempuan adalah seramai 867 orang, manakala pelajar lelaki pula berjumlah 757 orang. Perbezaan ini menunjukkan bahawa terdapat sedikit kelebihan dalam penyertaan responden perempuan berbanding lelaki dalam kajian ini. Walaupun jurang peratusan antara kedua-dua kumpulan tidak terlalu besar, namun ia memberikan gambaran bahawa pelajar perempuan lebih ramai atau lebih cenderung untuk terlibat dalam kajian soal selidik ini. Taburan ini juga penting bagi memastikan bahawa analisis data kajian dapat mewakili kedua-dua perspektif jantina secara seimbang, sekaligus meningkatkan kebolehpercayaan dapatan kajian yang melibatkan kepuasan pelajar terhadap kemudahan dan perkhidmatan yang disediakan.

Jadual 4. Taburan responden mengikut jantina

Jantina	Kekerapan	Peratusan
Lelaki	757	46.61
Perempuan	867	53.39
Jumlah	1624	100

b. Analisis Kebolehpercayaan

Jadual 5 menunjukkan kesemua nilai pekali Cronbach's Alpha yang diperoleh bagi setiap pembolehubah dalam kajian ini melebihi nilai minimum 0.7, iaitu tahap yang lazimnya diterima sebagai penunjuk kebolehpercayaan yang baik dalam kajian sosial dan pendidikan. Keputusan ini secara langsung menunjukkan bahawa instrumen soal selidik yang digunakan mempunyai tahap konsistensi dalaman yang tinggi serta mampu mengukur konstruk yang dikaji secara tepat dan menyeluruh. Menurut Hair, Black, Babin dan Anderson (2010), nilai Cronbach's Alpha yang melebihi 0.7 menandakan bahawa item-item dalam satu dimensi atau pembolehubah adalah seragam dan saling berkaitan, sekali gus menunjukkan kestabilan dalam respons responden terhadap soalan-soalan yang dikemukakan. Dalam konteks kajian ini, keputusan tersebut memberi keyakinan bahawa setiap konstruk yang diuji sama ada berkaitan kemudahan fizikal, perkhidmatan sokongan atau aspek persekitaran adalah sah dan boleh dipercayai. Keutuhan kebolehpercayaan ini penting kerana ia menjadi asas kepada kesahan inferens yang dibuat daripada data yang dikumpulkan.

Jadual 5. Jadual Interprestasi Skor Alpha Cronbach (Bond & Fox, 2015)

Perkhidmatan dan Kemudahan	Bilangan Item	Cronbach alpha
Sukan/Rekreasi	5	0.911
Kantin & Kafeteria	5	0.896
Perpustakaan	5	0.901

3.3 Keputusan dan Perbincangan

Bahagian B: Sukan/Rekreasi

BHGN	PERKARA		SKOR (%) PELAJAR
B1	Kemudahan asas sukan dan rekreasi mencukupi		86.08
B2	Kemudahan asas sukan dan rekreasi mudah diperolehi		85.16
B3	Kemudahan asas sukan dan rekreasi berfungsi dengan baik		89.35
B4	Tempat dan persekitaran sesuai untuk aktiviti sukan		93.41
B5	Layanan pegawai adalah baik dan mesra		92.05
		PURATA	89.21

Dapatan menunjukkan bahawa kesemua lima item yang dinilai dalam Bahagian B telah berjaya melepasi penanda aras Petunjuk Prestasi Utama (KPI) iaitu 85% yang telah ditetapkan oleh pihak institusi. Ini memberi gambaran bahawa tahap kepuasan pelajar terhadap kemudahan sukan dan rekreasi di PTSB berada pada tahap yang sangat memuaskan. Secara keseluruhan, skor purata yang dicapai adalah 89.21%, ini menunjukkan majoriti pelajar PTSB mempunyai persepsi positif terhadap kemudahan yang disediakan seperti padang bola, gelanggang sukan, gimnasium, serta ruang riadah yang kondusif dan mudah diakses oleh pelajar.

Bahagian C: Kantin/ Kafeteria

BHGN	PERKARA	SKOR (%) PELAJAR
C1	Kemudahan asas di kantin/ kafeteria mencukupi	86.88
C2	Tahap kebersihan di kantin/ kafeteria adalah baik	80.67
C3	Kualiti makanan dan minuman adalah memuaskan	79.93

C4	Harga makanan/minuman/adalah berpatutan		79.93
C5	Layanan kaunter adalah baik dan mesra		91.81
		PURATA	83.84

Berdasarkan maklum balas pelajar, didapati hanya dua item yang melepasi aras Petunjuk Prestasi Utama (KPI) iaitu 85%. Ini menunjukkan kebanyakan responden kurang berpuas hati dengan aspek kebersihan, makanan dan harga makanan di kafeteria PTSB. Perkhidmatan yang tidak memuaskan ini sekaligus akan menjejaskan tahap kesihatan, emosi dan tumpuan pelajar dalam pembelajaran. Zamri (2000), menyatakan bahawa kafeteria merupakan satu tempat yang penting bagi pelajar mendapatkan makanan yang baik dan rehat yang berkualiti bersama teman-teman. Menurut Abu Bakar dan Noraini Azuani (2010), pemakanan yang seimbang bukan sahaja penting untuk kesihatan fizikal, malah turut mempengaruhi sahsiah dan prestasi pelajar.

Bahagian D: Perpustakaan

BHGN	PERKARA	SKOR (%) PELAJAR
D1	Persekitaran dan ruang belajar perpustakaan adalah kondusif	96.55
D2	Sumber/bahan rujukan terkini	94.09
D3	Sumber/bahan rujukan mencukupi	94.95
D4	Perkhidmatan wifi adalah memuaskan	94.95
D5	Layanan pegawai perpustakaan adalah baik	77.03
	PURATA	91.51

Keputusan analisis data bagi item D1, D2, D3 dan D4 berjaya melepasi Petunjuk Prestasi Utama (KPI**)** iaitu 85% yang telah ditetapkan. Dengan skor purata keseluruhan adalah 91.51%, menunjukkan bahawa responden memberikan maklum balas yang positif, sekaligus menunjukkan tahap persetujuan yang tinggi terhadap item yang dikemukakan dalam soal selidik. Item D5 hanya mencapai 77.03% dan tidak mencapai KPI yang telah ditetapkan.Item ini memerlukan perhatian dan penambahbaikan dari pihak pengurusan. Secara keselurugan bagi item D dapat membuktikan bahawa kemudahan perpustakaan di PTSB diterima baik oleh pelajar, meskipun masih terdapat ruang untuk penambahbaikan dalam aspek tertentu. Dapatan ini menyokong kajian oleh Nurulhuda, Chai dan Fazli (2009) yang mendapati bahawa keselesaan ruang, ketersediaan tempat duduk, dan kemudahan wifi memberi kesan kepada pengalaman pelajar di perpustakaan. Shafee et al. (1995), juga menegaskan bahawa perpustakaan merupakan prasarana penting dalam meningkatkan budaya membaca dan akses kepada ilmu pengetahuan. Oleh yang demikian, tahap kepuasan pelajar terhadap kemudahan perpustakaan bukan sahaja menjadi indikator kepada keberkesanan fungsi perpustakaan sebagai pusat sokongan akademik, malah mencerminkan komitmen institusi dalam menyediakan persekitaran pembelajaran yang menyeluruh dan berkualiti.

4. Kesimpulan

Secara keseluruhannya, dapatan menunjukkan bahawa ketiga-tiga pembolehubah yang dikaji iaitu kepuasan pelajar terhadap kemudahan dan perkhidmatan sukan/ rekreasi, perpustakaan serta kantin/ kafeteria amat mempengaruhi tahap kepuasan keseluruhan pelajar di Politeknik Tuanku Sultanah Bahiyah. Kajian mendapati bahawa tahap kepuasan pelajar PTSB terhadap kemudahan perkhidmatan sukan/ rekreasi dan perpustakaan amat memuaskan dimana peralatan dan kemudahan yang disediakan adalah mencukupi. Ini menunjukkan bahawa PTSB dapat menyediakan fasiliti sukan dan perpustakaan yang mencukupi untuk kegunaan

setiap pelajar. Tahap kepuasan pelajar PTSB terhadap kemudahan dan perkhidmatan kantin/ kafeteria adalah ditahap sederhana.

Bagi sasaran Petunjuk Prestasi Utama (KPI), pelajar 100% berpuashati dengan kemudahan dan perkhidmatan sukan & rekreasi yang disediakan di PTSB berdasarkan kepada kelima-lima item melebihi KPI yang ditetapkan 85%. Bagi kemudahan dan perkhidmatan perpustakaan, hanya satu item yang tidak mencapai KPI 85% dan selebihnya melebihi sasaran yang ditetapkan. Pelajar tidak berpuas hati dengan kemudahan dan perkhidmatan kantin/ kafeteria terutamanya bagi kualiti makanan dan minuman, harga makanan dan minuman dan tahap kebersihan. Bagi meningkatkan tahap kepuasan pelajar terhadap perkhidmatan makanan di kantin/ kafeteria PTSB, pihak pengurusan PTSB perlu mengkaji terlebih dahulu rekod pengusaha kantin/ kafeteria sebelum kontrak diberikan kepada mereka. Pemantauan yang berterusan perlu dilakukan bagi memastikan harga makanan di kantin/ kafeteria adalah pada kadar yang munasabah. Pihak PTSB juga boleh berkolaborasi dengan pihak Kementerian Kesihatan Malaysia (KKM) bagi menjamin tahap kebersihan yang memuaskan.

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A CDIO-BASED APPROACH TO DEVELOPING A CREATIVE MARKETING PLAN FOR STUDENT INNOVATION PRODUCTS

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Abstract

This study aims to explore the effectiveness of the CDIO (Conceive, Design, Implement, Operate) approach in developing creative marketing plans by polytechnic students to promote their innovative products. The identified issue is the lack of creativity, originality, and structured marketing elements in the promotional materials produced by students. This action research involved 42 students as primary respondents through questionnaire distribution and document review of the marketing materials produced. The findings show that the CDIO approach enhances students' understanding of the planning, design, implementation, and operation processes in marketing material development. Assessment results indicate improvements in creativity, message clarity, and promotional effectiveness. This study recommends broader integration of the CDIO approach into the marketing curriculum to enhance students' competitiveness and practical skills holistically.
Keywords: CDIO; Creative marketing plan; Product innovation.

1. Introduction

In the era of modern marketing driven by digital and creative platforms, the ability to produce appealing and effective marketing materials is a vital skill for students in the field of marketing. However, it has been found that many students still lack exposure and training in developing innovative and impactful marketing content. The CDIO (Conceive, Design, Implement, Operate) approach, which emphasizes real-world project-based learning, can help students develop practical skills in real-world contexts. This action research focuses on the development of creative marketing materials by students to promote their innovative products using the CDIO approach.

The objectives of this study are:

a) To evaluate students' understanding of the CDIO approach in developing creative marketing plans.
b) To identify the impact of the CDIO approach on the quality of marketing materials produced by students.

The CDIO approach has been widely used in engineering education and is now being applied in various fields including marketing and technical education. According to Crawley et al. (2011), CDIO supports problem-based and outcome-oriented learning. In the context of polytechnic education, this approach provides opportunities for students to actively engage in the entire project development process from conceptual planning to implementation and evaluation. A study by Nordin et al. (2018) indicated that the use of CDIO in teaching helps enhance creative thinking and problem-solving skills among students.

Kotler & Keller (2016) emphasize the importance of experiential learning in marketing, aligning with CDIO's hands-on approach. Laurillard (2012) argues that iterative project-based learning (as in CDIO) enhances students' ability to develop customer-centric marketing strategies.

Gremler et al. (2000) found that simulated and real-world marketing projects improve students' ability to apply theoretical knowledge practically, a core principle of CDIO.

Innovation products developed by students require creative and adaptive marketing strategies due to their novel nature. CDIO provides a systematic way to:

i. Conceive – Conduct market research and identify unique value propositions (Ries & Trout, 2001).
ii. Design – Develop branding, positioning, and promotional strategies (Aaker, 1996).
iii. Implement – Test marketing tactics through digital campaigns, guerrilla marketing, or crowdfunding (Hollensen, 2020).
iv. Operate – Use analytics and feedback to refine the marketing approach (Chaffey & Ellis-Chadwick, 2022).

The CDIO approach is praised for making marketing education more practical and industry relevant. By engaging students in product development, branding, and market testing, the curriculum closely mirrors real business challenges (Malmqvist et al., 2015). Malmqvist, Hugo, and Kjellberg (2015) conducted a global survey of 47 CDIO institutions in 2014 to explore implementation effects, including perceived benefits, barriers, and future development needs.

Creativity is an essential competency in the fields of marketing and innovation. According to Hassan and Othman (2020), marketing education should incorporate structured creativity training to ensure alignment with evolving industry demands. The integration of the CDIO (Conceive-Design-Implement-Operate) framework facilitates this by promoting iterative design thinking, reflective implementation processes, and user-centric product development strategies.

Further supporting this perspective, Tan and Sim (2023) examined the impact of CDIO-driven interdisciplinary collaborations between engineering and business students, revealing that such partnerships enhance creative outcomes in marketing. Their findings underscore the model's efficacy in fostering innovation by bridging disciplinary divides within academic settings. However, there is a significant research gap in the application of CDIO specifically in the development of creative marketing materials by TVET institution students. This study aims to fill the gap by focusing on the practical application of CDIO in the context of student innovation product promotion.

2. Methodology

This study adopted an action research design, integrating both qualitative and quantitative methods to comprehensively assess the effectiveness of the CDIO approach in developing creative marketing plans for student innovation products. The research employed a mixed-methods data collection strategy, utilizing structured questionnaires and systematic document analysis to evaluate student performance before and after the CDIO intervention.

A total of 42 students participated as respondents, selected through purposive sampling to ensure relevance to the study's objectives. The questionnaire was divided into two key sections:

a) Demographic Information – Capturing participants' academic background, prior experience in marketing, and familiarity with innovation-driven projects.
b) Evaluation of the CDIO Approach – Assessing students' perceptions of the framework's effectiveness in enhancing creativity, strategic thinking, and practical application in marketing.

In addition, a document review was conducted on students' marketing materials, including campaign proposals, branding strategies, and promotional content. A standardized evaluation form and rubric were applied to ensure consistency in assessing the quality, originality, and feasibility of the outputs.

3. Results and Discussion

Findings from the questionnaire showed that the majority of students had a good understanding of the CDIO concept and agreed that the approach helped improve creativity and effectiveness in producing marketing materials. Moreover, document reviews revealed quality improvements in aspects such as design, promotional messaging, and delivery strategy. Students demonstrated a higher capability in producing engaging, professional, and audience-appropriate marketing content.

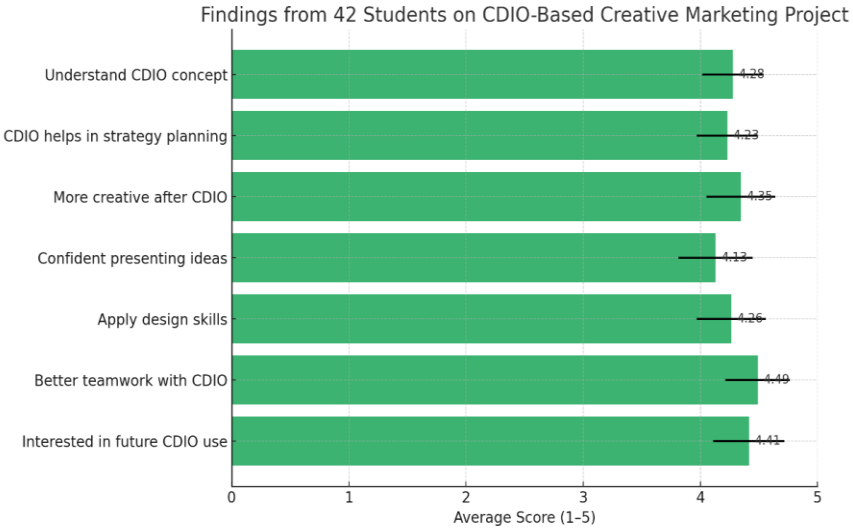

Fig. 1. CDIO-based creative marketing project

Table 1. Findings

No.	Statement	Mean Score	Standard Deviation
1	Understand CDIO concept	4.28	0.26
2	CDIO helps in strategy planning	4.23	0.26
3	More creative after CDIO	4.35	0.29
4	Confident presenting ideas	4.13	0.32
5	Apply design skills	4.26	0.29
6	Better teamwork with CDIO	4.49	0.28
7	Interested in future CDIO use	4.41	0.30

The highest mean score (4.49) was recorded for "Better teamwork with CDIO", indicating strong student agreement that CDIO promotes effective collaboration. Students also strongly agreed that CDIO increased their interest in future project-based learning (M = 4.41) and helped boost creativity (M = 4.35). The lowest score was still positive: "Confident presenting ideas" (M = 4.13), which may suggest a need for additional support in presentation or communication skills. All items scored above 4.1, reflecting consistently positive perceptions of CDIO in supporting learning and innovation in marketing education.

i. Understanding of the CDIO Concept
Students reported a strong grasp of the CDIO framework (Mean = 4.28, SD = 0.26), indicating that the conceptual foundation was effectively communicated through course instruction. This understanding is fundamental as it supports students in applying the

model to real-world marketing problems, aligning with findings from Malmqvist et al. (2015) on the pedagogical benefits of CDIO in higher education.

ii. Strategic Planning Skills
The statement *"CDIO helps in strategy planning"* recorded a mean score of 4.23. This suggests that students were able to utilize the structured phases of CDIO to better organize their marketing strategies—from idea conception to campaign execution. The low standard deviation (0.26) further indicates consistency in this perception across the cohort.

iii. Enhancement of Creativity
A mean score of 4.35 was reported for *"More creative after CDIO"*, reflecting students' belief that the CDIO approach encouraged out-of-the-box thinking, particularly during the "Design" and "Implement" phases. This supports research by Ali & Zainal (2022), who found that the CDIO framework nurtures creativity in technical and marketing education.

iv. Presentation Confidence
Although slightly lower than other items, the mean score of 4.13 for *"Confident presenting ideas"* still reflects overall agreement. This suggests that while CDIO provides opportunities for public speaking and pitching (e.g., during the "Operate" phase), some students may still require further support or practice to boost their presentation confidence.

v. Application of Design Skills
With a mean of 4.26, the statement *"Apply design skills"* indicates that students felt capable of incorporating graphic design, branding, and multimedia elements into their projects. These skills were further observed in the document analysis, which highlighted improved visual quality and persuasive messaging in student marketing materials.

vi. Teamwork and Collaboration
The highest-rated item was *"Better teamwork with CDIO"* (Mean = 4.49, SD = 0.28), underscoring the effectiveness of CDIO in promoting collaborative learning. Through project-based work, students engaged in team-based decision-making, role allocation, and problem-solving—critical competencies in both marketing and engineering contexts.

vii. Future Interest in CDIO
Students expressed a strong interest in continuing with the CDIO approach in future courses (Mean = 4.41), indicating that they found it not only effective but also engaging. This sentiment supports the long-term sustainability and scalability of CDIO-based curricula in applied education settings.

4. Conclusion

Based on the research findings, several recommendations are proposed:

i. The CDIO approach should be fully integrated into the marketing curriculum in polytechnics.
ii. Workshops or specialized training on creative marketing material design should be organized regularly.
iii. Ongoing assessment of student outputs using a CDIO rubric can help lecturers monitor students' development and achievements more systematically.

In conclusion, the CDIO approach has proven to have a positive impact on the development of creative marketing materials by students. It not only enhances students' creativity and technical competence but also strengthens critical thinking, teamwork, and practical problem-solving skills. This study supports the adoption of CDIO as a relevant and effective teaching approach in current TVET education.

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HUBUNGAN ANTARA PENYERTAAN BENGKEL PENASIHATAN MATEMATIK DAN MOTIVASI TERHADAP PENCAPAIAN MATEMATIK KEJURUTERAAN 1

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Abstrak

Kajian ini bertujuan untuk mengenalpasti hubungan antara penyertaan Bengkel penasihatan matematik dan motivasi pelajar terhadap pencapaian dalam kursus Matematik Kejuruteraan 1 di kalangan pelajar lepasan Kolej Komuniti di Politeknik Tuanku Sultanah Bahiyah (PTSB). Kajian ini melibatkan 63 orang pelajar dari sesi I dan II Tahun Akademik 2024/2025. Pendekatan kuantitatif digunakan dengan instrumen soal selidik sebagai alat pengumpulan data. Data dianalisis menggunakan aplikasi *SPSS for windows* versi 27 bagi statistik deskriptif dan inferensi iaitu analisis Korelasi Pearson. Hasil analisis menunjukkan bahawa tahap penyertaan pelajar dalam Bengkel penasihatan matematik adalah pada tahap yang baik iaitu sebanyak 50.8%. Hanya segelintir pelajar sahaja mempunyai kehadiran yang rendah iaitu sebanyak 4.8%. Terdapat hubungan positif yang lemah di antara kehadiran Bengkel penasihatan matematik dan pencapaian dalam Matematik Kejuruteraan 1 dengan nilai korelasi, r=0.226, namun hubungan ini tidak signifikan secara statistik, p=0.075 . Sementara itu, terdapat hubungan negatif yang sangat lemah di antara faktor motivasi dan pencapaian pelajar, dengan nilai korelasi r=-0.182, p=0.273. Hubungan ini juga tidak signifikan secara statistik. Kajian ini diharap dapat memberikan gambaran yang lebih jelas tentang keberkesanan program sokongan seperti Bengkel penasihatan matematik dalam meningkatkan motivasi dan pencapaian pelajar. Hasil kajian ini juga akan menjadi rujukan penting untuk pensyarah dan pihak pengurusan dalam merangka strategi pengajaran yang lebih berfokus kepada keperluan pelajar lepasan Kolej Komuniti yang melanjutkan pelajaran di politeknik.

Kata kunci: Bengkel penasihatan matematik; Motivasi; Pencapaian.

1. Pengenalan

Matematik merupakan salah satu kursus teras yang wajib diambil oleh pelajar bidang kejuruteraan di politeknik Malaysia. Syarat kemasukan ke program kejuruteraan telah menetapkan keperluan memperoleh sekurang-kurangnya tiga kepujian dalam peperiksaan Sijil Pelajaran Malaysia (SPM), termasuk mata pelajaran Matematik. Menurut Er Xiao Hui dan Roslinda (2021), individu yang pintar matematik diperlukan dalam menghadapi perkembangan teknologi dan persaingan dunia pendidikan serta pekerjaan. Oleh kerana Politeknik menyediakan pelbagai program teknikal, pelajar TVET seharusnya memiliki asas matematik yang kukuh. Ini kerana keperluan penguasaan terhadap asas matematik adalah penting bagi kursus teknikal yang sebahagiannya terdiri daripada konsep pengiraan. Mohd Zulfabli dan Siti Salwa (2014) dalam kajiannya telah menyatakan pencapaian cemerlang dalam Matematik di peringkat SPM mempunyai hubungan dengan kebolehan pelajar menguasai kursus kejuruteraan di politeknik.

Kursus Matematik Kejuruteraan 1 merupakan kursus teras bagi semua pelajar semester pertama dalam program Diploma Kejuruteraan. Kursus ini adalah prasyarat kepada Matematik Kejuruteraan 2. Kandungan kursus ini terdiri daripada lima topik utama iaitu Asas Algebra, Trigonometri, Nombor Kompleks, Matriks serta Vektor dan Skalar. Topik-topik ini merangkumi silibus Matematik di peringkat sekolah menengah. Oleh itu, prestasi pelajar dalam Matematik semasa peringkat SPM memberi kesan langsung terhadap pencapaian mereka dalam kursus ini.

Bagi memperluas akses pendidikan teknikal dan vokasional (TVET), Kementerian Pendidikan Tinggi telah memperkenalkan pengajian di peringkat sijil di Kolej Komuniti iaitu sebagai laluan alternatif kepada pelajar lepasan SPM yang tidak memenuhi syarat kelayakan ke program diploma di politeknik. Program ini dijalankan secara sepenuh masa selama dua tahun, merangkumi 25% pembelajaran teori dan 75% latihan amali, selari dengan misi Kolej Komuniti sebagai 'Peneraju Komuniti Berilmu dan Berkemahiran' (JPPKK, 2013). Namun begitu, syarat kemasukan yang sangat rendah iaitu lulus Bahasa Melayu dan Sejarah, mengakibatkan ramai pelajar lemah subjek matematik turut diterima masuk ke Kolej Komuniti.

Kesannya, apabila pelajar lepasan Kolej Komuniti ini melanjutkan pengajian ke politeknik, bermula dengan kursus Matematik Kejuruteraan 1 pada semester pertama. Pelajar akan menghadapi kesukaran untuk mengikuti pengajaran akibat daripada asas matematik yang sangat lemah. Berdasarkan pemerhatian pensyarah di Jabatan Matematik, Sains dan Komputer (JMSK), Politeknik Tuanku Sultanah Bahiyah (PTSB), kursus Matematik Kejuruteraan 1 sering dianggap sukar dan mencabar oleh pelajar, terutamanya yang mempunyai keputusan matematik yang rendah semasa di peringkat sekolah menengah. Isu ini bukan sahaja mengganggu proses pengajaran dan pembelajaran, malah turut menjejaskan motivasi pelajar berkenaan. Tempoh pengajaran yang ditetapkan bagi sesuatu topik juga perlu dipanjangkan bagi kelas yang mempunyai bilangan pelajar lemah yang tinggi.

Pelbagai inisiatif telah diperkenalkan untuk membantu pelajar meningkatkan pencapaian, termasuk mengadakan Bengkel Pengukuhan Peperiksaan Akhir, Bengkel Bijak Algebra dan Bengkel Skor Ujian. Namun begitu, kadar kegagalan bagi kursus DBM10013 masih di tahap membimbangkan. Statistik Penilaian Akhir Semester Sesi II: 2023/2024 di PTSB menunjukkan 16.5% pelajar gagal dalam kursus ini dan peratus kegagalan ini disumbangkan oleh pelajar lepasan Kolej Komuniti. Kegagalan ini bukan sahaja memberi kesan terhadap motivasi pelajar, malah menambah beban akademik pelajar kerana terpaksa mengulang kursus. Oleh itu, bagi meningkatkan pencapaian pelajar lepasan Kolej Komuniti terhadap kursus Matematik Kejuruteraan 1, pihak pengurusan telah memohon JMSK untuk melaksanakan program intervensi dengan mengadakan Bengkel penasihatan matematik. Bengkel ini memfokuskan kepada konsep algebra yang merupakan asas kepada matematik (Simposium PTSB, 2024). Bengkel ini dijalankan secara berkala pada setiap minggu dengan penglibatan pelajar lepasan Kolej Komuniti dan pensyarah sebagai fasilitator.

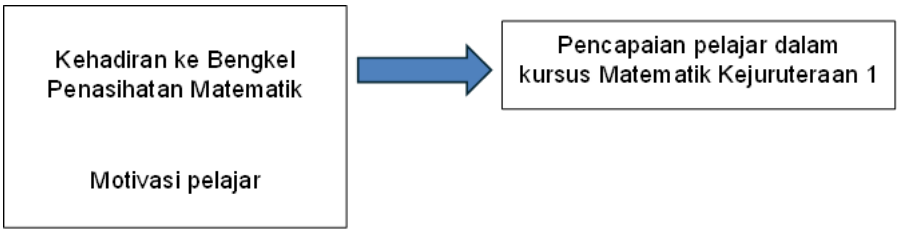
Justeru itu, kajian ini bertujuan mengenal pasti hubungan antara penyertaan Bengkel penasihatan matematik dan motivasi pelajar terhadap pencapaian dalam kursus Matematik Kejuruteraan 1 di kalangan pelajar lepasan Kolej Komuniti di Politeknik Tuanku Sultanah Bahiyah (PTSB). Objektif kajian ini adalah untuk mengenal pasti tahap penyertaan pelajar dalam Bengkel penasihatan matematik, mengenalpasti hubungan antara penyertaan Bengkel penasihatan matematik dengan pencapaian Matematik Kejuruteraan 1 dan mengenalpasti hubungan antara faktor motivasi dengan pencapaian Matematik Kejuruteraan 1. Fokus kajian adalah pada kehadiran pelajar ke bengkel yang disediakan dan motivasi kumpulan pelajar ini. Berdasarkan objektif kajian yang telah dinyatakan, kajian ini mencadangkan dua hipotesis iaitu yang pertama, wujudnya hubungan yang signifikan antara penyertaan bengkel dengan pencapaian Matematik Kejuruteraan 1. Hipotesis kedua pula sama ada terdapat hubungan yang signifikan antara faktor motivasi pelajar dengan pencapaian Matematik Kejuruteraan 1.

Kajian terdahulu menunjukkan bahawa tindakan pencegahan seperti bengkel pengukuhan atau kelas bimbingan mampu memberi impak positif terhadap pemahaman dan pencapaian pelajar dalam subjek Matematik, terutamanya dalam kalangan pelajar yang lemah. Kajian oleh Mohamad Nor dan Ruzlina (2020), mendapati bahawa pelajar yang menyertai bengkel pengayaan matematik menunjukkan peningkatan prestasi yang ketara berbanding pelajar yang tidak menyertainya. Dapatan Melati dan Nor Fadzlina (2022), menunjukkan terdapat hubungan yang positif bagi pencapaian pelajar dalam Peperiksaan Akhir setelah menghadiri

Bengkel Pengukuhan Matematik. Ini menunjukkan bahawa kehadiran ke Bengkel Pengukuhan Matematik membantu pelajar meningkatkan pencapaian mereka.

Selain itu, pencapaian akademik turut dipengaruhi oleh faktor motivasi. Kamus Dewan Edisi Keempat, mentakrifkan motivasi sebagai kehendak yang keras atau semangat yang kuat pada diri seseorang. Semangat ini akan mendorong seseorang itu untuk berusaha atau melakukan sesuatu untuk mencapai kejayaan. Motivasi menurut kajian ini terbahagi kepada dua jenis kategori iaitu motivasi dalaman dan motivasi luaran. Noraini (2005), menyatakan pelajar yang cemerlang dalam Matematik biasanya digerakkan oleh motivasi dalaman sementara motivasi luaran berkait rapat dengan konsep pengukuhan. Ini merujuk kepada sokongan moral dari luar seperti ibubapa, guru dan rakan sebaya. Manakala, Ainul Mardhiah dan Kamarulzaman (2018) pula menegaskan bahawa motivasi dalaman seperti minat, kepercayaan diri dan sikap positif terhadap subjek matematik memainkan peranan penting dalam menentukan tahap pencapaian pelajar. Dapatan oleh Wan Nazliza dan Siti Mistima (2020) menunjukkan bahawa tahap motivasi terhadap matematik mempengaruhi tahap pencapaian matematik murid secara sederhana. Norlia et al. (2006) yang menggunakan Model Inventori Pembelajaran di Sekolah oleh Selmes, mendapati pencapaian Matematik Tambahan berkait dengan gaya pembelajaran mendalam, usaha gigih, dan pendekatan terancang. Terdapat hubungan signifikan antara gaya pembelajaran mendalam dan motivasi dalaman. Namun, tiada perbezaan signifikan dari segi jantina, etnik, dan pencapaian awal. Secara keseluruhan, motivasi dikenal pasti sebagai faktor penting dalam pemilihan gaya pembelajaran pelajar.

Oleh itu, dengan menggabungkan penyertaan bengkel dan faktor motivasi, kajian ini berharap dapat memberikan gambaran yang lebih menyeluruh tentang faktor-faktor yang menyumbang kepada kejayaan pelajar dalam kursus Matematik Kejuruteraan 1, khususnya dalam kalangan pelajar lepasan Kolej Komuniti di politeknik seperti kerangka teori yang dibangunkan dalam Rajah 1.



Rajah 1. Kerangka teori kajian

2. Metodologi

Bab ini membincangkan sampel kajian, instrumen kajian dan kajian rintis yang dijalankan. Sampel kajian terdiri daripada 63 orang pelajar lepasan Kolej Komuniti yang melanjutkan pelajaran di peringkat diploma di Politeknik Tuanku Sultanah Bahiyah bagi sesi I dan II Tahun Akademik 2024/2025. Pelajar-pelajar ini terdiri daripada pelajar semester 1 di Jabatan Kejuruteraan iaitu Jabatan Kejuruteraan Awam, Jabatan Kejuruteraan Elektrik dan Jabatan Kejuruteraan Mekanikal yang mengambil kursus Matematik Kejuruteraan 1. Kajian ini berbentuk kuantitatif dengan instrumen soal selidik sebagai alat pengumpulan data. Soal selidik tersebut dibahagikan kepada dua (2) bahagian iaitu bahagian demografi dan faktor motivasi. Soal selidik yang dibangunkan adalah adaptasi daripada Inventori Pembelajaran di Sekolah oleh Selmes, dalam Norlia et al, (2006). Soalan soal selidik yang digunakan diubahsuai mengikut kesesuaian bagi mencapai objektif kajian. Soalan faktor motivasi mengandungi lapan (8) soalan yang terdiri daripada motivasi dalaman dan luaran. Manakala bagi pencapaian akademik, pembolehubah yang digunakan ialah nilai mata berdasarkan gred.

Jadual 1. Nilai mata dan gred

Markah	Nilai mata	Gred	Markah	Nilai mata	Gred
90 - 100	4.00	A+	50 - 54	2.00	C
80 - 89	4.00	A	47 - 49	1.67	C-
75 - 79	3.67	A-	44 - 46	1.33	D+
70 - 74	3.33	B+	40 - 43	1.00	D
65 - 69	3.00	B	30 - 39	0.67	E
60 - 64	2.67	B-	20 - 29	0.33	E-
55 - 59	2.33	C+	0 - 19	0.00	F

Sumber : Arahan Peperiksaan dan Kaedah Penilaian Politeknik dan Kolej Komuniti (2025).

Skala likert 5 nilai skor digunakan dalam soal selidik bagi kajian ini pada faktor motivasi. Nilai skor bagi skala likert adalah seperti berikut:

Jadual 2. Skala likert

Peringkat	Skor
Sangat tidak setuju	1
Tidak setuju	2
Tidak pasti	3
Setuju	4
Sangat setuju	5

Data yang diperoleh telah dianalisis menggunakan SPSS. Nilai min yang diperolehi bagi setiap faktor akan ditafsirkan mengikut skala yang ditetapkan seperti berikut:

Jadual 3. Tahap julat skor min

Skor Min	Tahap
Kurang 2.33	Rendah
2.33 hingga 3.67	Sederhana
Lebih 3.67	Tinggi

Soal selidik ini telah diuji kesahan dan kebolehpercayaannya melalui kajian rintis. Seramai 14 orang pelajar telah terlibat dengan kajian rintis ini. Nilai kebolehpercayaan diukur menggunakan nilai pekali Alpha Cronbach dengan menggunakan perisian SPSS. Mohd Najib (1999), menyatakan bahawa Alpha Cronbach merupakan pekali kebolehpercayaan yang menunjukkan item-item kajian berhubung antara satu sama lain. Sekiranya nilai Alpha Cronbach tersebut menghampiri 1, maka kebolehpercayaannya adalah tinggi, baik dan berkesan. Nilai di antara 0.6 dan 0.7 pula bermaksud nilai tersebut boleh diterima. Manakala nilai yang melebihi 0.8 bermaksud sangat baik. Berikut adalah cronbach alpha bagi setiap soalan:

Jadual 4. Cronbach alpha

Item	N	Cronbach alpha
Motivasi	8	0.803

Data dianalisis menggunakan aplikasi *SPSS for windows* versi 27 bagi statistik deskriptif dan inferensi iaitu analisis korelasi Pearson. Analisis korelasi Pearson digunakan bagi menentukan hubungan di antara dua pemboleh ubah. Pekali korelasi Pearson, *r* dapat menentukan kekuatan hubungan dan arah hubungan linear antara 2 pembolehubah. Julat nilai *r* adalah di antara -1 hingga +1. Jadual 1 menunjukkan skala kekuatan hubungan oleh Cohen et al (2011). Dalam kajian ini, korelasi Pearson digunakan untuk menentukan samada

terdapat hubungan yang signifikan antara kehadiran terhadap Bengkel penasihatan matematik dengan pencapaian pelajar dalam kursus Matematik Kejuruteraan 1 dan faktor motivasi dengan pencapaian pelajar dalam kursus Matematik Kejuruteraan 1.

Jadual 5. Aras kekuatan hubungan mengikut nilai pekali korelasi

Pekali Korelasi (r)	Kekuatan korelasi
±.81 hingga 1.00	Sangat kuat
±.51 hingga .80	Kuat
±.31 hingga .50	Sederhana
±.21 hingga .30	Lemah
±.01 hingga .20	Sangat lemah

3. Dapatan dan Perbincangan

Bahagian ini membincangkan latar belakang responden yang terlibat, merangkumi aspek jantina, program pengajian serta pencapaian dalam subjek Matematik Kejuruteraan 1. Seramai 63 orang pelajar telah terlibat sebagai responden dalam kajian ini.
Jadual 6 menunjukkan bahawa majoriti responden terdiri daripada pelajar lelaki, iaitu seramai 55 orang atau 87.3%, manakala pelajar perempuan hanya seramai 8 orang atau 12.7%. Ini menunjukkan bahawa terdapat ketidakseimbangan dari segi agihan jantina dalam kalangan responden yang merupakan ambilan pelajar lepasan Kolej Komuniti, dengan pelajar lelaki mendominasi kajian ini. Responden kajian terdiri daripada pelajar pelbagai program pengajian di peringkat diploma di PTSB. Program yang mempunyai bilangan responden yang tertinggi ialah Diploma Kejuruteraan Elektrik (DET), dengan responden seramai 31 orang atau 49.2%. Manakala, program Diploma Kejuruteraan Awam (DKA) dan Diploma Kejuruteraan Mekanikal (DKM) masing-masing mencatatkan seramai 10 orang responden atau 15.9%. Program-program lain seperti Diploma Kejuruteraan Mekanikal (Pembuatan) (DTP) dan Diploma Kejuruteraan Elektrik Elektronik (DEE) mencatatkan 4 orang responden (6.3%), manakala program Diploma Kejuruteraan Elektrik (Komputer) (DTK) mempunyai 2 orang responden (3.2%) dan program Diploma Geomatik (DGU) serta Diploma Kejuruteraan Elektrik (Perhubungan) (DEP) masing-masing hanya mempunyai seorang responden (1.6%).

Jadual 6. Latar belakang responden

Item		N	%
Jantina	Lelaki	55	87.3
	Perempuan	8	12.7
Program	DKA	10	15.9
	DGU	1	1.6
	DET	31	49.2
	DEP	1	1.6
	DTK	2	3.2
	DEE	4	6.3
	DKM	10	15.9
	DTP	4	6.3
Pencapaian mengikut gred	A- hingga A+	5	7.9
	B- hingga B+	14	22.2
	C+ hingga C-	27	42.9
	D hingga D+	7	11.1
	E dan ke bawah	10	15.9

Seterusnya, dari segi pencapaian akademik dalam subjek Matematik Kejuruteraan 1, didapati bahawa majoriti responden memperoleh gred pada tahap sederhana iaitu C+ hingga C, iaitu seramai 27 orang atau 42.9%. Seramai 14 orang responden pula (22.2%) memperoleh gred B- hingga B+. Manakala 10 orang responden (15.9%) memperoleh gred E dan ke bawah. Seramai 7 orang responden (11.1%) memperoleh gred D hingga D+, dan hanya 5 orang responden (7.9%) yang mencapai gred cemerlang iaitu A- hingga A+. Dapatan ini menunjukkan bahawa majoriti daripada pelajar berada pada tahap pencapaian sederhana, dengan hanya sebilangan kecil sahaja yang memperoleh keputusan cemerlang.

Jadual 7. Kehadiran pelajar ke Bengkel penasihatan matematik

	Item	N	%
Kehadiran pelajar dalam Bengkel penasihatan matematik	80 % hingga 100%	32	50.8
	60% hingga 79%	10	15.9
	40% hingga 59%	11	17.5
	20 % hingga 39%	7	11.1
	Bawah 19%	3	4.8

Jadual 7 menunjukkan kehadiran pelajar dalam Bengkel penasihatan matematik Kejuruteraan 1. Data menunjukkan bahawa sebahagian besar responden mempunyai tahap penyertaan yang tinggi. Seramai 32 orang pelajar (50.8%) mencatatkan kehadiran di antara 80% hingga 100%. Ini menunjukkan bahawa pelajar sedar akan kepentingan Bengkel penasihatan matematik yang dijalankan dengan memberikan komitmen yang baik. Namun begitu, seramai 11 orang pelajar (17.5%) hadir pada tahap 40% hingga 59%, dan 10 orang (15.9%) hadir pada tahap 60% hingga 79%. Terdapat juga pelajar yang hadir kurang daripada 19% iaitu seramai 3 orang (4.8%). Ini menunjukkan, wujudnya jurang penyertaan yang ketara dalam kalangan pelajar yang mungkin dipengaruhi oleh faktor-faktor lain seperti motivasi, terlibat dengan program politeknik, urusan peribadi, atau kekangan lain. Dapatan ini selari dengan kajian oleh Mustafa dan Mohd Rashid (2021), iaitu pelajar yang hadir secara konsisten dalam sesi bimbingan lebih cenderung untuk menunjukkan peningkatan prestasi dalam subjek Matematik. Tambahan pula, Norazila dan Halim (2019) menegaskan bahawa tahap kehadiran yang rendah sering dikaitkan dengan kurangnya keyakinan dan motivasi pelajar terhadap subjek yang diambil. Dalam konteks kajian ini, penglibatan yang rendah dalam bengkel mungkin menjadi antara faktor penyumbang kepada pencapaian yang kurang memuaskan. Kenyataan ini dibuktikan dalam latar belakang responden yang memperoleh gred rendah. Oleh itu, adalah penting untuk merangka strategi yang lebih berkesan untuk meningkatkan kehadiran, termasuk pendekatan pembelajaran yang lebih menarik, fleksibel serta berpusatkan pelajar.

Jadual 8. Hubungan antara kehadiran ke Bengkel penasihatan matematik dengan pencapaian

		Kehadiran	Pencapaian
Kehadiran	Pearson Correlation	1	0.226
	Sig. (2-tailed)		0.075
Pencapaian	Pearson Correlation	0.226	1
	Sig. (2-tailed)	0.075	

Analisis korelasi Pearson dijalankan bagi menentukan hubungan antara kehadiran ke Bengkel penasihatan matematik dengan pencapaian pelajar. Jadual 8 menunjukkan bahawa terdapat hubungan positif yang lemah antara kehadiran Bengkel penasihatan matematik dan pencapaian dalam Matematik Kejuruteraan 1 dengan nilai $r(63) = .23$. Namun, hubungan ini tidak signifikan secara statistik, dengan $p = .075$. Ini menunjukkan bahawa peningkatan kehadiran pelajar ke bengkel tidak berkait secara langsung dengan peningkatan pencapaian

akademik. Penemuan ini sejajar dengan kajian Crede et al (2010) yang mendapati kehadiran semata-mata tidak menjamin peningkatan pencapaian akademik sekiranya tiada motivasi dalaman dan penglibatan aktif daripada pelajar. Aspek kehadiran yang dilihat tidak memberikan impak yang signifikan terhadap pencapaian turut berkait dengan kenyataan Faizi dan Alvi (2023) bahawa walaupun kehadiran penting sebagai indikator komitmen pelajar, ia bukan satu-satunya faktor yang mempengaruhi pencapaian pelajar.
Berdasarkan kajian-kajian lepas, dapat disimpulkan bahawa kehadiran ke Bengkel penasihatan matematik semata-mata tidak mencukupi untuk menjamin peningkatan prestasi akademik. Ini kerana peningkatan pencapaian pelajar perlu juga mengambil kira faktor-faktor lain seperti keberkesanan penyampaian, penglibatan pelajar dalam aktiviti pengajaran dan pembelajaran, faktor sikap, dan motivasi pelajar itu sendiri. Pelajar juga perlu diberi galakan dan dorongan bagi memastikan mereka turut serta secara aktif dalam program yang dirancang. Penambahbaikan dari segi pelaksanaan bengkel dan kaedah pemantauan juga menjadi penyumbang kepada peningkatan pencapaian pelajar dalam Matematik Kejuruteraan 1.

Jadual 9. Hubungan antara faktor motivasi dan pencapaian

		Pencapaian	Motivasi
Pencapaian	Pearson Correlation	1	-0.182
	Sig. (2-tailed)		0.273
Motivasi	Pearson Correlation	-0.182	1

Dapatan analisis pada Jadual 9 menunjukkan bahawa terdapat hubungan negatif yang sangat lemah di antara motivasi dan pencapaian pelajar, dengan nilai korelasi Pearson r = -0.182. Selari dengan dapatan Saemah dan John (2006), faktor motivasi mempunyai hubungan langsung negatif yang ke atas pencapaian akademik. Namun begitu, hubungan ini tidak signifikan secara statistik kerana nilai p adalah lebih besar daripada aras signifikan 0.05 (p = 0.273). Ini menunjukkan bahawa motivasi pelajar dalam konteks kajian ini tidak mempunyai hubungan yang bermakna secara statistik terhadap pencapaian mereka dalam subjek tersebut. Dapatan ini mungkin disebabkan oleh faktor lain yang lebih dominan mempengaruhi pencapaian pelajar seperti kebolehan asas matematik, teknik pengajaran, atau kehadiran ke kelas.

Hasil analisis ini disokong oleh kajian lepas yang dijalankan oleh pengkaji terhadap pelajar yang mengulang kursus Matematik Kejuruteraan 2, dapatan menunjukkan tiada hubungan di antara motivasi dan pencapaian pelajar (Masniza dan Maziah, 2019). Namun demikian, sebaliknya hasil dapatan menunjukkan terdapat hubungan antara motivasi dalaman dan luaran adalah signifikan *(p = 0.871, t=0.000*). Ini menunjukkan bahawa motivasi dalaman akan mendorong motivasi luaran pelajar dalam memastikan lulus dalam peperiksaan. Norlia et al (2006) berpendapat bahawa faktor motivasi memainkan peranan penting dalam menentukan pemilihan gaya pembelajaran yang diamalkan oleh pelajar seterusnya secara tidak langsung dapat meningkatkan pencapaian mereka. Manakala, penemuan ini berbeza dengan kajian oleh Faizi dan Alvi (2023), yang menunjukkan motivasi mempunyai peranan penting dalam menentukan pencapaian akademik pelajar.

4. Kesimpulan

Secara keseluruhannya, dapatlah disimpulkan bahawa kehadiran pelajar ke Bengkel penasihatan matematik adalah pada tahap yang baik. Hanya segelintir sahaja pelajar mempunyai kehadiran yang rendah. Kehadiran pelajar yang rendah dalam Bengkel penasihatan matematik mungkin menjadi faktor penyumbang kepada pencapaian yang kurang memuaskan. Analisis Korelasi Pearson dijalankan bagi menentukan hubungan antara

kehadiran ke Bengkel penasihatan matematik dengan pencapaian pelajar. Terdapat hubungan positif yang lemah di antara kehadiran Bengkel penasihatan matematik dan pencapaian dalam Matematik Kejuruteraan 1, namun hubungan ini tidak signifikan secara statistik. Manakala, terdapat hubungan negatif yang lemah di antara faktor motivasi dan pencapaian pelajar. Hubungan ini juga tidak signifikan secara statistik. Walaupun dapatan ini menunjukkan keputusan yang sebaliknya, tetapi Bengkel penasihatan matematik masih relevan untuk diteruskan.

Diharapkan maklumat ini dapat menjadi rujukan pensyarah untuk memperkasakan program intervensi bagi pelajar lepasan Kolej Komuniti. Selain itu, pengkaji mengemukakan beberapa cadangan untuk kajian di masa hadapan. Faktor motivasi yang dikaji perlu lebih menyeluruh dengan bilangan sampel yang lebih besar daripada beberapa politeknik di Malaysia. Selain itu, disarankan agar kajian lanjutan menggunakan pendekatan kualitatif seperti temubual untuk memahami dengan lebih mendalam jenis motivasi yang mendorong pelajar serta cabaran yang mereka hadapi dalam subjek Matematik Kejuruteraan 1.

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RELATIONSHIP BETWEEN TEST AND FINAL EXAM ASSESSMENT FOR ENGINEERING MATHEMATICS COURSE: A CASE STUDY

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Abstract

This study involves all Engineering Mathematics courses offered by the Department of Mathematics, Science, and Computing at Politeknik Tuanku Sultanah Bahiyah. The respondents who participated in this study were 349 from the course DBM10013, 340 from DBM20023, 120 from DBM30033, and 150 from DBM30043. The aims are to explore students' perceptions and to identify the relationship between test scores and final examination scores. The study utilizes the Pearson correlation coefficient and a two-tailed hypothesis test. The research instruments used were questionnaires, tests, and final examination papers. Findings from the questionnaire revealed that between 50% and 70% of students were uncertain about their ability to perform well in the final examination if their test scores were poor. The analysis results showed that the correlation coefficients for all courses exceeded 0.5. The scatter plot graphs also indicated a positive correlation, where an increase in one variable corresponded with an increase in the other. In addition, the p-value obtained (< .001) from the two-tailed hypothesis test supports the hypothesis that test scores can serve as early indicators of students' academic performance. This can assist lecturers in planning appropriate interventions before the final examinations. The large sample size also contributes to the reliability of the study's findings. Overall, the results of this study are expected to serve as a guide for lecturers in identifying students who require early assistance and in focusing on topics that need greater emphasis in preparation for the final examination.
Keywords: Correlation; Test; Final exam.

1. Introduction

One of the core subjects in the Malaysian education system is Mathematics, and it is an important field of knowledge not only in schools but also at institutional levels such as polytechnics and universities. Mathematics is defined as the study of numbers and diagrams where the study or learning revolves around structural patterns, quantities, changes, and spaces (Ahmad Shahrulazahar, 2011). Mathematics is seen as a simple extension of writing and conversational language with very clear grammar and vocabulary to delve into and explain conceptual and physical relationships.

Since the quality of education is closely related to the curriculum of the course being conducted, this is where the role of the curriculum evaluator lies in ensuring that the curriculum being conducted complies with the quality and meets the objectives that have been set. Overall, assessment in education plays an important role in ensuring that the teaching and learning process in the classroom runs smoothly and effectively. Without an assessment carried out by educators, it is certain that the educators will not be able to detect students' weaknesses in the learning process. In technical education settings such as polytechnics, Engineering Mathematics is a foundational subject that demands both conceptual understanding and procedural fluency. Engineering Mathematics is a challenging course and is mandatory for all engineering students at polytechnics. There are four Engineering Mathematics courses offered, namely DBM10013 Engineering Mathematics 1, DBM20023

Engineering Mathematics 2, DBM30033 Engineering Mathematics 3 and DBM30043 Electrical Engineering Mathematics.

Each Engineering Mathematics course has individual assessments, namely tests and final exams. Tests are one of the assessment instruments to identify student achievement after studying certain topics in the syllabus, while the final exam is an assessment of the entire topic at the end of the semester. Thus, the relationship between test performance (as a form of CA) and final exam results is of particular interest to educators and policymakers seeking to enhance teaching effectiveness and student outcomes.

1.1 Continuous Assessment (CA) and Student Performance

Continuous assessment refers to regular, formative evaluations conducted throughout a course, including quizzes, assignments and tests. Studies have consistently demonstrated that the implementation of continuous assessment has proven to be effective in improving students' academic performance. CA fosters consistent engagement and allows students to receive timely feedback, thus improving their overall academic achievement. Finally, she concluded that there is a strong relationship between the continuous assessment method, the implementation of continuous assessment and its impact on students (Farhana Sabidin, 2002). A moderate positive correlation between the average continuous assessment score and students' class performance. Their findings suggest that when students are evaluated frequently, they are more likely to stay motivated and make consistent efforts to improve (Nurul Husna Hasan et al., 2017). Continuous assessment has a positive effect on student achievement. Lecturers who are skilled in assessment and evaluation techniques should use their expertise for the purpose of improving student performance at the primary level (Melati Sabtu et al., 2022; Mohammad Iqbal et al., 2017).

Assessment plays a significant role in modern education, particularly in evaluating the effectiveness of teaching and the progress of student learning. It serves various purposes, such as improving teaching strategies, guiding curriculum development and providing feedback to both educators and students (Nik Muhammad Anas, 2018; Jill Morrison, 2003). In the context of higher education, continuous assessment and final examinations are commonly used methods to measure student achievement and understanding of course content. In a recent study focusing on Engineering Mathematics, revealed a strong and statistically significant correlation ($r = 0.718$, $p < 0.01$) between CA and FE scores of students for the Engineering Mathematics 1 course at PSMZA..

The study concluded that students who perform well in assessments during the semester are more likely to succeed in final examinations (Ade et al., 2024). Assessment is a continuous process throughout a teacher's teaching session (Fatimah, 2000). Assessment means collecting information (Smith, 1997). Therefore, through assessment, information about knowledge, understanding, ability and attitude can be obtained (Morris, 1991). However, the extent to which this test assessment can predict student achievement in the final examination is still not discussed in depth.

1.2 Final Examination and Academic Achievement

Final examinations are summative assessments that provide a comprehensive evaluation of student learning at the end of a course. They test students' ability to synthesize and apply knowledge acquired throughout the semester (Azlin Norhaini, 2018).cThe impact of a Mathematics Reinforcement Workshop and observed a positive relationship between continuous assessment and final exam performance, indicating that supplementary academic interventions can enhance student outcomes in mathematics (Melati Sabtu et al., 2022). Meanwhile, emphasized the need for assessment-literate instructors who can align formative and summative evaluations to support student success (Mohammad Iqbal et al., 2017). In a

seminar review published in *Assessment in Education: Principles, Policy & Practice*, affirmed that formative assessment has one of the most significant positive impacts on student learning. Their work underlined the importance of frequent feedback and data-driven instruction, especially in technical subjects (Internationally, Black and Wiliam, 1998). A study among 552 pre-university engineering students in Malaysia, demonstrating that quizzes and open-book test scores are significant predictors of final mathematics exam performance, accounting for approximately 46.7% of the variance, adjusted $R^2 = 0.467$ (Bahrom and Hisham, 2024). Analyzed data from 250 pre-university students and found a strong positive correlation between diagnostic assessment scores and final mathematics exam outcomes, substantiating the use of scatterplot visualization and Pearson correlation in predictive analysis (Tan et al., 2017).

1.3 Motivation, Learning Style, and Confidence as Influencing Factors

A significant relationship between intrinsic motivation and extrinsic performance outcomes (p = 0.871, t=0.000), indicating that internally driven students tend to perform better in assessments. Academic success is multifaceted and can be influenced by psychological and behavioural factors. This shows that intrinsic motivation will drive students' extrinsic motivation in ensuring they pass the exam (Masniza et al., 2019). Kinesthetic learners tend to excel in Higher-Order Thinking Skills (HOTS) tasks when teaching methods align with their learning styles. These findings reinforce the importance of differentiated instruction in technical education. The results of Nurin Wajahah's study found that there is a significant relationship between kinesthetic learning styles and students' HOTS (Nurin Wajahah, 2017). The role of student self-confidence and discovered a strong positive correlation (r = 0.74) with academic achievement. Her study emphasized that confident students are more active in class, more resilient in facing challenges and generally perform better academically (Farahiyah, 2013).

2. Methodology

This study employs a quantitative approach, utilizing two research instruments. The first instrument is a questionnaire. This questionnaire was given to respondents after receiving their test scores to find out students' perceptions about test evaluations and final exams. Ethical approval was obtained from the institution, and participants were informed that their responses would be kept anonymous and confidential. The second instrument was data from test and final exam paper. A comparison of correlation coefficient values was done to see the actual relationship between test scores and final exam scores.

The study data was analyzed using SPSS version 27.0 software with the Pearson Correlation Coefficient method, two-tailed hypothesis. This two-tailed hypothesis was used because this study only wanted to find out if there was a significant relationship, without making any initial assumptions about the direction of the relationship.
H_0 (nul): There is no significant relationship between test scores and final exam scores.
H_1 (alternative): There is a significant relationship between test scores and final exams.
This analysis is used to determine the level of strength and correlation value between two sets of data and then assess the reliability of the test as a tool for predicting final exam achievement.

Data was taken from two sessions where for Session I: 2023/2024, the courses involved were DBM10013 Engineering Mathematics 1, DBM30033 Engineering Mathematics 3 and DBM30043 Electrical Engineering Mathematics. While for Session II: 2023/2024, the course involved was DBM20023 Engineering Mathematics 2. Respondents consisted of Civil Engineering (JKA) students, Electrical Engineering Department (JKE) students and Mechanical Engineering Department (JKM) students representing their respective courses. For JKM, respondents were taken from the Diploma in Mechatronics Engineering (DEM), Diploma in Mechanical Engineering (DKM) and Diploma in Manufacturing Mechanical

Engineering (DTP) programmes. For JKA, respondents were taken from the Diploma in Geomatics (DGU) and Diploma in Civil Engineering (DKA) programmes. For JKE, respondents were taken from the Diploma in Electrical and Electronics Engineering (DEE), Diploma in Electronic and Communication Engineering (DEP), Diploma in Electrical Engineering (DET) and Diploma in Computer Electronics Engineering (DTK) programmes.

This study employed a total population sampling approach, where the entire population of interest was included as the sample. Total population sampling was chosen due to the manageable size of the population and the need to obtain comprehensive and accurate data from all relevant participants. This method also ensures that the findings are representative of the whole group without the need for sampling estimation or generalization. The detailed findings of the number of respondents taken are as shown in Table 1 below, with a breakdown of 349 respondents for the DBM10013 course, 340 respondents for the DBM20023 course, 120 respondents for the DBM30033 course, and 150 respondents for the DBM30043 course.

Table 1. Number of respondents

	Session I:2023/2024						Session II:2023/2024	
	DBM10013		DBM30033		DBM30043		DBM20023	
JKM	DKM1A,B,C	70	DKM3A,B,C	60			DKM2A,B,C	70
	DTP1A	25	DTP3A	16			DTP2A	20
	DEM1A	19	DEM3A,B	44			DEM2A	18
JKE	DTK1A	23			DTK3A	31	DTK2A	23
	DEP1A	16			DEP3A	16	DEP2A	16
	DEE1A,B	47			DEE3A,B	38	DEE2A,B	47
	DET1A,B,C	76			DET3A,B,C	65	DET2A,B,C	76
JKA	DKA1A,B	48					DKA2A,B	44
	DGU1A,B	25					DGU2A,B	26
	TOTAL	349	TOTAL	120	TOTAL	150	TOTAL	340

3. Results and Discussion

The first objective of this study is to determine students' perceptions of test and final exam evaluations. The findings of the first instrument are data from a questionnaire distributed to respondents. All data presented in this study were collected in accordance with ethical research standards. Respondents gave informed consent, and their anonymity and confidentiality were ensured throughout the data collection and analysis process. There are 5 question items asked to respondents and the findings are as shown in Table 2 below.

Table 2. Student perception questionnaire regarding test and final exam evaluation

	Item soalan	Percentage 'YES'			
		DBM10013	DBM30033	DBM30043	DBM20023
1.	Are you agree that the implementation of test assessments done individually?	86.0%	83.1%	93.1%	88.8%
2.	If my test scores are high, I'm sure my final exam scores will also be high.	75.7%	75.0%	73.3%	72.6%

3.	Good test scores boosted my confidence for the final exam.	97.1%	94.2%	90.0%	97.1%
4.	Even though my test scores are low, I am confident that I can still excel in the final exam.	51.4%	62.5%	66.7%	55.9%
5.	I believe that achievement in tests is closely related to achievement in the final exam.	86.0%	83.1%	93.1%	88.8%

The fact that over 80% of respondents in all courses agreed with the implementation of individual test assessments reflects strong support for individualized evaluation methods. This suggests that students value fair and personal assessment of their knowledge and abilities. It also indicates a high level of readiness among students to be accountable for their own performance, which aligns with the principles of outcome-based education (OBE). Although Item 2 recorded agreement percentages ranging from 70% to 76%, this only indicates a moderate level of confidence among students regarding the consistency between test scores and final exam results.

This may imply some uncertainty regarding their performance stability or perhaps concern about other influencing factors such as differences in test formats, exam pressure, or the perceived difficulty of final exams. Hence, students may not fully view test results as a direct predictor of final exam success. The respondents are not very confident that if their test scores are high, their final exam scores will also be high. Interestingly, Item 3 revealed that over 90% of students felt that good test performance increased their confidence for the final exam. While Item 2 showed that students were not fully convinced that test performance guaranteed final results, this finding highlights the motivational and psychological benefits of doing well in continuous assessments.

It suggests that formative assessments can play a crucial role in building students' self-efficacy and reducing exam anxiety, both of which are important for academic success. This supports Masniza & Maziah (2019) and Farahiyah (2013), who argue that psychological factors like motivation and self-confidence significantly affect academic outcomes. In essence, even if students are uncertain of a direct outcome, the psychological reinforcement from doing well in tests contributes to better performance. Only 50% to 70% of students believed they could still perform well in the final exam despite having low test scores for Item 4. This indicates a lack of confidence in their ability to recover or improve over time, suggesting that students may place significant weight on early test performance.

It also raises concerns about the level of academic resilience among students and whether they are equipped with the skills or mindset to improve through continued effort. The high percentage (above 80%) of agreement for Item 5 shows that most students believe there is a strong correlation between test performance and final exam results. This perception reinforces the idea that students view continuous assessment not only as a learning tool but also as a predictor of final outcomes. It supports findings from Items 1 and 3, highlighting students' recognition of the role of tests in shaping both their academic development and confidence. This also aligns with prior research emphasizing the value of formative assessments in promoting sustained learning and achievement.

Furthermore, the results align with the theoretical framework presented by Black and Wiliam (1998), who emphasized that formative assessments, when integrated purposefully, significantly enhance student learning and long-term retention. In this study, tests appear to serve not only as evaluative tools but also as learning checkpoints that prepare students for the cognitive demands of the final exam. The second objective is to identify whether there is a significant relationship between test and final exam evaluations. The third objective is to assess the reliability of tests as a predictive tool for final exam achievement.

Next, the findings of the second instrument are data from the test scores and final exam scores of the respondents. The correlation coefficient value studied is the relationship between the test scores and the overall final exam score. The correlation value is used to find the relationship between two or more variables whether they influence each other or not. The interpretation of the strength of correlation in this study is based on the interpretation of the strength of correlation from the Davies (1971) study as shown in Table 3.

Table 3. Interpretation of correlation strength

Mean score	Scale
0.70 – 1.00	Very High
0.50 – 0.69	High
0.30 – 0.49	Medium
0.10 – 0.29	Low
0.00 – 0.09	Ignore

Table 4 shows the details of the correlation coefficient analysis and interpretation for each course. The results of the correlation coefficient values show a VERY HIGH level of correlation for the DBM10013, DBM20023 and DBM30033 courses. Meanwhile, the correlation coefficient values show a HIGH level of correlation for the DBM30043 course. The correlation coefficient values exceeding 0.5 for all these courses indicate that there is a strong positive relationship between test scores and final examination scores. However, while the results are consistent and statistically significant within the Engineering Mathematics context, they may not be generalizable to other disciplines or institutions with different teaching methods, assessment formats, or student demographics.

Table 4. Correlation coefficient value for each course

Analysis DBM10013

KORELASI DBM10013

		ujianDBM10013	akhirDBM10013
ujianDBM10013	Pearson Correlation	1	.761**
	Sig. (2-tailed)		<.001
	N	349	349
akhirDBM10013	Pearson Correlation	.761**	1
	Sig. (2-tailed)	<.001	
	N	349	349

**. Correlation is significant at the 0.01 level (2-tailed).

Interpretation DBM10013

There is a VERY HIGH and statistically significant positive relationship between student achievement in tests and final exams. (r = 0.761, p < .001, *two-tailed*).

Analysis DBM20023

KORELASI DBM20023

		ujianDBM20023	akhirDBM20023
ujianDBM20023	Pearson Correlation	1	.753**
	Sig. (2-tailed)		<.001
	N	340	340
akhirDBM20023	Pearson Correlation	.753**	1
	Sig. (2-tailed)	<.001	
	N	340	340

**. Correlation is significant at the 0.01 level (2-tailed).

Interpretation DBM20023

There is a VERY HIGH and statistically significant positive relationship between student achievement in tests and final exams.
(r = 0.753, p < .001, *two-tailed*).

Analysis DBM30033

KORELASI DBM30033

		ujianDBM30033	akhirDBM30033
ujianDBM30033	Pearson Correlation	1	.741**
	Sig. (2-tailed)		<.001
	N	120	120
akhirDBM30033	Pearson Correlation	.741**	1
	Sig. (2-tailed)	<.001	
	N	120	120

**. Correlation is significant at the 0.01 level (2-tailed).

Interpretation DBM30033

There is a VERY HIGH and statistically significant positive relationship between student achievement in tests and final exams.
(r = 0.741, p < .001, *two-tailed*).

Analysis DBM30043

KORELASI DBM30043

		ujianDBM30043	akhirDBM30043
ujianDBM30043	Pearson Correlation	1	.630**
	Sig. (2-tailed)		<.001
	N	150	150
akhirDBM30043	Pearson Correlation	.630**	1
	Sig. (2-tailed)	<.001	
	N	150	150

**. Correlation is significant at the 0.01 level (2-tailed).

Interpretation DBM30043

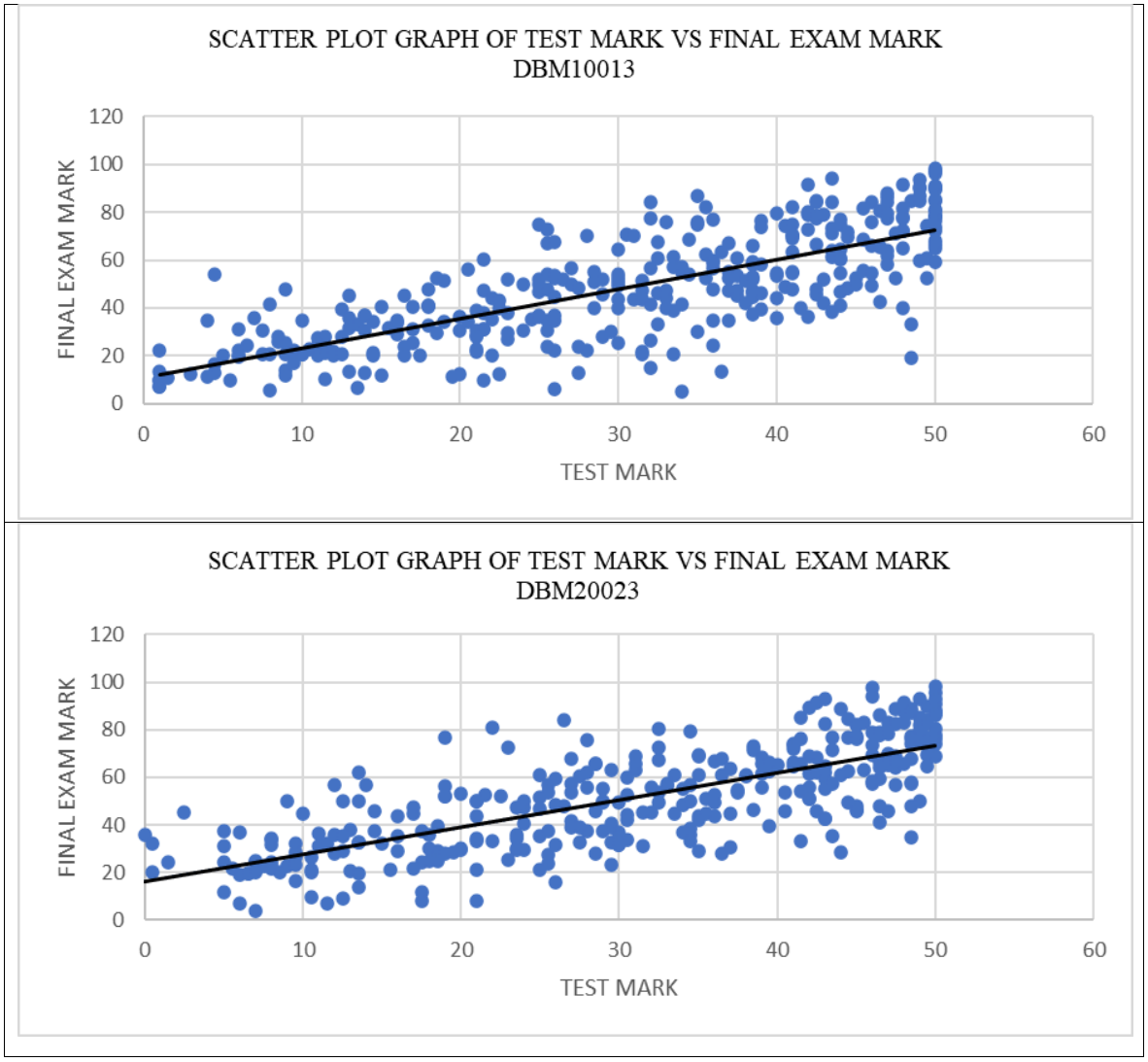
There is a HIGH and statistically significant positive relationship between student achievement in tests and final exams.
(r = 0.630, p < .001, *two-tailed*).

These findings clearly indicate a statistically significant and strong positive relationship between students' test scores and their final examination results across all Engineering Mathematics courses surveyed. The strength of correlation values, particularly those exceeding r = 0.74 for DBM10013, DBM20023 and DBM30033, suggest that formative assessments play a substantial role in predicting and potentially influencing summative performance. This is in line with the findings of Ade et al. (2024), who reported a similar very strong correlation in the Engineering Mathematics 1 course at PSMZA. The present study, however, expands on that evidence by including multiple courses and different levels (introductory and advanced) within the Engineering Mathematics curriculum, reinforcing the consistency of this relationship across course structures.

This result supports the hypothesis that tests can be used as an early indicator of student performance and can help lecturers to plan interventions ahead of the final exams. The large number of respondents also gave confidence in the reliability of these findings. The implication for educators is that test performance can be a reliable early indicator of final achievement.

Lecturers can use this information to identify at-risk students earlier and implement targeted remedial interventions before the final exam. Figure 1 presents a scatter plot illustrating the correlation between test scores and final examination results across all Engineering Mathematics courses. This scatter plot graph uses dots to represent the values of two different numerical variables. The position of each dot on the horizontal and vertical axes indicates the value for an individual data point. Each dot represents an individual student's performance, with the horizontal axis showing test scores and the vertical axis representing final exam scores.

This scatter plot graph is used to see the relationship between variables. When the dots in the graph increase, moving from left to right, then the scatter plot shows a positive correlation. The overall upward trend of the data points from left to right indicates a positive correlation. This means that the value of one variable is increasing in relation to the other. This shows the relationship of test scores to final exam scores. These findings clearly indicate a statistically significant and strong positive relationship between students' test scores and their final examination results. This suggests that students who perform well in tests are more likely to achieve higher scores in their final examinations, reinforcing the value of continuous assessment as a predictor of academic performance.



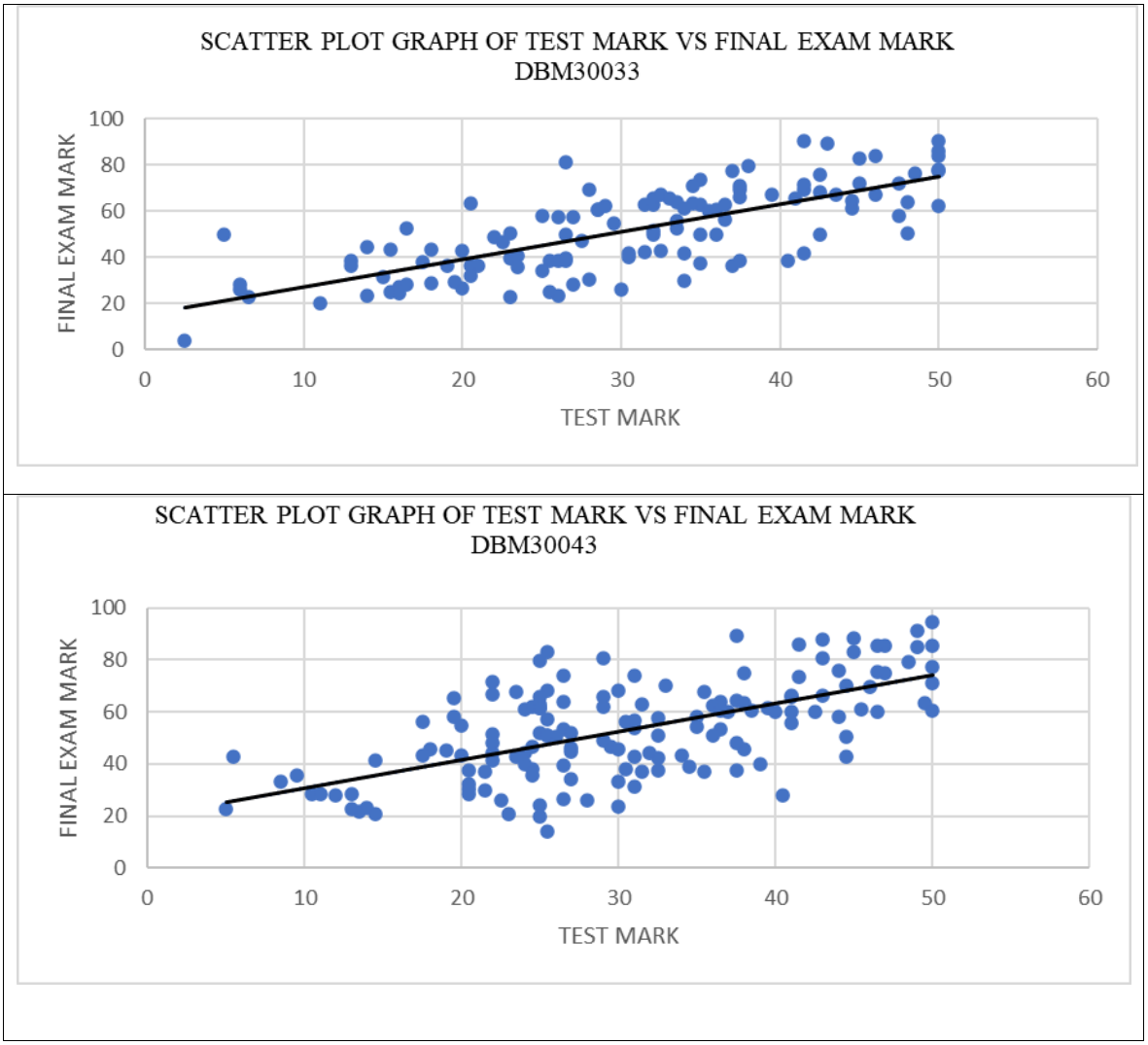


Fig. 1. Scatter plot graph of correlation coefficient values for each course

4. Conclusion

Overall, it can be concluded that there is a significant relationship between achievement in the test and the final examination. The correlation values that are on the VERY HIGH and HIGH scale indicate that for each course studied, students will show the same performance even though they involve different assessment items. The test not only functions as a continuous assessment tool but can also be used to predict the final performance of students. Therefore, through this study, it is hoped that it can help lecturers to identify weak students at the initial stage (test) to ensure that student achievement can be improved through the final examination. Lecturers are advised to pay more serious attention to the analysis of test results and use the data to identify students at risk.

It is a CQI (Continuous Quality Improvement) approach to improve CLO achievement for courses and subsequently help in improving PLO, PEO for the study programs offered. Among other things, as a result of this study, lecturers can identify topics that need to be emphasized to ensure that students can master the topic well. In this regard, lecturers indirectly have the opportunity to produce teaching materials, innovations and appropriate teaching and learning methods or techniques to improve students' understanding of the relevant topics. In addition, the motivation aspect also needs to be given attention so that weak students can be helped progressively.

The role of lecturers as facilitators needs to be more proactive so that students can improve their weaknesses and deficiencies through a more effective and meaningful approach. As a result, students and lecturers receive positive benefits collectively in addition to being able to improve the quality and achievement of courses in particular (CLO) and programs (PLO) in general. Future research may consider comparing Engineering Mathematics courses with other technical or non-technical subjects like Programming or Communication Skills to explore whether the strength of this correlation is unique to mathematical disciplines. It would also be beneficial to investigate how different assessment formats impact student outcomes and confidence levels.

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SENSE3 SQUARE: A SIMPLE APPROACH TO SOLVE DOOLITTLE AND CROUT METHOD

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Abstract

Sense3 Square is an innovative learning kit designed to improve students' understanding of the Crout and Doolittle Methods in the Numerical Method topic of Engineering Mathematics 3. Many third-semester polytechnic students struggle to understand the Crout and Doolittle methods in Engineering Mathematics 3, leading to a failure rate of over 50% in written tests. Many third-semester polytechnic students struggled with linear equations, as shown by a 46% failure rate in the Session II 2023/2024 test. Additionally, 38% of 83 surveyed students reported difficulty with 3x3 matrix multiplication. These findings served as a guide for developing Sense3 Square as a step to enhance skills in solving linear equations using the Crout and Doolittle Methods. Using the ADDIE model (Analysis, Design, Development, Implementation, Evaluation), Sense3 Square integrates sight, touch, and hearing to support kinesthetic learning. This multi-sensory approach aims to reduce common calculation errors and enhance conceptual understanding, ultimately boosting students' performance in solving systems of linear equations.
Keywords: ADDIE; Crout method; Doolittle method.

1. Introduction

Teaching aids enhance student engagement and understanding, moving beyond traditional chalk-and-talk methods. The use of teaching aids during Teaching and Learning (TnL) sessions greatly helps teachers enhance students' understanding of a particular topic This learning aid can help students improve their academic performance as well as enhance their higher-order thinking skills which were progressing from knowing and understanding to solving problems involving the levels of application, analysis, evaluation, and eventually creation (Ghazali & Setambah, 2024). These tools, which range from non-electronic models and charts to modern digital applications, are essential for improving academic performance and developing higher-order thinking skills, as students' progress from simple knowledge to complex problem-solving and creation (Wang & Abdullah, 2024). In mathematics education, particularly at the tertiary level, these aids capture student interest and foster conceptual mastery, especially in challenging subjects like numerical methods. Numerical methods, a foundational topic in engineering mathematics, are often difficult for students, leading to high failure rates (Voon et al., 2024). While historically dominant, traditional teaching methods are less effective in addressing these topics' abstract and complex nature, often failing to provide the interactive and visual support many students need to succeed (Meylani, 2024). This has spurred a growing body of research advocating integrating technology-enabled learning tools to improve student outcomes in STEM disciplines.

A significant number of studies have highlighted the benefits of technology-enabled learning over traditional approaches. For instance, research by Luo & Zhou (2024) found that students using interactive digital tools in a blended learning environment demonstrated a 25% higher pass rate in numerical methods compared to their peers in traditional classrooms. Similarly, Sun et al.'s (2024) meta-analysis concluded that technology-enhanced instruction significantly improves student motivation, engagement, and conceptual understanding in mathematics.

These findings underscore the need for innovative instructional aids that can bridge the gap left by traditional methods.
In response to this pedagogical challenge, Sense3 Square is an innovative teaching aid specifically developed for engineering mathematics students. It is designed to support lecturers and learners in grasping complex numerical methods, such as LU decomposition using the Crout and Doolittle approaches. This study aims to enhance the development of Sense3 Square using the ADDIE instructional design model, which consists of five phases: Analysis, Design, Development, Implementation, and Evaluation. By following a structured design process, we can ensure the teaching aid is relevant, adaptable, and effective across various educational levels—from secondary schools to higher education institutions, especially in STEM-related disciplines. The objectives of this study are:

1. To determine the percentage of students who face difficulties in understanding the Doolittle and Crout methods through a structured questionnaire survey.
2. To design and develop the Sense3 Square teaching aid using the ADDIE instructional design models to support learning in Numerical Methods.

According to statistics from the Test of Engineering Mathematics 3 in Session II 2022/2023, 53% and 46% of students failed the exam in DBM30033 (Mechanical Engineering) and DBM30043 (Electrical Engineering), respectively. An analysis of the test questions revealed that most students consistently struggled with Question 3, which pertains to Numerical Method, due to the complexity of long and structured calculations. Learning difficulties and inactivity in the classroom also contribute to this issue. Traditional learning methods, such as chalk and talk, can cause disorientation and lead to a weak understanding. Meghana et al. (2022) investigated the perception of traditional learning as either active or not. In response to these challenges, the Sense3 Square teaching aid was developed to integrate three sensory elements, sight, touch, and hearing, into a single learning kit with the potential to enhance learning patterns and academic outcomes.

2. Methodology

This study employed a quantitative approach using a structured questionnaire as the main data collection tool. Descriptive statistics were used to analyse students' understanding and identify learning difficulties prior to the development of the teaching aid. A survey method was adopted, aligning with the research objective of assessing practical classroom challenges based on real responses rather than assumptions. According to Taherdoost (2021), research questions in practical studies help address uncertainties through empirical evidence.

The population for this study consisted of all students enrolled in the Engineering Mathematics 3 course at Politeknik Tuanku Sultanah Bahiyah. To ensure the sample size was statistically sufficient and representative of this population, the study used a random sampling technique and determined the required sample size using a widely accepted formula for finite populations (Krejcie & Morgan, 1970).

The calculated minimum required sample size was 80 based on a total population (N) of 100 Engineering Mathematics 3 students enrolled in the course. The number of respondents, 83, met this minimum requirement, confirming the statistical sufficiency and reliability of the sample for this study.

The data were analysed using descriptive statistics, focusing on frequency and percentage distribution across five Likert scale levels: Strongly Agree (5), Agree (4), Not Sure (3), Disagree (2), and Strongly Disagree (1). The results reflect students' understanding of the Crout and Doolittle methods, particularly in 3x3 matrix multiplication.

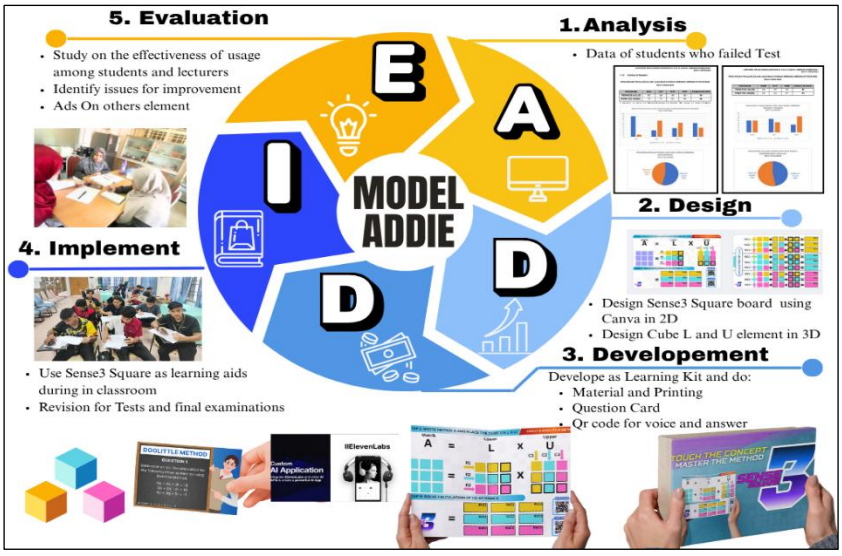

Fig. 1. Five phases of ADDIE (Development process of Sense3 Square)

The method for creating Sense3 Square was developed by exploring creative ideas using the ADDIE model as a structured framework. As shown in Figure 1, the five phases: Analysis, Design, Development, Implementation, and Evaluation represent a dynamic and flexible guideline that enhances the effectiveness of this teaching aid. According to Adeoye et al. (2024), the ADDIE model is a trusted instructional design framework that is widely used in research and proven effective in education. The process began with analysing results from a Theory Test on the Numerical Method topic and a questionnaire study on students' understanding of LU Matrix Multiplication in the Doolittle and Crout Methods. The analysis identified a key issue: students' weakness in matrix multiplication, often due to poor focus. A sensory-based approach was adopted, as the students' demonstrated difficulty concentrating.

As illustrated in Figure 2, the design integrates the five primary senses: sight, hearing, touch, taste, and smell that converge toward the brain, symbolising how sensory inputs can enhance learning. Fan et al. (2024) highlighted that the core principle is simple and powerful. When learners engage with content through multiple senses, they form stronger neural connections, leading to deeper understanding and longer retention. Next, 2D and 3D designs were created for the matrix multiplication board and cube elements. These designs incorporated vibrant colours to increase user engagement. Once the designs were finalised, the Sense3 Square prototype was developed and tested with two sensory elements: sight and touch. A QR code was also integrated to allow students access to questions and instructions via AI-generated voice, addressing the hearing element. Finally, the Sense3 Square was implemented with users and evaluated to identify areas for improvement.

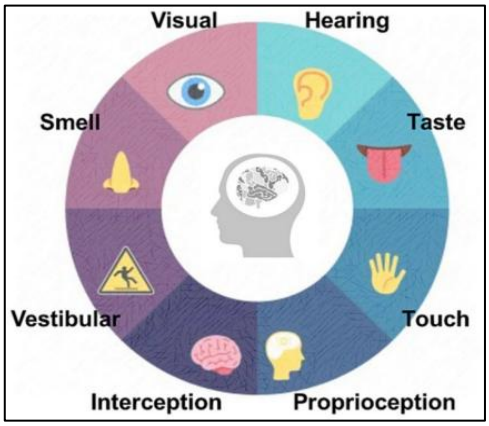

Fig. 2. Fan et al. (2024) highlight the five primary senses (Smell, Visual, Hearing, Taste and Touch)

3. Results and Discussion

The data from the student questionnaire were analysed using simple descriptive statistics. The analysis provides insights into the students' understanding and perceptions of the Crout and Doolittle methods, particularly in 3x3 matrix multiplication in traditional learning and before using any innovation of teaching aid. A total of 83 students who participated in the intervention responded to the questionnaire distributed after implementing both intervention phases. The questionnaire employed a five-point Likert scale (1 = Strongly Disagree, 5 = Strongly Agree). The instrument's reliability was tested and analysed using SPSS version 27, which produced Cronbach's alpha value of 0.898. According to Chua (2020), a Cronbach's alpha value of ≥ 0.7 indicates that the constructed items have good validity and are acceptable. Table 4 presents a summary of the students' questionnaire findings.

Table 1. Analysis of students' understanding and perceptions of the Crout and Doolittle Methods

No.	Item	Strongly Disagree 1	Disagree 2	Not Sure 3	Agree 4	Strongly Agree 5	Mean
1.	I can use the Matrix system (3 x 3).	0%	1%	11%	31%	51%	4.31
2.	I understand the 3x3 Matrix Multiplication technique in the Crout and Doolittle methods.	5%	15%	23%	22%	35%	4.19
3.	I am able to solve LU Multiplication to obtain the value of each element.	6%	14%	22%	29%	29%	4.19
4.	I am able to solve the next step, which is LY = B.	0%	5%	16%	37%	42%	4.17
5.	I am able to complete the next step, which is UX = Y, to obtain the values of X, Y, and Z	0%	5%	23%	29%	43%	4.10
6.	The lecturer makes full use of the whiteboard in teaching the Crout and Doolittle methods	0%	1%	10%	17%	72%	4.61
7.	The lecturer uses teaching aids in teaching the Crout and Doolittle methods	4%	11%	19%	18%	48%	3.93
8.	I understand the 3x3 Matrix Multiplication technique for the Crout and Doolittle methods as explained by the lecturer using whiteboard and book.	2%	14%	17%	27%	40%	4.33

The data in Table 1 provides critical insights into students' understanding of 3×3 matrix multiplication and their experiences with traditional teaching approaches before introducing the Sense3 Square. Most students demonstrated confidence in basic matrix operations, as shown by Item 1 with a mean score of 4.31. However, their understanding was weakened when they faced the more complex LU decomposition stages. Yap et al. (2021) found that students often fail to grasp complex linear algebra techniques without visual and interactive representations, especially when only traditional methods are used. Specifically, 38% of students were unsure or disagreed about their ability to solve LU element values in Item 2, which had a mean of 4.19. Similar uncertainty appeared in the subsequent steps involving solving LY equals B in Item 4, with a mean of 4.17, and UX equals Y in Item 5, with a mean of 4.10. These declining mean scores highlight a growing conceptual gap as tasks become more abstract and computationally demanding. Rahma et al. (2025) reported that abstract mathematical procedures, such as LU decomposition, require more than verbal instruction as students benefit significantly from guided visualisation and repeated practice.

Although lecturers relied heavily on the whiteboard, as reflected by Item 6 with a mean of 4.61, the use of interactive teaching aids was inconsistent and received a lower mean of 3.93 in Item 7, with nearly a third of students expressing uncertainty or disagreement about their effectiveness. Subramaniam & Rosli (2024) emphasised that teaching aids must be contextually appropriate and adapted to the content level, or they risk becoming distractions rather than support tools While some understanding was achieved through whiteboard and book explanations, as shown in Item 8 with a mean of 4.33, about 33 % of students still lacked confidence, which reflects the limitations of passive teaching methods. Direnga (2021) suggested that static materials alone are ineffective unless paired with active questioning, peer interaction, or hands-on demonstration.

These findings confirm that traditional instruction alone does not fully address diverse learning needs. This underscores the necessity of an innovative multi-sensory approach like the Sense3 Square to actively engage students and strengthen their comprehension of the Doolittle and Crout methods. The development and implementation of the Sense3 Square learning kit were guided by the ADDIE instructional design model that comprises five phases: Analysis, Design, Development, Implementation, and Evaluation. Its instructional philosophy is grounded in sense elements: sight, touch, and hearing. The combined model addresses challenges students face in understanding 3x3 matrix multiplication and LU decomposition. Sense3 Square was developed through brainstorming sessions and the exploration of creative ideas. The ADDIE design technique was also applied to create this innovative learning kit. Several testing phases were conducted to determine the specifications and functional design of Sense3 Square until it was successfully implemented.

Based on students' weaknesses in test failure data, it guided the need for a structured, step-by-step solution approach. Sridhar & Balamurugan (2025) emphasised that logical structure and cognitive scaffolding improve comprehension in mathematics. The design phase focuses on the sight element, which involves putting the colour codes on the pattern board and the 3D cube for the touch element, which allows hands-on manipulation of the L and U matrices. Development is a crucial phase in producing a complete learning kit. To incorporate sound as a hearing element, an AI-generated voice is the best approach to assist students, along with question and answer cards that can be accessed via QR code. Gatchalian & Leon (2023) found that combining audio and visuals boosts engagement and long-term recall. A prototype of Sense3 Square will be used during classroom teaching, exam revision, and group activities for Numerical Methods. This implementation phase evaluates whether students can successfully solve problems and demonstrate understanding using the learning kit. Garner & Gabitova (2022) highlighted that tactile learning tools reduce stress and promote positive emotional learning in the STEM classroom.

Based on student feedback and classroom observation, the evaluation phase surveys the kit's effectiveness after implementation. Post-use evaluation is conducted through student questionnaires and performance comparisons. Wang (2021) emphasised that continuous feedback is essential for iterative design improvements in educational kits, particularly when addressing conceptual learning. Sense3 Square has significantly impacted classroom teaching time, addressing difficulties in matrix multiplication and enhancing performance in the Theory Test, which previously had a less than 50% pass rate.

4. Conclusion

The development of the Sense3 Square learning kit, guided by the ADDIE model and enhanced through multi-sensory SENSE elements, has proven to be a valuable innovation in supporting students' understanding and applying the Crout and Doolittle methods in numerical methods. Data from the structured questionnaire confirmed that traditional teaching strategies relying solely on chalk and talk were insufficient, with 38% of students lacking confidence in mastering matrix multiplication steps. Even when some teaching aids were used, they were

often static, passive, or misaligned with students' needs, leading to disengagement and persistent knowledge gaps. In direct response to these issues, the Sense3 Square was successfully designed, developed, and implemented using the ADDIE instructional design model. Integrating the sensory elements of sight, touch, and hearing into a cohesive, interactive learning kit allowed students to engage with abstract concepts in a concrete, hands-on way. Introducing colour-coded 3D cubes for tactile learning and AI-generated voice instructions addressed diverse learning preferences, fostering active participation and deeper conceptual understanding.

The development process of the Sense3 Square proved that a multi-sensory approach significantly enhances comprehension and retention in challenging STEM topics. Its lightweight, interactive, and user-friendly design allows lecturers and students to engage more effectively in teaching and learning. Moving forward, iterative refinements should continue based on ongoing feedback. Nevertheless, wider implementation of the Sense3 Square should be explored within polytechnics and other institutions teaching numerical methods. Moreover, expanding this sensory-based approach to other complex engineering topics could further reduce failure rates, improve engagement, and transform learning outcomes in STEM education.

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THE INFLUENCE OF FINANCIAL LITERACY AND LIFESTYLE ON CONSUMER BEHAVIOR OF DANA APPLICATION USERS IN GENERATION Z

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Abstract

This study aims to analyse the influence of financial literacy and lifestyle on the consumer behaviour of those who use the Dana application in the Siti Rejo I sub-district of Jalan Sakti Lubis Gang Karyawan Medan. The research method used is quantitative with a survey approach. The research sample was taken using a purposive sampling technique, with 50 respondents from residents or students who use the Dana application. Data were collected through questionnaires and analysed using multiple linear regression. The results showed that financial literacy had a negative and significant effect on consumer behaviour, while lifestyle had a positive and significant effect. These findings indicate that increasing financial understanding can reduce consumer behaviour, while a consumer's lifestyle strengthens it. Therefore, students need to improve their financial literacy as an effort to control spending, especially in the use of digital wallets.
Keywords: Financial literacy, Lifestyle, Consumer behaviour, Fund applications.

1. Introduction

The development of digital technology has significantly changed various aspects of life, including payment systems and personal financial management. One widely used innovation today is digital wallets (e-wallets), such as the Dana app. The convenience, speed, and various attractive features offered by these apps have made them popular, especially among younger generations such as students. However, behind this convenience is the potential for uncontrolled consumer behaviour, especially if users lack adequate financial literacy.

According to Wiyanto, Putri, and Budiono (2019), personal financial planning is crucial because it is a self-learning process where each individual must be able to manage their finances. Good financial behaviour can improve living standards, minimise the risk of financial disaster, make optimal investments, and accumulate wealth over a short period. Good financial behaviour can be seen from the habit of recording monthly expenditures, determining and setting goals and tasks for each financial item, carrying out financial activities according to income, and being able to separate needs from wants (Husni Mubarok, 2017). This research was conducted on residents or students in the Siti Rejo I sub-district, Jalan Sakti Lubis Gang Karyawan Medan, as one of the active users of financial technology in everyday life. By understanding the relationship between financial literacy, lifestyle, and consumer behaviour, it is hoped that it can become a basis for developing financial education strategies and developing wiser consumption habits among the residents of the Siti Rejo I sub-district, Jalan Sakti Lubis Gang Karyawan Medan.

2. Methodology

This study uses a quantitative approach. Primary data were collected through questionnaires from 50 respondents who use the DANA application. The variables used are financial literacy (X1), Lifestyle (X2), and Consumptive behaviour (Y). This study was conducted in the Siti Rejo I sub-district among Jalan Sakti Lubis Gang Karyawan Medan residents in April 2025. The population in this study were students and residents. The population used in the study was a portion of residents who use the Dana application, totalling 150 people. This number became the basis for determining the population in this study. The sample in this study used the Slovin formula, which is as follows:

$$n = \frac{N}{1+N\ e^2} \quad (1)$$

Information:
n: Number of samples
N: Population size
margin of error (0.10 for 10%)

This study employed a quantitative data collection method with a survey approach, using an online questionnaire based on a 1-5-point Likert scale as the primary instrument. This method was chosen because it aligns with the research objective of measuring and testing the relationship between financial literacy, lifestyle, and consumer behaviour variables. The analysis will calculate the coefficient of agreement between the numbers and the total value of the existing question numbers. Validity testing will be conducted using SPSS version 22. If the calculated r value > r table (at a significance level of 0.05) and the sig. Value (p-value) < 0.05, then the statement item is declared valid. If the calculated r value < r table (at a significance level of 0.05) and the sig. Value (p-value) > 0.05, then it is declared invalid and can be considered for disposal or correction.

Reliability tests measure an instrument's consistency (reliability).(Sugiyono, 2019)This test was conducted using Cronbach's Alpha technique. If the Cronbach's Alpha value ≥ 0.60, then the instrument is declared reliable or consistent. If the Cronbach's Alpha value is < 0.60, then the instrument is declared less reliable. Multiple linear regression tests determine the effect of more than one independent variable (X) on one dependent variable (Y) simultaneously or partially. The variables are financial literacy, lifestyle, and consumer behaviour. The general regression equation used is:

$$Y = \alpha + \beta 1X1 + \beta 2X2 + e \quad (2)$$

Information:
Y = Consumer Behaviour
α = Constant
β1, β2 = Regression coefficients
X1 = Financial Literacy
X2 = Lifestyle
e = Error

3. Results and Discussion

In this study, validity testing was conducted using correlation techniques, namely by measuring the relationship between each question item's score and the relevant variable's total score. The instrument is declared valid if the calculated r-value is greater than the table r-value and the significance value is <0.05, indicating that the item is suitable for measuring the construct in the study. All items (X1.1 to X1.10) have a calculated r value greater than the r-table and a significance value <0.05, so it can be concluded that all items are valid to

measure the Digital marketing construct at a significance level of 0.05. This means that each item in the questionnaire has a significant and strong correlation to the total score of each construct, so that all the instruments proposed are declared valid and suitable for use in the data collection process.

Table1. Results of the validity test of the research Instrument X1

No	Item	r Count	r Table (0.05)	Sig. (2-tailed)	Information
1	X1.1	0.630	0.254	0	Valid
2	X1.2	0.698	0.254	0	Valid
3	X1.3	0.761	0.254	0	Valid
4	X1.4	0.805	0.254	0	Valid
5	X1.5	0.728	0.254	0	Valid
6	X1.6	0.848	0.254	0	Valid
7	X1.7	0.820	0.254	0	Valid
8	X1.8	0.683	0.254	0	Valid
9	X1.9	0.820	0.254	0.015	Valid
10	X1.10	0.275	0.254	0.027	Valid

All indicators X1.1 to X1.10 have a calculated r value greater than the table r and a significance value below 0.05, so it can be concluded that all indicators are valid.

Table 2. Results of the validity test of the research instrument X2

No	Item	r Count	r Table	Sig. (2-tailed)	Information
1	X2.1	0.853	0.254	0.011	Valid
2	X2.2	0.665	0.254	0	Valid
3	X2.3	0.907	0.254	0.036	Valid
4	X2.4	0.905	0.254	0	Valid
5	X2.5	0.889	0.254	0.002	Valid
6	X2.6	0.898	0.254	0	Valid
7	X2.7	0.913	0.254	0	Valid
8	X2.8	0.753	0.254	0	Valid
9	X2.9	0.899	0.254	0	Valid
10	X2.10	0.787	0.254	0	Valid

All indicators X2.1 to X2.10 have a calculated r value greater than the table r and a significance value below 0.05, so it can be concluded that all indicators are valid.

Table 3. Results of the validity test of research instrument Y

No	Item	r Count	r Table	Sig. (2-tailed)	Information
1	Y1	0.724	0.254	0	Valid
2	Y2	0.552	0.254	0	Valid
3	Y3	0.825	0.254	0	Valid
4	Y4	0.779	0.254	0	Valid
5	Y5	0.764	0.254	0	Valid
6	Y6	0.787	0.254	0	Valid
7	Y7	0.820	0.254	0	Valid
8	Y8	0.716	0.254	0	Valid
9	Y9	0.832	0.254	0.01	Valid
10	Y10	0.730	0.254	0	Valid

All indicators Y1 to Y10 have r count > r table and sig. < 0.05, so they are declared valid. An instrument is considered reliable if the Cronbach's Alpha value is > 0.60. The closer the value

is to 1, the higher the instrument's reliability. This test is crucial to ensure the questionnaire's stability and reliability in measuring the construct being studied.

Table 4. Results of the reliability test of research variables

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1,643	2,659		.618	.540
	Financial Literacy	.204	.131	.210	1,556	.126
	Lifestyle	.698	.135	.699	5,180	.000
a. Dependent Variable: CONSUMER BEHAVIOR						

The reliability test results in the table above show that all statement items in the independent variables, namely financial literacy and lifestyle, and the dependent variable, consumer behaviour, are above 0.60. This indicates that each construct in Financial Literacy used in this study is reliable and has good internal consistency. Multiple linear regression testing determines the effect of more than one independent variable (X) on a single dependent variable (Y) simultaneously or partially. This model is suitable for research involving complex constructs such as the Technology Acceptance Model (TAM).

Table3. Multiple linear regression test

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1,643	2,659		.618	.540
	FINANCIAL LITERACY	.204	.131	.210	1,556	.126
	LIFESTYLE	.698	.135	.699	5,180	.000

The multiple linear regression test results indicate that of the two independent variables tested, only Financial Literacy has a positive and partially significant influence on Lifestyle. Meanwhile, Consumption behaviour does not have a significant influence. This means that Financial Literacy plays a greater role in driving Lifestyle.

4. Conclusion

Financial literacy (X1) negatively and significantly influences consumptive behaviour in Generation Z in Siti Rejo 1 Village, Jalan Sakti Lubis Gang Pegawai, Medan City. Thus, with better financial literacy, Generation Z will better understand basic financial concepts such as budgeting, savings, investment, and debt. Therefore, it can help them make wiser financial decisions and avoid consumptive behaviour that can harm long-term finances. Lifestyle (X2) negatively and significantly influences consumptive behaviour in Generation Z in Medan. Thus, good self-control will help Generation Z manage impulsive shopping desires and focus on more important financial priorities. This includes saving for the future, paying off debt, and making profitable investments. Generation Z in Depok City experiences significant negative consumptive behaviour due to financial literacy (X1) and Lifestyle (X2). Therefore, this can be interpreted as an increase in financial literacy and Lifestyle simultaneously/together towards consumptive behaviour.

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PERANAN MINI PROJECT KURSUS ENGINEERING SCIENCE DALAM MEMUPUK BUDAYA STEM DALAM KALANGAN PELAJAR

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Abstrak

Mini projek pelajar merupakan aktiviti pembelajaran yang sangat penting kepada pelajar. Ini kerana ia membantu meningkatkan kemahiran praktikal, pemikiran kritis, dan keupayaan menyelesaikan masalah dalam situasi dunia sebenar. Namun begitu, timbul persoalan, sejauh mana aktiviti dalam mini projek dapat memupuk budaya STEM dalam kalangan pelajar. Isu ini timbul kerana apabila mini projek dijalankan secara berkumpulan, terdapat risiko ketidakseimbangan dalam pembahagian tugas, di mana sesetengah ahli kumpulan mungkin kurang menyumbang, menyebabkan beban kerja tidak diagihkan secara adil. Begitu juga boleh berlaku konflik atau perbezaan pendapat antara ahli kumpulan boleh timbul, yang berpotensi mengganggu kelancaran dan keberkesanan pelaksanaan projek. Justeru itu kajian ini dijalankan adalah untuk menilai sendiri dari perspektif pelajar tentang peranan mini projek kursus engineering science dalam memupuk budaya STEM dalam kalangan pelajar. Seramai 74 orang di Politeknik Kuching Sarawak, terlibat dalam kajian ini. Analisis kajian ini menggunakan analisis deskriptif untuk mengukur tahap persetujuan pelajar terhadap item kajian dalam soal selidik berdasarkan nilai min. Hasil kajian mendapati bahawa majoriti pelajar bersetuju bahawa mini projek kursus engineering science dapat memupuk budaya STEM dalam kalangan pelajar. Kajian ini penting kerana ia dapat menilai sejauh mana pendekatan yang dimainkan oleh mini projek yang diperkenalkan oleh institusi atau pensyarah mampu meningkatkan kemahiran teknikal, pemikiran kritis, dan minat pelajar terhadap bidang STEM, sekaligus menyokong pembangunan modal insan yang berdaya saing.
Kata kunci: STEM; Mini projek; Kursus Engineering Science.

1. Pengenalan

STEM ialah program pendidikan yang dibangunkan untuk menyediakan pelajar sama ada di peringkat sekolah rendah dan menengah hinggalah ke kolej, pengajian siswazah dan kerjaya dalam bidang sains, teknologi, kejuruteraan dan matematik (STEM). Sebagai tambahan kepada pembelajaran khusus subjek, STEM bertujuan untuk memupuk minda bertanya, penaakulan logik dan kemahiran kerjasama (Lutkevich, 2025). STEM di institusi pengajian tinggi mengajar pelajar berfikir secara kritis, menyediakan mereka untuk kerjaya, dan melatih mereka menyelesaikan masalah sukar dari pelbagai bidang sains. Dapat penulisan Muniz (2023) menjelaskan bahawa senario hari ini mendapati pekerjaan dalam bidang STEM mendapat permintaan tinggi, dan kebanyakannya permintaan dijangka kekal dan terus meningkat selama beberapa tahun. Sekiranya dilihat situasi di luar negara pada masa ini, seperti kerajaan Amerika, mereka sangat menggalakkan pelajar untuk belajar STEM kerana negara tersebut kekurangan tenaga profesional dalam bidang STEM. Ini dapat dibuktikan apabila pada 2019, pentadbiran Trump melabur $578 juta dalam pendidikan STEM (Muniz, 2023). Bidang STEM sangat penting kerana menurut National Science Foundation pekerja STEM menyumbang kepada taraf hidup dan pertumbuhan ekonomi negara. Tidak menghairankan bahawa Biro Statistik Buruh Amerika mengunjurkan bahawa pekerjaan dalam

bidang STEM dijangka berkembang sebanyak 10.8% hingga 2032, berbanding dengan 2.3% untuk pekerjaan bukan STEM.

Kursus Engineering Science membawa pelajar mengenali dan mengaplikasi konsep fizik dalam topik-topik seperti pergerakan linear, daya, konsep kerja, tenaga dan kuasa. Pelajar diploma politeknik akan mengambil kursus ini pada semester satu peringkat pengajian. Pelajar seharusnya boleh mengaplikasikan konsep matematik, sains, asas kejuruteraan dan kejuruteraan khusus merangkumi semua aspek kejuruteraan dalam peringkat program pengajian mereka. Penghasilan produk dalam mini projek kursus ini menimbulkan minat dan memupuk sifat kreatif pelajar dalam menghasilkan produk atau mesin ringkas yang mengaplikasi konsep sains dan kejuruteraan dalam penciptaan mereka.

Berdasarkan kepada senario ini, budaya STEM perlu dipupuk dalam kalangan pelajar khususnya pelajar dalam institusi TVET. Di Politeknik Kuching Sarawak, dalam membudayakan STEM dalam kalangan pelajar, mini projek telah diperkenalkan dalam kursus kejuruteraan sains sebagai inisiatif awal. Ini kerana kerana melalui mini projek dilihat dapat membekalkan pengalaman pembelajaran praktikal yang menggabungkan semua elemen STEM dalam konteks dunia sebenar. Melalui mini project, pelajar bukan sahaja mempelajari teori tetapi juga mengaplikasikan konsep sains, menggunakan teknologi, mereka bentuk penyelesaian kejuruteraan, dan menggunakan matematik untuk menyelesaikan masalah yang rumit. Mini project juga mewujudkan persekitaran pembelajaran kolaboratif di mana pelajar bekerja dalam pasukan, berkomunikasi secara berkesan, dan belajar daripada kesilapan, di mana inilah kemahiran penting yang diperlukan dalam kerjaya STEM. Namun begitu, walaupun mini projek dalam kursus Engineering Science dilihat berpotensi untuk memupuk budaya STEM dalam kalangan pelajar, tahap persetujuan pelajar terhadap keberkesanan pendekatan ini masih belum dapat dipastikan. Ini kerana pelajar merupakan unit peserta aktif dalam proses pembelajaran ini. Maklum balas pelajar yang mengikuti mini projek adalah penting untuk menjelaskan tahap keberkesanan sebenar mini projek dalam memupuk budaya STEM. Justeru itu berdasarkan kepada isu ini, objektif kajian ini dijalankan adalah untuk mengenal pasti peranan mini projek kursus engineering science dalam memupuk budaya STEM dalam kalangan pelajar.

Banyak kajian membincangkan hubungan antara STEM dan juga mini projek (Ambo, 2022; Nutramara, 2023; Suryonegoro, 2025). Mini projek memainkan peranan penting dalam pendidikan, terutama dalam memperkaya pengalaman pembelajaran pelajar. Melalui pendekatan Pembelajaran Berasaskan Projek (PBP), pelajar tidak hanya memperoleh pengetahuan teori tetapi juga pengalaman praktikal yang diperlukan dalam situasi dunia sebenar. Menurut Sulong dan Sulong (2022), PBP memfokuskan pembelajaran kepada pelajar, memupuk sikap proaktif, kemahiran penyelesaian masalah, serta berfikiran kritis dan kreatif. Ini kerana pendekatan ini memberikan ruang kepada pelajar untuk menghasilkan produk atau inovasi, menyokong teori konstruktivisme yang menekankan pentingnya belajar dengan melakukan secara praktikal. Dengan melaksanakan gabungan aktiviti STEM berasaskan projek dalam pembelajaran teradun mempunyai potensi besar untuk melibatkan pelajar dalam pengalaman pembelajaran tulen dan praktikal yang menghubungkan pengetahuan teori dengan aplikasi praktikal (Kelley & Knowles, 2016). Kaharudin (2023) juga menjelaskan bahawa pelaksanaan projek dalam pembelajaran dapat melibatkan pelajar dalam merancang, melaksanakan, dan membentangkan hasil kerja mereka, sekaligus membina kemahiran kolaboratif dan komunikasi.

Dari aspek peranan mini projek dalam STEM, Mustaza (2021) menjelaskan bahawa projek pementoran dalam STEM dapat membantu meningkatkan kemahiran teknikal pelajar serta menggalakkan mereka untuk bersaing dan belajar dalam persekitaran yang kondusif dan menyokong. Ini selari dengan pandangan Zavalevskyi (2023) di mana STEM, menumpukan pada pembangunan pemikiran kritis, penyelesaian masalah dan kemahiran kerjasama melalui pendekatan bersepadu untuk pembelajaran. Sebelum ini Huang, (2020) juga menyatakan

bahawa pelaksanaan pendidikan STEM telah dibuktikan dapat meningkatkan kebolehan menyelesaikan masalah, kreativiti dan kemahiran inovasi pelajar. Begitu juga dengan kajian Fini (2018) dan Domenici (2022) telah menunjukkan keberkesanan aktiviti STEM berasaskan projek dalam meningkatkan hasil pembelajaran pelajar, meningkatkan motivasi, dan menyediakan pelajar untuk kerjaya masa depan dalam bidang STEM. Antara kejayaan mini projek juga diterangkan oleh Simatupang (2021) di mana beberapa projek berorientasikan STEM dan bahan pengajaran penyelidikan mini yang dicipta oleh pelajar prasiswazah telah digunakan di sekolah sebagai sumbangan kampus kepada sekolah.

2. Metodologi

Kajian ini dijalankan dengan menggunakan pendekatan kaedah kuantitatif. Kaedah kuantitatif yang digunakan dalam kajian ini merujuk kepada pendekatan penyelidikan yang menggunakan data berbentuk angka untuk menganalisis dan memahami fenomena tertentu iaitu sejauh mana peranan mini projek kursus engineering science dalam memupuk budaya STEM dalam kalangan pelajar. Kajian ini melibatkan pengumpulan data melalui kaedah seperti soal selidik, yang kemudiannya dianalisis menggunakan statistik. Seramai 74 orang pelajar di Politeknik Kuching Sarawak, terlibat dalam kajian ini. Instrumen kajian ialah soal selidik Likert 5 skala yang dibina sendiri berdasarkan peranan mini project kursus engineering science dalam memupuk budaya STEM, yang telah dibincangkan secara meluas dalam kajian lepas. Analisis kajian ini menggunakan analisis deskriptif untuk mengukur tahap persetujuan pelajar terhadap item kajian dalam soal selidik berdasarkan nilai min, dengan tafsiran tahap mengikut skala seperti yang digunakan oleh Ngadiman (2019): 1.00–1.99 (Lemah), 2.00–2.99 (Rendah), 3.00–3.99 (Sederhana) dan 4.00–5.00 (Tinggi).

3. Dapatan dan Perbincangan

a) Latar belakang responden

Jadual 1. Latar Belakang Responden

Item		%	n
Jantina	Lelaki	55.4	41
	Perempuan	44.6	33
Jabatan	JKE	14.9	11
	JKM	38.5	28
	JKA	47.3	35
Semester	1	50	37
	2	50	37
HPNM	1.01 - 2.00	10.8	8
	2.01 - 3.00	41.9	31
	3.01 - 4.00	47.3	35

Kajian ini melibatkan 74 responden dari Politeknik Kuching Sarawak (lelaki - 55.4%; perempuan - 44.6%). Responden terdiri daripada pelajar Jabatan Kejuruteraan Elektrik (JKE) sebanyak 14.9% (11 orang), Jabatan Kejuruteraan Mekanikal (JKM) sebanyak 38.5% (28 orang), dan Jabatan Kejuruteraan Awam (JKA) sebanyak 47.3% (35 orang). Dari segi pencapaian akademik (HPNM), majoriti pelajar mempunyai HPNM antara 3.01 - 4.00 (47.3%, 35 orang), diikuti oleh HPNM 2.01 - 3.00 (41.9%, 31 orang), dan HPNM 1.01 - 2.00 (10.8%, 8 orang).

b) Peranan Mini Projek Terhadap Budaya STEM

Jadual 2. Analisis Peranan Mini Projek Terhadap Budaya STEM

Bil	Item	S.P	Skor Min
	Tahap Penglibatan Dalam Mini Projek		
1	Terlibat secara aktif dalam semua fasa mini projek	0.683	4.419
2	Menyumbang idea dan pendapat semasa perbincangan	0.681	4.405
3	Mengambil inisiatif untuk mencari maklumat tambahan	0.696	4.378
4	Melaksanakan tugasan dengan penuh komitmen.	0.646	4.486
5	Komunikasi berkesan dengan ahli kumpulan sepanjang projek.	0.687	4.500
	Peranan Mini Projek Dalam STEM		
1	Membolehkan penggunaan teknologi untuk menyelesaikan masalah.	0.743	4.446
2	Meningkatkan kemahiran mereka bentuk kejuruteraan.	0.762	4.459
3	Membantu menggunakan matematik dalam projek kejuruteraan.	0.707	4.473
4	Memperkenalkan penggunaan STEM dalam kehidupan sebenar.	0.778	4.432
5	Menunjukkan hubungan antara sains, teknologi, kejuruteraan, dan matematik.	0.707	4.486
6	Meningkatkan kemahiran berfikir kritis dalam STEM.	0.762	4.459
7	Membolehkan eksperimen untuk menguji idea kejuruteraan.	0.687	4.514
8	Mengaplikasikan kemahiran STEM dalam kejuruteraan.	0.779	4.446
9	Menerangkan kepentingan matematik dalam kejuruteraan.	0.725	4.459
10	Meningkatkan kesedaran tentang kepentingan STEM untuk kelangsungan alam sekitar.	0.775	4.405
11	Membantu meningkatkan kreativiti dalam menyelesaikan masalah STEM.	0.742	4.432
12	Mengajar penggunaan kaedah saintifik dalam kejuruteraan.	0.707	4.473
13	Mendedahkan kepentingan kerja berpasukan dalam projek STEM.	0.726	4.486
14	Meningkatkan minat terhadap kerjaya dalam bidang STEM.	0.707	4.473
15	Meningkatkan kesedaran tentang kepentingan STEM dalam pembangunan teknologi.	0.725	4.459
16	Membantu memahami konsep sains dalam kejuruteraan.	0.707	4.473

Jadual 2 akan menjelaskan peranan mini projek terhadap budaya STEM. Sebelum menarangkan peranan mini projek, perlu juga diterangkan tahap penglibatan pelajar dalam mini projek. Ini kerana pelajar yang terlibat sudah pasti dapat menerangkat kesan sesuatu program. Berdasarkan kepada Jadual 2, tahap penglibatan pelajar dalam pelbagai mini projek adalah tinggi. Ini menunjukkan bahawa pelajar terlibat secara aktif dalam semua fasa projek, termasuk perancangan, pelaksanaan, dan pembentangan (min 4.419). Mereka juga menyumbang idea dan pendapat semasa perbincangan kumpulan (min 4.405) serta mengambil inisiatif mencari maklumat tambahan untuk menyokong projek (min 4.378). Selain itu, pelajar juga menunjukkan komitmen dalam melaksanakan tugasan yang diberikan (4.186) dan berkomunikasi secara berkesan dengan ahli kumpulan sepanjang projek (4.400).

Bagi peranan mini projek dalam memupuk budaya STEM, secara keseluruhannya semua item memperoleh tahap persetujuan yang tinggi daripada responden, di mana semua item memperoleh min melebihi 4.00. Ini menunjukkan bahawa mini projek sangat berkesan dalam membudayakan STEM dalam kalangan pelajar kejuruteraan. Berdasarkan kepada tiga peranan mini projek dalam STEM yang memperoleh skor min tertinggi menunjukkan bahawa mini projek mendedahkan kepada kepentingan kerja berpasukan dalam projek STEM, (min 4.486). Ini menunjukkan bahawa pelajar sangat menghargai kerja berpasukan sebagai elemen penting dalam melaksanakan projek, seperti kolaborasi untuk membantu mereka mencapai matlamat bersama. Selain itu, mini projek juga berjaya menunjukkan hubungan antara sains, teknologi, kejuruteraan, dan matematik (min 4.486). Ini membantu pelajar memahami bagaimana elemen-elemen STEM saling berkait dan diaplikasikan dalam menyelesaikan masalah kejuruteraan. Manakala yang ketiga adalah mini projek

membolehkan pelajar menjalankan eksperimen untuk menguji idea kejuruteraan (min 4.514). Aktiviti ini memberikan pengalaman praktikal yang penting dalam memahami konsep kejuruteraan secara lebih mendalam. Secara keseluruhnya, semua peranan ini membuktikan bahawa mini projek berkesan dalam meningkatkan kemahiran pelajar dan memupuk minat terhadap STEM.

4. Kesimpulan

Mini projek dalam silibus Engineering Science berupaya menimbulkan rasa minat dan menguji kemahiran pelajar dalam menghasilkan produk yang mengikut topik dan memupuk semangat bekerjasama dalam kumpulan di kalangan pelajar. Didapati pelajar mampu menyelesaikan masalah yang timbul dalam penghasilan dan pengujian mini projek mereka. Keadaan ini menimbulkan minat dan keupayaan untuk mencuba dan mengaplikasikan prinsip sains dan matematik dalam menjayakan mini projek mereka. Ini dapat dilihat dalam konteks meningkatkan kreativiti dalam mengaplikasikan konsep sains dalam membina dan menyelesaikan masalah dalam proses penghasilan mini project pelajar di mana skor adalah 4.432 dan 4.472. Skor ini secara tidak langsung menunjukkan pelajar-pelajar berminat dengan aktiviti pembelajaran seperti mini project dalam proses pengajaran dan pembelajaran mereka di politeknik.

Pengenalan kepada STEM dalam membina dan membentuk minat pelajar dalam bidang STEM ini boleh dikembangkan melalui mini project dan sebenarnya pelajar juga didapati mudah menerima unsur-unsur sains dalam mengaplikasikan konsep sains dan matematik dalam menyelesaikan masalah dan menjayakan mini project mereka. Pelajar juga mula menyedari perkembangan kerjaya dalam bidang STEM di negara ini dan kepentingan STEM dalam meneruskan kelangsungan (sustainability) alam sekitar yang menjadi tanggungjawab setiap ahli masyarakat. Perkembangan STEM di kalangan pelajar di peringkat sekolah, politeknik dan institusi pengajian tinggi dilihat dapat menyelesaikan masalah utama dalam bidang kejuruteraan di mana Malaysia kini berada di landasan dalam meuju ke arah negara maju yang bersaing dalam perkembangan sains dan teknologi dunia.

Hasil daripada kajian ini mungkin dapat membuka pandangan dan tanggapan bahawa pelajar adalah amat berminat dengan aktiviti pembelajaran seperti mini projek dalam proses pengajaran dan pembelajaran mereka dan mini project ini membawa pelajar untuk berani merekabentuk sistem, membuat proses ujilari dan kemahiran menyelesaikan masalah selain mengasah kemahiran pelajar dalam mengaplikasi konsep sains dan matematik bagi menghasilkan mini project yang berfungsi dengan baik dengan rekabentuk yang memenuhi konsep terkini. Melalui hasil kajian ini dicadangkan pemerkasaan dan penekanan dalam bidang STEM dalam kandungan kurikulum pengajaran di sekolah, politeknik dan institusi pengajian perlu diperluas dan dikembangkan bagi persediaan pelajar menghadapi bidang sains, teknologi dan kejuruteraan yang semakin maju dan berdaya saing. Pelajar perlu bersedia menghadapi cabaran bidang kerjaya yang sukar dan kemahiran dalam menyelesaikan masalah terutama yang berkaitan dengan kemahiran sains dan matematik bagi menghadapi saingan negara dalam menuju ke arah revolusi 4.0.

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INTERPRETASI AYAT-AYAT *QITAL* (PERANG) DALAM PERSPEKTIF AL-QURAN

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Abstrak

Perkataan *qital* bukanlah sesuatu yang asing bagi masyarakat dunia. Sebelum pengutusan Nabi Muhammad SAW sebagai Rasul, peperangan telah pun berlaku dan berterusan sehingga ke hari ini. Menerusi *Surah al-Baqarah ayat* 190 yang diterjemahkan: "Dan perangilah di jalan Allah orang-orang yang memerangi kamu, tetapi janganlah kamu melampaui batas, kerana sesungguhnya Allah tidak menyukai orang-orang yang melampaui batas." Kajian kualitatif ini menjelaskan bahawa perang bukan semata-mata konflik fizikal. Bahkan, *qital* dalam konteks *fi sabilillah* merujuk secara khusus kepada pertempuran yang merupakan sebahagian kecil daripada konsep *jihad*. Ayat-ayat *qital* dalam penelitian ini melibatkan sebanyak 9 ayat yang secara langsung menggunakan kata *qital* dan 157 ayat lain yang menggunakan bentuk derivasinya. Dari sudut morfologi, derivasi kata *qital* merangkumi *fi'il maḍi* (kata kerja lampau), *fi'il muḍari'* (kata kerja sekarang/akan datang), dan *fi'il amr* (kata perintah). Ayat-ayat *qital* dalam *al-Quran* ditafsirkan oleh para *mufassir* sebagai perintah berperang melawan golongan kafir yang melakukan serangan terhadap umat Islam, iaitu dalam bentuk peperangan defensif (difa'iyyah), dan Islam melarang peperangan yang bersifat menyerang atau ofensif (talabiyyah).
Kata kunci: Qital; Jihad; Derivasi kata.

1. Pendahuluan

Dalam konteks sejarah Islam, peperangan yang dipimpin oleh Rasulullah SAW dicatat ada antara 19 hingga 21 kali *ghazwa* (perang besar) (al-Mubarakfuri, 2002). Seiring dengan itu, *sariyyah* (perang kecil) juga merupakan peperangan yang tidak dipimpin langsung oleh Rasulullah SAW dan terjadi sebanyak 35 hingga 42 kali (Ibn Hisham, 1955). Menurut bahasa, perkataan *qital* merupakan bentuk *masdar* (kata dasar) daripada kata *qatala - yuqatilu* (Ibn Manzur, 1990). Perkataan ini membawa tiga makna utama: pertama, bererti bertarung atau bergaduh dengan seseorang; kedua, bermaksud memusuhi (*'adahu*); dan ketiga, memerangi musuh (*ḥarabahu al-'ada'*) (Al-Fairuzabadi, 1998). Menurut para ahli tafsir, maksud *qital* dalam konteks ini ialah peperangan menentang musuh-musuh Islam daripada kalangan orang kafir (al-Faruqi, 1982).

Menurut Muhammad Abduh, maksud larangan "melampaui batas" dalam surah al-Baqarah, ayat 190 ialah melakukan kekejaman dalam peperangan atau memulakan serangan terhadap pihak yang tidak memerangi umat Islam (Abduh, 1961). Sedangkan *qital* dalam konteks *fi sabilillah* merujuk secara khusus kepada pertempuran yang hanya merupakan sebahagian kecil daripada keseluruhan konsep jihad. Menurut Muhammad Khair Haykal, definisi *syar'i* bagi jihad ialah *al-qital fi sabilillah bi al-shuruṭihi*, yang bermaksud "perang di jalan Allah dengan memenuhi syarat-syaratnya" (Haykal, 2002). Sabda Rasulullah SAW, "Jihad itu akan terus berlangsung sejak Allah mengutusku sehinggalah umatku yang terakhir memerangi Dajjal" (Abu Dawud, n.d.).

Kajian terdahulu termasuk "Deradikalisasi Pemahaman al-Quran (Ayat-ayat Jihad dan Qital)" oleh Husna Amin & Saiful Akmal (2021), "Explaining ISIS: Differences and Misconception of Jihad and Qital" oleh Umi Nur Zahidah (2021), dan "Analisis Pendekatan Interpretasi Syahrur terhadap ayat jihad dan Qital" oleh Ahmad Anas Muhsin (2021). Penegasan Rasulullah SAW bahawa jihad akan berterusan sehingga akhir zaman menunjukkan betapa penting dan relevannya konsep ini dalam konteks syariat Islam (Haykal, 2002).

Istilah qital berasal daripada kata akar Arab "qatala", yang bermaksud membunuh atau berperang. Dalam konteks al-Quran, istilah ini tidak semata-mata membawa makna kekerasan fizikal, tetapi berkait rapat dengan konsep keadilan, pertahanan dan perlindungan terhadap umat Islam (Asad, 2003). Al-Zamakhsyari (n.d.) dan al-Razi (n.d.) menegaskan bahawa ayat-ayat qital mesti difahami berdasarkan konteks sejarahnya, terutamanya asbab al-nuzul. Muhammad Asad (2003) pula menekankan bahawa ayat-ayat perang dalam al-Quran bersifat defensif, bukan agresif. Hal ini turut disokong oleh Fazlur Rahman (1982) yang menegaskan perlunya penafsiran kontekstual.

Kajian oleh Ismail, Arni, Arham, dan Hermanto (2021) mendalami pandangan Sayyid Qutb yang menekankan bahawa qital juga mencakupi aspek ofensif untuk menegakkan kalimat Allah. Kajian oleh Muhsin (2021) meneliti pendekatan hermeneutik moden Muhammad Shahrur yang menolak penafsiran literal dan berusaha memberikan kerangka tafsir yang lebih kontekstual. Kajian oleh Toyib (2022) pula membincangkan bagaimana ayat-ayat qital menekankan prinsip etika dan nilai kemanusiaan yang tinggi, seperti larangan membunuh orang awam.

2. Metodologi

Kajian ini menggunakan pendekatan kualitatif melalui kaedah kajian kepustakaan (library research) (Creswell, 2014). Reka bentuk kajian ini bersifat deskriptif dan analitikal. Kajian ini menggunakan pendekatan tafsir tematik (tafsir mawdu'i). Data utama diperoleh daripada ayat-ayat al-Quran serta kitab-kitab tafsir seperti Tafsir al-Tabari (Al-Tabari, 2001), Tafsir Ibn Kathir (Ibn Kathir, 2000), dan Tafsir al-Qurtubi (Al-Qurtubi, 2006). Kaedah pengumpulan data dilakukan melalui analisis kandungan (content analysis) terhadap teks-teks daripada sumber primer dan sekunder (Creswell, 2014; Wan Daud, 2010). Kaedah analisis data menggunakan pendekatan analisis kandungan untuk meneliti ayat-ayat al-Quran yang mengandungi perkataan qital serta derivatifnya (Krippendorff, 2018).

3. Dapatan dan Perbincangan

Dalam konteks Islam, peperangan yang disyariatkan merangkumi dua kategori utama, iaitu peperangan defensif (jihad difa'i) dan peperangan ofensif (jihad hujumi) (Haykal, 1993). Menurut Abdul Baqi Ramdhun, peperangan secara defensif merujuk kepada perintah berperang yang diturunkan hanya kepada mereka yang secara nyata memerangi umat Islam (Ramdhun, 1995). Peperangan secara ofensif pula merujuk kepada tindakan memerangi golongan kafir melalui serangan langsung, sama ada mereka telah memulakan serangan atau tidak (Ramdhun, 1995). Izin untuk melancarkan peperangan seumpama ini diberikan apabila kezaliman golongan kafir telah melampaui batas, sebagaimana firman Allah SWT dalam Surah al-Hajj, ayat 39 (Al-Razi, n.d.). Allah SWT juga memerintahkan kaum Muslim untuk memerangi orang kafir dalam rangka menghilangkan fitnah (kesyirikan), yang merupakan perintah perang bersifat ofensif (Ramdhun, 1995), seperti dalam Surah Al-Baqarah, ayat 193.

Menurut al-Ṭabari, matlamat utama peperangan ialah untuk menghapuskan segala bentuk kesyirikan (Al-Ṭabari, 2001). Pandangan ini disokong oleh al-Razi yang menyatakan tujuannya adalah memastikan agama Allah sahaja yang ditegakkan (Al-Razi, n.d.). Al-Quran juga menetapkan etika peperangan yang jelas, seperti mematuhi perjanjian damai (Surah al-

Taubah, 9:4), larangan membunuh warga sipil (Surah al-Baqarah, 2:190), dan melayan tawanan perang dengan baik (Surah al-Insan, 76:8).

Terdapat sembilan ayat yang secara langsung menggunakan kata qital dan 157 ayat lain yang menggunakan derivasinya, menjadikan jumlah keseluruhan 166 ayat (Ibn Kathir, 2000; Al-Tabari, 2001). Penggunaan kata qatal dan turunannya muncul sebanyak 170 kali dalam al-Quran. Makna kata qital dan derivasinya bersifat kontekstual; umumnya merujuk kepada "perang," tetapi boleh juga bermakna "membinasakan," "mengutuk" (Surah At-Taubah, 30; Surah al-Munafiqun, 4), "dibunuh" (Surah al-Ahzab, 61), atau "bertengkar" (Surah al-Qashash, 15).

4. Kesimpulan

Dalam konteks geopolitik moden, pemahaman qital perlu dirujuk berdasarkan prinsip maqasid syariah dan bukan dibaca secara literal. Kumpulan ekstremis telah memanipulasi ayat-ayat ini, sedangkan ulama menegaskan bahawa qital terikat dengan syarat seperti wujudnya kezaliman nyata dan perintah pemerintah yang sah. Islam melarang keras pembunuhan orang tidak bersalah (Surah al-Ma'idah, 32) dan cenderung kepada perdamaian (Surah al-Anfal, 61). Hadis Nabi Muhammad SAW juga melarang pembunuhan wanita, kanak-kanak, dan orang tua (Muslim ibn al-Hajjaj, 2007; Abu Dawud, 2008). Ulama kontemporari seperti Dr. Muhammad Tahir-ul-Qadri dan Sheikh Abdulaziz bin Abdullah Al-Ashaykh (Mufti Besar Arab Saudi) telah mengeluarkan fatwa yang menegaskan bahawa keganasan adalah haram dan bertentangan dengan ajaran Islam (Tahir-ul-Qadri, 2010; Al-Ashaykh, 2001).

Kajian ini menunjukkan bahawa konsep qital dalam al-Quran tidak merujuk kepada peperangan konvensional tetapi mempunyai dimensi syariah dan etika yang khusus. Peperangan hanya dibenarkan untuk mempertahankan diri, menentang kezaliman, dan menjaga kebebasan beragama, dengan etika yang menekankan keadilan dan kemanusiaan. Kepelbagaian makna kata qital mencerminkan perbezaan konteks yang memerlukan tafsiran holistik. Justeru, qital adalah instrumen syariah yang berpaksikan prinsip rahmah, keadilan, dan maqasid al-shari'ah.

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THE INFLUENCE OF LOVE OF MONEY, FEAR OF MISSING OUT, AND SELF-CONTROL ON PERSONAL FINANCIAL PLANNING GENERATION Z

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Abstract

This study aims to analyze the influence of Love of money, Fear of missing out, and Self-Control on Personal financial planning in Generation Z in Medan City. Generation Z is an age group that is very familiar with technology and social media, so it has the potential to face psychological challenges in managing personal finances. This research uses a quantitative approach with a survey method of 150 respondents aged 18-27 years. The data collection instrument was a questionnaire with a Likert scale, and the data were analyzed using multiple linear regression. The results showed that Fear of missing out and Self-Control have a positive and significant effect on Personal financial planning. In contrast, Love of money did not show a significant effect. Simultaneously, the three variables have a significant effect on Personal financial planning. This finding confirms that psychological and social factors play an important role in Generation Z's financial behavior. Improving self-control and managing the influence of social media are crucial in shaping healthy financial habits among the younger generation.
Keywords: Love of money; Fear of missing out; Self-control.

1. Introduction

Amidst the rapid development of information technology and digitalization of the financial system, Personal financial planning is becoming increasingly important, especially for productive age groups such as Generation Z. Born between 1997 and 2012, this generation has grown up in a world full of information, connectivity, and lifestyle expectations from social media. Unfortunately, various research and news show that many of them do not have the ability to manage their finances effectively. According to an OCBC NISP survey cited by (Sidoarjo, 2024) the majority of Gen Z in Indonesia do not have a clear saving habit or a monthly budget.

The impact of this lack of financial planning is very serious (Budiman, 2023) reported that many young people from Gen Z are trapped in the vortex of illegal online loans (pinjol) due to consumptive behavior and lack of financial control. An article from (Awaludin, 2024) even mentions that many Gen Z face financial insolvency from a young age, due to unplanned spending, lifestyle pressures, and lack of investment awareness and financial protection. This shows that the inability to manage finances not only affects their personal economic situation, but also the mental and social stability of this generation in the future. Personal financial planning itself is the process of managing income, expenses, savings, and investments with the aim of achieving financial stability in the present and future (Keuangan, Khoirunnisa, & Purnamasari, 2024). However, success in financial planning is not only determined by financial literacy, but also by various psychological and social factors that influence individual behavior in managing their finances. This research highlights three main factors that are thought to significantly influence Gen Z's financial planning: Love of money, Fear of missing out, and Self-Control. Behavioral finance develops based on the assumption that individuals often act irrationally. Some of the main indicators of this approach include overconfidence bias, loss aversion, mental accounting, herding behavior, and self-control (Ernanto & Hermawan, 2022). In practice, this theory has been adopted by various studies to examine investment,

consumption, and Personal financial planning decisions. One application is in studies that observe the influence of psychological factors such as Love of money, Fear of missing out, and self-control on financial behavior (Przybylski et al., 2020; Milyavskaya et al., 2021; Tang et al., 2020).

Previous studies have explored the relationship between psychological factors and financial behavior, but they are generally limited. For example, (Dilla Agustin, Nersiwad Nersiwad, & Yuliasnita Verlandes, 2023), found that Love of money has a positive effect on Gen Z financial management in Mojokerto. (Keuangan et al., 2024) stated that Fear of missing out has a significant influence on consumptive behavior, but the Love of money and Self-Control variables do not show influence in the K-Pop fan community. Research (Permadani, 2024) shows that Self-Control is positively correlated with financial behavior but has not been tested directly in the context of long-term financial planning.

Love of money describes a person's view of money as a symbol of status, power, and success. Individuals with high Love of money values tend to pursue money aggressively, but do not necessarily have healthy financial planning habits (Przybylski, Murayama, DeHaan, & Gladwell, 2020). In the context of Generation Z, Love of money is becoming increasingly relevant due to exposure to social media, popular culture, and pressure to demonstrate financial status. Research by (Dilla Agustin et al., 2023) proves that Love of money has a significant effect on Gen Z's personal financial management in Mojokerto. Meanwhile, (Keuangan et al., 2024) stated that Love of money does not always have a significant effect, depending on the respondent's community background (e.g. K-Pop fans). Hypothesis developed: H1: Love of money does not have a significant effect on Personal financial planning in Generation Z.

Meanwhile, Fear of missing out is a psychological phenomenon in which a person is afraid of being left behind in trends or social activities seen through social media. Fear of missing out has been shown to encourage consumptive behavior and impulsive spending (Keuangan et al., 2024). In contrast, self-control is an individual's ability to delay gratification and make rational financial decisions. Individuals with a high level of self-control tend to have more mature financial planning (Park, 2021). Research (Keuangan et al., 2024) proves that FoMO has a significant impact on consumptive behavior. This is reinforced by (Mahena, Sofiah, & Arifiana, 2025) which states that FoMO encourages irregularity in personal financial management. These findings strengthen the argument that FoMO can interfere with Personal financial planning, so the hypothesis is formulated: H2: Fear of missing out has a significant effect on Personal financial planning in Generation Z.

Self-control is the ability to resist momentary urges in order to achieve long-term goals. In the financial context, individuals with high self-control tend to be able to manage budgets, delay consumption, and set financial priorities more wisely (Jennifer & Pamungkas, 2021).
Research by (Park, 2021) shows that self-control is positively correlated with saving habits and expense management. (Jennifer & Pamungkas, 2021) also found that self-control plays an important role in financial management, although not many have examined its direct effect on Personal financial planning. Based on this theoretical study, the proposed hypotheses are: H3: Self-control has a significant effect on Personal financial planning in Generation Z.

Based on the three theoretical studies and previous studies above, this study proposes a conceptual model that examines the partial and simultaneous effects of Love of money, Fear of missing out, and self-control on Personal financial planning. Simultaneous hypothesis: H4: Love of money, Fear of missing out, and self-control simultaneously have a significant effect on Personal financial planning in Generation Z. Thus, this study contributes to the development of behavioral finance, especially in the context of the digital generation in Indonesia and encourages the development of financial literacy strategies that consider the psychological aspects of individuals.

Personal financial planning in Indonesia is becoming increasingly important as people realize the importance of good financial management to achieve financial stability and prepare for a better future. Some of the factors that encourage Indonesians to do Personal financial planning include the increasing cost of living, the various types of credit and loans available, and the increasing complexity of investment products. Personal financial planning has an important role as a survival requirement that must be fulfilled by all individuals, including Generation Z. This is because generation Z usually has a high tendency to be consumptive in their daily lives. As a result, generation Z is less accustomed to saving, investing, buying insurance, and budgeting for unexpected expenses beforehand, which makes Personal financial planning very important for generation Z (Bado, Hasan, Tahir, & Hasbiah, 2023).

Previous research has discussed many factors that influence financial behavior, such as financial literacy (Putri, Nurwati, & Mahrita, 2023) materialistic attitudes, or self-control (Wahyuni, 2024) However, most previous studies have only examined one or two factors, for example, the effect of financial literacy on saving behavior. More focused on consumptive or investment behavior, not on comprehensive financial planning (T. S. Anggraini et al., 2025) Found that self-control has a positive relationship with financial behavior but has not been tested directly on long-term financial planning.

2. Methodology

This research was conducted in Medan City, North Sumatra Province, with the object of research being individuals who belong to the Generation Z group (aged 18-27 years).
The research was conducted for four months, from March to June 2025. The type of data used is quantitative data, which is data in the form of numbers and can be measured statistically. This data was obtained through the results of distributing questionnaires to Generation Z respondents. In this study, the data collection techniques used were primary data collection and secondary data. Primary data, namely data obtained directly from respondents through questionnaire instruments and secondary data, is used to support and complement primary data, such as theories from journals, books, and other relevant academic sources. The sampling technique used is purposive sampling, which is a sampling technique based on certain criteria or objectives that are in accordance with the research needs. This technique was chosen so that the data obtained was relevant to the variables studied. The purposive sampling technique was used to obtain 150 respondents. The sample in this study is part of the Generation Z population in Medan City who meet the criteria, namely: Aged between 18-27 years old, domiciled in Medan City and Willing to be a respondent and fill out a questionnaire honestly. The questionnaire consists of 30 statement items related to Love of money (10), Fear of missing out (8), self-control (5), and Personal financial planning (7). The research instrument used a questionnaire with a 5-point Likert scale, namely: 1= Strongly Disagree, 2= Disagree, 3= Neutral, 4= Agree, and 5= Strongly Agree.

In this study, data analysis was carried out quantitatively using multiple linear regression analysis to determine the effect of the variables Love of money, Fear of missing out (FoMO), and Self-Control on Personal financial planning in Generation Z. The stages of data analysis are Descriptive Analysis. The stages of data analysis are Descriptive Analysis, Validity and Reliability Test, Normality Test, Multicollinearity Test, Heteroscedasticity Test, Multiple Linear Regression Analysis, t-test (partial, F test (simultaneous), and Coefficient of Determination (R^2) test.

3. Results and Discussion

In this section, the demographic characteristics of respondents, consisting of gender, age, and employment status, are described. The purpose of presenting this profile is to provide an overview of the background of the respondents involved in the study. Data collection in this study was conducted online using a Google Form questionnaire distributed through the

WhatsApp application to various contacts and groups consisting of students, alumni, and the Generation Z community in Medan city. The distribution was carried out for approximately one month, with a total of around 250 questionnaire links distributed. Of these, 164 responses were collected, but after filtering based on completeness and suitability of criteria, only 150 questionnaires were declared valid and suitable for analysis. The questionnaire included demographic data as well as statements measuring the variables of Love of money, Fear of missing out, Self-Control, and Personal financial planning. The use of online methods proved to be effective and efficient in reaching respondents, so as to produce representative data in accordance with the research objectives.

Table 1. Description of respondents

	Frequency	Percent
Gender		
Male	65	43,4%
Female	85	56,7%
Total	150	100
Respondents' age		
<18 Years	3	2
18 – 22 Years	88	58,7
22 -27 Years	59	39,3
Total	150	100
Employment status		
Student/ College student	101	67,3
Employed	47	31,3
Others	2	1,4
Total	150	100

Based on the results of the study, it is known that out of a total of 150 respondents, 65 people (43.4%) were male and 85 people (56.7%) were female. In terms of age, there were 3 respondents under 18 years old (2%), 86 people (58.7%) aged 18-22 years old, and 57 people (39%) aged 22-27 years old. Meanwhile, based on activity background, the majority of respondents are students or college students, as many as 101 people, followed by respondents who have worked, as many as 47 people, and the remaining 2 people fall into other categories.

According to (Loindong, Tewal, & Sendow, 2023) validity is used to determine whether the questionnaire items are relevant and able to reflect the variable concept as a whole. If the item is invalid, then the interpretation of the research results can be misleading. "The validity test in this study was carried out using Pearson Product Moment correlation, with a significance of <0.05 as explained by (F. D. P. Anggraini, Aprianti, Setyawati, & Hartanto, 2022) If r count> r table and p-value <0.05, then the item is considered valid.
The validity test was carried out using the Pearson Product Moment correlation to assess whether each item of the research instrument accurately measured the intended construct. With a significance level of α = 0.05 and a critical r value of 0.1603 (N = 150), the results are as follows:

Table 2. Love of money validity test results

Variable	Statement Items	Correlation Coefficient (r)	Sig	Description
X1 (Love of money)	1	0,67	0	Valid
	2	0,63	0	Valid
	3	0,60	0	Valid

	4	0,79	0	Valid
	5	0,61	0	Valid
	6	0,69	0	Valid
	7	0,80	0	Valid
	8	0,83	0	Valid
	9	0,84	0	Valid
	10	0,81	0	Valid

Based on the results of the analysis in Table 2, all statement items on the Love of money variable are declared valid because the correlation coefficient value of each item> r-table value (r-table for N = 150 and α = 0.05 (df = 148) ≈ 0.1603) and the significance level is below 0.05. Thus, the ten indicators of Love of money are feasible to use for the next stage of analysis.

Table 3. Fear of missing out validity test results

Variable	Statement Items	Correlation Coefficient (r)	Sig	Description
X2 (Fear of missing out)	1	0,87	0	Valid
	2	0,82	0	Valid
	3	0,88	0	Valid
	4	0,89	0	Valid
	5	0,86	0	Valid
	6	0,78	0	Valid
	7	0,71	0	Valid
	8	0,83	0	Valid

Based on the results of Table 3, all statement items on the Fear of missing out variable are declared valid because the correlation coefficient value of each item> r-table value (r-table for N = 150 and α = 0.05 (df = 148) ≈ 0.1603) and the significance level is below 0.05. Thus, the eight fear-of-missing-out indicators are suitable for the next stage of analysis.

Table 4. Self-control validity test results

Variable	Statement Items	Correlation Coefficient (r)	Sig	Description
X3(Self-control)	1	0,82	0	Valid
	2	0,85	0	Valid
	3	0,65	0	Valid
	4	0,88	0	Valid
	5	0,87	0	Valid

Based on Table 4, all statement items on the self-control variable are declared valid because the correlation coefficient value of each item> r-table value (r-table for N = 150 and α = 0.05 (df = 148) ≈ 0.1603) and the significance level is below 0.05. Thus, the five indicators of self-control are suitable for the next stage of analysis.

Table 5. Personal financial planning validity test results

Statement Items	Correlation Coefficient (r)	Sig	Description
1	0,83	0	Valid
2	0,77	0	Valid
3	0,88	0	Valid
4	0,78	0	Valid
5	0,82	0	Valid
6	0,88	0	Valid
7	0,76	0	Valid

Based on Table 5, all statement items on the Personal financial planning variable are declared valid because the correlation coefficient value of each item> r-table value (r-table for N = 150

and α = 0.05 (df = 148) ≈ 0.1603) and the significance level is below 0.05. Thus, the seven Personal financial planning indicators are suitable for the next stage of analysis.

Reliability testing is conducted to assess how consistently a measurement instrument produces the same results when applied repeatedly to the same subject. An instrument is considered reliable if the Cronbach's Alpha value is equal to or greater than 0.70.

Table 6. Reliability test results

No	Variable	Cronbach's Alpha	Description
1	Love of money (X1)	0,90	Reliable
2	Fear of missing out (X2)	0,93	Reliable
3	Self-control (X3)	0,86	Reliable
4	Personal financial planning	0,91	Reliable

Based on the reliability test results presented in Table 6, all variables in this study have Cronbach's Alpha values of ≥ 0.70, indicating that all measurement instruments are considered reliable. The Cronbach's Alpha values for each variable are as follows: Love of money at 0.90, Fear of missing out at 0.93, Self-Control at 0.86, and Personal financial planning at 0.91. These results show that each instrument has a very high level of internal consistency and is suitable for use in this research.

The normality test is conducted to determine whether the residuals in the regression model follow a normal distribution. Non-normality in the data may result in invalid and inaccurate parametric analysis. In this study, normality testing was carried out using the Kolmogorov-Smirnov and Shapiro-Wilk approaches. The Kolmogorov-Smirnov test measures the difference between the cumulative distribution of the observed data and the theoretical normal distribution, while the Shapiro-Wilk test is more responsive for small to medium-sized samples. According to (Monter-Pozos & González-Estrada, 2024), the data is considered normally distributed if the significance value (p-value) is greater than 0.05, and conversely, considered non-normal if the value is 0.05 or less.(Monter-Pozos & González-Estrada, 2024),

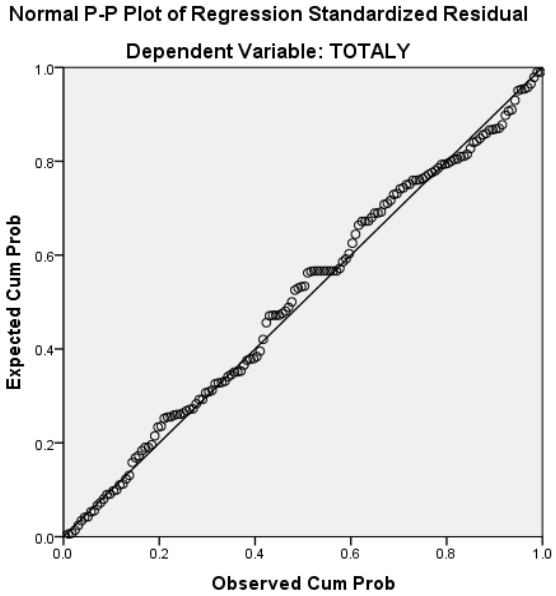

Fig. 1. Q-Q plot results

Because the significance value (0.200) is greater than 0.05, the residual data is normally distributed. A Q-Q Plot, which shows a point distribution pattern that follows the diagonal line. So, it can be concluded that the normality assumption is met, and the data are suitable for further regression analysis. The multicollinearity test aims to determine whether there is a high correlation between the independent variables in the regression model. Testing is done by

looking at the Variance Inflation Factor (VIF) and Tolerance values. If the VIF value < 10 and Tolerance > 0.1, then there is no multicollinearity. This test is important to ensure that the regression model provides valid and reliable results.

Table 7. Multicollinearity test

Model	Tolerance	VIF
Total X1 (Love of money)	.746	1.340
Total X2 (Fear of missing out)	.847	1.181
Total X3 (Self-control)	.857	1.167

The multicollinearity test results show that all independent variables do not experience multicollinearity, because:

- Love of money has a Tolerance of 0.746 > 0.10 and VIF 1.340 < 10.
- Fear of missing out has a Tolerance of 0.847> 0.10 and VIF 1.181 < 10.
- Self-Control has a Tolerance of 0.857 > 0.10 and VIF 1.167 < 10.

All values meet the criteria, so the regression model is free from multicollinearity.

The heteroscedasticity test is one of the tests in regression analysis used to detect whether the variance of the residuals or errors of the regression model is constant (homoscedasticity) or not (heteroscedasticity). The heteroscedasticity test aims to ensure that the variance of the residuals in the regression model is constant (homoscedasticity). One of the ways used is by looking at the pattern on the scatterplot graph. If the points on the graph spread randomly and do not form a certain pattern, it can be concluded that there is no heteroscedasticity.

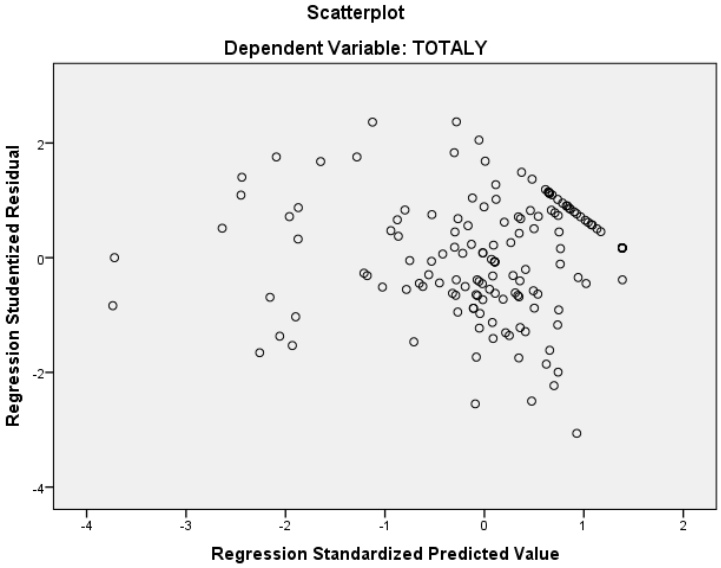

Fig. 2. Scatterplot graph

It can be seen from the scatter plot graph above that the dots appear to spread quite randomly and do not form a special pattern (no clear funnel pattern or conical pattern). Thus, there are no symptoms of heteroscedasticity.

Multiple linear regression analysis is used to test the extent to which Love of money (X_1), Fear of missing out (X_2), and self-control (X_3) affect Personal financial planning (Y).

Table 8. Multiple linear regression analysis

Model	B	Std.Error	Beta	t	Sig
Constant	3.768	1.892		1.992	.048
Love of money	-.010	.047	-.012	-.208	.835
Fear of missing out	.136	.039	.191	3.493	.001
Self-control	1.026	.075	.745	13.711	.000

Based on the results of multiple linear regression analysis, the regression equation is obtained as follows:

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3+e \quad (1)$$

Where:

a = constant
Y = Personal financial planning
X_1 = Love of money
X_2 = Fear of missing out (FOMO)
X_3 = Self-Control
e = error term

By replacing the coefficient values in the model, the regression equation becomes:

$$Y = 3.768 - 0.010X_1 + 0.136X_2 + 1.026X_3+e \quad (2)$$

Interpretation of results:

- The Love of money variable (X_1) has a regression coefficient of -0.010 with a significance value of 0.835 (> 0.05), so it has no significant effect on Personal financial planning (Y).
- The Fear of missing out variable (X_2) has a coefficient of 0.136 with a significance of 0.001 (<0.05), showing a positive and significant effect on Y.
- The Self-Control variable (X_3) shows a coefficient of 1.026 with a significance of 0.000 (<0.05), which means it has a positive and significant influence on Y.

Thus, it can be concluded that in this model, only the variables Fear of missing out and Self-Control significantly influence Personal financial planning, while Love of money does not have a significant effect.

The t (partial) test is one of the statistical methods used in regression analysis to test whether each independent variable (predictor) has a significant effect individually on the dependent variable, assuming other independent variables are considered constant. According to Ghozali (2021), the partial t-test is used to test the significance of the individual effect of the independent variable on the dependent variable in the multiple linear regression model. This test is done by comparing the calculated t value with the t table or by looking at the p-value (Sig.) compared to the significance level (usually α = 0.05). If the p-value < α, then the independent variable has a significant effect.

Table 9. Results of t-test (partial)

Coefficients[a]		
Model	t	Sig
(Constant)	1.992	.048
TOTALX1	-.208	.835
TOTALX2	3.493	.001
TOTALX3	13.711	.000

Test t (Partial regression coefficient):

- H1: The significance value of X1 is 0.835 (> 0.05) and t count -0.208 (< 1.976), then H1 is rejected → X1 has no effect on Y. The results of this study indicate that the Love of money variable has no significant effect on Personal financial planning in Generation

Z in Medan City. This shows that orientation towards money does not necessarily translate into planned financial behavior. This finding is in line with a study conducted by oleh (Khoirunnisa & Purnamasari, 2024) which found that in the K-pop fan community, Love of money has no significant effect on financial management behavior. This is attributed to the dominance of consumptive values and the pressure of popular culture, which encourages individuals to spend money for social status rather than for long-term financial goals. In the context of Generation Z, money is often seen as a symbol of lifestyle and social achievement, rather than a tool for rational financial planning. As explained by (Przybylski, Murayama, DeHaan, & Gladwell, 2020) Love of money may strengthen extrinsic motivation, but it is not necessarily aligned with healthy financial planning habits. Therefore, even though someone has a high love for money, it does not guarantee good financial planning behavior, because this orientation may be driven more by the need for self-actualization or the influence of the social environment rather than mature financial considerations.

- H2: The significance value of X2 is 0.001 (<0.05) and t count 3.493 (> 1.976), then H2 is accepted → X2 has a significant effect on Y.
- H3: The significance value of X3 is 0.000 (<0.05) and t count 13.711 (> 1.976), then H3 is accepted → X3 has a significant effect on Y.

The simultaneous test is a method used to assess whether all independent variables in a regression model have a significant impact collectively on the dependent variable. The F-test functions to evaluate the overall significance of the regression model, specifically to determine whether the independent variables collectively have a significant effect on the dependent variable. In the context of multiple linear regression, this test helps assess the feasibility of the regression model for forecasting purposes. Additionally, the F-test is also applied in analysis of variance (ANOVA) to identify differences in means among three or more groups, as well as in testing the homogeneity of variances to evaluate whether two or more populations have comparable variances. The decision is based on the significance value (p-value), where a p-value ≤ 0.05 indicates that the test result is considered significant.

Table 10. F test results (simultaneous)

Model	F	Sig
Total	83.055	000

Based on Table 7, it is known that the significant value for the simultaneous influence of x1, x1, and x3 on Y is 0.000 <0.05, and the calculated F value is 83.055> F table 2.67, so it can be concluded that H4 is accepted, which means that there is a simultaneous influence of X1, X2 and X3 on Y.

The Coefficient of Determination (R^2) is a statistical measure used in regression analysis to describe the proportion of variation in the dependent variable (Y) that can be explained by the independent variable (X) in a regression model. The Coefficient of Determination (R^2) plays a role in assessing how much of the variation in the dependent variable can be explained by the independent variable within a given regression model. The R^2 value ranges from 0 to 1, where a value closer to 1 indicates that the model can explain most of the data variation, while a value closer to 0 indicates that the model has very limited ability to explain the dependent variable. Therefore, R^2 provides information on how well the regression model explains the data. However, R^2 cannot determine whether the relationship between variables is causal or statistically significant, thus requiring support from t-tests and F-tests."

Table 11. Coefficient of determination (R2)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.794[a]	.631	623	3.69350

Based on the Model Summary output in Table 8, the coefficient of determination (R Square) is 0.631, indicating that 63.1% of the variation in Personal financial planning can be explained by the variables Love of money (X1), Fear of missing out (X2), and Self-Control (X3) simultaneously, while the remaining 36.9% is influenced by other factors outside this research model. The Adjusted R Square value of 0.623 shows that the model remains stable even after being adjusted for the number of predictor variables, and the correlation coefficient (R) of 0.794 indicates a strong relationship between independent and dependent variables. Thus, this regression model has good predictive power in explaining Personal financial planning behavior among Generation Z.

Based on the multiple linear regression analysis, it appears that not all independent variables in this study have a significant impact on Personal financial planning among Generation Z in Medan City. Of the three variables tested individually, two showed a significant impact, while one did not demonstrate a meaningful effect.
First, the Love of money variable does not show a significant influence on Personal financial planning. This is evidenced by the significance value of 0.835, which is far above the 0.05 threshold, and a t-value of -0.208, which is lower than the t-table value of 1.976. This means that an individual's orientation toward money, even if high, does not necessarily lead to systematic financial planning habits. This may be due to the tendency of Generation Z to focus more on fulfilling lifestyle desires and instant gratification rather than long-term wealth accumulation. This finding is in line with Khoirunnisa et al. (2024), who stated that Love of money does not significantly influence financial behavior among K-pop fan communities within Generation Z, as their consumption is more strongly driven by popular culture trends than by intrinsic financial motivation.

Second, the Fear of missing out variable shows a positive and significant influence on Personal financial planning. With a significance value of 0.001 and a t-value of 3.493 (> t-table), this result confirms that FoMO, although often associated with impulsive spending behavior, can actually drive some individuals to become more aware of the importance of managing their finances. The Fear of missing out on social trends or viral lifestyles on social media pushes some respondents to create financial plans in order to keep up socially without compromising their overall financial condition. This suggests that social pressure in the form of FoMO can have an adaptive effect if responded to wisely.

Third, the Self-Control variable has the strongest influence on Personal financial planning. A significance value of 0.000 and a t-value of 13.711 confirm that the higher a person's level of self-control, the better their behavior in planning personal finances. Individuals who can resist impulsive spending, are disciplined in managing expenses, and make rational financial decisions tend to have a more structured financial plan. This finding reinforces the view that self-control is a crucial foundation in forming healthy financial habits, especially among the younger generation living in a highly consumptive environment.

Simultaneously, the results of the F-test indicate that the three independent variables — Love of money, Fear of missing out, and Self-Control — collectively have a significant effect on Personal financial planning. A significance value of 0.000 and an F-value of 83.055, which is higher than the F-table value (2.67), indicate that the model used in this study is valid and can explain the relationship between these variables.
Furthermore, the coefficient of determination (R^2) of 0.631 indicates that 63.1% of the variation in Personal financial planning behavior among Generation Z can be explained by the three independent variables. The remaining 36.9% is influenced by other factors outside the scope of this study, such as financial literacy, family influence, socio-economic status, or access to digital financial products. Thus, the findings of this study highlight the importance of psychological and social aspects in shaping financial behavior among Generation Z. Self-control proves to be the most dominant factor, while Love of money is not a primary determinant in the formation of Personal financial planning among this generation.

4. Conclusion

Based on the research findings and discussion, it can be concluded that Personal financial planning behavior among Generation Z in Medan is influenced by psychological factors such as Fear of missing out and Self-Control, while Love of money does not have a significant effect. Partially, Fear of missing out (FoMO) shows a positive and significant influence on Personal financial planning. This finding indicates that the drive to not fall behind on social trends or peer lifestyles can serve as a motivation for some members of Generation Z to become more aware of the need to plan their finances. Although FoMO is often perceived negatively due to its association with impulsive consumption, in the context of this study, FoMO actually encourages individuals to take more deliberate financial steps in order to remain socially relevant.

Meanwhile, Self-Control proves to be an important factor that positively and significantly affects Personal financial planning. Generation Z individuals who are capable of resisting impulsive urges and making rational financial decisions tend to be more disciplined in budgeting, saving, and preparing for their financial future. On the other hand, Love of money, or an excessive attachment to money, does not significantly influence financial planning behavior. This indicates that even if someone has a strong orientation toward money, it does not necessarily translate into planned or rational financial actions. This may be because a money-oriented mindset is more related to symbolic values rather than practical attitudes toward daily financial management. Simultaneously, the three independent variables in this study are proven to have a significant combined influence on Personal financial planning among Generation Z. This reinforces the understanding that young people's financial behavior is not solely determined by cognitive abilities or financial literacy, but also by complex psychological and social factors. Therefore, efforts to improve the financial behavior of this generation require approaches that not only provide technical education but also strengthen self-control and raise social awareness regarding the influence of digital environments and consumer culture.

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THE INFLUENCE OF TIKTOK LIVE STREAMING AND PRELOVED TRENDS ON PURCHASE DECISIONS AMONG YOUNG CONSUMERS

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Abstract

This study aims to examine the influence of TikTok live streaming and the Preloved trend on purchasing decisions among young consumers, specifically students at College X. The increasing use of TikTok as a shopping platform and the rising popularity of preloved items viewed as cost-effective and environmentally friendly serve as the main background for this research. Preloved products, though second-hand, are still suitable for use and are considered appealing by the younger generation due to their economic value, sustainability, and environmental benefits. A descriptive quantitative approach was utilized, with data gathered through the distribution of questionnaires to 170 respondents using accidental sampling. Multiple linear regression analysis was performed using SPSS to examine both the simultaneous and individual effects of the independent variables on the dependent variable. The results show that both TikTok live streaming (X1) and the Preloved trend (X2) have a positive and significant effect—both partially and simultaneously—on purchasing decisions (Y). The coefficient of determination (R^2) value of 0.583 indicates that 58.3% of the variation in purchasing decisions can be explained by the two independent variables. The findings highlight the significant role of digital platforms and sustainability trends in shaping consumer behavior. Live streaming provides interactive experiences and builds trust, while the Preloved trend attracts consumers with its affordability and environmental consciousness. This study offers valuable insights for entrepreneurs and academics in understanding consumer behavior in the digital era.
Keywords: TikTok live streaming; Preloved trend; Purchase decision.

1. Introduction

Live streaming**,** or real-time broadcasting, is essentially a form of media convergence derived from traditional broadcasting platforms such as television, but accessible via mobile devices, aligning with the lifestyle of today's internet users. The convenience offered by live streaming has made it a popular medium for storytelling. Unlike pre-recorded videos or photos, which often undergo an editing process, live streaming involves no such process (Patricia et al., 2024). In the current digital era, consumer shopping behavior, particularly among younger generations, has undergone significant changes, driven in part by the emergence of platforms like TikTok that feature live streaming and support the preloved (second-hand) product trend. This phenomenon raises questions regarding the impact of such elements on the shopping choices of young consumers.

Online shopping transactions in Indonesia are projected to reach IDR 487 trillion this year, up from IDR 453 trillion in 2023. Live streaming has emerged as a key feature in boosting sales. According to the Ministry of Trade, the number of online shopping platform users is expected to rise by 11.9%, from 58.63 million in 2023 to 65.65 million in 2024. Based on data from Statistics Indonesia (BPS), 37.79% of micro, small and medium enterprises (MSMEs) in the country are engaged in online commerce (Yoga et al., 2025).
One of the platforms frequently used by the public for shopping, in addition to Shopee and Lazada, is Tokopedia. Tokopedia has established a partnership with TikTok. In recent times,

TikTok has become one of the most popular platforms, particularly among younger generations. According to a report by We Are Social and Meltwater, the number of TikTok users worldwide reached 1.58 billion in 2024, with the majority of users falling within the 18 - 34 age range. The latest data from DataReportal also shows that Indonesia has the largest number of TikTok users in the world, reaching 157.6 million, surpassing the United States with 120.5 million users (Setyowati, 2024). The widespread use of mobile phones drives the high number of TikTok users in Indonesia. TikTok also offers a live streaming feature that has gained popularity among users and business actors. Through live streaming, sellers can interact directly with their audience, showcase products, and answer questions in real time. This interaction creates a more personalized and engaging shopping experience, which can enhance consumer engagement and strengthen purchase decisions. Additionally, TikTok is frequently used to sell secondhand or "preloved" items.

Preloved items refer to products that have been purchased and used only briefly, sometimes never used at all, or received as gifts but never worn pakai (Fernandi, 2024). The trend of purchasing preloved or high-quality secondhand goods has significantly increased. The term "preloved" is often used by young people to replace the word "secondhand" in order to make it sound more appealing and trendier. Although preloved goods are technically secondhand, if they are branded and refurbished to look like new, they can be resold at a highly profitable price (Robot et al., 2024).

TikTok live streaming and the Preloved trend present distinct opportunities for businesses to promote their products. In this context, there is a growing need to understand how live streaming influences consumer perceptions of preloved products. Live streaming represents a significant advancement in media by facilitating real-time interaction (Robot et al., 2024).
The importance of this research lies in the increasing use of digital platforms for shopping activities and the limited understanding of the impact of TikTok live streaming and the Preloved trend on consumer purchasing decisions, particularly among students at College X. This makes College X an ideal site to examine the interaction between social media and consumer behavior. The novelty of this study lies in its specific focus on the influence of TikTok live streaming and the Preloved trend in a context that remains underexplored. While customers may be more inclined to purchase products through live interactions, there is a gap in the literature on how these factors influence buying behavior in local contexts. Therefore, this study seeks to provide deeper insight and offer practical recommendations for sellers not yet using TikTok—particularly live streaming—as a sales strategy.

Several previous studies are relevant to this research. For example, a study titled The Influence of Live Streaming and Lifestyle on the Purchase Intention of Secondhand Clothing at Story Manado found that, based on simultaneous testing, both live streaming and lifestyle had a positive and significant influence on purchase intention. Partial testing showed that both variables individually had a positive and significant impact as well (Robot et al., 2024). Another study *titled* The Influence of Live Streaming, Price, and TikTok Shop Promotions on the Purchase Intention of Preloved Products Among Generation Z in Bengkulu found that the promotion variable (X3) had a t-value of 3.700 > t-table of 1.672 and a significance value of 0.000 < 0.05, leading to the acceptance of Ha and rejection of H0. This indicates that promotion has a positive and significant influence on the purchase intention of Generation Z consumers in Bengkulu (Habibullah et al., 2025).

In addition, a journal study titled *The Impact of TikTok live streaming on Purchasing Decisions* showed that TikTok live streaming, both directly and through the mediating variable of purchase intention, has a significant and beneficial effect on consumer purchasing decisions. This study also confirms the strategic role of live streaming as an effective digital marketing tool to increase customer engagement. However, aside from real-time interaction, other factors also influence the relationship between live streaming and purchasing decisions,

including product quality, trust in the host, and the responsiveness of the host to customer inquiries (Yoga et al., 2025).

TikTok's live streaming feature enables direct interaction between sellers and buyers, creating a more immersive and engaging shopping experience. On the other hand, the trend of secondhand goods, which emphasizes sustainability and economic value, also attracts younger consumers. These individuals not only seek affordable products but also aim to contribute to waste reduction and reduce overconsumption. Although there is still limited research on the impact of secondhand product trends on purchasing decisions, the growing popularity of the preloved market indicates a shift in consumer preferences toward greater environmental awareness. The combination of live streaming and the secondhand trend represents a new transformation in the shopping behavior of younger generations. This knowledge can help businesses design more effective marketing strategies that align with the values held by today's youth. Based on the discussion above, the author is interested in conducting a study titled "The Influence of TikTok live streaming and the Preloved trend on Purchasing Decisions Among Young Consumers."

2. Methodology

This research was conducted at College X, located in the city of Medan. The study employed a quantitative research approach. "Quantitative research methodology is essentially a scientific way of thinking used to acquire knowledge" (Suryadi et al., 2019). The population of this study consisted of students from the 2021 and 2022 cohorts. The 2021 cohort included 111 students, while the 2022 cohort included 183 students, resulting in a total population of 294 students.

The sampling technique used in this study was non-probability sampling, in which not all individuals or elements in the population have an equal chance of being selected as a sample. Specifically, the method applied was accidental sampling**,** which involves selecting respondents who happen to be encountered or are conveniently available at the time of data collection.

$$n = \frac{N}{N \,.\, e\text{^}2+1} \quad (1)$$

Explanation:

n = Number of samples to be determined
N = Population size
e = Margin of error (error tolerance)

The sample size consisted of 170 respondents; the questionnaires were distributed to 170 students from College X Medan, comprising the 2021 and 2022 cohorts. In this study, the data collection technique employed was the questionnaire. A questionnaire is a method of gathering information by providing a list of questions to research respondents. The data obtained in this study were collected directly through the completion of questionnaires by the respondents. Questionnaires were distributed to 170 respondents using an accidental sampling technique. Data analysis was carried out using multiple linear regression with the SPSS software to examine both the simultaneous and partial effects of the independent variables on the dependent variable. The results of the multiple linear regression analysis indicated that the variables of TikTok live streaming (X1) and the Preloved trend (X2) have a positive and significant influence, both partially and simultaneously, on purchasing decisions (Y).

3. Results and Discussion

Respondent characteristics refer to the identity of the respondents who constitute the research sample. The research sample consisted of 170 students who completed the questionnaire.

The respondents' characteristics are presented by age, gender, and highest level of education. The data on respondent characteristics are provided as follows.

Table 1. Respondent characteristics based on gender

No	Gender	Frequency
1	Male	30
2	Female	140
Total		170

From the table above, it is evident that the number of female respondents exceeds that of male respondents. This is because the 2021 and 2022 student cohorts at College X consist of a higher proportion of female students compared to male students.

Table 2. Respondent characteristics based on age

No	Age Group	Frequency
1	16 – 20 years	23
2	21 – 25 years	147
Total		170

From the table above, it can be seen that the number of student respondents aged 16–20 years is greater than the number of respondents aged 21–25 years. This is because the majority of students from the 2021 and 2022 cohorts fall within the 16–20 age range.

Table 3. Respondent characteristics based on the highest education level

No	Age	Frequency
1	MA	10
2	SMA	119
3	SMK	41
Total		170

From the table above, it can be observed that the majority of student respondents have a High School (SMA) education background, compared to those with a Madrasah Aliyah (MA) or Vocational High School (SMK) education. This is also influenced by the fact that most students from the 2021 and 2022 cohorts at College X graduated from SMA rather than MA or SMK.

This study was conducted to analyze the influence of TikTok live streaming and the Preloved trend on the purchasing decisions of students at College X. Data were collected through the distribution of questionnaires to 170 respondents. Data analysis was performed using multiple linear regression tests, including partial tests (t-test), simultaneous tests (F-test), and the coefficient of determination test (R^2).

The validity test is used to assess the accuracy of the instruments employed in the research. An instrument is considered valid if the calculated r-value is greater than the critical r-value. The validity results of each research instrument are as follows:

Table 4. Instrument validity of the TikTok live streaming variable (X1)

Instrument	Validity Value		Description
	Calculated r	r table value	
TikTok live streaming1	0,708		Valid
TikTok live streaming2	0,77		Valid
TikTok live streaming3	0,41		Valid
TikTok live streaming4	0,676		Valid
TikTok live streaming5	0,721		Valid
TikTok live streaming6	0,696		Valid
TikTok live streaming7	0,729		Valid
TikTok live streaming8	0,748	0,1506	Valid
TikTok live streaming9	0,782		Valid

TikTok live streaming10	0,739		Valid
TikTok live streaming11	0,755		Valid
TikTok live streaming12	0,789		Valid
TikTok live streaming13	0,666		Valid
TikTok live streaming14	0,766		Valid
TikTok live streaming15	0,642		Valid

Based on the table above, the test results for each item of the TikTok live streaming variable (X1) show a calculated r-value of 0.1506. Therefore, it can be concluded that, overall, the statement items used for the live streaming variable are valid.

Table 5. Instrument validity of the preloved variable (X2)

Instrument	Validity Value		Description
	Calculated r	r table value	
TikTok live streaming1	0,708		Valid
TikTok live streaming2	0,77		Valid
TikTok live streaming3	0,41		Valid
TikTok live streaming4	0,676		Valid
TikTok live streaming5	0,721		Valid
TikTok live streaming6	0,696		Valid
TikTok live streaming7	0,729		Valid
TikTok live streaming8	0,748	0,1506	Valid
TikTok live streaming9	0,782		Valid
TikTok live streaming10	0,739		Valid
TikTok live streaming11	0,755		Valid
TikTok live streaming12	0,789		Valid
TikTok live streaming13	0,666		Valid
TikTok live streaming14	0,766		Valid
TikTok live streaming15	0,642		Valid

Based on the table above, the test results for each item of the Preloved trend variable (X2) show a calculated r-value of 0.1506. Therefore, it can be concluded that, overall, the statement items used for the Preloved trend variable are valid.

Table 6. Instrument validity of the purchase decision variable (Y)

Instrument	Validity Value		Description
	Calculated r	r table value	
TikTok live streaming1	0,708		Valid
TikTok live streaming2	0,77		Valid
TikTok live streaming3	0,41		Valid
TikTok live streaming4	0,676		Valid
TikTok live streaming5	0,721		Valid
TikTok live streaming6	0,696		Valid
TikTok live streaming7	0,729		Valid
TikTok live streaming8	0,748	0,1506	Valid
TikTok live streaming9	0,782		Valid
TikTok live streaming10	0,739		Valid
TikTok live streaming11	0,755		Valid
TikTok live streaming12	0,789		Valid
TikTok live streaming13	0,666		Valid
TikTok live streaming14	0,766		Valid
TikTok live streaming15	0,642		Valid

Based on the table above, the test results for each item of purchase decision variable (Y) show a calculated r-value of 0.1506. Therefore, it can be concluded that, overall, the statement items used for the purchase decision variable are valid. The validity test is used to ensure that the instruments applied are reliable, consistent, and stable when used repeatedly over time. An instrument is considered reliable if the Cronbach's alpha value is greater than the accepted reliability threshold (0.6). The results of the reliability test are presented as follows:

Table 7. Reliability results of the research instrument

No	Variable	Cronbach's Alpha	Description
1	TikTok live streaming (X1)	0,746	Reliabel
2	Preloved trend *(*X2)	0,801	Reliabel
3	Purchase Decision (Y)	0,792	Reliabel

The results of the reliability test show that the Cronbach's Alpha values for all variables are greater than 0.6. Therefore, it can be concluded that the research questionnaire is a reliable instrument. This test was conducted to examine the influence of live streaming and the Preloved trend on purchasing decisions among young consumers at College X in Medan. The following table presents the results of the multiple linear regression analysis for each variable:

Table 8. Results of the multiple linear regression analysis

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	17,021	2,134		7,976	0		
	Live Streaming (X1)	0,33	0,046	0,48	7,213	0	0,563	1,777
	Preloved trend (X2)	0,214	0,04	0,355	5,337	0	0,563	1,777

a. Dependent Variable: Purchase Decision (Y)

Based on the results of the analysis above, the multiple linear regression equation is obtained as follows:

$$Y = 17{,}021 + 0{,}330\ X_1 + 0{,}214X_2 \quad (2)$$

In the multiple linear regression model, the constant value for employee productivity was estimated to be 17.021. This means that when the independent variables (X1 and X2) have a value of zero, the dependent variable (Y) is 17.021. The regression coefficients for each independent variable are positive, indicating that the purchase decisions at College X can be influenced by live streaming and the Preloved trend.

The coefficient of determination aims to measure the extent to which the independent variables explain the variation in the dependent variable. The value of the coefficient of determination is illustrated in the following table.

Table 9. Results of the coefficient of determination test (R^2)

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,764[a]	0,583	0,578	3,60919

The coefficient value obtained was 0.583 or 58.3%, indicating that the variables of live streaming and the Preloved trend are able to explain 58.3% of the variation in purchase decisions at College X, while the remaining 41.7% is explained by variables not examined in

this study.

The simultaneous test (F-test) was conducted to examine the simultaneous effect of TikTok live streaming and the Preloved trend on purchase decisions. The test was performed at a 95% confidence level or a significance level of α = 0.05 (5%), with the following criteria:

If the calculated F-value (F_h) ≤ the critical F-value (F_t), then H_0 is accepted and H_1 is rejected, indicating that the variables have no effect on the study simultaneously. Suppose the calculated F-value (F_h) is greater than the critical F-value (F_t). In that case, H_0 is rejected and H_1 is accepted, indicating that the variables have a significant effect on the study simultaneously.

Table 10. Results of the simultaneous test (F-test)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3043,198	2	1521,599	116,81	,000[b]
	Residual	2175,39	167	13,026		
	Total	5218,588	169			

Based on the table, it can be observed that the calculated F-value of 116.810 is greater than the critical F-value of 3.05, and the significance value of 0.000 is less than the alpha level of 0.05. Therefore, the decision is to reject H_0 and accept H_1. This indicates that the independent variables, consisting of TikTok live streaming (X_1) and the Preloved trend (X_2), are able to explain the variation in the dependent variable, Purchase Decision (Y). Thus, the variables TikTok live streaming and the Preloved trend simultaneously have a positive and significant effect on purchase decisions at College X. The partial test (t-test) aims to examine the effect of live streaming and the Preloved trend on purchasing decisions, with the following criteria:

If the calculated t-value (t_h) is less than or equal to the t-table value (t_t), then H_0 is accepted and H_1 is rejected, indicating that the variable does not have a partial effect in this study.
If the calculated t-value (t_h) is greater than the critical t-table value (t_t), then H_0 is rejected and H_1 is accepted, indicating that the variable has a significant partial effect in this study.

Table 11. Results of Partial Test (t-test)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	17,021	2,134		7,976	0		
	Live Streaming (X1)	0,33	0,046	0,48	7,213	0	0,563	1,777
	Preloved trend (X2)	0,214	0,04	0,355	5,337	0	0,563	1,777

Based on the table, the following can be observed:
1. The calculated t-value for the live streaming variable is 7.213, which is greater than the critical t-value of 3.05, and the significance value is 0.000, which is less than the alpha level of 0.05. Therefore, the null hypothesis (H0) is rejected, and the alternative hypothesis (H1) is accepted. This indicates that, partially, the live streaming variable has a positive and significant effect on purchasing decisions.
2. The calculated t-value for the Preloved trend variable is 5.337, which is greater than the critical t-value of 3.05, and the significance value is 0.000, which is less than the alpha level of 0.05. Therefore, the null hypothesis (H0) is rejected, and the alternative hypothesis

(H1) is accepted. Thus, partially, the Preloved trend variable has a positive and significant effect on purchasing decisions.

4. Conclusion

Based on the results and discussions in the previous chapter, the following conclusions can be drawn:

1. TikTok live streaming has a positive and significant influence on purchasing decisions among young students at College X, both simultaneously and partially. This influence indicates that the more active and engaging the TikTok live streaming content is, the greater the likelihood that students will make a purchase decision.
2. The Preloved trend also has a positive and significant effect on purchasing decisions, both partially and simultaneously. This suggests that interest in trending pre-loved items can increase students' desire to purchase certain products.
3. Collectively, TikTok live streaming and the Preloved trend significantly affects purchasing decisions, indicating that these two factors together play an important role in influencing the buying behavior of young consumers.

Managerial Recommendations

1. Optimize TikTok live streaming Strategy: Marketing owners should allocate resources to improve the quality of live streaming content, particularly in terms of audio, visuals, and interaction. Hosts or streamers should be trained to deliver product information in an engaging, honest, and communicative manner.
2. Develop Branding for Preloved Products: Product owners can leverage the Preloved trend by incorporating storytelling or emotional narratives behind the products to attract young customers who value sustainability and uniqueness.
3. Facilitate Easier Transactions: Operations owners should ensure that the purchasing process after live streaming is quick and easy (e.g., instant payments, courier options, and guaranteed timely delivery), so as not to hinder the purchase intention generated during the live session.
4. Regular Trend Analysis and Adaptation: The marketing division should routinely analyze popular Preloved trends and products on TikTok. This enables them to adjust products, promotions, and content in accordance with customers' evolving preferences.

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STARTUP FOR BEGINNERS IN INDONESIA IN 2025

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Abstract

This study examines the dynamics of early-stage startups in Indonesia through a systematic literature review (SLR) of global and local research conducted from 2015 to 2025. The objective is to identify the critical success factors, prevailing business models, key challenges, and ecosystem support mechanisms that influence novice entrepreneurs. Guided by the PRISMA methodology, 20 peer-reviewed articles and influential publications were analyzed across themes of founder competencies, digital business models, and entrepreneurial ecosystems. The findings reveal that founder-related capabilities such as prior experience, innovation, and adaptability play a decisive role in startup survival. Externally, incubators, government policies, and access to funding are essential yet remain fragmented in the Indonesian context. Platform-based, subscription, and freemium models dominate the digital startup landscape, offering scalability but also exposing ventures to risks of inadequate product-market fit. Startups in developing nations face greater barriers—including limited capital and weak ecosystem integration—compared to those in advanced economies with robust entrepreneurial infrastructures. This study concludes that startup success depends on aligning internal competencies with external ecosystem support, particularly within Indonesia's evolving digital economy. The research contributes to the development of theory in digital entrepreneurship and provides practical implications for entrepreneurs, policymakers, and ecosystem stakeholders in fostering sustainable startup growth.
Keywords: Digital; Entrepreneurship; Ecosystem.

1. Introduction

Entrepreneurship and startup development have emerged as dominant engines of innovation, job creation, and economic transformation in the digital age. Startups, particularly in their early stages, are viewed as crucial vehicles for translating novel ideas into marketable solutions, driving technological advancement, and creating entirely new industries (Eesley & Roberts, 2012). In an increasingly knowledge-driven economy, the entrepreneurial process has been redefined by rapid technological change, the availability of digital platforms, and the growing interconnectedness of global markets. The rise of digital entrepreneurship is not merely a phenomenon confined to Silicon Valley or other established hubs of innovation but has spread across both developed and developing economies, reshaping how entrepreneurs identify opportunities and mobilize resources (Nambisan, 2017; Giones & Brem, 2017). These dynamics underscore the urgency of understanding how startups emerge, adapt, and survive in volatile and uncertain environments.

Despite their celebrated role in fostering innovation, startups face formidable challenges, particularly during their formative years. Early-stage startups operate under conditions of extreme uncertainty, resource scarcity, and institutional ambiguity, which often result in high failure rates (Aldrich & Fiol, 1994; Shepherd & Gruber, 2020). Founders must not only develop a compelling value proposition but also acquire the skills and resilience required to navigate

rapidly changing market dynamics. The lean startup approach, for example, highlights the necessity of iterative experimentation and entrepreneurial learning as key mechanisms to achieve product-market fit (Blank, 2013; Shepherd & Gruber, 2020). At the same time, digital transformation has lowered barriers to entry in many industries but has also increased competitive intensity, forcing startups to differentiate through innovation and superior execution (Brem & Voigt, 2009). These pressures illustrate that while opportunities for entrepreneurship have expanded in the digital era, the complexity and risks associated with building a successful venture remain significant.

A critical dimension of these challenges lies in the interplay between internal and external factors that influence startup trajectories. On the one hand, founder-level attributes such as entrepreneurial cognition, prior experience, and innovation capabilities strongly shape new venture performance (Eesley & Roberts, 2012; Brem & Voigt, 2009). On the other hand, external factors—such as the presence of supportive incubators, access to venture capital, and conducive institutional frameworks—are equally vital for survival and growth (Clarysse et al., 2014; Mian et al., 2016). Entrepreneurial ecosystems, comprising networks of actors, institutions, and resources, provide legitimacy, knowledge spillovers, and relational support that are often decisive for early-stage ventures (Spigel, 2017; Autio et al., 2018). Yet, research has also highlighted how ecosystems in emerging economies are often fragmented and underdeveloped, lacking the density of resources and institutional support found in advanced economies (Roundy, 2019). This asymmetry raises important questions about how startups in different contexts overcome resource and legitimacy constraints to scale their ventures.

Existing studies provide valuable insights into entrepreneurship, but several research gaps remain. Much of the entrepreneurship literature has historically focused on developed economies, with ecosystems such as Silicon Valley, London, or Berlin serving as dominant case studies (Spigel & Harrison, 2018; Brown & Mason, 2017). Comparatively fewer studies examine how early-stage startups emerge and sustain themselves in less mature ecosystems characterized by institutional voids, limited funding, and cultural barriers toward risk-taking (Zahra & Wright, 2016). Moreover, while theories such as the resource-based view (Barney, 1991), dynamic capabilities (Teece, 2010), and effectuation (Sarasvathy, 2001) offer useful lenses, there remains a need to synthesize these perspectives systematically to understand the interplay of micro-level founder competencies and macro-level ecosystem enablers. This gap is particularly acute in the digital era, where startups rely heavily on platform-based, subscription, and freemium business models that create new forms of scalability but also expose ventures to unique risks (Colombo & Piva, 2020). Thus, a systematic literature review of global evidence can help integrate fragmented insights, address existing gaps, and develop a conceptual framework that is more applicable across contexts.

The purpose of this research is therefore twofold. First, it seeks to systematically review and synthesize the existing literature on early-stage startups, with a specific focus on internal founder-related factors, external ecosystem-related factors, dominant digital business models, and recurring barriers to startup survival. By doing so, the study aims to provide a holistic understanding of what enables or hinders startups in their formative stages. Second, this research endeavors to highlight the differences in entrepreneurial dynamics between advanced and emerging economies, thereby providing nuanced insights into the contextual nature of entrepreneurship. Through this dual focus, the study contributes not only to theory development but also to practical and policy-relevant discussions on how to support startups more effectively in diverse environments.

The significance of this study extends to multiple stakeholders. From an academic perspective, it provides a systematic map of the literature on startup development, integrating theoretical perspectives such as effectuation, dynamic capabilities, and ecosystem theory with empirical findings from global contexts. Practically, the findings offer evidence-based guidance for entrepreneurs and startup teams seeking to understand the key success factors and pitfalls

during the early stages of venture creation. For policymakers, the study provides insights into how to design supportive frameworks and ecosystems—such as incubators, accelerators, and funding mechanisms—that can nurture entrepreneurial activity and enhance survival rates. Collectively, these contributions underscore the importance of aligning individual entrepreneurial capabilities with supportive ecosystem structures to maximize the potential of startups as engines of innovation and economic growth.

Literature evaluations about the evolution of early-stage startups are intrinsically linked to the theoretical framework of entrepreneurship, which provides the scholarly basis for elucidating the emergence, growth, and sustainability of new enterprises within a competitive environment. The Resource-Based View (RBV) is a prominent theory in startup studies that highlights the significance of internal resources as key factors in achieving competitive advantage (Barney, 1991). In the realm of early-stage businesses, the Resource-Based View (RBV) is pertinent as founders frequently face constraints in funding and assets; hence, the capacity to effectively manage limited resources, including knowledge, social networks, and creativity, is crucial for success (Wernerfelt, 1995). Alongside the Resource-Based View, the Dynamic Capabilities hypothesis proposed by (Teece, 2018) holds significant importance in startup research.

Digital economy policy and startups in Indonesia have inadequate product-market fit, exacerbating this. (Teece, 2018) Startups in the digital market require these dynamic capabilities due to the rapid shifts in consumer tastes and technology. Consequently, this hypothesis establishes a crucial basis for elucidating why certain firms can adapt and endure, whereas others succumb to failure. Effectuation Theory, formulated by (Read et al., 2010) is another prominent grand theory that posits novice entrepreneurs typically do not commence with a comprehensive rational plan; instead, they construct their enterprises utilizing available resources, pre-existing networks, and improvisational abilities (Read et al., 2010). This concept is particularly pertinent to nascent firms in Indonesia, where restricted access to capital and formal markets frequently compels founders to employ an ad hoc strategy in business development (Fisher, 2012). Moreover, Institutional Theory is crucial in comprehending the evolution of nascent companies. This theory emphasizes the impact of norms, rules, and culture on organizational behavior (Jakobsen, 2015) In the realm of digital startups, governmental regulatory assistance, the existence of incubators, and fiscal policies can establish legitimacy that enhances business sustainability (Bruton et al., 2010).

Alongside institutional theory, Entrepreneurial Ecosystem Theory has garnered heightened interest in recent literature. This idea emphasizes the significance of an entrepreneurial ecosystem comprising entities such as government, universities, incubators, investors, and communities to facilitate startup expansion (Stam, 2015). Simultaneously, the Business Model Innovation (BMI) theory functions as an essential framework for elucidating how companies might generate new value via business model innovation. This thesis posits that a startup's capacity to innovate its value creation, delivery, and capture mechanisms is crucial for market success (Foss & Saebi, 2017). Early-stage firms frequently utilize business model innovation as a way to address resource limitations and penetrate the market more effectively (Chesbrough, 2010). Moreover, current advancements underscore the significance of Digital Entrepreneurship Theory, which accentuates the pivotal function of digital technology as the foremost catalyst of contemporary entrepreneurship (Nambisan, 2017)This thesis asserts that business opportunities are progressively generated by digital platforms, social media, and data-driven technology. For startup organizations, the capacity to utilize digital technology influences both marketing effectiveness and operational efficiency, as well as access to investors (Autio et al., 2018).

Literature studies suggest that integrating theories can yield a more thorough comprehension. For instance, the Resource-Based View (RBV) elucidates the significance of internal resources, whilst the Entrepreneurial Ecosystem Theory highlights the necessity of external

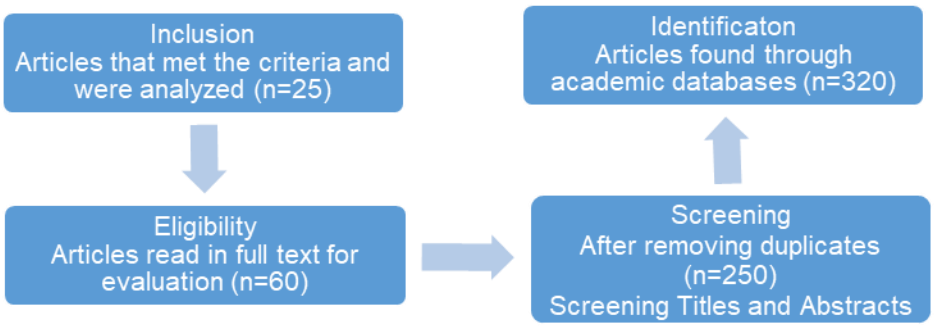
support; when integrated, these frameworks provide a more profound comprehension of how startups can thrive despite constraints (Roundy et al., 2018) The amalgamation of Effectuation Theory and Dynamic Capabilities elucidates how startups engage in short-term improvisation while cultivating long-term adaptive capacity (Read et al., 2010). An examination of contemporary grand theories indicates that the establishment of a startup cannot be elucidated by a singular theory; rather, it necessitates a multi-theoretical framework that incorporates both internal and external elements, along with interactions with digital technology. This review underscores the necessity for systematic research that can cohesively integrate various theories to offer direction for scholars, practitioners, and policymakers. This study seeks to conduct a thorough literature review on startup business growth for novices, emphasizing success factors, difficulties, and suggested techniques. This study will delineate the predominant business models, prevalent challenges, and the influence of the digital ecosystem and external assistance on the success of nascent firms.

2. Methodology

This study employs a Systematic Literature Review (SLR) methodology to examine, locate, and analyze pertinent literature concerning startup business growth for novices. SLR was selected due to its capacity to furnish a thorough review of prior research advancements via a methodical methodology of seeking, choosing, assessing, and synthesizing (Kitchenham, B., & Charters, 2007). This methodology can reduce researcher bias, enhance reliability, and yield findings applicable for both academic and practical usage.

This study adheres to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) criteria, namely the article selection flowchart, recognized as the international standard for performing systematic literature reviews (SLRs). PRISMA was selected due to its comprehensive framework for each phase of the research, encompassing the formulation of the research question, literature search strategy, criteria for inclusion and exclusion, article selection procedure, and data synthesis stage (Moher et al., 2009). This study is anticipated to exhibit robust methodological transparency by adhering to PRISMA guidelines.

Fig. 1. PRISMA Article selection flowchart



The article selection procedure is depicted in a PRISMA diagram, which details the number of articles identified (see Fig. 1), those excluded at each phase, and the ultimate number of articles examined. The literature search technique involved querying multiple reputable academic databases, specifically Scopus, Web of Science, IEEE Xplore, SpringerLink, and Google Scholar. These databases were chosen due to their extensive array of publications, encompassing esteemed international journals and conference proceedings pertinent to the domain of digital entrepreneurship and startups. The search timeframe was confined to 2015–2025 to guarantee that the literature acquired was contemporary and pertinent to the setting of digital startup growth. The literature search additionally included Indonesian-language publications from SINTA-indexed national journals to enhance the local context. Research

questions (RQs) were developed to direct the literature search and analytical procedure. The inquiries are as follows:

RQ1: What determinants affect the success of nascent startups?
RQ2: Which business models are predominantly employed by early-stage startups?
RQ3: What are the primary obstacles encountered by nascent firms during the foundational phase?
RQ4: Which ecosystem support mechanisms are most successful in promoting the sustainability of early-stage startups?

These research questions facilitate a focused and thematic literature review, ensuring that the findings address pertinent concerns. To guarantee that the acquired literature corresponds with the research objectives, the subsequent inclusion and exclusion criteria were formulated:

Inclusion Criteria: (1) Scientific articles published in peer-reviewed journals; (2) Articles addressing early-stage startups, digital entrepreneurship, or nascent business models; (3) Empirical, conceptual, or literature review studies pertinent to the subject; (4) Articles published from 2015 to 2025; (5) Articles written in English or Indonesian.

Exclusion Criteria: (1) Publications categorized as editorials, comments, or non-scholarly news; (2) Studies concentrating on major firms or well-established startups; (3) Articles exhibiting low methodological rigor (ambiguous data sources or analysis).

Utilizing these criteria, the literature selection process can be streamlined to encompass only pertinent and high-caliber papers.

The article selection procedure was conducted in three phases. Initially, titles and abstracts were screened to exclude items that were evidently irrelevant. Secondly, reviewing the complete content to verify that the articles satisfied the inclusion criteria. Third, quality assessment utilizing a checklist that evaluates the clarity of the approach, the research contribution, and the relevance to the research issue.

This research possesses numerous methodological constraints. Despite the extensive database search, there remains a likelihood that pertinent items were overlooked due to a lack of indexing. The limitation of the publication year to 2015–2025 may omit seminal works that could be pertinent. Third, the emphasis on English and Indonesian literature may neglect significant works in other languages.

Nonetheless, these constraints are expected with a comprehensive search method, explicit inclusion-exclusion criteria, and thorough theme analysis. Thematic synthesis was employed for data analysis, comprising the subsequent steps:

- Preliminary Coding: Recognizing keywords, themes, or significant topics inside each piece.
- Classification: Organizing these themes into overarching categories, including internal variables, external aspects, business models, and ecosystem support.
- Thematic Synthesis: Constructing a narrative that elucidates the interconnections across categories, as well as the similarities and disparities in findings among investigations.

An analysis was performed by juxtaposing research findings from developing nations, such as Indonesia, with those from wealthy nations to discern contextual similarities and contrasts. Consequently, this study offers comprehensive insights while maintaining specificity to the local situation.

The SLR research method can be succinctly delineated as follows: (1) Formulating research inquiries; (2) Crafting a literature search strategy; (3) Executing searches inside databases. (4) Selection based on inclusion and exclusion criteria; (5) Extraction of data from selected publications; (6) Analysis and synthesis of data; Presentation of results in narrative and tabular formats.

The SLR research methodology was created in alignment with worldwide standards, utilizing the PRISMA principles, establishing a robust framework for the literature evaluation on startup development. The research results are anticipated to delineate the principal aspects affecting success, the obstacles encountered, and pertinent solutions for startups through a methodical methodology. This study is anticipated to enhance the development of digital entrepreneurship theory and policy practices in Indonesia.

3. Results and Discussion

The systematic review of twenty peer-reviewed journal articles and influential publications on early-stage entrepreneurship provides a comprehensive picture of the factors shaping startup success and failure. The review first identifies internal factors that directly relate to the competencies and decisions of founders. Across studies, the role of founder characteristics—such as prior entrepreneurial experience, technical knowledge, and managerial skills—emerges as a consistent driver of new venture performance (Eesley & Roberts, 2012). For instance, entrepreneurs with a blend of innate ability and accumulated experience tend to navigate uncertainty more effectively and demonstrate stronger decision-making capacity when evaluating opportunities and managing scarce resources. Lean startup methodologies highlight the importance of entrepreneurial learning and iterative experimentation in this process, positioning experimentation as a mechanism through which founders refine ideas and achieve product-market fit (Blank, 2013; Shepherd & Gruber, 2020). Innovation capabilities are also crucial, as evidenced by Brem and Voigt (2009), who illustrate that balancing technology push with market pull enhances the potential of startups to design scalable solutions that resonate with customers. This internal perspective reinforces that success is not solely a matter of innovative ideas but depends equally on the founder's strategic flexibility, willingness to learn, and capacity to pivot. Taken together, these insights emphasize the centrality of human capital and entrepreneurial cognition in shaping startup trajectories during the formative years.

Beyond the level of individual founders, the review highlights external factors that either enable or constrain entrepreneurial activity. A large body of literature underscores the importance of incubators, accelerators, and entrepreneurial ecosystems as external supports for nascent ventures (Clarysse et al., 2014; Mian et al., 2016). Incubation programs provide mentoring, access to networks, and financial resources that enhance a startup's survival chances, particularly in highly uncertain technological fields. In addition, the development of entrepreneurial ecosystems, characterized by relational networks, cultural attitudes toward risk, and availability of venture capital, plays a pivotal role in shaping entrepreneurial opportunities (Spigel, 2017; Autio et al., 2018). In advanced economies, ecosystems are often digitally enabled and supported by universities, governments, and established firms, facilitating new venture creation through knowledge spillovers and institutional legitimacy. Conversely, emerging economies exhibit fragmented ecosystems, where support is uneven and access to finance remains a structural barrier (Roundy, 2019). These findings align with the argument of Aldrich and Fiol (1994) that new ventures often struggle with legitimacy in institutional contexts that lack established norms for entrepreneurship. The external dimension thus demonstrates how context and ecosystem embeddedness fundamentally shape the resources, legitimacy, and resilience of early-stage startups. Importantly, digital technologies emerge as a transformative external enabler by lowering entry barriers, enabling virtual collaboration, and creating new platform-based business opportunities (von Briel et al., 2018; Giones & Brem, 2017).

An additional finding relates to the predominance of certain business models and recurring barriers to growth. The review shows that platform-based models, subscription models, and freemium approaches dominate the landscape of digital startups (Teece, 2010; Colombo & Piva, 2020). These models offer scalability and revenue predictability, which are attractive in uncertain environments where rapid adoption is crucial. They also fit well with lean startup practices, allowing continuous experimentation and customer feedback loops. However, across contexts, startups face significant barriers such as insufficient capital, lack of managerial expertise, and difficulty in achieving product-market fit (Brown & Mason, 2017; Aldrich & Fiol, 1994). Many founders underestimate the time and resources required to validate their solutions and scale operations, leading to premature scaling or failure. Furthermore, the comparative perspective between developed and developing countries suggests that while startups in advanced ecosystems benefit from dense support networks, those in emerging markets confront persistent institutional voids and regulatory uncertainties. As Zahra and Wright (2016) argue, entrepreneurship is not only an economic act but also a socially embedded phenomenon, meaning that weak institutions, limited investor trust, and cultural attitudes toward failure exacerbate challenges in such contexts. Synthesizing these findings, the analysis suggests that startup outcomes are best understood as the product of interactions between founder-level capabilities, supportive or unsupportive ecosystems, and strategic choices regarding business models. The implication for theory is a call to integrate micro-level insights on entrepreneurial cognition with macro-level perspectives on ecosystems and institutions. For practice, the evidence underscores the need for founders to strategically align their internal strengths with the external resources and constraints of their environment.

The findings of the analysis can be succinctly reported in accordance with the research questions (RQ1–RQ4). Initially, concerning the success determinants of nascent startups (RQ1), the predominant factors include founder competencies, creativity in product innovation, and the capacity to manage internal resources, as elucidated by the Resource-Based View (RBV) and the theory of dynamic capabilities (Wernerfelt, 1995)Secondly, about the prevailing business model (RQ2), numerous nascent firms implement platform-based models owing to their substantial scalability, subscription models for consistent revenue, and freemium models as a tactic to entice initial customers (Chesbrough, 2010; Foss & Saebi, 2017)

Third, regarding the primary hurdles (RQ3), the literature reveals that early-stage companies face significant obstacles, including insufficient finance, inadequate managerial experience, and challenges in achieving product-market fit (Hidayat et al., 2022). The aforementioned issues are the principal factors contributing to the elevated failure rate of startups in Indonesia. Fourth, concerning ecosystem support (RQ4), literature suggests that the functions of incubators, governmental rules, and access to investors are essential; yet a disparity persists between policy and practical requirements on the ground (Putri & Nugroho, 2022; Saragih & Nasution, 2021). Consequently, the findings of this study affirm that establishing a startup necessitates not just unique concepts but also a synthesis of robust internal capabilities, suitable business model tactics, and sufficient external assistance. The practical ramifications of these findings need the enhancement of the digital entrepreneurial environment in Indonesia via expanded incubation programs, inclusive funding regulations, and augmented digital literacy for potential founders. The synthesis of literary data indicates that the dynamics of early-stage startup development are intricately connected to digital entrepreneurship theory, which underscores the significance of invention, technological application, and flexibility in unpredictable contexts. Theory of digital entrepreneurship (Nambisan, 2017) posits that digital technology serves not merely as a business support mechanism but also as a conduit for generating new opportunities via online platforms, application ecosystems, and the integration of big data. This corresponds with study findings indicating that platform-based, subscription, and freemium business models prevail in early-stage startup activities due to their inherent flexibility and rapid scalability.

Table 1. The systematic review of 25 peer-reviewed articles

No	Author (Year)	Article Title	Journal	Main Finding
1	(Cavallo et al., 2019)	Entrepreneurial ecosystem research: Present debates and future directions	International Entrepreneurship and Management Journal	Indonesia's digital ecosystem remains fragmented, with the roles of universities and the government being crucial.
2	(Colombo & Piva, 2020)	Start-ups launched by recent STEM university graduates: The impact of university education on entrepreneurial entry	Small Business Economics	Links business model design to startup performance
3	(Mian et al., 2016)	Technology business incubation: An overview of the state of knowledge	Technovation	Reviews the global role of incubators in supporting startups
4	(Spigel, 2017)	The relational organization of entrepreneurial ecosystems	Entrepreneurship Theory and Practice	Identify components of entrepreneurial ecosystems
5	(Huber, 2022)	The lean startup and the business model: Experimentation revisited	International Journal of Management Reviews,	Established a popular framework for building new ventures
6	(von Briel et al., 2018)	Digital technologies as external enablers of new venture creation in the IT hardware sector.	Entrepreneurship Theory and Practice	Explores the external enabling role of digital technologies
7				
8	(Brown & Mason, 2017)	Looking inside the spiky bits: A critical review and conceptualisation of entrepreneurial ecosystems.	Small Business Economics	Provides a critical review of the ecosystem concept
9	(Autio et al., 2018)	Digital affordances and entrepreneurial ecosystems	Strategic Entrepreneurship Journal	Digital technology creates new opportunities within the entrepreneurial ecosystem.
10	(Nambisan, 2017)	Digital entrepreneurship	Entrepreneurship Theory and Practice	Digitalization expands global market access for early-stage startups.
11	(Fisher, 2012)	Effectuation and bricolage	Entrepreneurship Theory and Practice	Early-stage startups often use an improvisational approach (effectuation).
12	(Foss & Saebi, 2017)	Business model innovation	Journal of Management	Business model innovation is a key determinant of a startup's competitive advantage.
13	(Bruton et al., 2010)	Institutional theory and entrepreneurship	Entrepreneurship Theory and Practice	Regulations and social norms have a significant impact on a startup's sustainability.
14	(Stam, 2015)	Entrepreneurial ecosystems and regional policy	European Planning Studies	The entrepreneurial environment is a key factor in the growth of startups.
15	(Zahra & Wright, 2016)	Understanding the social role of entrepreneurship	Journal of Management Studies	Analyzes the societal impact of entrepreneurship
16	(Teece, 2018)	Business models and dynamic capabilities	Long Range Planning	Dynamic capabilities help startups adapt to the market.

No	Author (Year)	Article Title	Journal	Main Finding
17	(Wernerfelt, 1995)	Resource-based view revisited	Strategic Management Journal	RBV emphasizes the importance of leveraging internal resources.
18	(Gans et al., 2018)	Strategy for startups	Harvard Business Review	Established a popular framework for building new ventures
19	(Read et al., 2010)	Effectual entrepreneurship	Routledge	Startup founders often use effectuation in the early stages.
20	(Roundy et al., 2018)	Emergence of entrepreneurial ecosystems	Journal of Business Research	The entrepreneurial ecosystem is a complex adaptive system.
21	(Giones & Brem, 2017)	Digital technology entrepreneurship: A definition and research agenda	Technology Innovation Management Review	Proposes a digitalization framework for startups
22	(Chesbrough, 2010)	Business model innovation	Long Range Planning	Business model innovation opens new opportunities in competition.
23	(Barney, 1991)	Firm resources and sustained competitive advantage	Journal of Management	RBV: Unique resources are crucial for startup competitiveness.
24	(Clarys 2014)	Creating value in ecosystems: Crossing the chasm between knowledge and business ecosystems.	Research Policy	Highlights the critical role of incubators in startup growth
25	(Brem & Voigt, 2009)	Integration of market pull and technology push in the corporate front end and innovation management—Insights from the German software industry.	Technovation	Balancing market needs with technological development

Effectuation theory (Fisher, 2012; Read et al., 2016) posits that in the initial phases, several businesses depend on accessible resources, social networks, and improvisational strategies rather than strict long-term planning. This literature synthesis indicates that Indonesian entrepreneurs typically include both strategies: utilizing digital technology as a basis for company innovation and employing the flexibility of the effectuation strategy to manage market volatility. The resource-based view theory (Wernerfelt, 2020) and dynamic capabilities theory (Teece, 2018) are pertinent, as they indicate that the success of early-stage startups is primarily influenced by the founders' proficiency in managing internal resources (competencies, experience, creativity) and their ability to swiftly adapt to external changes. The integration of digital entrepreneurship theory with these literary findings underscores that the success of startups is contingent not only on innovative ideas but also on the interplay between internal factors (founder competencies, product innovation, business model) and external factors (ecosystem support, regulations, access to funding).

A comparative review of data in developed and developing nations finds substantial disparities in the difficulties and facilitating factors for startup growth. In developed nations like the United States, the United Kingdom, and Germany, literature suggests that the startup ecosystem is comparatively advanced, characterized by robust venture capital support, innovation-conducive regulations, and established digital infrastructure (Roundy et al., 2018; Spigel & Harrison, 2018). Startups in these nations encounter heightened obstacles in global competition, including the identification of value differences and the preservation of competitive advantage in saturated marketplaces. In contrast, developing nations such as Indonesia, India, and Nigeria face primary challenges including insufficient initial capital, a deficiency of managerial expertise among founders, and limited access to supportive ecosystems like incubators or angel investors (Setiawan et al., 2021; Hidayat et al., 2022). Startups in developing nations frequently do not endure beyond the initial three years due to an inadequate product-market fit, exacerbated by stringent or inconsistent regulatory obstacles (Indrawati et al., 2020; Saragih & Nasution, 2021). Nonetheless, startups in underdeveloped nations have significant improvisational ability, wherein effectuation and bricolage methodologies emerge as essential techniques to navigate resource limitations. This distinction highlights the necessity of comprehending digital entrepreneurship theory within the framework of local ecosystems: in developed nations, the theory focuses on the administration of extensive opportunities, whereas in developing nations, it is more pertinent when associated with how founders can leverage constrained resources and communal support to generate new values.

Literature studies and international comparisons indicate that Indonesia must enhance the integration of its startup ecosystem to diminish failure rates and bolster global competitiveness. At present, Indonesia's digital entrepreneurship ecosystem is disjointed, lacking a cohesive structure that integrates support from incubators, universities, the government, and the business sector (Prasetyo & Sutopo, 2018). University incubators typically have restricted outreach and primarily serve as fundamental training environments, lacking substantial access to investors or markets (Putri & Nugroho, 2022). The government has initiated several strategies, including the National Movement for 1,000 Digital Startups; nevertheless, their execution is impeded by regulations that lack inter-ministerial synchronization (Indrawati et al., 2020). This research underscores the necessity of establishing a cohesive entrepreneurial ecosystem that links incubators, universities, investors, large enterprises, and government agencies into a synergistic network. Universities can function as hubs for cultivating entrepreneurial skills and conducting digital business research; incubators and accelerators can offer mentorship and market access; the government can establish favorable regulations and tax incentives; and the private sector can facilitate collaboration and funding opportunities. An integrated ecosystem will enhance the survival prospects of Indonesian startups and enable them to compete in regional and global markets. The integration of the startup ecosystem will substantially enhance the national digital economy, fostering job creation and sustainable innovation.

4. Conclusion

This study develops a conceptual framework for novice entrepreneurs to establish a startup business, grounded in three primary elements: first, internal factors encompassing founder competence, product innovation, and the selection of an appropriate digital business model; second, external factors including ecosystem support from incubators, access to funding, and government policies favorable to startups; and third, the interaction dynamics between these two factors, expressed through adaptability, improvisation, and continuous learning. This conceptual framework emphasizes that establishing a startup goes beyond relying solely on innovative ideas; it requires a synergy between internal competencies and an external ecosystem that mutually reinforce one another, alongside the founder's ability to discern the convergence of market potential and the solutions provided. According to literature, the predominant business models employed by startup companies, especially in the digital domain, are platform-based, subscription, and freemium models, all of which facilitate the establishment of economies of scale through technological advancements and network-driven market expansion. Nonetheless, the data indicate that early-stage companies frequently encounter significant challenges, including insufficient finance, inadequate managerial expertise, and impediments in achieving product-market fit, resulting in many failing within the initial three years. The significance of digital entrepreneurship theory, effectuation theory, and dynamic capabilities is underscored, highlighting the necessity for founders to exhibit the audacity to utilize available resources, establish strategic networks, and develop sustainable adaptive capabilities, enabling startups to prosper despite uncertainty. Although global literature thoroughly addresses these dimensions, a notable research deficiency persists, especially within the Southeast Asian context, including Indonesia, where the majority of studies concentrate on prominent, successful startups (e.g., Gojek, Tokopedia, Grab). Conversely, investigations into early-stage or nascent startups are scarce, particularly regarding internal team dynamics, survival strategies in the face of resource limitations, and the impact of the local ecosystem on business sustainability. This gap highlights the need for more contextualized research, including comprehensive case studies of early-stage startups across diverse regions, comparative analyses among developing nations in Southeast Asia, or empirical evaluations of the effectiveness of incubation and acceleration programs at universities and governmental institutions. Moreover, subsequent studies may focus on incorporating interdisciplinary viewpoints, such as connecting digital entrepreneurship with public policy, financial technology, or societal changes stemming from the expansion of the digital economy. Additional study is advised to establish an evaluation methodology grounded in sustainability indicators, enabling startups to be assessed not solely on economic growth but also on their contributions to job creation, community empowerment, and inclusive innovation. The findings of this research not only summarize the factors influencing the success of early-stage startups but also present a targeted, comprehensive, and pertinent framework for future research that aligns with the requirements of the digital entrepreneurship ecosystem in Indonesia and the broader Southeast Asian region.

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PEMBANGUNAN REALITI TERIMBUH SIRIH WARISAN DALAM PEMULIHARAAN WARISAN ADAT DAN BUDAYA MASYARAKAT MELAYU MENGGUNAKAN *WEBAR WORLD CAST*

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Abstrak

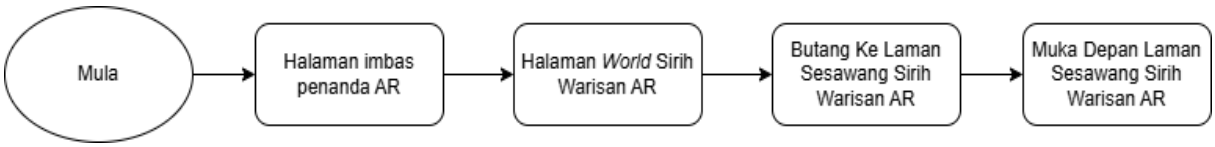
Tepak sirih merupakan simbol penting dalam budaya Melayu yang melambangkan adat, kesopanan dan nilai murni. Namun, penggunaannya kian terpinggir akibat perubahan zaman dan kurangnya kesedaran generasi muda. Kajian ini bertujuan memahami, membangunkan dan menilai keberkesanan teknologi Realiti terimbuh dalam usaha memulihara warisan budaya tepak sirih. Pembangunan projek ini melibatkan model 3D tepak sirih menggunakan perisian 3Ds Max, Substance Painter dan WorldCast. Aset 3D diterbitkan dengan ciri interaktif Realiti terimbuh. Sebanyak 84.4% responden bersetuju aplikasi ini memudahkan pemahaman tentang fungsi dan sejarah tepak sirih, 87.5% menyatakan kandungan maklumat mudah difahami dan tersusun, serta 87.5% bersetuju visual 3D memberi gambaran jelas tentang bentuk sebenar tepak sirih. Penambahbaikan masa hadapan termasuk penambahan elemen Realiti maya bagi memperkukuh pengalaman pengguna dan menarik minat generasi muda terhadap warisan Melayu.
Kata kunci: Tepak sirih; Warisan budaya melayu; Realiti terimbuh.

1. Pengenalan

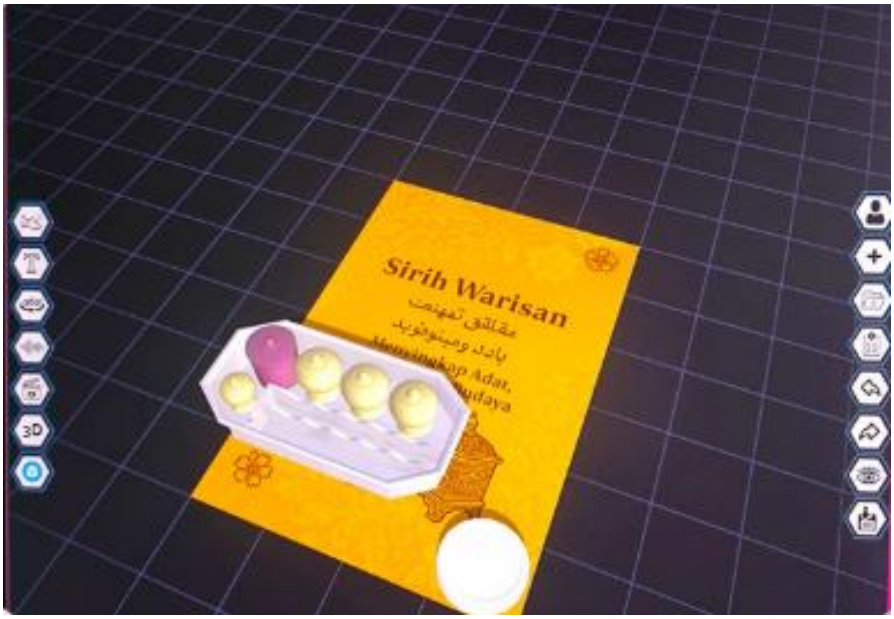
Penggunaan tepak sirih dalam kalangan masyarakat Melayu, khususnya generasi muda, semakin terpinggir dan terbatas kepada majlis rasmi seperti perkahwinan (Norhuda Salleh & Keum Hyunn Rou Kim, 2016). Kemerosotan pemahaman terhadap simbolisme seni ukiran dan fungsi tepak sirih menjadikan warisan ini kian dilupakan. Kajian menunjukkan penggunaannya semakin berkurang, malah di tempat yang masih mengamalkannya seperti di Tanjung Balai, maksud asal tepak sirih tidak lagi difahami (Ade Irma Marpaung, 2018). Kekurangan pelapis muda turut mengancam kelangsungan seni pembuatan tepak sirih (Ayu Nor Azilah Mohamad et al., 2024). Projek ini bertujuan mengenal pasti kaedah penggunaan asal tepak sirih, membangunkan model 3D interaktif, dan menilai keberkesanan aplikasi Sirih Warisan AR dalam meningkatkan pemahaman budaya.

2. Metodologi

Kajian ini menggunakan dua set soal selidik (pra dan pasca penggunaan aplikasi) melibatkan 32 responden berumur 18–25 tahun (87.5%), dengan 71.9% lelaki. Data dikumpul mengenai tahap pengetahuan awal, pengalaman menggunakan aplikasi, dan pandangan tentang keberkesanan AR dalam pembelajaran. Proses pembangunan bermula dengan pengumpulan rujukan visual, lakaran awal, dan pemodelan 3D menggunakan Autodesk 3Ds Max (Rujuk Rajah 1). Tekstur dihasilkan menggunakan Adobe Substance Painter, dan model dimuat naik ke WebAR WorldCast. Sesi *playtest* diadakan untuk menilai visual, kefahaman kandungan, dan tahap interaktiviti.



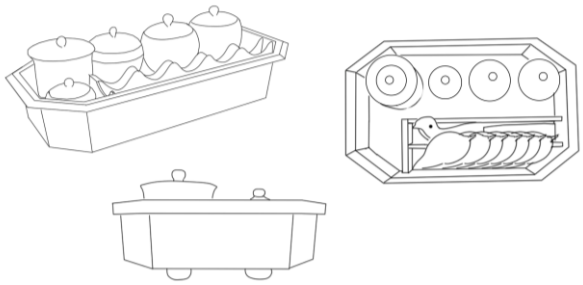
Rajah 1. Carta alir Sirih Warisan AR



Rajah 2. Produk Sirih Warisan AR

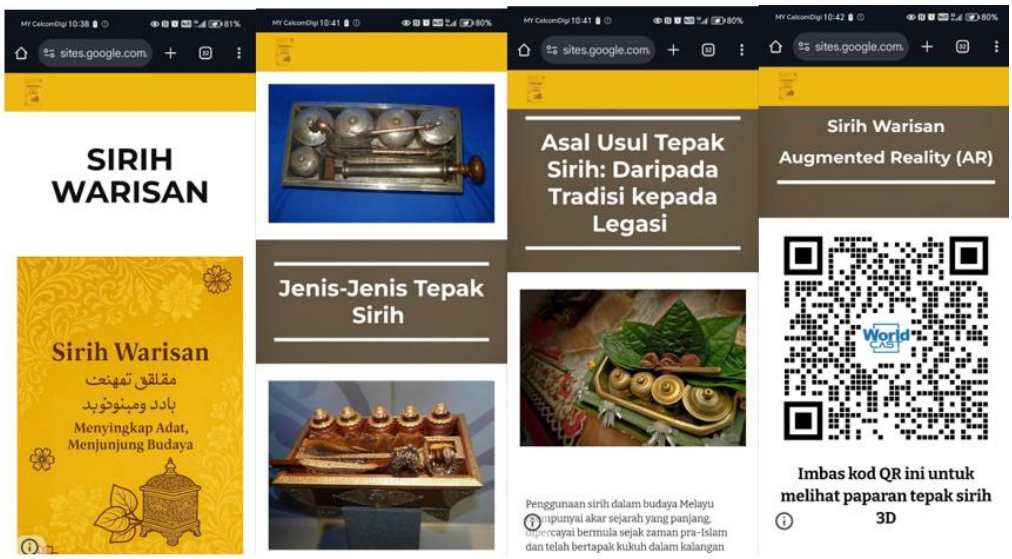
Aplikasi ini dibangunkan menggunakan perisian Autodesk 3Ds Max dan Adobe Substance Painter, dengan bantuan komputer berprestasi tinggi dan pen tablet. Proses pengesahan melibatkan sesi *playtest* bersama pengguna dan semakan oleh pakar. Pembangunan aplikasi ini berpaksikan objektif utama projek, iaitu untuk memahami dan memperkenalkan semula kaedah penggunaan tepak sirih dalam kalangan masyarakat Melayu. Aset visual 3D yang menarik telah diintegrasikan ke dalam platform *WebAR World Cast* bagi meningkatkan minat dan pengetahuan pengguna (Rajah 2). Kaedah

pengumpulan data merangkumi soal selidik, temu bual, dan kajian literatur, manakala keberkesanan aplikasi dinilai melalui sesi *playtest* dan maklum balas pakar.



Rajah 3. Lakaran Model Tepak Sirih

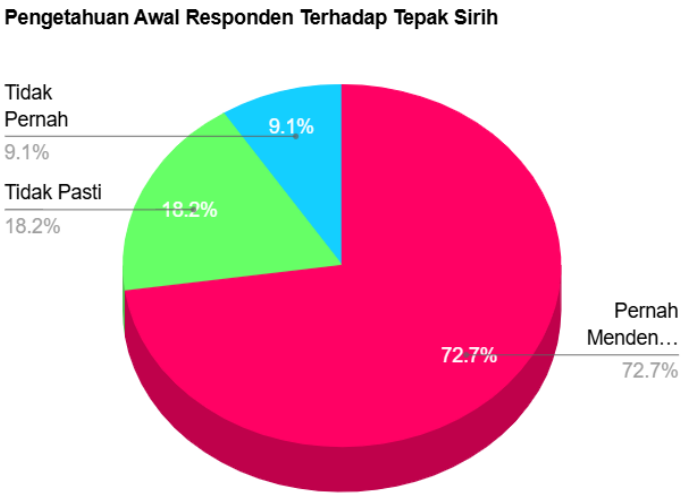
Rajah 3 menunjukkan pandangan atas objek, yang terdiri daripada komponen-komponen utama seperti kacip pinang, cembul, dan bekas sireh. Lakaran 3D tepak sirih ini direka bentuk menggunakan perisian *Adobe Photoshop* bagi menggambarkan bentuk fizikal dari pelbagai sudut pandangan.



Rajah 4. Sumber maklumat tepak sirih warisan
di platform Google Site yang boleh diakses menerusi AR Sirih Warisan

3. Dapatan dan Perbincangan

Kajian ini mendedahkan bahawa tahap pengetahuan awal responden terhadap tepak sirih adalah sederhana dan cenderung kepada pengenalan umum tanpa pemahaman mendalam. Berdasarkan data soal selidik sebelum penggunaan aplikasi Sirih Warisan AR, majoriti responden (72.7%) pernah melihat atau mendengar tentang tepak sirih, manakala 9.1% tidak pernah, dan 18.2% tidak pasti. Walaupun lebih separuh pernah terdedah kepada artifak ini, hanya 45.5% mengetahui fungsinya dalam upacara adat seperti perkahwinan. Sebanyak 27.3% mengetahui bahawa setiap komponen tepak sirih mempunyai maksud simbolik tersendiri, 45.5% tidak mengetahuinya, dan 27.3% hanya pernah mendengar tetapi kurang pasti.



Rajah 5. Dapatan kajian kesedaran masyarakat terhadap tepak sireh

Dapatan ini menunjukkan bahawa walaupun tepak sirih masih wujud dalam kesedaran masyarakat, kefahaman mengenai fungsi dan simbolisme semakin berkurangan. Fenomena ini selari dengan penemuan Norhuda Salleh & Keum Hyunn Rou Kim (2016) yang mendapati penggunaan tepak sirih kini terhad kepada majlis rasmi dan semakin jarang dilihat dalam kehidupan seharian. Ia juga mengesahkan laporan Ade Irma Marpaung (2018) yang menyatakan bahawa masyarakat di Tanjung Balai masih mengamalkan tepak sirih, tetapi maksud asalnya sudah tidak difahami.

Selepas menggunakan aplikasi Sirih Warisan AR, berlaku peningkatan ketara dalam tahap kefahaman responden. Sebanyak 84.4% bersetuju aplikasi ini memudahkan pemahaman tentang fungsi dan sejarah tepak sirih. Sebanyak 87.5% menyatakan kandungan maklumat mudah difahami dan tersusun, manakala 87.5% bersetuju visual 3D memberi gambaran jelas tentang bentuk sebenar tepak sirih. Pengalaman interaktif ini membolehkan pengguna melihat setiap komponen secara lebih terperinci, sekali gus mengatasi keterbatasan media cetak atau gambar statik.

Maklum balas pakar turut mengesahkan bahawa model 3D tepak sirih mempunyai struktur topologi yang baik. Walau bagaimanapun, tekstur kelihatan agak pucat, berkemungkinan disebabkan tetapan eksport atau pencahayaan dalam platform WorldCast. Pakar mencadangkan penambahbaikan pada pencahayaan dan tekstur bagi menghasilkan visual yang lebih realistik. Cadangan ini penting kerana visual berkualiti tinggi mampu meningkatkan minat pengguna untuk meneroka lebih lanjut, seperti disokong oleh kajian Masduki et al. (2021) yang membuktikan bahawa visual yang jelas dan menarik memainkan peranan penting dalam aplikasi AR berasaskan warisan budaya.

Dari sudut keberkesanan pedagogi, dapatan ini membuktikan bahawa penggunaan AR dapat mengatasi isu kekurangan pelapis muda dalam warisan budaya, seperti yang dibangkitkan oleh Ayu Nor Azilah Mohamad et al. (2024). Aplikasi ini bukan sahaja membantu memelihara warisan, malah berpotensi dijadikan medium pendidikan di sekolah atau muzium bagi meningkatkan kesedaran generasi muda. Secara keseluruhannya, Sirih Warisan AR telah memenuhi objektif kajian dengan berkesan, namun ruang untuk penambahbaikan seperti integrasi modul pembelajaran dan sokongan pelbagai bahasa wajar dipertimbangkan untuk kajian seterusnya.

4. Kesimpulan

Kajian ini mencadangkan penambahbaikan aplikasi Sirih Warisan AR seperti penambahan elemen interaktif Virtual Realiti (VR), modul pembelajaran, penglibatan pakar budaya, serta peluasan ke pelbagai platform dan bahasa. Penilaian dan kemaskini berterusan juga disarankan agar aplikasi kekal relevan. Kajian ini terhad oleh saiz sampel kecil yang memfokuskan kepada golongan muda, ciri interaktiviti dan grafik yang terhad, serta keperluan peranti AR. Tempoh kajian yang singkat turut menyukarkan penilaian jangka panjang. Ini menunjukkan keperluan untuk kajian pada masa akan datang yang lebih menyeluruh. Dapat disimpulkan bahawa penggunaan tepak sirih berkurang terutamanya dalam kalangan generasi muda akibat dari kurangnya pemahaman terhadap fungsinya. Pembangunan aset 3D berasaskan teknologi AR telah menawarkan pendekatan interaktif untuk memelihara warisan ini dan wajar diteruskan ke perkakasan atau adat Melayu yang lain. Walaupun berdepan cabaran seperti kekurangan rujukan dan keperluan pengalaman AR yang lancar, teknologi ini berpotensi besar dalam pendidikan dan pemuliharaan budaya, serta memperkenalkan adat Melayu secara moden kepada masyarakat.

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PERANAN APLIKASI AI DALAM PEMBELAJARAN: KAJIAN DALAM KALANGAN PELAJAR KOLEJ KOMUNITI HULU LANGAT

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Abstrak

Dalam era digital yang pesat berkembang, AI dilihat dapat membantu dalam pembelajaran. Namun sejauh mana sejauh mana pelajar mengambil peluang menggunakan AI dalam aktiviti pembelajaran mereka. Justeru itu, kajian ini dijalankan untuk mengenal pasti kekerapan penggunaan kecerdasan buatan (AI) dan sejauh mana responden bersetuju AI membantu mereka dalam pembelajaran. Sampel yang digunakan dalam kajian ini ialah pelajar Kolej Komuniti Hulu Langat (KKHL). Kajian ini menggunakan pendekatan kuantitatif dalam bentuk tinjauan. Instrumen kajian yang digunakan adalah soal selidik 5-skala likert. Item kajian dibina sendiri berdasarkan peranan AI yang dibincangkan dalam banyak literatur. Data yang diperoleh dianalisis secara deskriptif untuk menentukan tahap persetujuan responden mengenai peranan aplikasi dalam meningkatkan pengalaman pembelajaran. Secara ringkasnya hasil kajian menunjukkan bahawa ramai pelajar menggunakan AI dalam pembelajaran mereka. Di samping itu ramai pelajar bersetuju AI membantu mereka dalam aktiviti pembelajaran. Kajian ini penting untuk memahami bagaimana teknologi AI dapat menyokong aktiviti pembelajaran dan memberikan panduan kepada pendidik dan institusi untuk membantu pelajar menggunakan AI dengan betul dan beretika.
Keywords: Aplikasi AI; Pembelajaran; Pelajar KKHL.

1. Pengenalan

Terdapat banyak kajian yang membincangkan tentang Peranan Aplikasi AI dalam Pembelajaran. Ini menunjukkan bahawa terdapat potensi besar teknologi ini dalam meningkatkan kualiti pendidikan. Kajian-kajian seperti oleh Arifen et al. (2024) menunjukkan bahawa AI mampu mempercepatkan proses pembelajaran dan memudahkan pemahaman konsep yang kompleks. Saroh et al. (2024) menekankan peranan AI dalam mewujudkan pengalaman pembelajaran yang lebih interaktif dan menarik, manakala Nordin et al. (2024) menggariskan kelebihan AI dalam menyediakan akses kepada bahan pembelajaran yang bersesuaian. Selain itu, Qiu et al. (2022) mendapati bahawa AI berkesan dalam membantu pelajar memahami topik yang sukar. Tambahan pula, kajian oleh Alimunir (2023) pula menyatakan bahawa AI membantu pelajar mengurus masa dengan lebih baik melalui penyediaan sumber yang tepat. Abulibdeh et al. (2024) menyimpulkan bahawa AI dapat meningkatkan efisiensi pembelajaran dengan menyelesaikan masalah pembelajaran dengan lebih cepat. Dapatan-dapatan ini memperlihatkan bahawa aplikasi AI menjadi alat penting dalam menyokong dan memperkasa proses pembelajaran moden.

Dalam era digital ini, kecerdasan buatan (AI) semakin diterima dalam pembelajaran. Walaubagaimanapun terdapat kajian membincangkan kesan negatif penggunaan AI kepada pelajar. Salah satu isu utama yang timbul berkaitan penggunaan AI ialah kecenderungan pelajar untuk bergantung kepada teknologi ini. Ini berpotensi untuk mengurangkan kemahiran kognitif asas pelajar. Sebagai contoh, apabila pelajar kerap menggunakan AI untuk menyiapkan tugasan, terdapat risiko bahawa mereka akan menjadi kurang mahir dalam pemikiran kritis dan penyelesaian masalah, yang merupakan kemahiran penting dalam

pendidikan (Maola et al., 2024; Apriliani, 2024). Tambahan pula, penggunaan AI akan menyebabkan interaksi sosial akan berkurangan dalam kalangan pelajar. Ini kerana AI kadangkala menggantikan interaksi bersemuka dalam proses sosial dan pembelajaran. Oleh itu, AI berpotensi membawa kepada peningkatan pengasingan sosial dan menjejaskan keupayaan pelajar untuk bekerjasama dan berkomunikasi secara berkesan dengan rakan sebaya mereka (Tampubolon et al., 2024). Sebagai contoh, satu kajian menunjukkan bahawa pelajar yang kerap menggunakan aplikasi pembelajaran berasaskan AI cenderung mengalami penurunan interaksi sosial berbanding mereka yang belajar secara konvensional; ini menggambarkan kesan negatif teknologi yang jelas dalam konteks sosial (Thamrin et al., 2024). Selain itu, timbul isu berkaitan privasi dan etika. Penggunaan AI dalam pembelajaran biasanya melibatkan pengumpulan data peribadi pelajar, di mana boleh menimbulkan kebimbangan tentang keselamatan maklumat dan potensi penyalahgunaan data (Cahyono et al., 2023; Sahara et al., 2023).

Di samping itu, terdapat juga isu ketidaksamaan dalam akses kepada teknologi AI. Tidak semua pelajar mempunyai akses yang sama kepada teknologi AI, justeru boleh mewujudkan jurang pembelajaran antara mereka yang menggunakan AI dan tanpa AI. Apabila AI digunakan dalam proses pembelajaran, ketidaksamaan dalam keupayaan pembelajaran boleh memburukkan lagi keadaan, di mana pelajar dari latar belakang yang lebih miskin ketinggalan dari segi pengetahuan dan kemahiran teknologi (Tampubolon et al., 2024; Sukatin & Saputra, 2023). Oleh yang demikian. Berdasarkan kepada situasi ini, timbul persoalan Sejauh mana tahap kekerapan penggunaan AI dalam kalangan pelajar? Sejauh mana peranan AI dalam aktiviti pembelajaran pelajar? Justeru itu untuk menjawab persoalan ini, kajian perlu dijalankan untuk mengenal pasti kekerapan penggunaan AI dalam kalangan pelajar dan bagaimana peranan AI dalam meningkatkan pengalaman pembelajaran mereka. Kajian ini penting kerana dengan mengetahui kekerapan penggunaan AI dan peranannya, kajian ini boleh menjadi asas bagi pengurusan kolej dan pensyarah untuk merancang strategi yang lebih berkesan dalam menggunakan AI ke dalam kurikulum bagi meningkatkan hasil pembelajaran.Objektif kajian ini dijalankan untuk:

i. Mengenal pasti kekerapan penggunaan AI dalam kalangan pelajar Kolej Komuniti Hulu Langat
ii. Mengenal pasti peranan Kecerdasan Buatan (AI) dalam Pembelajaran Bagi Pelajar Kolej Komuniti Hulu Langat

Banyak kajian dijalankan menunjukkan bagaimana kecerdasan buatan (AI) memainkan peranan penting dalam pelbagai aspek pembelajaran. Fitri et al. (2024) dan Susanto, E. (2023) mendapati AI digunakan secara meluas oleh pelajar untuk mencari bahan pembelajaran yang relevan. Selain itu, menurut Mizan et al. (2024), AI juga membantu pelajar dalam menyelesaikan tugasan akademik dengan lebih efisien. Noorul et al. (2024) pula menyatakan bahawa AI berperanan dalam memudahkan pemahaman topik-topik yang sukar difahami. Samsudin et al. (2024) menekankan kepentingan AI dalam memberikan cadangan pembelajaran yang bersesuaian dengan keperluan pelajar. Menurut Jalil et al. (2024), penggunaan AI secara harian untuk tujuan pembelajaran semakin menjadi amalan biasa dalam kalangan pelajar, menunjukkan keberkesanan teknologi ini dalam meningkatkan pengalaman pendidikan.
Menurut Arifen et al. (2024), AI dapat mempercepatkan proses pembelajaran dan membantu dalam pemahaman konsep. Saroh et al. (2024) pula menyatakan bahawa AI meningkatkan pengalaman pembelajaran yang lebih interaktif dan menarik. Nordin et al. (2024) menegaskan bahawa AI menyediakan akses yang lebih banyak kepada bahan pembelajaran yang relevan dan diperibadikan. Dalam membantu pelajar memahami topik yang sukar, Qiu et al. (2022) mendapati AI berperanan penting dalam memperbaiki pemahaman pelajar. Selain itu, Alimunir (2023) menyatakan AI membantu mengurus masa dengan lebih baik dengan menyediakan sumber dan bahan yang tepat. Abulibdeh et al. (2024) pula menunjukkan AI

mampu meningkatkan efisiensi pembelajaran dan mempercepatkan penyelesaian masalah pelajar.

2. Metodologi

Kajian ini dijalankan dengan menggunakan pendekatan kuantitatif. Sampel terdiri daripada 100 orang pelajar dari Kolej Komuniti Hulu Langat. Instrumen kajian yang digunakan adalah soal selidik dengan 5 skala Likert, yang dibina sendiri berdasarkan tinjauan literatur seperti yang dibincangkan dalam sorotan kajian. Item kajian telah melalui proses semakan daripada pensyarah yang masih dalam penulisan dan juga telah disahkan oleh Unit Penyelidikan, Inovasi Dan Komersialan (UPIK) di Kolej Komuniti Hulu Langat. Teknik pensampelan yang digunakan adalah secara rawak yang diedarkan secara dalam talian. Dari segi kebolehpercayaan item, nilai cronbach alpha yang diperoleh adalah 0.906. Ini menunjukkan item yang dibina adalah sah dan sesuai untuk digunakan dalam penyelidikan. Teknik analisis yang digunakan adalah analisis deskriptif untuk menentukan tahap berdasarkan nilai min. Nilai skor min akan diterjemahkan kepada tahap seperti yang dicadangkan oleh Ngadiman et al. (2019), iaitu: 1.00–1.99 (Lemah), 2.00–2.99 (Rendah), 3.00–3.99 (Sederhana), dan 4.00–5.00 (Tinggi).

3. Dapatan dan Perbincangan

Responden kajian terdiri daripada 100 orang pelajar daripada 3 program di KKHL yang menjawab soal selidik. Majoriti responden adalah lelaki (65.0%) manakala selebihnya adalah perempuan (35.0%). Dari segi semester, majoriti pelajar berada pada semester pertama (53.0%), diikuti oleh semester kedua (27.0%), dan semester ketiga (20.0%).

Jadual 1. Latar belakang responden

Item	n	%
Jantina	Lelaki	65
	Perempuan	35
Semester	1	53
	2	27
	3	20
Program	Sijil Pengoperasian Perniagaan (SPP)	8
	Sijil Penyejukan dan Penyamanan Udara (SPU)	32
	Sijil Teknologi Maklumat (STM)	60
HPNM	2.00-2.99	2
	3.00-3.33	7
	3.43-3.67	14
	3.68-4.00	25
	Belum ada HPNM (Sem 1)	52

Majoriti responden terdiri daripada pelajar STM (60.0%), manakala pelajar SPU (32.0%) dan seterusnya SPP (8.0%). Kebanyakan responden adalah pelajar semester 1 yang belum mempunyai HPNM (52.0%), pelajar yang memperoleh HPNM 3.68-4.00 (25.0%), yang mempunyai HPNM 3.43-3.67 (14.0%), HPNM 3.00-3.33 (7.0%) dan HPNM 2.00-2.99 (2.0%).

Jadual 2. Ringkasan analisis menggunakan SPSS

No	Item	S.P	Min	Kekerapan
A1	Saya menggunakan aplikasi AI untuk mencari bahan pembelajaran.	1.035	3.40	Sederhana
A2	Saya kerap menggunakan aplikasi AI untuk menyelesaikan tugas.	1.010	3.01	Rendah
A3	Saya menggunakan aplikasi AI untuk memahami topik yang sukar.	1.009	3.46	Sederhana
A4	Saya sering menggunakan aplikasi AI untuk mendapatkan cadangan pembelajaran.	1.064	3.14	Sederhana
A5	Saya menggunakan aplikasi AI setiap hari dalam pembelajaran.	1.019	2.82	Rendah
	Purata	1.027	3.166	Sederhana

Jadual 2 menunjukkan tahap kekerapan penggunaan AI. Secara puratanya, tahap kekerapan penggunaan AI dalam kalangan pelajar berada pada tahap sederhana secara purata (min 3.166). Berdasarkan Jadual 2, tiga item yang memperoleh nilai min tertinggi. Pertama, pelajar menggunakan aplikasi AI untuk memahami topik yang sukar, dengan nilai min 3.46 yang berada pada tahap sederhana. Selain itu, pelajar turut menggunakan aplikasi AI untuk mencari bahan pembelajaran, juga pada tahap sederhana (min 3.40). Seterusnya, pelajar sering menggunakan aplikasi AI untuk mendapatkan cadangan pembelajaran dengan nilai min (3.14). Namun, dari segi menggunakan aplikasi AI setiap hari dalam pembelajaran, tahapnya adalah rendah, dengan min 2.82. Ini menunjukkan bahawa pelajar lebih suka dan kerap menggunakan AI dalam membantu pembelajaran mereka secara keseluruhan. Secara rumusannya, dapatan ini menunjukkan bahawa pelajar menggunakan aplikasi AI dalam pembelajaran, namun tidak secara konsisten atau menyeluruh. Tahap penggunaan yang sederhana ini mungkin menjelaskan bahawa pelajar masih dalam proses menyesuaikan diri dengan teknologi AI, terutamanya pelajar semester awal yang belum sepenuhnya memahami potensi dan kaedah penggunaan AI secara efektif dalam pembelajaran. Banyak faktor-faktor yang boleh mempengaruhi tahap penggunaan ini, seperti tahap pendedahan, kemahiran digital, sikap terhadap teknologi, serta sokongan daripada pensyarah dan institusi.

Jadual 3. Ringkasan analisis menggunakan SPSS

No	Item	S.P	Min	Tahap
B1	Aplikasi AI dapat membantu mempercepatkan proses pembelajaran dan pemahaman konsep.	0.935	3.79	Sederhana
B2	Penggunaan aplikasi AI dalam pembelajaran meningkatkan pengalaman pembelajaran yang lebih interaktif dan menarik.	1.009	3.55	Sederhana
B3	Aplikasi AI memberi pelajar lebih banyak akses kepada bahan pembelajaran yang relevan dan diperibadikan.	0.880	3.71	Sederhana
B4	Aplikasi AI dapat memperbaiki pemahaman saya terhadap topik yang sukar dipelajari.	0.884	3.81	Sederhana
B5	Aplikasi AI dalam pembelajaran membantu pelajar mengurus masa dengan lebih baik dengan menyediakan sumber dan bahan yang tepat pada masa yang sesuai.	0.916	3.70	Sederhana
B6	Aplikasi AI meningkatkan efisien pembelajaran dengan menyediakan penyelesaian cepat untuk masalah yang sering dihadapi pelajar.	0.899	3.80	Sederhana
	Purata	0.920	3.723	Sederhana

Jadual 3 menunjukkan tahap persetujuan peranan Kecerdasan Buatan (AI) dalam pembelajaran bagi pelajar. Secara puratanya, tahap persetujuan peranan Kecerdasan Buatan (AI) dalam pembelajaran bagi pelajar berada pada tahap sederhana secara purata (min 3.723). Berdasarkan Jadual 3, tiga item yang memperoleh nilai min tertinggi. Pertama, Aplikasi

AI dapat memperbaiki pemahaman pelajar terhadap topik yang sukar dipelajari., dengan nilai min 3.81 yang berada pada tahap sederhana. Selain itu, Aplikasi AI meningkatkan efisien pembelajaran dengan menyediakan penyelesaian cepat untuk masalah yang sering dihadapi pelajar, juga pada tahap sederhana (min 3.80). Namun, Penggunaan aplikasi AI dalam pembelajaran meningkatkan pengalaman pembelajaran yang lebih interaktif dan menarik, mempunyai nilai yang paling rendah iaitu 3.55. Ini menunjukkan bahawa pelajar bersetuju dengan peranan AI dalam membantu pembelajaran mereka secara keseluruhan. Tahap sederhana dalam hasil analisis ini merujuk kepada persepsi pelajar terhadap keberkesanan aplikasi AI dalam pembelajaran yang berada pada tahap positif tetapi belum mencapai tahap yang tinggi atau optimum. Dengan min purata 3.723, dapatan ini menunjukkan bahawa pelajar secara umum bersetuju bahawa AI memberi manfaat seperti mempercepatkan proses pembelajaran, meningkatkan interaktiviti, bahan pembelajaran kendiri, serta membantu pemahaman topik sukar. Namun, tahap sederhana ini juga menunjukkan bahawa masih terdapat ruang untuk penambahbaikan, dari segi pendedahan yang lebih luas, latihan penggunaan AI secara berstruktur, atau penggunaan yang lebih sistematik dalam proses pengajaran dan pembelajaran. Tahap sederhana ini boleh dianggap sebagai satu petunjuk awal bahawa pelajar menyedari potensi AI, namun belum sepenuhnya memanfaatkannya secara maksimum.

4. Kesimpulan

Kajian ini mendapati bahawa majoriti pelajar Kolej Komuniti Hulu Langat (KKHL) menggunakan kecerdasan buatan (AI) dalam pembelajaran mereka pada tahap rendah ke sederhana. Bagi penanan AI kepada pelajar, dapatan menunjukkan bahawa tahap persetujuan responden adalah pada tahap sederhana. Secara kesimpulannya dapatan kajian ini menjelaskan bahawa AI memainkan peranan penting dalam meningkatkan pengalaman pembelajaran, termasuk mempercepatkan pemahaman konsep, menjadikan pembelajaran lebih interaktif dan menarik. Selain itu, AI membantu pelajar mengurus masa dengan lebih baik serta meningkatkan kecekapan dalam menyelesaikan tugasan dan memahami topik yang mencabar. Secara rumusannya, dapatan kajian ini menegaskan kepentingan AI dalam pendidikan serta keperluan untuk memanfaatkannya secara lebih strategik. Berdasarkan kepada dapatan kajian ini, kajian ini mencadangkan beberapa strategi boleh dilaksanakan bagi meningkatkan penggunaan AI yang lebih berkesan dalam pembelajaran. Dari sudut amalan pengajaran, pensyarah perlu diberikan latihan profesional untuk mengaplikasikan AI secara efektif dalam aktiviti bilik kuliah, termasuk penggunaan AI untuk pembelajaran adaptif dan penilaian formatif. Dari segi perancangan kurikulum, elemen literasi AI perlu dimasukkan sebagai sebahagian daripada hasil pembelajaran, sama ada melalui kursus khusus atau penggunaan dalam subjek sedia ada. Manakala dari aspek dasar pendidikan, pihak institusi boleh mempertimbangkan untuk membangunkan garis panduan penggunaan AI secara etika dan bertanggungjawab serta menyediakan kemudahan digital yang menyokong pembelajaran berasaskan teknologi. Strategi ini mampu memperkukuh kesediaan pelajar dan pensyarah dalam menghadapi landskap pendidikan yang semakin dipacu oleh kecerdasan buatan.

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EXPLORING THE INTERRELATIONSHIP BETWEEN SUSTAINABLE PRACTICES AND TECHNOLOGICAL INNOVATIONS IN MALAYSIA'S ENVIRONMENTAL POLICIES

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Abstract

This paper examines the relationship between sustainable practices and technological innovations within the context of Malaysia's environmental policies. The increasing need for advanced technological solutions in addressing environmental issues falls under the purview of policy frameworks at the national level and above, in the age of growing global environmental concern. This study critically examines the evolution of Malaysia's environmental governance mechanisms in adapting to sustainable development guidelines and the emergence of green technologies. The study examines key national policy instruments and stakeholder roles. Results suggest that although sustainability is well-articulated in policy narratives, the translation into practice, particularly through technology-based strategies, is heterogeneous. Several systemic barriers — including fragmented coordination among institutions, regulatory ambiguity, limited resources for innovation, and low public awareness — render policy implementation ineffective. In contrast, opportunities exist for applying digital apps in environmental monitoring, energy-optimized infrastructure systems, and waste elimination technologies. To encourage closer policy alignment between sustainable development goals and technology, the research proposes a framework. An inter-agency collaboration and incentive structures are at the heart of this model for encouraging the uptake of innovative technologies. By doing so, it broadens the debate around environmental policymaking, demanding a calculation of how government, policymakers, and the public can take on an integrated approach to ensure coherence between the ability to deploy cost-effective technologies and environmental protection goals. It provides practical implications for government agencies, industry actors, and academic institutions that utilize innovation-oriented sustainable development to enhance Malaysia's environmental performance.
Keywords: Sustainable development policy; Green technological innovation; Environmental governance.

1. Introduction

Sustainable development in Malaysia has gained heightened attention due to the country's rapid economic growth, necessitating a balance between development and environmental preservation (Khan et al., 2021). The government has initiated various policies to facilitate sustainable practices, particularly in high-impact sectors such as agriculture, manufacturing, and services. The commitment to sustainability is articulated through Malaysia's Vision 2020. It is currently aligned with the Sustainable Development Goals (SDGs) as part of the

framework for a long-term national development strategy. The Malaysian government has laid out a detailed National Environmental Policy to promote the integration of environmental considerations into the national agenda. Recent trends reflect a growing affinity toward adopting green technologies and sustainable practices, aiming to reduce carbon footprints and enhance environmental performance (Idris et al., 2024). For instance, various policies focus on sustainable waste management and green energy initiatives as part of the broader environmental preservation efforts. A notable shift towards sustainable farm practices is evident through programs aimed at enhancing productivity while minimizing ecological impact, in sectors like palm oil and aquaculture (Sani et al., 2024).

Fig. 1. Sustainable Development Goals (SDGs)

The introduction of legislation such as the Environmental Quality Act and the National Policy on Climate Change has further illuminated a path towards greater environmental accountability. Enhanced public awareness and regulatory frameworks have underscored the importance of sustainable approaches in maintaining the ecological balance and fostering economic resilience. However, the transition remains challenging, as sectors grapple with understanding and integrating sustainable practices effectively, often hindered by a knowledge gap, costs, and infrastructural limitations (Masyhur et al., 2024; Tajudeen et al., 2020).

In this context, technological innovation emerges as a pivotal catalyst to drive sustainable practices forward in Malaysia. The role of technology is paramount, as advanced technological solutions have the potential to address environmental challenges comprehensively. Studies emphasize that the integration of innovative technologies can lead to significant advancements in resource efficiency and productivity across various sectors, including agriculture and manufacturing (Lee et al., 2023). For instance, green innovations, such as precision agriculture, leverage data-driven technologies to optimize resource use, significantly impacting crop yields and minimizing the carbon footprint associated with food production. The adoption of such technologies is critical, given Malaysia's dependence on agriculture as a mainstay of its economy (Zainol et al., 2024). Further, linking modern digital technologies with agricultural practices emerges as a viable solution to enhance environmental outcomes while simultaneously improving growers' economic stability (Hamid et al., 2021).

Moreover, research has indicated that the infusion of digital solutions, including Green Information Systems, plays a crucial role in fostering a culture of sustainability within organizations. Proactive management of environmental information through tailored IT

systems helps firms track their sustainability performance efficiently, thereby facilitating better decision-making and compliance with environmental regulations (Gopinathan et al., 2025). This relationship exemplifies the significant impact technology has on promoting a sustainable corporate culture and enhancing organizational performance. Technological innovations also extend to banking practices, with green banking initiatives becoming increasingly prominent in Malaysia's financial sector. This forward-thinking approach not only accentuates the importance of funding for green initiatives but also drives the business case for sustainability within the financial framework. Comprehensive policies encouraging green investments further signal progress in Malaysia's commitment to fostering sustainable economic practices (Khalid et al., 2024).

As industries transition towards low-carbon economies, the connection between innovation and environmental performance cannot be overstated. Numerous case studies illustrate that organizations adopting green technologies tend to observe improved operational efficiency and reduced environmental impacts (Mubarik et al., 2021). For example, studies in the palm oil sector demonstrate that implementing sustainable practices using innovative technologies not only curtails environmental degradation but also enhances the overall economic viability of businesses involved in palm oil production (Mahbob et al., 2021). Importantly, research shows that public sectors remain significant players in advancing sustainability through innovation. Government policies that stimulate research and development in sustainable technologies have demonstrated positive outcomes for the environment, especially regarding pollution reduction and resource conservation (Ong et al., 2022). Therefore, the importance of governmental support for innovation in sustainable practices is clear, as it sets the foundation upon which the private sector can build successful sustainable business models. Technological advancements, therefore, work hand-in-hand with environmental policies to support a comprehensive approach to sustainability in Malaysia. The interplay between innovation, environmental performance, and sustainable practices illustrates a holistic pathway toward achieving long-term ecological goals that align with economic growth (Yadegaridehkordi et al., 2020). As such, fostering a culture of innovation across sectors is imperative to fully leverage the potential benefits technological advancements can offer in meeting sustainability targets effectively and efficiently.

Current literature suggests a pressing need for further investments into research and development to support the evolution of new technologies that promote sustainable practices, especially within the Malaysian context. Only through continued effort and collaboration among stakeholders—including government, industry players, and civil society—can Malaysia hope to achieve its sustainability objectives while driving economic progress into the future.

Malaysia's commitment to addressing environmental sustainability is demonstrated through various regulations and initiatives established over the years. The government has made strides in integrating environmental considerations into national policies, guided by a framework promoting sustainable development. A pivotal catalyst for these efforts is the National Policy on the Environment, launched in 2002, which provides a comprehensive approach to managing environmental issues, including pollution control, biodiversity conservation, and sustainable resource management (Jalil et al., 2025). In recent years, additional initiatives such as the Environmental Quality Act (1974) have been pivotal in regulating pollution, enforcing standards on wastewater treatment, and addressing hazardous waste (Khan et al., 2021). Concurrently, the adoption of environmental impact assessments (EIAs) as a prerequisite for major development projects signifies a forward-looking approach, ensuring that environmental aspects are systematically evaluated before project implementation.

Parallel to these frameworks, public awareness and engagement in environmental issues play a critical role in the success of environmental policies. Initiatives aimed at promoting environmental education and awareness, including campaigns by governmental and non-

governmental organizations, are essential to foster community involvement. Programs that engage local communities in sustainability initiatives, such as tree planting and waste management, have shown promise in raising awareness and promoting responsible practices among citizens (Masyhur et al., 2024). Moreover, economic incentives have formed a crucial part of Malaysia's strategy, where green financing mechanisms are introduced to promote investment in sustainability initiatives. These include tax incentives for businesses adopting environmentally friendly practices and financial support for green technology development (Idris et al., 2024). However, the efficiency of these incentives in translating into practice remains limited, particularly among small and medium enterprises (SMEs).

Despite the progress made in establishing environmental policies, Malaysia faces considerable challenges in implementing sustainable practices. One significant barrier is the lack of awareness and understanding of sustainability principles among the general public and stakeholders (Saad et al., 2024). Research indicates that a large segment of the population lacks adequate knowledge regarding the implications and benefits of adopting green practices, which hampers concerted efforts toward environmental protection. Additionally, limited access to sustainable technologies and financial constraints further impede SMEs from adopting environmentally friendly practices. For instance, SMEs often struggle with the costs associated with implementation, such as acquiring technology that complies with environmental standards (Mubarik et al., 2021). As highlighted by Ojo et al. (2022), despite the presence of policies encouraging green management practices, the actual adoption remains low among SMEs compared to larger corporations, primarily due to resource limitations.

Fig. 2. Green supply chain practices

The existing regulatory framework also presents complexities that create uncertainty for businesses. The multiplicity of regulations can lead to confusion, as companies may be uncertain about compliance requirements, thereby leading to neglect in adhering to environmental standards (Zainol et al., 2024). As a result, firms may adopt a minimal compliance approach rather than proactively engaging in sustainable practices, which can ultimately undermine the effectiveness of environmental initiatives. Public awareness campaigns, although beneficial, often lack depth and reach, further complicating stakeholder engagement in sustainability discourse. Many initiatives focused on education do not sufficiently address the technological aspects necessary for implementing green practices,

leaving gaps in knowledge about how to effectively utilize available technology (Hamzah et al., 2022).

To address the aforementioned challenges, stakeholder engagement plays a critical role in nurturing environmental practices. Engaging local communities and businesses is essential for developing environmentally responsible behaviors and practices. Structured platforms, through which stakeholders can participate in discussions about environmental management, are vital. For instance, local governments could establish regular community forums to deliberate environmental policies and gather input on sustainable practice implementations (Khalid et al., 2024). Additionally, engaging businesses in collaborative initiatives, such as public-private partnerships, serves to leverage resources and knowledge towards common sustainability goals. Successful models from other regions emphasize the potential for enhanced outcomes through such collaborations (Ojo et al., 2022). The involvement of educational institutions in fostering research into sustainable practices further underscores the need for collaborative efforts across sectors to build a comprehensive approach to sustainability.

Academically, studies highlighting the role of green technology adoption demonstrate that SMEs that invest in eco-friendly innovations report improved operational efficiencies and cost savings over time (Mubarik et al., 2021). These findings can encourage local businesses to consider the long-term benefits of adopting green practices, thereby fostering a shift in perspective on sustainability. Overall, the interplay among awareness, economic incentives, and stakeholder collaboration forms the backbone of Malaysia's environmental initiatives. A multi-faceted strategy that layers these components may offer greater resilience and effectiveness in addressing the pressing challenges of sustainable practices. It is essential for Malaysia to continue refining its approach to engaging stakeholders at all levels, ensuring that policies are not only well-crafted but also effectively communicated to all parties involved in environmental stewardship.

An examination of the implementation of green energy initiatives further substantiates this necessity. For example, the uptake of renewable energy technologies has been relatively slow despite favorable policies due to misconceptions regarding feasibility and cost (Tajudeen et al., 2020). Therefore, targeted educational programs highlighting successful case studies of green energy implementations can help demystify the process and encourage broader acceptance among stakeholders. As the nation progresses, future research should focus on longitudinal studies that monitor the effectiveness of current policies and education initiatives over time (Jalil et al., 2025). This understanding will be pivotal in developing responsive and adaptive policies that can promote sustainable practices effectively in the ever-evolving sociopolitical environment of Malaysia.

2. Methodology

The research design plays a critical role in studying sustainability, as it lays the foundation for how data is collected and analyzed. In recent studies, methodologies have utilized both qualitative and quantitative approaches to explore various dimensions of sustainability within Malaysia and have become a conceptual paper. In contrast, quantitative methods are effective in measuring specific variables and establishing relationships through statistical analyses. Surveys, particularly, provide a broad range of data from numerous respondents, allowing researchers to generalize findings across larger populations. For example, a study by Ong et al. (2022) utilized surveys to gauge the attitudes of small and medium enterprises (SMEs) towards sustainability practices. By analyzing data from over 200 firms, the researchers were able to determine factors influencing the adoption of green practices, such as perceived costs and regulatory pressures. Combining both qualitative and quantitative methods in a mixed-methods approach can leverage the strengths of each, providing a comprehensive

understanding of sustainability issues. Researchers may utilize qualitative interviews to gain insights into the motivations behind sustainability practices and then use quantitative surveys to measure the prevalence of these practices across different sectors. This methodological triangulation enhances the validity and reliability of the research findings.

Effective data collection strategies are essential for yielding valuable insights into the state of sustainability in Malaysia. Using a combination of case studies and surveys can significantly enrich the data landscape. For instance, case studies provide contextual richness as they focus on specific instances of sustainability practices within particular organizations. Mahbob et al. (2021) conducted a case study that evaluated energy benchmarking in the Malaysian palm oil industry, helping gain insights into operational practices and the challenges that firms face when attempting to enhance sustainability. Through on-site observations and interviews with key stakeholders, the researchers gathered nuanced data that statistical methods alone may not have revealed. Moreover, employing structured questionnaires in surveys enables researchers to quantify the effectiveness and scope of sustainable practices. As highlighted by Hamzah et al. (2022), surveys were distributed across various SMEs to examine their engagement with sustainable management practices. This included assessing the awareness of environmental issues, adherence to regulatory compliance, and integration of green technologies in operations. The responses gathered were subjected to regression analyses to determine significant predictors of sustainability engagement.

Additionally, leveraging technology in data collection can streamline the process and enhance the accuracy of results. For example, online survey tools can facilitate data gathering from larger populations, particularly in the context of remote work environments, which have become more prevalent due to recent global events. This shift allows for increased flexibility and accessibility, potentially increasing response rates and diversity in sample populations.
Sample Population

Selecting an appropriate sample population is pivotal in sustainability research as it reflects the diversity and scope of the study. In studies focusing on sustainable practices in Malaysia, researchers have predominantly turned their attention to SMEs, which form the backbone of the economy yet often lack the resources to adopt comprehensive sustainability measures. Hamzah et al. (2022) emphasized the necessity for a balanced representation of industries engaged in sustainable practices, including agriculture, manufacturing, and services. By including various sectors, the findings can be generalized across the economic landscape, offering insights relevant to numerous stakeholders. When defining the sample population, researchers should aim for a diversity of company sizes, operational scopes, and geographical locations to capture a comprehensive view of sustainability practices. For instance, studies that incorporate perspectives from both urban and rural SMEs can reveal important differences in challenges and opportunities for sustainable development. As noted by Ramli et al. (2021), socioeconomic factors and localized environmental issues can significantly influence sustainability engagement within different communities.

Furthermore, the rationale behind sample selection should align with the research objectives. If the goal is to explore barriers to sustainable practices, including firms that have unsuccessfully attempted to implement sustainability measures, may offer valuable insights into shortcomings and obstacles. On the other hand, focusing on successful case studies provides data points for best practices that can be modeled by other firms. Researchers, therefore, must carefully consider their criteria for sample selection and ensure that the chosen subjects are representative of the population being studied. Rigorous methods implementing sampling are also pivotal. An example of this practice is through stratified sampling, which may ensure all relevant industry segments are included in the study. By stratifying the sample, researchers can maintain the proportional representation of different sectors, thereby increasing the generalizability of findings. This approach is essential, especially in a country

like Malaysia, which has a multifaceted economic framework and a diverse industrial base involved in various environmental initiatives.

In conclusion, discussions on sample determinants must also consider ethical considerations in research. Transparency in data collection and engagement with participants are fundamental ethical responsibilities that researchers must uphold. Providing a clear outline of how data will be used, ensuring confidentiality, and gaining informed consent from participants enrich the ethical framework of sustainable research (Idris et al., 2024). Ethical clarity strengthens the credibility of research findings and fosters trust between researchers and participants.

3. Results and Discussion

The role of green technology in fostering sustainability has garnered significant attention across various industries in Malaysia. The implementation of green technologies not only reduces environmental impacts but also promotes long-term economic viability. According to Mubarik et al. (2021), green technologies, especially those involving renewable energy sources such as solar and wind power, enhance operational efficiency while reducing greenhouse gas emissions. In the manufacturing sector, for instance, the adoption of green technologies has demonstrated a remarkable reduction in waste production and energy consumption, leading to lower operational costs while contributing to environmental sustainability.

Successful case studies abound that illustrate the positive impacts of green technologies. Mahbob et al. (2021) highlight specific instances in the Malaysian palm oil industry where technologies aimed at improving energy efficiency have been implemented. These changes not only optimized production processes but also aligned with sustainable practices, thereby reducing the overall environmental footprint of the industry. Companies that embraced technological innovations reported enhanced profitability alongside their environmental performance, suggesting a direct correlation between green technology implementation and business benefits.
Furthermore, digital technologies, integrating the Internet of Things (IoT) and data analytics, play a crucial role in advancing sustainable operational practices. These technologies enable real-time monitoring of resource usage, waste management, and energy consumption, thereby empowering organizations to make informed decisions regarding their environmental impact.

Innovations in agricultural practices represent another critical area where technology convergence is forming a new paradigm for sustainability in Malaysia. As the agricultural sector faces increasing pressures due to climate change and resource depletion, advanced technologies pave the way for enhanced productivity and sustainability. Zainol et al. (2024) notes that smart agricultural technologies, including precision farming tools, drone applications for crop monitoring, and advanced irrigation systems, are transforming traditional farming methods. These technologies reduce water use while maximizing crop yields and minimizing environmental degradation. The integration of digital technologies within agricultural practices enables farmers to adopt data-driven strategies. For instance, utilizing algorithms to analyze soil health and crop performance allows for targeted interventions that improve input efficiency (Zainol et al., 2024). As a result, farmers can reduce the amount of fertilizers and pesticides applied, leading to healthier ecosystems and reduced costs associated with unnecessary expenditures.

Moreover, mobile applications assisting in crop management and market access empower local farmers, enhancing their economic conditions while promoting sustainable practices. By fostering communication and innovation among agricultural stakeholders, these technologies help build resilient food systems capable of adapting to changing environmental conditions.

Environmental policies are vital in shaping the adoption of sustainable practices and technological innovations. Ojo et al. (2022) conduct a comprehensive review of existing environmental policies within Malaysia, noting the effectiveness of certain initiatives that encourage innovation among businesses. For instance, regulations that set clear sustainability benchmarks for industries compel organizations to integrate green technologies that meet environmental standards. The authors argue that policies fostering innovation—such as grants for research and development in green technologies or tax incentives for sustainable practices—have proven successful in driving developments within the Malaysian green sector. Khalid et al. (2024) provides a quantitative analysis evaluating the impact of these policies on company performance, revealing a strong correlation between government regulations and the adoption of environmentally sustainable practices. Their research indicates that firms that actively engage with policies promoting environmental sustainability often experience enhanced financial performance, suggesting that a conducive policy environment not only boosts sustainability efforts but also drives economic growth. However, it is essential to recognize the nuances and limitations within the existing frameworks. Policies that lack enforcement or clarity may hinder the intended outcomes. Collaborative approaches that involve various stakeholders, from policymakers to industries and communities, can significantly enhance the effectiveness of these environmental initiatives.

The significance of stakeholder engagement in environmental policymaking cannot be overstated. Masyhur et al. (2024) emphasize that involving communities in decision-making processes fosters a sense of ownership and responsibility toward sustainability initiatives. Engaging stakeholders, including local communities, non-profit organizations, and businesses—ensures a comprehensive understanding of the environmental challenges faced on the ground and encourages better-targeted solutions. Strategies to enhance public participation in sustainability initiatives can vary significantly. For example, educational programs aimed at raising awareness about environmental issues can enlist local communities in collaborative efforts to protect natural resources and promote sustainability. Workshops and outreach campaigns are vital tools to inform stakeholders about sustainability practices, enabling them to contribute actively toward environmental conservation (Masyhur et al., 2024).

Furthermore, leveraging technological platforms for public input in environmental governance empowers communities to share their perspectives and participate in monitoring environmental impacts. Digital engagement channels can facilitate faster communication between governments and communities, ensuring that the voices of all stakeholders are heard in policy formulation. In conclusion, by harnessing the potential of green technologies and nurturing strong stakeholder engagement in policy-making processes, Malaysia can effectively advance its environmental agenda. The interplay between technology, policies, and community initiatives forms a robust framework for achieving sustainability in the face of growing environmental challenges.

In light of the pressing need for enhanced green policies and the adoption of innovative technologies, it is crucial for policymakers to implement robust frameworks that effectively support sustainable practices. To bolster these initiatives, the following recommendations emerge, supported by recent research findings:

1. Development of Comprehensive Green Tax Frameworks: Saad et al. (2024) suggest that the current reliance on tax incentives alone is insufficient. A more dynamic approach that integrates both positive incentives and penalties for unsustainable practices could encourage businesses to adopt greener technologies. An optimal green tax framework should be characterized by elements that encourage compliance while facilitating innovation in environmentally friendly technologies.
2. Empowering SMEs through Financial Support: The positive correlation between environmental performance and financial stability for SMEs has been emphasized in

multiple studies. For example, Lee et al. (2023) highlighted that support from governmental policies has improved the adoption of sustainable practices among firms. Therefore, dedicating financial resources to provide SMEs with grants or low-interest loans can incentivize them to invest in green technologies and training programs that facilitate sustainable practices.

3. Investing in Education and Training Programs: An essential prerequisite for the successful implementation of green policies is educating business owners and employees about sustainability. Masyhur et al. (2024) found that a lack of awareness and understanding often hinders the adoption of green technologies. Thus, integrating sustainability education in the curriculum of vocational training and providing workshops can increase confidence and competence among workforce participants to implement green practices.
4. Enhancing Stakeholder Participation: Engaging various stakeholders, including the community, business owners, and non-governmental organizations, in the environmental policymaking process is critical. Studies like that of Ojo et al. (2022) have shown that participatory approaches lead to policies that are well-received and have a higher implementation success rate. Encouraging public forums and discussions during the policy formulation stage can help tailor solutions to specific community needs and provide feedback mechanisms for future revisions.
5. Promotion of Green Technologies: There exists a need for comprehensive strategies to promote the diffusion of green technologies within industries. Mubarik et al. (2021) outlined various technologies that have successfully reduced environmental footprints. Programs should not just focus on providing subsidies for technology adoption but also on creating awareness campaigns showcasing success stories and the long-term savings and operational benefits associated with green compliance.
6. Regulatory Frameworks to Foster Innovation: Frameworks that stimulate rather than stifle innovation should be developed. The studies emphasize that rigid regulations can lead to innovation stagnation. For instance, Jabir et al. (2022) indicated that flexible regulations allow companies, particularly in the technology sector, to explore novel solutions to meet environmental targets while spurring economic growth. Tailored regulations that reward innovation will ensure that firms remain competitive and environmentally responsible.
7. Long-term Monitoring and Implementation Plans: Effective policies must not only be instituted but continuously monitored for effectiveness. The establishment of metrics to evaluate the impact of policies relating to environmental sustainability enables municipalities and organizations to adapt and cater needed changes proactively (Idris et al., 2024). This alignment of evaluation with policy can ensure that strategies remain relevant and effective over time.

Future investigations are vital to reinforcing the landscape of technology and sustainability in Malaysia. Focused areas for upcoming research, which can significantly contribute to understanding and improving green policies and practices, include the following:

1. Exploring the Role of Emerging Technologies: Research should delve into how emerging technologies, such as artificial intelligence and blockchain, can enhance the sustainability of businesses. Tajudeen et al. (2020) emphasized the growing importance of these technologies in managing supply chains and reducing waste. Investigating the potential applications of such technologies in various contexts can provide foundational knowledge that supports practical applications and policymaking.
2. Impact of Consumer Behavior on Sustainability Initiatives: Analyses related to consumer preferences and their impacts on the adoption of sustainable practices in businesses could yield significant insights. Understanding what drives consumer shifts towards greener products could motivate companies to adjust their practices in alignment with market trends, fostering a win-win situation for both businesses and the environment.
3. Longitudinal Studies on Policy Effectiveness: Long-term studies that track the impacts of sustainability-oriented policies over time are warranted. Such research could provide evidence of the efficacy or shortcomings of certain strategies and guide future

policymaking while providing empirical data that illustrates success stories or necessary adjustments. This area is particularly relevant to communities implementing new policies in diverse sectors (Khalid et al., 2024).

4. Sector-Specific Sustainability Approaches: More comprehensive research is required to understand how different sectors can uniquely adopt and benefit from sustainability practices. For instance, while some sectors might benefit more from technological solutions, others might require a focus on education and community engagement. Specific studies on sectors such as agriculture, manufacturing, and services will ensure policies are tailored to the unique challenges they face. Zainol et al. (2024) indicated that considering sectoral nuances would yield better sustainability outcomes.
5. Barriers to Adoption of Technology: While numerous studies focus on the benefits of adopting new technologies, there is also a clear need to investigate the barriers preventing such adoptions. Understanding these impediments will allow stakeholders to develop targeted strategies that address specific issues, thus enabling smoother transitions to sustainable practices across various sectors (Idris et al., 2024).
6. Interrelation between Policy and Innovation: Research that examines the interplay between policy enforcement and innovation outputs can provide valuable insights into the effectiveness of current regulatory approaches in fostering creativity and technological advancements. This includes analyzing how compliance requirements can both hinder and facilitate innovation trajectories in businesses (Hamzah et al., 2022).

On one hand, environmental policies set the framework and regulations that encourage the adoption of sustainable practices across industries. For instance, the Malaysian government has instituted various sustainability initiatives to improve environmental performance, including the introduction of green financing and tax frameworks to incentivize businesses (Saad et al., 2024). By promoting such initiatives, policymakers can stimulate industries to invest in innovative technologies that support sustainable practices.

On the flip side, the adoption of green technologies provides the necessary tools and methodologies that help firms implement their sustainability strategies effectively. Technological advancements not only enhance operational efficiency but also enable compliance with environmental regulations. For instance, the use of Green Information Systems (Green IS) has been shown to positively influence environmental performance in organizations (Ojo et al., 2022). The fostering of technological innovations sets a foundation for industries to embrace sustainable practices, creating a cyclic pattern of improvement and commitment to sustainability.

Additionally, as industries evolve and incorporate new technologies, they provide feedback to policymakers, which can lead to further refinement and enhancement of environmental policies. As noted by Khalid et al. (2024), the influence of regulatory pressure significantly correlates with the adoption propensity of green innovations. Such interactions underscore the necessity for strategic cooperation between the government, corporations, and stakeholders to realize the full potential of sustainability initiatives in Malaysia.

In light of the evolving dynamics surrounding sustainable practices and technological innovations, it subsequently becomes apparent that further studies are warranted to uncover additional dimensions of this relationship. Future research can delve deeper into the effectiveness of green supply chain practices in the Malaysian context, particularly how they vary across different sectors and how technology can play a role in enhancing these efforts (Mubarik et al., 2021). Research suggests that addressing the complexities and challenges regarding technology adoption could directly correspond to improved environmental outcomes in the long term (Tajudeen et al., 2020).

Moreover, ongoing investigations into stakeholder engagement and community participation in the policymaking process will prove critical for advancing sustainable innovations in

Malaysia. Engaging local communities not only fosters a sense of ownership but also enhances the effectiveness of policies that aim to integrate sustainability into daily practices (Masyhur et al., 2024). Such participatory methods could enrich the feedback loop depicted in Figure 3, creating a more holistic approach to sustainability in the country. In summary, visual representations of sustainable practices and their technological interplay offer vital insights into the patterns and relationships essential for fostering effective sustainability policies in Malaysia. Each figure embodies a facet of the broader narrative that encompasses the interplay of technology, policy, and practices, assisting stakeholders in navigating the complexities of sustainability effectively.

4. Conclusion

In synthesizing the insights from the existing literature, this review underscores the pivotal role of technological innovations in fostering sustainable practices within the framework of Malaysia's environmental policies. The findings indicate a significant relationship between the adoption of green technology and the effectiveness of sustainability initiatives, albeit with notable challenges that need to be addressed, such as public awareness and stakeholder engagement. The emphasis on policy recommendations implores policymakers to create an inclusive environment that encourages innovation and sustainable practices among SMEs and larger corporations. Therefore, the need for longitudinal studies is crucial, as they will provide deeper insights into the long-term impacts of implemented strategies, guiding future efforts in enhancing Malaysia's sustainability agenda.

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ANALYSIS OF EQUITY RATIO AND OPERATING EXPENSES RATIO TO NET PROFIT MARGIN IN MSMES RIZKY JUICE FOR THE 2024 PERIOD

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Abstract

This study aims to analyze the financial performance of Rizky Juice MSMEs during 2024 using financial ratios in the form of *Equity Ratio* (ER), *Operating Expenses Ratio* (OER), and *Net Profit Margin* (NPM). The data used are monthly financial statements from January to December 2024 obtained through field observations and direct interviews. The research methodology used in this study is quantitative analysis with a descriptive approach and multiple linear regression. The results of the analysis show that the business has a very strong capital structure, stable operational efficiency, and profitability that increases over time. Multiple linear regression tests showed that ER and OER had a significant influence on NPM, both simultaneously and partially. The R^2 value of 17.4% indicates that the model explains only a small fraction of the NPM variation, so other factors beyond ER and OER need to be explored further. Based on these findings, it is recommended that business owners consider external financing, improve cost control, diversify products, and undergo management training to support sustainable growth.
Keywords: Financial performance; Financial ratios; MSMEs.

1. Introduction

Micro, Small, and Medium Enterprises (MSMEs) have an important role in contributing to employment and income equity in the growth of the real sector. More than 99% of business actors in Indonesia are classified as MSMEs, making them important actors in maintaining economic stability, especially in the midst of global uncertainty. However, MSMEs also have challenges in efforts to optimize finances. Common problems that often occur include weak financial records, a lack of managerial understanding, and low efficiency in controlling operational costs. One of the main obstacles lies in the capital structure that depends on private capital and the difficulty of accessing formal financing. This condition leads to a low *Equity Ratio (ER)* and a high *Operating Expenses Ratio (OER),* which reflects a large operating expense on revenue. This imbalance has the potential to reduce the level of business profitability, especially in generating optimal net profits. Therefore, further analysis of how capital structure and operational cost efficiency affect the profitability of MSMEs is also needed.

In general, profitability is the main indicator in assessing the financial success of a company. This ratio measures a company's ability to profit from various business activities carried out. Profitability also has a strategic role in attracting investors, ensuring business survival, and being the basis for the formulation of short-term and long-term managerial policies. One of the most widely used measures of profitability is *Net Profit Margin* (NPM). NPM is a financial ratio that measures the percentage of net profit to total revenue or sales. In other words, NPM shows how much net profit is generated from each unit of sales.

NPM is an important indicator that reflects the company's effectiveness in managing revenue and reducing overall operating expenses. Even though the company recorded high sales, net profit could still be low if operating costs, interest, or taxes were too large. Therefore,

maintaining a balance between revenue and expense efficiency is key to maintaining optimal NPM. NPMs also have strategic value in decision-making, such as pricing, cost control, and expansion plans. However, in practice, NPM levels vary between companies depending on cost structure, business strategy, and managerial efficiency. This indicates that further analysis of the factors influencing NPM in order to increase profitability on a sustainable basis is needed.

In an effort to understand the factors that affect profitability, ER and OER are two important indicators that are worth analysing. ER reflects the proportion of business funding that comes from its own capital. Theoretically, the higher the ER, the less reliance on debt will decrease, so the interest expense is reduced and the net profit tends to increase. However, in practice, this relationship is not always appropriate. Meanwhile, OER is used to assess business efficiency in managing operational costs to revenue. The lower this ratio, the more efficient the company will be in reducing costs to generate revenue. However, a high OER does not necessarily mean low profitability, especially if the volume of revenue is very large. Therefore, neither ER nor OER necessarily has a linear relationship with profitability, i.e., NPM.

In MSMEs, Rizky Juice shows the importance of this analysis. Despite having good market opportunities, the business experienced profit fluctuations due to an imbalance between capital structure and cost efficiency. In this context, a deeper understanding of the extent to which ER and OER affect NPM is needed so that MSMEs can make more appropriate and sustainable financial decisions. The following is the financial statement data of Rizky Juice's MSMEs, which are analyzed to measure the financial condition of the business during the 2024 period based on financial ratios:

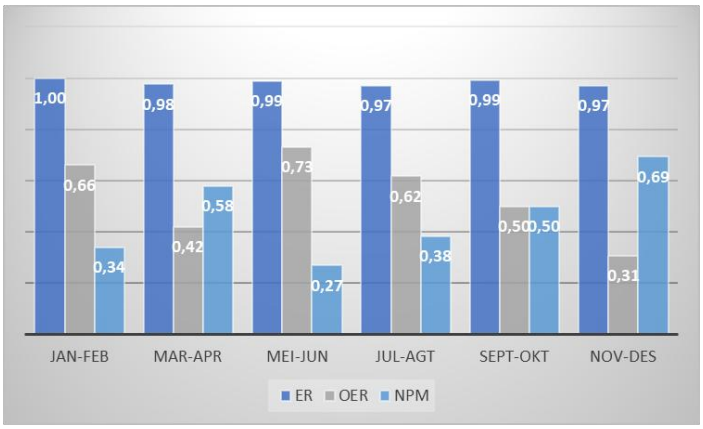

Fig. 1. Analysis Chart of Rizky Juice's MSME Financial Ratio as of 2024

Based on Rizky Juice's MSME financial statement data for 2024, an analysis was carried out on three financial ratios, namely ER, OER, and NPM. The results of the analysis tend to remain at 0.97 to 1.00, indicating that operational efficiency still needs to be improved. Then OER went up and down, with the highest value occurring in May-June (0.73) and the lowest in November-December (0.31). Meanwhile, NPM moved in the opposite direction to OER, which was lowest in May-June (0.27) and highest in November-December (0.69). This shows that the more efficient the operational costs, the greater the profits obtained.

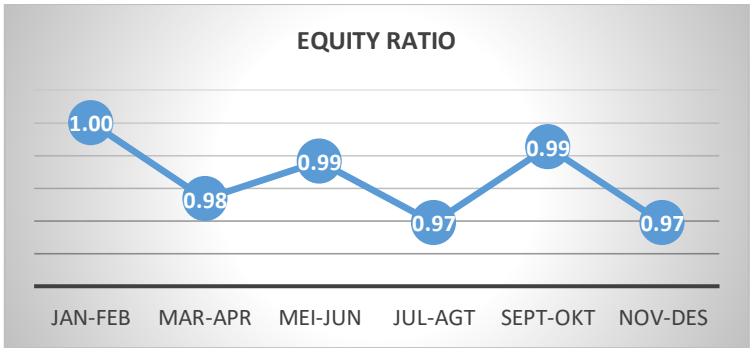

Fig. 2. Equity Ratio Analysis Results

Based on the graph, it can be seen that throughout 2024 the value of the ER shows a pattern in the form of fluctuations with values in the range of 0.97 to 1.00. The highest value was recorded in January–February of 1.00, which indicates that the entire revenue is used to cover operating costs, so the efficiency is very low. Meanwhile, the lowest values were reached in July–August and November–December at 0.97, indicating a slight improvement in efficiency. However, overall, the fluctuations that occurred were very small, indicating that there was no significant change in the company's operational efficiency throughout the year.

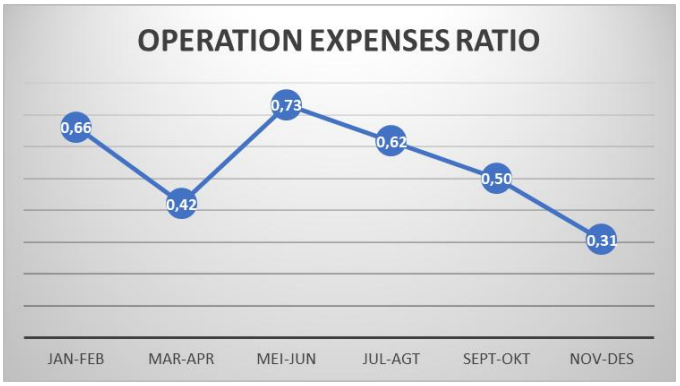

Fig. 3. Operation Expenses Ratio Analysis Results

Furthermore, based on OER analysis, it is evident that the value of the Operating Expense Ratio (OER) exhibits significant fluctuations throughout the year. The highest OER was recorded in the May-June period, at 0.73, indicating a high proportion of operating costs to revenue. In contrast, the lowest OER occurred in November–December at 0.31, indicating more efficient operating expenses. Overall, the month-to-month change in OER reflects differences in effectiveness in controlling operating costs throughout the year.

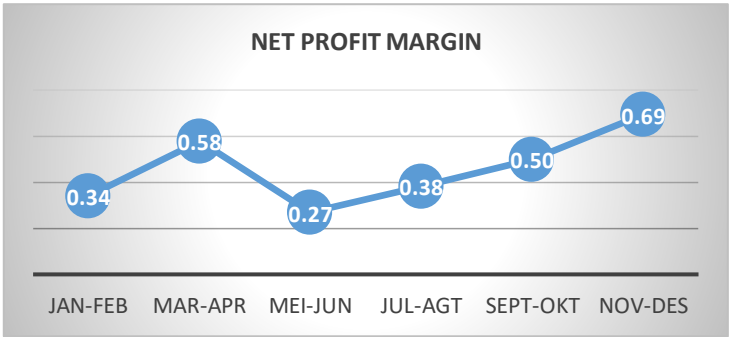

Fig. 4. NPM Analysis Results

Based on the NPM data in the figure, it can be seen that the NPM value fluctuates throughout the year. The lowest NPM occurred in the third period of 0.27, indicating the smallest net profit relative to revenue. Meanwhile, the highest NPM occurred in the last period with a value of

0.69, reflecting the most favorable financial performance. In general, there is an upward trend in NPM towards the end of the year, which indicates an improvement in cost management or an increase in net income. This shows that the company's profitability increases over time.

Through this analysis, it aims to obtain an overview of how much personal capital efficiency (equity) of Risky Juice MSMEs on business assets financed by their own capital compared to the total assets owned, measure how high the level of business operational efficiency is in managing costs on revenue or sales and see an overview of the level of net profit of the business after deducting operational expenses.

2. Methodology

The data in this study are primary and secondary data. Primary Data is direct data obtained by researchers from the first source (Sri Anjarwati et al., 2024). In this study, primary data is in the form of direct interviews with MSME owner Rizky Juice and secondary data through the collection of financial statement documents during 2024, such as cash, equipment, inventory, revenue, and operational costs. The data source used in this study is an internal data source, namely, data obtained from Risky Juice MSME business owners who are the object of direct research. Internal data sources include official company-owned documents that reflect real business activities, such as monthly financial statements, transaction records, and expense recaps (Sri Anjarwati et al., 2024). This internal data is used to calculate financial ratios such as ER, OER, and NPM, which are the main focus of this study's analysis. The population is the whole object in collecting the necessary research data (Sugiyono, 2021). The population in the study is all the financial statements of Rizky Juice MSMEs during 2024. The data includes financial information from January to December.

Samples are a part of the number and characteristics possessed by the population, which are used as a data source in the study (Sugiyono, 2021). In this study, because the population only consists of twelve financial statements of Rizky Juice MSMEs during 2024 (January-December), all population data is used in the analysis. Therefore, the total sampling method is used, which is a technique in which all elements of the population are used as research samples. The use of total sampling was carried out because the amount of data was not too large and was entirely relevant to the purpose of the research.

The data retrieval technique used in this study is a field research method (*Field Research*), which is a data collection technique that is carried out by going directly to the location of the research object to obtain real information (Sugiyono, 2021). This study uses physical observation methods and unstructured interviews to explore financial data from Rizky Juice MSMEs during the 2024 period. The field research method is a data collection technique by conducting a direct review of the field that is the object of the research, in order to obtain data that is in accordance with the research objectives (Kalengkoangan et al., 2021) Unstructured interviews were chosen so that the researcher had flexibility in digging up information, especially regarding financial statements and business operational activities, based on the answers and situations that developed during the interview process.

This research was conducted on one of the MSMEs in the field of healthy beverages, namely Rizky Juice, which aims to analyze the financial performance of the business in the 2024 period. This study uses two independent variables, namely Equity Ratio (ER) as X1 and Operating Expenses Ratio (OER) as X2, as well as one dependent variable, namely Net Profit Margin (NPM) as Y.

1. Equity Ratio (ER)

Equity Ratio is a ratio that describes how much of the company's total assets are financed using its own capital (Ali, Hasan, & Machmud, 2022). This ratio describes the level of

independence of a company in its capital structure and its ability to run operations without a high dependence on external loans. The higher the ER value, the more stable the company's financial condition is because it relies more on internal funds.
This ratio is used to measure solvency, which is the ability of a company to bear all its obligations with its own capital. The formula for calculating ER in this study (Fauziah, 2023):

$$\text{Equity Ratio} = \text{Equity} / \text{Total Assets} \times 100\% \quad (1)$$

Interpretation:
- < 40%: high dependence on debt.
- 40%–60%: balanced capital structure.
- > 60%: predominance of financing by equity, companies tend to be safer.

Thus, ER is used as an indicator of Rizky Juice's level of financial stability in running his business.

2. Operating Expenses Ratio (OER)

Operating Expenses Ratio measures the proportion of operational costs to sales (Faizal. 2022). The greater the value of OER, the greater the portion of revenue used for operating expenses, which can reduce net profit.
The purpose of using OER is to assess the operational efficiency of a company. The calculation formula is (Sulasmy & Cahyaningtyas, 2021).

$$\text{Operating Expenses Ratio} = \text{Operating Expenses} / \text{Net Sales} \times 100\% \quad (2)$$

Interpretation:

i. > 80%: low efficiency, operational load is too large.
ii. 60%–80%: Efficiency is moderate.
iii. < 60%: high efficiency, controlled operational load.

Therefore, OER is used as a reference to assess Rizky Juice's ability to manage business costs efficiently.

3. Net Profit Margin (NPM)

Net Profit Margin is the ratio used in measuring the percentage of net profit to net sales generated by the company (Nurul et al., 2024). The higher the NPM value, the greater the net profit generated after deducting all operating expenses.
This ratio is used to assess the level of profitability of a company. The NPM calculation formula from Pardosi (2021) is:

$$\text{Net Profit Margin} = 100\% \text{ Net Profit} / \text{Net Sales}$$

Interpretation:

i. < 5%: low profitability, small profit margin.
ii. 5%–15%: the profit rate is quite good.
iii. > 15%: high profitability, the company is very efficient in generating profits.

NPM in this study is used as the main indicator to assess financial performance and the level of net profit obtained by Rizky Juice from its business activities.

This study uses a data analysis method with a quantitative approach, namely a research method that utilizes statistical tools and mathematical calculations to measure and describe the analyzed data (Sugiyono, 2021) Meanwhile, the analysis model used in this study uses multiple regression analysis. Before conducting hypothesis testing, it is necessary to first carry

out a classical assumption test. The purpose of this test is to ascertain whether the resulting parameters are valid and reliable. Therefore, if a violation of basic assumptions is found, it is necessary to carry out further testing and adjustments. Classical assumptions tests in regression analysis include normality, multicollinearity, heteroscedasticity, and autocorrelation tests.

The purpose of the normality test is to assess whether the data in the regression model is normally distributed, which is one of the requirements in classical regression analysis (Ghozali, 2021). Because the number of samples of the variable < 50, the results in the statistical test refer to the results of the value *Shapiro-wilk* Namely a statistical test used to test the normality of data. This test calculates the W statistic, which compares the actual data sequence with the expected data sequence if the data were normal.

To determine whether the data is normally distributed or not, the following decision-making basis is used:

i. If the significance value (sig.) is less than 0.05, then H_0 is rejected, which means the data does not follow the normal distribution.
ii. Conversely, if the significance value (sig.) is more than 0.05, then H_0 is accepted, which indicates that the data is normally distributed.

The heteroscedasticity test was carried out to find out whether in the regression model there is a difference in residual variance between observations. If the residual variance is constant from one observation to another, this condition is called homoscedasticity. However, if the variance is not the same, it is called heteroscedasticity. In this test, the white and scatterplot test methods were used.

To find out whether there is a heteroscedasticity problem or not, the basis for decision-making is as follows:

i. If the chi-squared value is calculated to be smaller than the chi-squared table, then it is concluded that there are no symptoms of heteroscedasticity.
ii. If the chi-squared value is calculated to be greater than the chi-squared table, then it is concluded that a symptom of heteroscedasticity occurs.

The multicollinearity test aims to evaluate whether there is a correlation relationship between independent variables in the regression model. Ideally, a good regression model does not show a correlation between its independent variables. This test also aims to measure the tightness of relationships between independent variables through correlation coefficients. In this study, *the Variance Inflation Factor* (VIF) value was used to detect multicollinearity to measure the variability of independent variables as dependent variables and the regression to other independent variables. In general, the critical value used to declare multicollinearity is that if the VIF value is < 10, then multicollinearity does not occur. Meanwhile, if the VIF value is > 10, then multicollinearity occurs (Ghozali, 2021).

The autocorrelation test was performed to detect whether there was a correlation between the residual in one observation and the residual in the other observations in sequence of time. A regression model is said to be good if it does not contain autocorrelation. In this study, autocorrelation testing was carried out using the Durbin-Watson method (DW test). The guidelines for determining whether or not there is an autocorrelation are based on certain criteria, which are described as follows Ghozali, (2021):

Table 1. Hypothesis Null

Hipotesis Nol	Keputusan	Jika
Tidak ada autokorelasi positif	Tolak	0 < d < dl
Tidak ada autokolerasi positif	No decision	Dl < d <du
Tidak ada korelasi negatif	Tolak	4-dl < d< 4

Tidak ada korelasi negatif	No decision	4-du ≤ d ≤ 4-d
Tidak ada autokorelasi positif dan negatif	Tidak ditolak	Du <d<4,-du

Multiple regression is a statistical technique used to evaluate the relationship between several independent variables and one dependent variable. The purpose of this analysis is to find out how much influence independent variables have on dependent variables, either collectively (simultaneously) or separately (partially) (Zulaikha & Hamni, 2022). Here's a model of this analysis equation:

$$Y=a+b1X1+b2X2+e \quad (3)$$

Where:
Y = bound variable (e.g. NPM or profitability)
a = constant (intercept)
b_1, b_2 = the regression coefficient of each independent variable
X_1, X_2 = independent variables (e.g. ER and OER)
e = error (residual)

1. Coefficient of Determination (R2)

R^2 shows how large the proportion of bound variables can be explained by the independent variables in a model. If the value of R^2 is close to 1, then this indicates that the independent variables (X1 and X2) have a strong influence on the dependent variables (Y).

2. Simultaneous Test (f)

The F test is a statistical tool in multiple regression that is used to evaluate whether all independent variables together have a significant influence on the dependent variable. This test was carried out to assess the simultaneous influence of variable X on variable Y.

The basis for decision-making is as follows:
a. If the value of F is calculated ≤ F of the table, then H_0 is accepted and H_1 is rejected, which means that simultaneously independent variables have no significant effect on the dependent variables.
b. If the value of F is calculated > F of the table, then H_0 is rejected and H_1 is accepted, indicating that simultaneously independent variables have a significant effect on the dependent variables.

3. Partial Test (t)

The use of Partial Test aims to see the effect of variable X on variable Y, with the following criteria:
a. If t calculates ≤ t table, then H0 is accepted and H1 is rejected which means that this research is partially ineffective.
b. If t calculates > t table, then H0 is rejected and H1 is accepted, which means that this research is partially influential.

3. Results and Discussion

Based on the results of the calculation of financial statement data on Rizky Juice MSMEs owned by Amiirul Nasution's brother for the 2024 period, using the ER formula. So, the following results were obtained:

Table 2. ER Analysis Presentation Results

Month	Total Equity	Total Assets	ER
JANUARI	Rp2,466,667	Rp2,466,667	1,00
FEBRUARY	Rp2,933,334	Rp2,933,334	1,00
MARCH	Rp4,200,000	Rp4,300,000	0,98
APRIL	Rp4,125,000	Rp4,225,000	0,98
MAY	Rp4,525,000	Rp4,675,000	0,97
JUNE	Rp4,625,000	Rp4,675,000	0,99
JULY	Rp3,612,000	Rp5,160,000	0,95
AUGUST	Rp4,625,000	Rp7,740,000	0,95
SEPTEMBER	Rp3,612,000	Rp3,648,000	0,99
OCTOBER	Rp6,708,000	Rp6,772,000	0,99
NOVEMBER	Rp5,080,000	Rp5,185,000	0,98
DECEMBER	Rp9,434,285	Rp9,629,285	0,98

Based on financial data from January to December, Rizky Juice's business showed a stable and high equity-to-asset (ER) ratio, ranging from 0.95 to 1.00. Highs of 1.00 were observed in January and February, indicating that all assets are financed by equity. In contrast, lows of 0.95 were recorded in July and August, which still indicate healthy financial conditions. The high ER reflects a strong financial structure and minimal reliance on debt, as most assets are financed by the owner's capital, and profits are retained. The average ER is close to 1, indicating that the business is in a good solvency position.

Based on the results of the calculation of financial statement data on Rizky Juice's MSMEs owned by Amiirul Nasution's brother for the 2024 period, using the OER formula. So, the following results were obtained:

Table 3. Presentation Results of OER Analysis

Month	Total Operational C	Total Income	OER
JANUARI	Rp3,533,333	Rp5,000,000	0,71
FEBRUARY	Rp3,561,666	Rp5,295,000	0,33
MARCH	Rp3,800,000	Rp5,300,000	0,72
APRIL	Rp3,700,000	Rp5,825,000	2,74
MAY	Rp3,675,000	Rp6,150,000	0,60
JUNE	Rp3,580,000	Rp6,450,000	0,56
JULY	Rp3,213,333	Rp7,023,333	0,46
AUGUST	Rp3,660,000	Rp8,500,000	0,43
SEPTEMBER	Rp3,442,000	Rp5,960,000	0,58
OCTOBER	Rp3,400,000	Rp8,108,000	0,42
NOVEMBER	Rp3,215,000	Rp5,945,000	0,46
DECEMBER	Rp3,306,000	Rp10,240,285	0,32

From the January to December monthly financial analysis, it is known that Rizky Juice experienced fluctuations in operating costs and revenue, which had an impact on the value of the operating expense to revenue ratio (OER). The OER value varies between 0.32 and 2.74, depending on the month. The highest OER occurred in April (2.74), indicating spending that far exceeded revenue, a condition that reflects inefficiencies or significant sales declines. In contrast, the lowest OER was recorded in December (0.32), indicating that only a small portion of the revenue was used for operations, which means efficiency was excellent. In general, low OER reflects cost efficiency, and from July to December, there is a downward trend and stabilization of OER below 0.60. This indicates consistent cost management improvements in the second half of the year.

Based on the results of the calculation of financial statement data on Rizky MSMEs *Squirrelly* belonging to Amiirul Nasution's brother for the 2024 period using the NPM formula. So the following results were obtained:

Table 4. NPM Analysis Presentation Results

Month	Net Profit	Net income	NPM
JANUARI	Rp1,466,667	Rp5,000,000	0,29
FEBRUARY	Rp1,733,334	Rp5,295,000	0,33
MARCH	Rp1,500,000	Rp5,300,000	0,28
APRIL	Rp2,125,000	Rp5,825,000	0,36
MAY	Rp2,475,000	Rp6,150,000	0,40
JUNE	Rp2,870,000	Rp6,450,000	0,44
JULY	Rp3,810,000	Rp7,023,333	0,54
AUGUST	Rp4,840,000	Rp8,500,000	0,57
SEPTEMBER	Rp2,518,000	Rp5,960,000	0,42
OCTOBER	Rp4,708,000	Rp8,108,000	0,58
NOVEMBER	Rp2,730,000	Rp5,945,000	0,46
DECEMBER	Rp6,934,285	Rp10,240,285	0,68

During the January to December period, Rizky Juice showed a stable profitability performance, with Net Profit Margin (NPM) in the range of 0.28 to 0.68. NPM measures how much net profit is obtained from each rupiah of income. The highest NPM occurred in December (0.68), reflecting remarkable efficiency in converting revenue into profit. On the other hand, the lowest NPM was recorded in March (0.28), which although lower, is still good for the MSME scale.

Throughout May to December, there was a stable and consistent trend of increasing NPM above 0.40. This shows that businesses are becoming more effective in managing costs and increasing net profits. This increase is most likely the result of a good strategy, such as operational efficiency, increased sales, or price adjustments that match the value of the product. In addition, the low OER ratio also supports the achievement of higher profit margins.

Table 5. Normality Test Results

	Kolmogorov-Smirnova			Shapiro-Wilk		
	Statistics	Df	Sig.	Statistics	Df	Sig.
NPM	.122	12	.200*	.957	12	.735

Based on the results of the normality test that has been carried out, the results of the Shapiro-Wilk test have a significance value of 0.735 > 0.05, and the results of the test show normally distributed data. The heteroscedasticity test aims to find out whether in the regression model there is a difference in residual variance between observations. In other words, this test is performed to ascertain whether or not the variance of the error (residual) is constant from one observation to another. Based on the results of the analysis, the heteroscedasticity test through the White method and scatterplot produced the following findings:

Table 6. White Test Results

Type	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.314a	.098	-.240	.01578

N * *R Square* = 12 * 0.098 = 1.2
Chi-Square Table 7.81473 (Df = 3)

Based on the results above, it is evident that Chi Square < Chi Squared Table (1.2 < 7.81473). Therefore, it is concluded that there are no symptoms of heterogeneity.

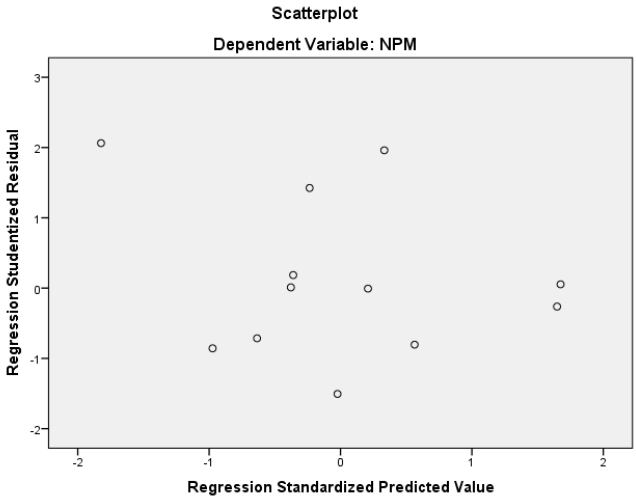

Fig. 5. Scatterplot Test Results

In the scatterplot, the dots are scattered randomly, either above or below the zero line on the vertical axis (Y axis). Therefore, it can be concluded that this regression model does not experience heteroscedasticity problems.

Table 7. Multicollinearity Test Results

Type		Collinearity Statistics	
		Tolerance	VIVID
1	ER	.999	1.001
	OER	.999	1.001

From the table of coefficients obtained, the value of VIF = 1.001. This means that the VIF score is < 10 (1,001 < 10). Thus, it can be concluded that there are no symptoms of multicollinearity among the free variables.

Table 8. Autocorrelation Test Results

Type	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.511a	.261	.050	.11608	1.778

Based on the Model Summary table, the *Durbin-Watson* value (DW) was obtained as 1.778. By calculating four minus the value of dU (4 - 1.5794), 2.4206 is obtained. Since the DW value is between dU and 4-dU, i.e., 1.5794 < 1.778 < 2.4206, it can be concluded that there are no autocorrelation problems in this model.

Table 9. Multiple Regression Test Results

Type		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIVID
1	(Constant)	3.843	2.038		1.885	.092		
	ER	-3.422	2.081	-.451	-1.645	.134	.999	1.001
	OER	-.064	.052	-.333	-1.216	.255	.999	1.001

$$Y= 3.843 - 3.422 X1 - 0.064 X2 \quad (4)$$

i. The constant value of 3.843 indicates that if the variables X1 and X2 are equal to zero, then the predicted value of variable Y is 3.843.
ii. The regression coefficient for the X1 variable of -3.422 means that every one unit increase in X1 will result in a decrease in the Y variable by 3.422.
iii. The regression coefficient for the X2 variable of -0.064 indicates that every one-unit increase in X2 will decrease the value of the Y variable by 0.064, and vice versa.

Table 10. Determination Coefficient Test Results

Type	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.569a	.324	.174	.11391

The Adjusted R Square value of 0.174 shows that the contribution of independent variables to dependent variables simultaneously is 17%. In other words, about 17% of the variation in dependent variables can be explained by independent variables in this regression model. The Adjusted R Square value of 0.174 means that about 17.4% of the change or variation in variable Y can be explained by the combination of the variables X1 and X2 in this model. In other words, this model is very effective in explaining the relationship between the independent variables (X1 and X2) and the dependent variable (Y). The remaining 82.6% came from factors outside the model, such as other variables that had not been included or errors in the data.

Table 11. Simultaneous Test Results

NEW ERA						
Type		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	.056	2	.028	12.820	.002b
	Residual	.020	9	.002		
	Total	.076	11			

Sig. of 0.002 (<0.05), it can be concluded that *independent variables* have a significant effect simultaneously on *dependent* variables.

Table 12. Partial Test Results

Type		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.843	.836		4.598	.001
	ER	-3.422	.853	-.682	-4.011	.003
	OER	-.064	.021	-.504	-2.965	.016

a. Dependent Variable: Y1

i. The significance value (Sig.) for the X1 variable is 0.003, which is smaller than 0.05, so it can be concluded that the X1 variable has a significant influence on the Y variable.
ii. The significance value (Sig.) for variable X2 is 0.016, which is also smaller than 0.05, so it can be concluded that variable X2 has a significant effect on variable Y.

4. Conclusion

Based on the analysis of financial statements and statistical tests, it can be concluded that the capital structure of Rizky Juice's MSMEs is relatively strong, with an average Equity Ratio (ER) of approximately 1.00, indicating a low dependence on debt. *The Operating Expenses Ratio* (OER) tends to be efficient when it is below 0.60, despite spikes in costs in certain months. NPM shows a positive trend, with a significant increase at the end of the year. The results of multiple linear regression confirm that ER and OER have a significant influence on NPM, both simultaneously and partially. This research model explains a 17.4% variation in profitability, suggesting that other factors also influence it.

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ANALYSIS OF THE EFFECT OF SERVICE QUALITY ON DANA APPLICATION USER SATISFACTION USING THE SERVQUAL DIMENSION

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Abstract

This study aims to analyze the effect of service quality on user satisfaction with the DANA digital wallet application, specifically in the city of Medan. Using the SERVQUAL model framework, which includes the dimensions of Tangibles, Reliability, Responsiveness, Assurance, and Empathy, this study measures user perceptions and expectations. Data was collected through a survey of 122 active DANA users in Medan. The results of the multiple linear regression analysis indicate that four SERVQUAL dimensions—Tangibles, Reliability, Responsiveness, and Assurance—have a positive and significant influence on user satisfaction. However, the Empathy dimension does not show a significant influence, indicating that in the context of digital services, functional and technical aspects are prioritized over personal attention. The gap analysis also revealed negative gaps in all dimensions, where users' perceptions of DANA's service performance were still lower than their expectations, with the largest gap in the Reliability dimension. Thus, this study concludes that to improve user satisfaction, DANA needs to prioritize improvements in reliability, responsiveness, security assurance, and application appearance.
Keywords: Service quality; User satisfaction; Digital wallet.

5. Introduction

The development of digital technology has driven transformation in various aspects of life, including in the financial sector. One form of digital innovation that is growing rapidly in Indonesia is the digital wallet (e-wallet), which facilitates fast and practical cashless transactions via mobile devices. According to data from Bank Indonesia (2023), e-wallet transactions have increased by more than 38% in the past year, reflecting the high adoption of app-based financial services among the public.

The rapid development of financial technology (fintech) has changed consumer expectations, demanding not only convenience but also a high-quality service experience. One fintech platform that has gained significant attention in Indonesia is DANA, a digital wallet service that offers various transaction capabilities such as bill payments, transfers, and online shopping. As user adoption increases, especially among young people in urban areas such as Medan, understanding how service quality dimensions affect user satisfaction is becoming increasingly important (Utomo & Yasirandi, 2024).

Service quality plays a central role in determining user satisfaction levels, particularly in the context of digital services. The SERVQUAL model, which encompasses the dimensions of tangibles, reliability, responsiveness, assurance, and empathy, serves as a widely used framework for measuring perceptions of service quality and its impact on customer satisfaction. Recent studies have emphasized the relevance of SERVQUAL in digital environments, including in electronic wallet services such as DANA (Nurcahyo et al., 2023) and within a conceptual framework of user satisfaction based on the gap between perception and expectation (Fainusa et al., 2019).

The significance of this study lies in its focus on the application of DANA in the city of Medan, one of the regions with the fastest growth in digital users in Indonesia. While previous research has examined fintech adoption and user satisfaction at the national level, studies at the regional level remain limited. This research fills this gap by exploring the specific perceptions and expectations of DANA users in Medan, providing insights for the development of locally oriented service design and user experience (Wahyuni et al., 2023).

The novelty of this study lies in its dual approach, combining gap analysis between expectations and perceptions with regression modeling to evaluate the individual influence of each SERVQUAL dimension on user satisfaction. Unlike previous studies that only focused on descriptive or inferential analysis, this study provides a comprehensive picture of how service quality mismatches can manifest as measurable user dissatisfaction (Utomo & Yasirandi, 2024).

Thus, the objectives of this study are: (a) to assess the gap between users' expectations and perceptions of DANA's service quality, and (b) to identify which SERVQUAL dimensions significantly influence user satisfaction. By achieving these objectives, this study aims to provide practical recommendations for improving the quality of digital services on fintech platforms, particularly electronic wallets such as DANA, which face tough challenges in maintaining customer satisfaction and loyalty (Ramadhan et al., 2023).

2. Methodology

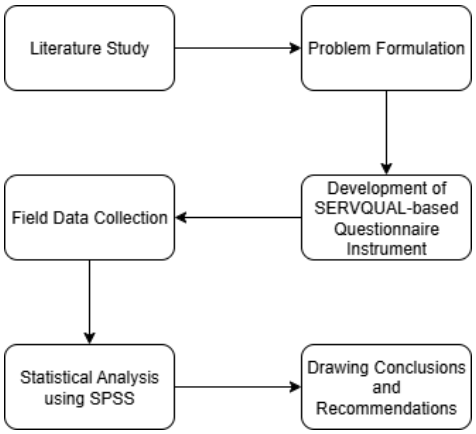

Fig. 1. Research Stages

This research was conducted through several systematic and structured stages to ensure that the process was carried out in accordance with scientific principles. The first stage was a literature study to identify basic concepts related to service quality, customer satisfaction, and the application of the SERVQUAL method to digital and financial services. This study also aimed to identify research gaps in previous literature.

The second stage was the formulation of research problems and objectives based on literature findings and phenomena observed in the field, particularly those related to the user experience of the DANA application in Medan City. From this formulation, hypotheses were established to be tested empirically. The third stage was the development of a questionnaire instrument based on the SERVQUAL dimensions. The indicators in the questionnaire were developed considering the characteristics of digital services, covering two main parts: user expectations and perceptions. The fourth stage is data collection. Data collection was conducted using online and offline survey methods to reach a broader and more representative sample of respondents. The target respondents were active users of the DANA application in Medan City who met specific criteria.

The fifth stage is data analysis. Data is analyzed using SPSS version 22, including validity and reliability testing of the instrument, descriptive analysis, and multiple linear regression to test the influence of the SERVQUAL dimensions on user satisfaction. The final stage is the interpretation of results, drawing conclusions, and formulating practical recommendations that can be used by DANA app managers and other digital wallet industry players. The entire process follows the quantitative framework as suggested by Creswell (Gabel et al., 2014).

User satisfaction is measured as an overall evaluation of the application services used. In the context of digital wallets, satisfaction reflects perceptions of the benefits, convenience, security, and quality of interaction during application use (Setiawan & Trianasari, 2023). DANA is a popular digital wallet in Indonesia, providing services such as payments, top-ups, and transfers. These services are widely used by various groups, making them relevant subjects for studies on user satisfaction and fintech service quality (Wati et al., 2024). SERVQUAL is a service quality measurement model developed by Parasuraman et al. (1988) and covers five main dimensions: tangibles, reliability, responsiveness, assurance, and empathy (Parasuraman et al., 2017). Each dimension is measured through indicators tailored to the digital wallet context.

This study tests five hypotheses, each representing the influence of one dimension of SERVQUAL on user satisfaction:

a) H1: Tangibles have a positive effect on user satisfaction.
b) H2: Reliability has a positive effect on user satisfaction.
c) H3: Responsiveness has a positive effect on user satisfaction.
d) H4: Assurance has a positive effect on user satisfaction.
e) H5: Empathy has a positive effect on user satisfaction.

The questionnaire was divided into two parts: the first part measured expectations and perceptions using a 1–5 Likert scale, and the second part measured user satisfaction. Validity was tested using item-total correlation, and reliability using Cronbach's Alpha. Data analysis was performed using multiple linear regression and gap analysis to measure the difference between expectations and perceptions of service (Hery et al., 2024).

The population in this study includes individuals who are active users of the DANA application residing in Medan City. The population criteria are determined based on users who have actively used the DANA application for more than three months and are over 17 years of age. This population is considered representative for assessing user perceptions of digital wallet services (Setiawan & Trianasari, 2023).

The sampling technique used in this study was convenience sampling, which is a method of selecting samples based on the availability and willingness of respondents to participate in the study. This technique was chosen because it allows researchers to obtain data efficiently from individuals who are easily accessible, especially in the context of financial technology (fintech) studies, where digital users tend to be more responsive and easily accessible through online platforms. The use of this technique is also supported by previous research indicating that convenience sampling is an appropriate approach for recruiting respondents who are users of digital applications, as explained by (Wati et al., 2024). Data collection was conducted through an online survey using Google Forms. The survey link was disseminated through social media and the DANA user community in Medan. This method was chosen because it is efficient and can reach respondents who have direct experience using the application in their daily lives (Sukandar & Febrianta, 2025).

3. Results and Discussion

This study involved 122 respondents who are active users of the DANA app in Medan City. Based on demographic characteristics, the majority of respondents were female (63.1% or 77 people), while males numbered 45 people (36.9%). The majority of respondents were in the 17-25 age group (57.4%), followed by the 26-35 age group (32.8%), and the remainder were over 36 years old (9.8%). The duration of DANA app usage among respondents also varied, with the largest group (42.6%) having used the app for 1 to 2 years. Users with a usage duration of 7-12 months accounted for 27.9%, over 2 years for 23%, and 3-6 months for 6.6%.

Table 1. Characteristics of Respondents

Characteristics	Category	Number	Percentage (%)
Gender	Male	45	36,9%
	Female	77	63,1 %
Age	17 - 25 years	70	57,4 %
	26 - 35 years	40	32,8 %
	> 36 years	12	9,8 %
Duration of Use	3 months – 6 months	8	6,6 %
	7 months – 12 months	34	27,9 %
	1 year – 2 years	52	42,6 %
	> 2 years	28	23 %

Table 2. Validity Test Results

No	Statement Item	Dimensions	Data Types	r-count	r-table	Description
1	The DANA app has an attractive interface and is easy to use.	Tangibles	Perception	0,394	0.1764	Valid
2	The information in the DANA app is presented clearly and is easy to understand.	Tangibles	Perception	0,323	0.1764	Valid
3	The features in the DANA app are comprehensive and easy to use.	Tangibles	Perception	0,456	0.1764	Valid
4	The DANA app rarely experiences disruptions when in use.	Reliability	Perception	0,626	0.1764	Valid
5	Transactions via DANA are carried out according to the promised time.	Reliability	Perception	0,452	0,1764	Valid
6	DANA is reliable for daily transaction needs.	Reliability	Perception	0,471	0,1764	Valid
7	DANA customer service responded quickly to my complaint.	Responsiveness	Perception	0,408	0,1764	Valid
8	The DANA app provides an effective solution when problems arise.	Responsiveness	Perception	0,421	0,1764	Valid
9	The help feature in the DANA app is easy to access.	Responsiveness	Perception	0,479	0,1764	Valid
10	I feel safe using DANA for financial transactions.	Assurance	Perception	0,396	0,1764	Valid
11	I am confident that my personal information is secure when using DANA.	Assurance	Perception	0,399	0,1764	Valid
12	DANA's security system makes me feel confident.	Assurance	Perception	0,477	0,1764	Valid
13	DANA understands my needs as a user.	Empathy	Perception	0,416	0,1764	Valid

No	Statement Item	Dimensions	Data Types	r-count	r-table	Description
14	I felt cared for when I encountered problems using DANA.	Empathy	Perception	0,325	0,1764	Valid
15	DANA shows its concern for user satisfaction.	Empathy	Perception	0,498	0,1764	Valid
16	Digital wallet applications should have an attractive appearance and be easy to use.	Tangibles	Expectations	0,366	0,1764	Valid
17	The information displayed must be clear, concise, and easy to understand.	Tangibles	Expectations	0,528	0,1764	Valid
18	The service features must be comprehensive and easily accessible.	Tangibles	Expectations	0,371	0,1764	Valid
19	Financial transactions must be carried out according to the agreed schedule.	Reliability	Expectations	0,500	0,1764	Valid
20	The application must be reliable for various financial needs.	Reliability	Expectations	0,460	0,1764	Valid
21	The application should rarely experience disruptions during use.	Reliability	Expectations	0,551	0,1764	Valid
22	Customer service must respond quickly to complaints or questions.	Responsiveness	Expectations	0,372	0,1764	Valid
23	Help features should be easily accessible at all times.	Responsiveness	Expectations	0,476	0,1764	Valid
24	The response from the application must be in line with user expectations.	Responsiveness	Expectations	0,517	0,1764	Valid
25	The application must guarantee the security of financial transactions.	Assurance	Expectations	0,493	0,1764	Valid
26	Users' personal and financial information must be kept confidential.	Assurance	Expectations	0,572	0,1764	Valid
27	The application security system must be reliable.	Assurance	Expectations	0,487	0,1764	Valid
28	Applications must understand the specific needs of their users.	Empathy	Expectations	0,399	0,1764	Valid
29	The service should pay attention when users encounter problems.	Empathy	Expectations	0,445	0,1764	Valid
30	The application should demonstrate concern for user comfort.	Empathy	Expectations	0,490	0,1764	Valid
31	I feel cared for as a user by the DANA service.	User Satisfaction	Satisfaction	0,552	0,1764	Valid
32	I am satisfied overall with the DANA app.	User Satisfaction	Satisfaction	0,533	0,1764	Valid
33	I will continue to use the DANA app in the future.	User Satisfaction	Satisfaction	0,332	0,1764	Valid
34	I would recommend DANA to others.	User Satisfaction	Satisfaction	0,471	0,1764	Valid
35	I rarely experience problems when using DANA.	User Satisfaction	Satisfaction	0,442	0,1764	Valid

The validity of the research instrument was tested by correlating each statement item with the total dimension score using an r-table of 0.1764. The validity test results (Table 2) show that all 35 statement items, both for independent and dependent variables, have an r-count value greater than the r-table. This confirms that all questionnaire items are valid and suitable for measurement.

Table 3. Reliability Test Results

Cronbach's Alpha	N of Items
0,742	35

Meanwhile, the reliability of the instrument was measured using Cronbach's Alpha coefficient. Based on Table 3, the Cronbach's Alpha value obtained was 0.742. This value is above the threshold of 0.70, so it can be concluded that the research questionnaire has high internal consistency and is reliable for collecting data.

Table 4. GAP Analysis

No	Dimension	Perception (Mean)	Expectation (Mean)	GAP (P–E)
1	Tangibles	4,33	4,51	-0,17
2	Reliability	4,20	4,49	-0,28
3	Responsiveness	4,24	4,48	-0,24
4	Assurance	4,34	4,50	-0,16
5	Empathy	4,34	4,57	-0,23

GAP analysis (Table 4) was used to measure the difference between user perceptions (P) and their expectations (E) regarding the quality of DANA services. The results show that the GAP values for all SERVQUAL dimensions are negative. This means that users' perceptions of the performance of the DANA application are generally lower than their expectations.
Specifically, the largest gap was found in the Reliability dimension with a GAP value of -0.28. This gap indicates that DANA still faces the greatest challenges in terms of service reliability, such as minimal application disruptions and transaction accuracy, which are least able to meet user expectations. Other significant negative gaps were found in the dimensions of Responsiveness (-0.24), Empathy (-0.23), Tangibles (-0.17), and Assurance (-0.16). Collectively, these findings indicate that there is substantial room for DANA to improve the quality of its services in all dimensions in order to meet and exceed user expectations.

Table 5. Normality Test Results (Kolmogorov-Smirnov)

		Unstandardized Residual
N		122
Normal Parameters[a,b]	Mean	0,0000000
	Std. Deviation	1,24002773
Most Extreme Differences	Absolute	0,079
	Positive	0,035
	Negative	-0,079
Test Statistic		0,079
Asymp. Sig. (2-tailed)		0.058[c]

The Kolmogorov-Smirnov test (Table 5) shows a significance value of Asymp. Sig. (2-tailed) of 0.058. Since this value is greater than 0.05, it can be concluded that the residual data is normally distributed.

Table 6. Multicollinearity Test Results (VIF - Variance Inflation Factor)

Model		Collinearity Statistics	
		Tolerance	VIF
1	Tangibles	0,701	1,427
	Reliability	0,591	1,693
	Responsiveness	0,698	1,432
	Assurance	0,630	1,587
	Empathy	0,698	1,432

Based on Table 6, the Variance Inflation Factor (VIF) values for all independent variables range from 1.427 to 1.693, all of which are below 10. The tolerance values are also above 0.1. These results indicate that there is no high correlation between the independent variables, so the model is free from multicollinearity.

Table 7. Heteroscedasticity Test Results (Gleiser Test)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2,683	1,027		2,613	0,010
	Tangibles	-0,088	0,075	-0,127	-1,181	0,240
	Reliability	0,008	0,060	0,017	0,141	0,888
	Responsiveness	-0,125	0,064	-0,211	-1,957	0,053
	Assurance	0,033	0,075	0,050	0,443	0,659
	Empathy	0,040	0,067	0,063	0,586	0,559

The Glejser test (Table 7) was used to detect heteroscedasticity. The results show that the significance value for each independent variable is above 0.05. Therefore, it can be concluded that there is no heteroscedasticity in the model, which means that the residual variance is constant.

Table 8. Coefficient of Determination (Model Summary)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.653[a]	0,426	0,401	1,266

The regression analysis results (Table 8) show a correlation coefficient (R) value of 0.653 and a coefficient of determination (R2) value of 0.426. These values indicate that 42.6% of user satisfaction variation can be explained by a model consisting of the dimensions of Tangibles, Reliability, Responsiveness, Assurance, and Empathy.

Table 9. F Test Results (Anova)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	138,040	5	27,608	17,213	.000[b]
	Residual	186,058	116	1,604		
	Total	324,098	121			

The F test (Table 9) tests the significance of the influence of all independent variables simultaneously. With an F value of 17.213 and a significance of 0.000, which is less than 0.05,

the hypothesis stating that SERVQUAL dimensions collectively have a significant effect on user satisfaction is accepted.

Table 10. T Test Results (Coefficientsa)

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	6,353	1,807		3,516	0,001
	Tangibles	0,416	0,132	0,266	3,162	0,002
	Reliability	0,230	0,106	0,199	2,172	0,032
	Responsiveness	0,290	0,112	0,217	2,583	0,011
	Assurance	0,281	0,132	0,189	2,133	0,035
	Empathy	-0,034	0,119	-0,024	-0,284	0,777

Hypothesis testing (H1-H5) was conducted partially by examining the significance value (Sig.) of each independent variable (Table 10):

a) H1 (Tangibles): The Tangibles variable has a significance value of 0.002 and a positive regression coefficient (B) of 0.416. Since the significance value is < 0.05, H1 is accepted. This means that the appearance and physical features of the application partially have a positive and significant effect on user satisfaction.
b) H2 (Reliability): The Reliability variable has a significance value of 0.032 and a positive regression coefficient of 0.230. Since the significance value is < 0.05, H2 is accepted. This indicates that the reliability and consistency of the service have a positive and significant influence on user satisfaction.
c) H3 (Responsiveness): The Responsiveness variable has a significance value of 0.011 and a positive regression coefficient of 0.290. Since the significance value is < 0.05, H3 is accepted. This means that the speed and responsiveness of the service have a positive and significant influence on user satisfaction.
d) H4 (Assurance): The Assurance variable has a significance value of 0.035 and a positive regression coefficient of 0.281. Since the significance value is < 0.05, H4 is accepted. It can be concluded that security and trust have a positive and significant influence on user satisfaction.
e) H5 (Empathy): The Empathy variable has a significance value of 0.777 and a negative regression coefficient of -0.034. Since the significance value is > 0.05, H5 is rejected. This result indicates that personal attention and understanding of users' specific needs do not have a significant influence on user satisfaction.

These findings indicate that four out of five SERVQUAL dimensions have a positive and significant influence on user satisfaction, while the Empathy dimension does not show a significant influence in the context of DANA's digital services in Medan City. This provides important insights into the aspects of service that are most valued by users of digital wallet applications.

This discussion section integrates findings from data analysis with theoretical foundations and previous research to provide an in-depth interpretation. The main finding of this study is that most SERVQUAL dimensions significantly influence user satisfaction, despite the gap between expectations and perceptions. The results of the multiple linear regression analysis show that four of the five SERVQUAL dimensions have a positive and significant influence on user satisfaction. The Tangibles, Reliability, Responsiveness, and Assurance dimensions have significance values below 0.05, confirming the acceptance of hypotheses H1 to H4. These findings are consistent with the SERVQUAL model, which places service quality as the main predictor of customer satisfaction. Specifically, the significance of Reliability underscores

the importance of digital service reliability, while the positive influence of Responsiveness and Assurance aligns with research evaluating determining factors in digital payment services.

Although the regression analysis shows a positive and significant influence, the GAP analysis results provide a different perspective. Negative gaps in all dimensions indicate that user expectations have not been fully met. The largest gap in the Reliability dimension (-0.28) is noteworthy, as although this dimension is important in enhancing satisfaction, DANA is still deemed to be suboptimal in meeting user expectations regarding service reliability. This situation implies a risk of dissatisfaction if performance in this area is not improved.

On the other hand, the most notable and distinguishing finding in this study was the rejection of hypothesis H5, in which the Empathy dimension, with a significance value of 0.777, was found to have no significant effect on user satisfaction. This result provides important insights in the context of digital services, where users of digital wallet applications tend to prioritize functional and technical aspects, such as reliability, security, and ease of use, over personal attention, which is the core of the empathy dimension. Although previous studies have emphasized the importance of empathy, in the context of the DANA application, this factor is not the primary driver of satisfaction. This finding reflects the characteristics of technology-based services, where efficiency, security, and speed are the primary focus for users, rather than individual attention or personal interaction. A study by Sroeurn and Kohsuwan (2025) in the digital finance sector in Cambodia also found that the empathy dimension had the least influence compared to other dimensions on user satisfaction (Sroeurn & Kohsuwan, 2025). Similar findings were reported by Tjendana and Pranitasari (2024), who stated that empathy and assurance were not significant in influencing customer satisfaction in the digital transportation sector in Indonesia (Yandi Tjendana & Diah Pranitasari, 2024).

Overall, this study successfully achieved its objectives, namely assessing the gap between expectations and perceptions and identifying the SERVQUAL dimensions that significantly influence user satisfaction. The analysis results provide practical recommendations for DANA app managers to prioritize improvements in the Tangibles, Reliability, Responsiveness, and Assurance dimensions to enhance user satisfaction, while noting that the Empathy aspect plays a less significant role in this digital service context.

4. Conclusion

Based on the data analysis and discussion, this study concludes several key points regarding the influence of DANA service quality on user satisfaction:

a) Service Quality Gap: GAP analysis shows that there is a negative gap between user expectations and perceptions across all SERVQUAL dimensions. This indicates that the quality of DANA's service as perceived by users has not yet fully met their expectations. The largest gap was found in the Reliability and Empathy dimensions.
b) Significant Influence: The results of the multiple linear regression test show that four out of five SERVQUAL dimensions have a positive and significant influence on DANA user satisfaction. These dimensions are Tangibles (application appearance and features), Reliability (service reliability and consistency), Responsiveness (service speed and readiness), and Assurance (security guarantees). This indicates that improvements in these aspects will directly contribute to increased user satisfaction.
c) Not Significant: The Empathy dimension (personal attention and understanding of user needs) does not have a significant influence on user satisfaction. This finding suggests that in the context of digital wallet services, which prioritize functional and technical interactions, personal and empathetic aspects are not the primary determinants of satisfaction.

In summary, to improve user satisfaction, DANA application managers need to prioritize improvements in reliability, responsiveness, security assurance, and application appearance.

Existing gaps, especially in the Reliability dimension, should be the focus of improvement to ensure that services not only meet but also exceed user expectations in a highly competitive market.

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THE EFFECT OF REVENUE GROWTH AND NET INCOME GROWTH ON FIRM VALUE AT TUTORING INSTITUTIONS AT PT XYZ

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Abstract

This study examines the effect of revenue growth and net income growth on firm value at tutoring institutions under PT XYZ from the first quarter of 2023 to the fourth quarter of 2024. Using a quantitative approach, this study analyses secondary data from the company's quarterly financial statements. Multiple linear regression analysis, classical assumption test, and hypothesis testing wee used as analysis methods. The mode fe.sibility test confirmed that the regression model was appropriate, and the classical assumption test results showed that all variables met the required assumptions. Hypothesis testing reveals that revenue growth and net income growth have a positive and statistically significant impact on firm value. This study concludes that these financial growth indicators simultaneously contribute to an increase in firm value. Based on these findings, PT XYZ is encouraged to implement strategies that promote revenue and profit growth to increase firm value.
Keywords: Revenue; Net Income; Value.

1. Introduction

In the era of more dynamic business competition, corporate value is an important indicator in assessing the success and sustainability of a company. Not only is attention to corporate values applicable to the large industrial sector, but it has also begun to be applied to non-formal educational institutions, such as tutoring. PT XYZ is one of the tutoring institutions that has experienced rapid growth in recent years. This growth raises questions about how internal financial performance, particularly revenue growth and net income growth, contributes to firm value in the context of educational service institutions.

Revenue growth indicates the company's ability to increase, revenue over time and reflects the effectiveness of sales strategies and competitiveness in the education services market (Majka, 2024). Revenue growth as one of the growth ratios is a ratio that shows an increase in revenue that can be achieved by a business entity (Sari et al, 2020). Based on Prihartanty & Rusmanto (2020), profit growth is a measure of the performance of a company to calculate future profits using profits in the previous period. On the other hand, net income growth reflects operational efficiency and overall resource management (Morningstar, 2023). Although these two indicators are commonly used in financial performance analysis, studies linking them to firm value in the non-formal education sector are limited.

Previous research provides mixed results. Suryani et al. (2023) in their research on the food and beverage sector on the Indonesia Stock Exchange showed that profitability has a significant effect on firm value, while sales growth does not have a significant effect. Widyaningsih & Sari (2024) who examined the energy sector concluded that company growth and governance affect firm value, but profit growth has no significant effect. In contrast, Timothy and Setyawan (2020) in a study of manufacturing companies found that earnings growth has a positive and significant effect on firm value.

The differences in the results of these studies indicate that further studies are still needed in sectors that have different operational characteristics, such as non-formal education institutions. PT XYZ was chosen as the object of research due to the availability of adequate and relevant financial data to be analyzed. This study specifically aims to determine the effect of revenue growth and net income growth on firm value, both partially and simultaneously.

The firm value in this study is measured by two financial indicators, namely Return on Assets (ROA) and Net Profit Margin (NPM). ROA measures how efficiently the company generates profit from its total assets (Ekuid, 2025), while NPM shows the percentage of net profit to sales as a measure of operational efficiency (Syaikhoni, 2024). These two indicators are considered appropriate for describing firm value in the context of sustainability-oriented institutions and long-term financial performance. As a result, this study is expected to contribute to enriching academic and practical understanding of the effect of financial growth on firm value in non-formal educational institutions, as well as a reference in making more strategic decisions in similar organizations.

2. Methodology

This research was conducted at PT XYZ, a tutoring institution located at Jalan Jenderal Besar A. H. Nasution No. 10, Medan. This location was chosen because PT XYZ is an institution that actively organizes non-formal education services and has a complete and structured internal financial report, making it suitable to be the object of an in-depth case study.

This research uses a quantitative approach with a case study design. The sampling technique was carried out by non-probability sampling with a purposive sampling method. The sample used is the quarterly income statement of PT XYZ during 2023 and 2024. The sample selection was based on the availability and completeness of financial data relevant to the research variables. Because this research focuses on one institution without comparison between units, the population and sample are identical in the form of historical financial data from one object of study.

This research involves three main variables: two independent variables and one dependent variable. The independent variables consist of revenue growth and net income growth. The dependent variable is firm value. Each of the variables has the following indicators:

Revenue growth is measured using the percentage change in revenue between periods with the formula:

$$Revenue\ Growth = \left(\frac{Revenue\ This\ Year - Revenue\ Last\ Year}{Revenue\ Last\ Year}\right) \times 100\% \quad (1)$$

Net income growth is measured by the percentage change in net income between periods with the formula:

$$Net\ Income\ Growth = \left(\frac{Net\ Income\ This\ Year - Net\ Income\ Last\ Year}{Net\ Income\ Last\ Year}\right) \times 100\% \quad (2)$$

Firm value is measured using two financial indicators, namely Return on Assets (ROA) and Net Profit Margin (NPM), each calculated using the formula:

$$ROA = \frac{Net\ Income}{Total\ Assets} \quad NPM = \frac{Net\ Income}{Sales} \times 100\% \quad (3)$$

Data was collected through two main methods. First, documentation from internal companies in the form of quarterly profit and loss statements of PT XYZ was collected directly from the company's finance department. This data has gone through an internal audit process and is considered valid. Second, a literature study was conducted to support the theoretical basis and strengthen the analysis by referring to journals, textbooks, accounting standards, and

previous research relevant to the variables studied. The data analysis technique used in this research is multiple linear regression analysis to test the effect of revenue growth and net income growth on firm value. The regression model used in this research is:

$$Y = \alpha + \beta 1X1 + \beta 2X2 + \varepsilon \quad (4)$$

Dimana: Y = Firm Value
$X1$ = *Revenue Growth*
$X2$ = *Net Income Growth*
α = Constant
$\beta 1, \beta 2$ = Regression Coefficient
ε = Error

Before performing regression, the model is tested with a series of classical assumption tests which include normality test, multicollinearity test, and heteroscedasticity test. The normality test was carried out with Shapiro-Wilk because the number of samples < 50. Multicollinearity test is seen from the Tolerance Value and Variance Inflation Factor (VIF), while the heteroscedasticity test is carried out using the Glejser method.

The hypothesis in this research is tested through two main statistical techniques, namely the F test for simultaneous influence and the t test for the partial influence of each independent variable on firm value. The dedecision-making criteria refer to the significance value (Sig.) <0.05 to state a significant influence. In addition, the coefficient of determination (R^2) is used to see the extent to which a combination of independent variables can explain variations in firm value.

The entire data processing process was carried out using the latest version of SPSS software. SPSS was used to run regression analysis, classical assumption test, hypothesis testing, and calculating the coefficient of determination and significance of each variable.
Through a systematic method and measurable analysis, this research is expected to be able to provide a clear picture of the relationship between revenue growth and net profit on firm value in non-formal education institutions, especially in the PT XYZ environment.

3. Results and Discussion

This test was conducted to investigate the impact of revenue growth and net income growth on firm value at PT XYZ, a tutoring institution. The following is a table of multiple linear regression tests, such as:

Table 1. Multiple linear regression test

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
Revenue Growth	-6.639	.000	-.183	-4.751	.005	.693	1.442
Net Income Growth	1.442	.000	1.087	28.198	.000	.693	1.442

Based on the test results from the two tables above, the multiple linear regression equation is obtained as follows:

$$Y = 0{,}382 - 6{,}639XI + 1{,}442X2 \quad (5)$$

The constant value of 0,382 indicates the value of the company when revenue growth and net income growth are zero. The revenue growth coefficient is negative (-6,639), which means that an increase in revenue growth reduces firm value. Conversely, net income growth has a positive coefficient (1,442), indicating that an increase in this metric will also increase firm

value. Therefore, net income growth has a positive effect, while revenue growth has a negative effect on firm value. The normality test is carried out to ensure that the revenue growth (X_1), net income growth (X_2), and firm value (Y) data are normally distributed. The regression model is considered good if the data follows the diagonal line pattern on the plot, which shows a distribution close to normal. The following is a normality test, which are:

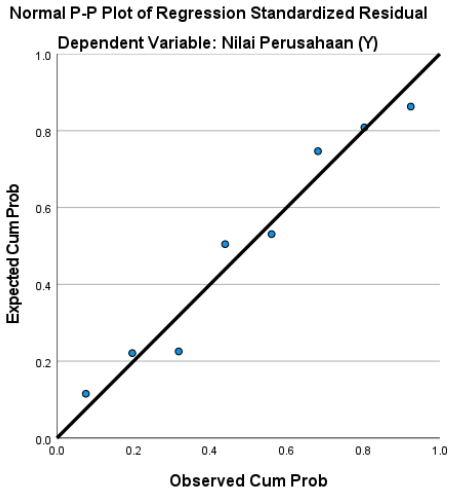

Fig. 1. Normality test

Based on Figure 1, the points (plots) follow the direction of the diagonal line, which means that the regression model is normally distributed. The multicollinearity test is carried out to determine whether there is a correlation between the independent variables. If the tolerance value > 0,10 and VIF < 10, then there is no multicollinearity (Ghozali, 2021). The following is a multicollinearity test:

Table 2. Multicollinearity test

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	.382	.114		3.35	.020		
Revenue Growth	-6.639	.000	-.183	-4.75	.005	.693	1.442
Net Income Growth	1.442	.000	1.087	28.19	.000	.693	1.442

From Table 2 above, the VIF value for revenue growth and net income growth is 1,442, and the tolerance value is 0,693. Because all VIF values < 10 and tolerance > 0,1, it can be concluded that there is no multicollinearity in the regression model. The heteroscedasticity test aims to test whether the residuals have the same variance between observations. The model is considered good if there is no specific pattern and the points spread randomly above and below the Y axis (Ghozali, 2021). The following is a heteroscedasticity test based on the firm value indicator:

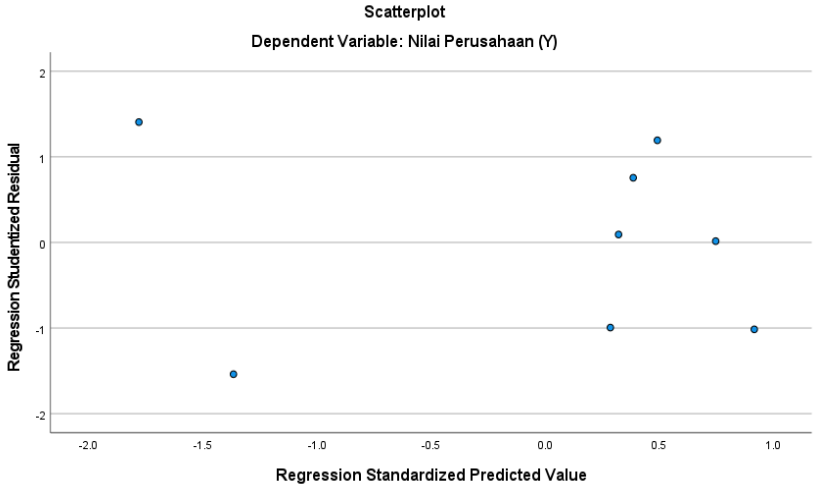

Fig. 2. Heteroscedasticity test

From Fig. 2, the dots do not form a clear pattern, and the dots spread above and below the number 0 of the Y axis, so it can be concluded that there is no heteroscedasticity in the regression model.

The F test is used to test the simultaneous effect of revenue growth and net income growth on firm value. Significant results are shown if the significance value is < 0,05, which means H_0 is rejected and H_a is accepted. The following are the results of simultaneous hypothesis testing:

Table 3. F-test

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	7.554	2	3.777	482.632	.000[b]
	Residual	.039	5	.008		
	Total	7.593	7			

From table 3 above, the F test results show an F_{count} of 482,632 with a significance of 0,000. Because the significance value < 0,05, H_0 is rejected and H_a is accepted. This means that simultaneously, revenue growth and net income growth have a significant effect on firm value at PT XYZ. The t-test is used to test the partial effect of revenue growth (X_1) and net income growth (X_2) on firm value (Y). If the significance < 0,05, then H_0 is rejected, indicating a significant effect. If > 0,05, then H_0 is accepted. The following are the results of simultaneous hypothesis testing:

Table 4. The t-test

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	.382	.114		3.352	.020		
	Revenue Growth	-6.639	.000	-.183	-4.751	.005	.693	1.442
	Net Income Growth	1.442	.000	1.087	28.198	.000	.693	1.442

The t-test results produce a regression equation Y = 0,382 - 6,639X_1 + 1,442X_2. The revenue growth variable (X_1) has a t_{count} of -4,751 with a significance of 0,005, and net income growth (X_2) has a t_{count} of 28,198 with a significance of 0,000. Since both are < 0,05, H_0 is rejected. This means that both revenue growth and net income growth have a significant effect on firm value at PT XYZ. Determination analysis in multiple linear regression is used to determine the percentage of variance in the dependent variable that is simultaneously explained by the independent variables. The following is the result of the coefficient of determination:

Table 5. Results of the coefficient of determination

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.997[a]	.995	.993	.088465106727164

Table 5 shows the coefficient of determination (R^2) of 0,995, meaning that 99,5% of the variation in firm value can be explained by revenue growth and net income growth, while 0,5% is influenced by other variables outside the model. When compared with previous research, the results of this study show some similarities and differences. Felix Liong et al. (2023) found that income growth has no significant effect on firm value, in contrast to this study which actually shows a significant, albeit negative, effect on firm value.

The results of this research are also in line with those of Mia Agustina Haryono and Indawati (2024), which indicate that earnings growth has a significant positive effect, similar to the net income growth observed in this study. The results of Mutia Rizky Nurul Mutifa and Januar Eko Prasetio (2024) which state that sales growth has no significant effect are different from the results of this study, although both of them use the firm value variable as the output. The other similarity is seen in the research of Putu Sarah Meilany Benggu and Ni Nyoman Ayu Diantini (2024), which shows that profitability has a positive effect on firm value, in line with the significant effect of net income growth in this study.

Meanwhile, Saladin Ahmad et al. (2024) stated that sales growth has a positive effect, in contrast to the results of this study where revenue growth has a negative effect. This shows the importance of considering the industry context, where the non-formal education sector has different financial and operational characteristics. Overall, the results of this study confirm that net income growth is the dominant factor in influencing firm value, while revenue growth requires a more contextual approach in its implementation.

4. Conclusion

Based on the results of the discussion, it can be concluded that revenue growth and net income growth have a significant effect on firm value. So the results of this research suggest that PT XYZ should evaluate its revenue growth strategy because the results show a negative effect on firm value. The company also needs to improve operational efficiency to encourage net income growth. In addition, it is recommended to build a financial monitoring system that contains indicators of revenue growth, net income growth, return on assets, and net profit margin to support more responsive and data-based decision-making.

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INFLUENCE OF DATA SECURITY, USER EXPERIENCE (UX), AND USER TRUST ON E-WALLET APPLICATION LOYALTY

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Abstract

This study aims to determine whether data security and trust have a significant influence on user satisfaction. The method used in this research is a quantitative approach, involving several tests, namely reliability analysis, classical assumption deviation test and linear regression. Based on the regression results of primary data processed using SPSS 18, the multiple linear regression equation is obtained as follows: Y = 1.288 + 0.313 + 0.664 + e. Partially, the data security variable (X1) has a positive and significant influence on user decisions, as evidenced by the value of t count> t table (5.595> 1.991). The trust variable (X2) has a positive and significant influence on user decisions, as evidenced by the value of t count> t table (11.262> 1.991). Simultaneously, the data security variable (X1) and trust (X2) have a positive and significant influence on user decisions. This means that the hypothesis in this study is accepted, as evidenced by the value of F count> F table (241.700> 3.12). Data security variables (X1) and trust (X2) able to contribute an influence on service quality variables by 86.3% while the remaining 13.7% is influenced by other variables not examined in this study. From the above conclusions, the authors suggest that people should be able to maintain data security objectively so that all their personal data does not leak with others.
Keywords: data security; user trust; e-wallet.

1. Introduction

The rapid development of information technology has encouraged digital transformation in various aspects of human life, including in terms of financial transactions. One of the tangible manifestations of this transformation is the emergence of various digital wallet applications or better known as e-wallets. E-wallet applications such as OVO, Go Pay, Dana, and Shopee Pay are practical solutions used by the public to make various transactions, from shopping payments, bills, to transfers between users. This phenomenon shows a shift in consumer preferences from conventional payment methods to digital payment systems.

Some factors that are thought to have a significant influence on e-wallet application user loyalty include data security, user experience, and user trust. Data security is a crucial aspect considering that e-wallet applications operate by storing and processing sensitive data such as users' personal and financial information Riset et al. (2024). When there is a security breach, this can damage the reputation of the application and reduce the level of trust and loyalty of users. In addition, user experience (UX) also plays an important role in shaping loyalty. A good UX includes ease of use, speed of access, intuitive interface design, and convenience in transactions. When users feel comfortable and do not encounter obstacles in using the application, the likelihood of them continuing to use the application in the long run will be higher. User trust is equally important. In the context of e-wallet applications, trust includes aspects of service provider integrity, transparency of the transaction process, and the reliability of the application in carrying out its functions. If users feel that the application can

be trusted and meets their expectations, then this will encourage the formation of loyalty. Although various previous studies have examined the factors that influence digital app user loyalty, there are still research gaps that need to be explored further Riset et al. (2024). First, many studies only highlight one or two factors, such as trust or UX, without comprehensively combining all three in one research framework (Aini et al., 2023). Second, most of the previous studies were conducted in different geographic and demographic contexts, so the results are not necessarily relevant to the context of e-wallet users in Indonesia, especially among students or the younger generation who are active users of this service (Pada et al., 2021). Third, the differences in research results related to the influence of each variable on user loyalty indicate that further studies are needed to obtain a clearer and more contextual understanding (Huda et al., 2023). For example, there are studies that find that UX has a dominant influence, while others state that data security determines loyalty more.

Data and information security refers to the systematic steps taken to protect data from being compromised, damaged, or misused by individuals both inside and outside the organization. Data and information security includes protecting data from unauthorized access, alteration, or destruction within a system, as well as protecting computer systems from cyberattacks and other potential risks (Dharma et al., 2023).

In recent years, the use of e-wallets or digital wallets has shown significant growth in Indonesia. According to data from Bank Indonesia in 2024, there are more than 400 million e-wallet transactions every month, with active user growth reaching 25% from the previous year. This surge is mainly among Generation Z and students who are accustomed to the digital ecosystem (Nurrahma et al., 2025). This phenomenon aligns with global trends, where people are shifting from conventional payments to cashless systems for convenience and efficiency. However, behind the increasing adoption of e-wallets, important questions arise regarding the factors influencing user loyalty toward these application (Nurrahma et al., 2025).

Previous studies have discussed the role of data security and user trust in shaping satisfaction and loyalty toward digital applications (Davis, 1989; McKnight et al., 2002). On the other hand, the aspect of user experience (UX) has also been proven to contribute to application retention, although the results often vary depending on the country context and user demographics (Nurrahma et al., 2025). Unfortunately, there has been limited comprehensive research examining the simultaneous influence of the three variables data security, UX, and trust in the context of e-wallet users in Indonesia. This is the basis for the urgency of this study.

Referring to McKnight's (2002) trust theory, this study aims to understand how these variables interact with one another. McKnight states that trust is a belief that allows individuals to voluntarily become customers of e-commerce service providers after considering the characteristics of e-commerce service providers. Trust can be measured through the form of customer confidence in the integrity, benevolence, and ability of the company. Trust has a positive effect on customer attitudes towards the company. Consumers who have a sense of trust in the company are more likely to make purchasing decisions from the company's own website. The statement items to measure the online trust variable refer to, as follows: this company is trusted, I trust this company wholeheartedly, this website does not make false statements, this website is characterized by the honesty offered to consumers, and the clarity of the services it offers to consumers.

2. Methodology

This study uses a quantitative approach with a survey method, which aims to empirically test the influence of data security, user experience (UX), and trust on e-wallet user loyalty. This study falls under the category of an exploratory study because its location coverage is limited and it is an initial mapping (Muhammad Dilto, 2024). The population in this study consists of active users of e-wallet applications in the Medan Amplas sub-district, specifically in the

location of this research is located at Jl. Bajak II-H Gg. Sumber Amal. This research is planned to be carried out for 6 months, from March to August 2025. The target population includes individuals who have used e-wallet services for at least the past three months (Muhammad Dilto, 2024). Although there is no exact data on the total population in the area, the researcher used assumptions based on the number of households and smartphone users in the area. “Primary data sources are data sources that directly provide data to data collectors”.

Primary data is data that can be obtained directly and immediately from the source; in this case, it is data obtained from questionnaires used and filled in by respondents containing questions (Pringgadini, 2022). The population in this study is people who live in the research site. Meanwhile, the sample is part of the population taken through certain methods which also have certain characteristics (Nazira et al., 2024). Given the size of this population, it cannot be ascertained that the people who live at that address. The sampling technique used is random sampling. So, the sample in this study amounted to 80 respondents.

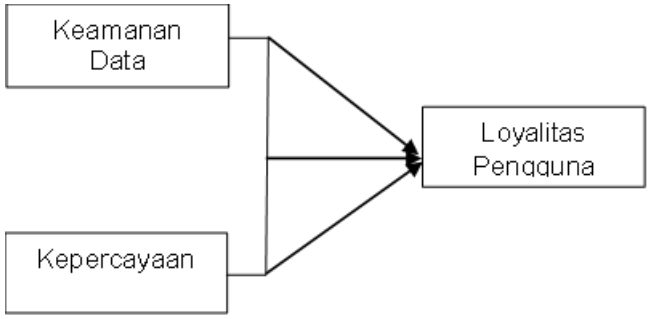

Fig. 1. Sampling for data

The research instrument was a closed questionnaire consisting of statements based on a 1–5 Likert scale. The questionnaire was compiled based on indicators from previous theories and research, which had been tested for validity and reliability in the initial pilot test stage. The collected data were analysed using SPSS software version 25, employing the following analytical techniques: validity and reliability tests, classical assumption tests (normality and multicollinearity), multiple linear regression analysis, and t-tests (partial), F-tests (simultaneous), and determination coefficients (R^2).

The researcher also ensured that data interpretation was conducted objectively, considering a significance level of 5% ($\alpha = 0.05$) in all statistical tests.
H1 : Data security has a positive and significant effect on user loyalty.
H3 : Trust has a positive and significant effect on user loyalty.
H3 : Data security and trust have a positive and significant effect on user loyalty.

3. Results and Discussion

These findings are in line with the trust theory proposed by McKnight et al. (2002), which states that trust in digital systems is one of the main indicators in increasing user behaviour intentions, including long-term loyalty. First, the results indicate that data security is a crucial aspect in maintaining user loyalty. In the context of e-wallets, users are highly concerned about the protection of personal information and transaction security. This is also supported by previous research, such as Putri & Rahman (2022), which found that perceptions of security have a positive correlation with the intensity of digital application reuse. Second, user experience (UX) has also been proven to have a significant influence. An intuitive interface design, ease of navigation, and system response speed have been shown to encourage users to remain loyal to the application. This is consistent with the study by Nugroho et al. (2021), which emphasises the importance of UX in increasing digital user engagement.

Third, user trust shows the most dominant influence among the three variables. This suggests that loyalty is not only shaped by technical features but also influenced by users' emotional perceptions of the credibility and integrity of service providers. This factor is very important in building long-term relationships between users and platforms.

Practically speaking, these results emphasise the importance for e-wallet developers to continue prioritising transparency in privacy policies, updating security features, and optimising user interfaces. From an academic perspective, this research contributes to strengthening trust theory in the field of financial technology applications. However, this study has limitations in terms of geographical scope and sample size. Therefore, these results should not be broadly generalised without further studies with a larger scope and more diverse respondent demographics. The multiple linear regression equation is obtained as follows:

$$Y = 1.288 + 0.313 + 0.664 + e \quad (1)$$

i. Constant (a) = 1.288 shows the constant value, where if the independent variable = 0 then the dependent variable = 1.288, meaning that if data security and trust are increased, user satisfaction remains at 1.288.
ii. The regression coefficient of the data security variable (X1) = 0.313 shows that data security has a positive effect on user satisfaction, so that if the data security variable is increased by 1 unit, the user satisfaction variable will increase by 0.313.
iii. The regression coefficient of the trust variable (X2) = 0.664 indicates that the trust variable has a positive effect on user satisfaction, so that if the trust variable is increased by 1 unit, user satisfaction will increase by 0.664.

In the Coefficients table, the t value is also obtained. The calculated t value is then compared with the t table value at α = 0.05. The value of the t table at df (n-k), where n is the number of samples and k is the number of variables, both independent and dependent variables, then 80-3 = 77. At df 77 with α = 0.05, the t table value is 1.991. The t value of the data security variable (X1) is 5.595; thus, t count> t table, then H0 is accepted and H1 is rejected, which means that the data security variable (X1) has a positive and significant effect on performance. The t value of the trust variable (X2) is 11.262; thus, t count> t table, then H0 is rejected and H1 is accepted, which means that the trust variable (X2) has a positive and significant effect on performance.

The results of the F test can be seen in the following table:

Table 1. F-test

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1085.138	2	542.569	241.700	.000[b]
	Residual	172.850	77	2.245		
	Total	1257.988	79			

In the Anova table, the calculated F value is 241.700 while the F table value is 3.12. Thus, F count> F table means that the data security and trust variables together have a positive and significant effect on user satisfaction. The determination coefficient (R^2) of the regression results can be seen in the table below.

Table 2. Determination coefficient

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.929[a]	.863	.859	1.49827	1.863

The coefficient of determination (R^2) value of the regression results is 0.863, meaning that the data security and trust variables contribute to the influence on user satisfaction by 86.3%. This result is the result of (R^2 x 100%), while the remaining 13.7% is influenced by other variables not examined in this study.

4. Conclusion

From the results of the research that has been discussed by processing and questionnaires and using several tests, the following conclusions can be drawn as partially, the data security variable (X1) has a positive and significant effect on user satisfaction, as evidenced by the value of t count> t table (5.595> 1.991). The trust variable (X2) has a positive and significant effect on user satisfaction, as evidenced by the value of t count> t table (11.262> 1.991). Simultaneously, the variables of data security (X1) and trust (X2) have a positive and significant influence on user satisfaction. This means that the hypothesis in this study is accepted, as evidenced by the value of F count> F table (241.700> 3.12). Data security variables (X1) and trust (X2) can contribute an influence on the user satisfaction variable by 86.3% while the remaining 13.7% is influenced by other variables not examined in this study.

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HAK WANITA DALAM ISLAM: SATU SOROTAN TERHADAP WANITA ISLAM BEKERJAYA DAN CABARAN DALAM KONTEKS MALAYSIA

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Abstrak

Pengetahuan terhadap realiti dunia pekerjaan dalam kalangan wanita Islam merupakan aspek penting untuk difahami secara mendalam bagi memastikan maruah mereka sentiasa terpelihara serta tanggungjawab hakiki terhadap keluarga dapat dijaga. Pada masa kini, kebanyakan wanita bukan sahaja berperanan sebagai suri rumah tetapi turut aktif bekerja dalam pelbagai sektor pekerjaan bagi menyumbang kepada kestabilan ekonomi keluarga. Secara khusus, kajian ini bertujuan untuk memahami konsep hak wanita Muslimah menurut perspektif Islam dalam konteks kerjaya dan tanggungjawab kekeluargaan, meneliti isu serta cabaran utama wanita Islam bekerjaya menurut konteks Malaysia serta menilai garis panduan syariah dan etika kerja Islam terhadap penglibatan wanita dalam sektor pekerjaan serta tanggungjawab sosial. Metodologi kajian adalah dengan menggunakan pendekatan kualitatif yang bersifat konseptual, dengan tumpuan kepada analisis kandungan dan analisis tematik. Data dikumpulkan melalui kajian kepustakaan, iaitu dengan meneliti pelbagai sumber rujukan seperti buku ilmiah**,** artikel jurnal akademik**,** laporan rasmi serta nas-nas utama yang bersumberkan al-Quran dan hadis bagi membantu penyelidik memahami pelbagai pandangan serta pendekatan yang telah dibincangkan oleh pengkaji terdahulu. Manakala analisis tematik pula digunakan bagi mengenal pasti isu-isu utama dan tema-tema penting yang berulang untuk membantu penyelidik menyusun dapatan kajian secara tersusun dan berfokus. Hasil kajian menunjukkan bahawa Islam memberi hak kepada wanita dalam kerjaya namun terdapat beberapa pedoman atau fiqh serta beberapa isu utama yang perlu diberi perhatian termasuklah aspek pemeliharaan maruah, kestabilan keluarga, serta pembangunan tenaga kerja Muslimah yang seimbang dari sudut spiritual dan profesional. Diharapkan kajian ini dapat memberi ilmu pengetahuan kepada masyarakat terutama golongan pekerja wanita Muslimah serta membuka ruang kepada penyelidik dalam mengkaji permasalahan wanita Islam dalam dunia kerjaya secara lebih menyeluruh.
Kata kunci: Hak wanita bekerjaya; Institusi kekeluargaan; Perspektif Islam.

1. Pengenalan

Islam mengiktiraf peranan serta meletakkan martabat yang tinggi terhadap wanita dalam pelbagai aspek kehidupan. Rasulullah SAW bersabda: "Dunia ini adalah perhiasan, dan sebaik-baik perhiasan dunia ialah wanita yang solehah." (Hadis riwayat Muslim, no. 1467; Kitab al-Rada, Bab Istihbab Nikah al-Bikr). Menurut al-Qurtubi (2006) dalam karya *al-Jami'li Ahkam al-Quran*, wanita solehah ialah wanita yang menyenangkan suaminya apabila dipandang, taat apabila diperintah, dan menjaga maruah dan harta suaminya ketika ketiadaannya. Ini jelas menggambarkan bahawa wanita yang hidup berpegang kepada prinsip-prinsip syariah mempunyai nilai yang tinggi serta memainkan peranan penting dalam pembentukan masyarakat yang harmoni.

Menurut al-Qaradawi (2001) penglibatan wanita dalam sektor pekerjaan telah bermula dari zaman Rasulullah SAW dan berperanan aktif dalam pelbagai bidang pekerjaan, termasuk dakwah, jihad, dan pembangunan ekonomi. Antaranya ialah Sayyidah Khadijah RA, seorang usahawan wanita terkemuka, serta Asma' binti Abu Bakar RA yang terlibat dalam urusan pentadbiran rumah tangga dan penternakan. Firman Allah SWT dalam Surah al-A'raf (7:32)

menyatakan *"Katakanlah (Wahai Muhammad), siapakah yang mengharamkan perhiasan Allah yang telah diberikan untuk hamba-hambanya dan demikian juga rezeki-rezeki yang baik lagi halal".* Menurut Wahbah al-Zuhayli (1998) ayat 32 Surah al-A'raf menegaskan bahawa Islam mengiktiraf hak setiap individu untuk menikmati keindahan dan rezeki yang halal sebagai satu pemberian rahmat Ilahi kepada hamba-Nya. Penafsiran ini turut menunjukkan bahawa tidak terdapat pengkhususan jantina, lelaki dan wanita dalam usaha mencari rezeki, sebaliknya, lelaki dan wanita sama-sama berhak bekerja dan menikmati rezeki dengan penuh tanggungjawab dan mematuhi prinsip syariah. Justeru itu, ayat ini mencerminkan prinsip keseimbangan dalam ajaran Islam antara tuntutan rohani dan keperluan duniawi.

Firman Allah dalam Surah al-Nisa' (4:32) menyebut: "Janganlah kamu iri hati terhadap kelebihan yang Allah kurniakan kepada sebahagian kamu daripada yang lain. Lelaki mendapat bahagian daripada apa yang mereka usahakan, dan wanita juga mendapat bahagian daripada apa yang mereka usahakan." Menurut Imam al-Qurṭubi, ayat ini mengandungi mesej yang berbentuk satu teguran terhadap sifat iri hati antara lelaki dan wanita dalam menerima anugerah dan kelebihan yang dikurniakan oleh Allah SWT, termasuk dalam aspek rezeki, kekuatan fizikal, kedudukan sosial, dan tanggungjawab. Sabda Rasulullah SAW bahawa seseorang yang keluar mencari rezeki untuk menanggung keluarga dan dirinya sendiri dengan niat yang ikhlas, maka dia berada di jalan Allah, seperti mujahid. (Riwayat al-Ṭabarani dalam *al-Mu'jam al-Kabir,* no. 8044). Justeru itu, pengkaji menekankan bahawa setiap lelaki dan perempuan berhak untuk bekerja dan mendapat hasilnya sendiri mengikut amal dan usahanya selagi mana tidak bertentangan dengan syariat.

Pelbagai faktor yang mendorong wanita untuk bekerja. Antara faktor utama bagi wanita Islam yang telah berkahwin adalah membantu suami dalam mencari rezeki bagi tujuan memastikan kestabilan pendapatan keluarga, manakala bagi wanita Islam belum berkahwin, faktor tahap pendidikan, kepuasan sosial dan aspirasi diri menjadi tujuan utama mereka melibatkan diri dalam kerjaya. Namun begitu, dalam persekitaran pekerjaan yang mencabar, wanita Islam perlu sentiasa berwaspada agar pemilihan kerja, cara berpakaian, pergaulan, serta pertuturan mereka tidak bertentangan dengan syariat Islam seperti yang ditegaskan oleh Noor (2020). Dalam konteks Malaysia, cabaran utama yang sering dibincangkan melibatkan isu diskriminasi gender, beban kerja berganda, tekanan sosial dan kurangnya dasar kerja yang mesra atau persekitaran kerja yang kadangkala tidak selaras dengan prinsip syariah. Oleh itu, terdapat keperluan mendesak untuk merujuk kepada pandangan ulama' serta mengikut garis panduan dan etika bekerja yang selari dengan prinsip *maqasid syariah* dalam mencari keseimbangan antara kerjaya dan tanggungjawab sebagai isteri dan ibu.

Pemilihan kerjaya bagi wanita perlu bersesuaian dengan fitrah wanita dan seiring dengan minat supaya keseimbangan antara tanggungjawab kerja dan keluarga dapat dicapai. Ini penting untuk menjamin keharmonian rumah tangga dan mengelakkan konflik peranan, Hassan et. al., (2021). Menurut Zulkifli Mohamad al-Bakri (2019) komitmen terhadap tanggungjawab sebagai isteri dan ibu merupakan perkara penting dalam pembentukan keluarga sakinah, juga menjadi teras kepada masyarakat yang stabil dan maju. Kajian ini menunjukkan wanita Muslimah yang berjaya dalam dunia kerjaya serta memiliki keluarga yang bahagia adalah mereka yang mendapat sokongan daripada pihak suami dan keluarga. Masyarakat hari ini, menyaksikan penglibatan wanita Islam dalam pelbagai sektor pekerjaan semakin meningkat. Menurut Statistik Pemerkasaan Wanita (2024) kadar penyertaan wanita dalam tenaga buruh di Malaysia ialah 56.2%, dengan penglibatan dalam bidang penggubalan dasar, pengurusan kanan dan profesional masing-masing pada kadar 25.4% dan 40.2%. Di peringkat politik pula, wanita merangkumi 13.5% ahli parlimen dan 16.1% menteri pada tahun 2023, Jabatan Perangkaan Malaysia (2024). Menurut Noraini (2024) sasaran kerajaan ialah untuk meningkatkan penglibatan wanita kepada 60% menjelang 2024. Data statistik ini menunjukkan bahawa wanita berperanan besar dalam pembangunan negara tanpa mengabaikan tanggungjawab terhadap keluarga. Justeru, wanita Islam diseru untuk memahami konsep asas bekerja dengan mengambil kira batas syariah serta bijak dalam

mengurus isu berkaitan hak dan peranan mereka dalam kerjaya. Menurut Norhafizah Musa (2023) peranan utama wanita sebagai pendidik dalam keluarga tidak boleh diambil mudah, walaupun aktif bekerja, seorang wanita perlu menjaga adab dan akhlak dalam setiap ruang kerja serta memelihara kehormatan diri agar tidak terjebak dalam budaya kerja yang bertentangan dengan Islam. Kenyataan ini turut disokong oleh Rafidah Hanim (2023) di mana beliau menegaskan bahawa pemerkasaan wanita dalam kerjaya perlu diiringi dengan kesedaran keagamaan dan kefahaman fiqh wanita bekerja. Kajian ini dijalankan bagi mencapai objektif berikut

1. Memahami konsep hak wanita Muslimah menurut perspektif Islam dalam konteks kerjaya dan tanggungjawab kekeluargaan.
2. Meneliti isu serta cabaran utama wanita Islam bekerjaya menurut konteks Malaysia.
3. Menilai garis panduan syariah dan etika kerja Islam terhadap penglibatan wanita dalam sektor pekerjaan serta tanggungjawab sosial.

Kajian ini adalah bersifat konseptual dan dilaksanakan melalui kaedah kajian perpustakaan. Fokus kajian adalah wanita Islam yang bekerja di mana penekanan tentang hak, peranan, konsep serta garis panduan syariah dibincangkan dalam konteks masyarakat Malaysia. Kajian ini juga melihat kepada isu dan cabaran yang sering dihadapi oleh wanita Islam dalam dunia pekerjaan. Selain itu, kajian ini bertujuan menilai sejauh manakah isu ini telah dibincangkan dalam kajian lepas. Skop ini bertujuan untuk merumuskan pemahaman yang lebih menyeluruh tentang adab, batas dan kedudukan wanita dalam melaksanakan tugasan kerja serta kepentingan memahami dan mematuhi prinsip-prinsip Islam.

2. Metodologi

Kajian ini menggunakan pendekatan kualitatif yang bersifat konseptual, dengan tumpuan kepada analisis kandungan dan analisis tematik. Pendekatan ini membolehkan penyelidik mengkaji dan meneliti secara mendalam bahan-bahan ilmiah yang berkaitan dengan isu wanita Islam bekerjaya. Data dikumpulkan melalui kajian kepustakaan, iaitu dengan meneliti pelbagai sumber rujukan seperti buku ilmiah, artikel jurnal akademik, laporan rasmi, fatwa kontemporari, serta nas-nas utama daripada al-Quran dan hadis. Sumber-sumber ini membantu penyelidik memahami pelbagai pandangan serta pendekatan yang telah dibincangkan oleh tokoh dan pengkaji terdahulu.

Analisis tematik digunakan bagi mengenal pasti isu-isu utama dan tema-tema penting yang berulang, seperti hak wanita untuk bekerja, peranan wanita dalam keluarga, cabaran sosial, dan kepentingan garis panduan syariah. Kaedah ini membantu penyelidik menyusun dapatan secara teratur dan berfokus. Pendekatan ini diambil berdasarkan cadangan Merriam (2009) dan Bowen (2009) yang menekankan bahawa dokumen dan teks ilmiah boleh menjadi sumber data yang sah dan berkesan dalam penyelidikan kualitatif, terutamanya apabila isu yang dikaji melibatkan nilai, prinsip dan kefahaman mendalam terhadap konteks agama dan sosial.

Manusia adalah khalifah Allah di muka bumi yang dipertanggungjawabkan untuk menjalankan amanah dengan mematuhi segala peraturan yang telah ditetapkan di dalam al-Quran. Manusia diperintahkan untuk berusaha mencari rezeki yang halal lagi baik kerana Allah telah menyediakan segala keperluan dan kelengkapan hidup bagi meneruskan kehidupan yang lebih sempurna. Firman Allah SWT dalam surah al-Baqarah (2):168, *"Wahai sekalian manusia, makanlah dari apa yang ada di bumi yang halal lagi baik".* Menurut Zulkifli Mohamad Al-Bakri (2019) tiada ketetapan yang jelas dalam hukum syarak yang menghalang wanita bekerja. Malah, dalam keadaan tertentu seperti menjadi balu atau janda, dibolehkan untuk keluar bekerja bagi memenuhi keperluan hidup. Secara umumnya, kajian menunjukkan bahawa Islam tidak menghalang wanita untuk bekerja, selagi mana tidak bertentangan dengan hukum syarak serta tidak mengabaikan tanggungjawab terhadap keluarga.

Kenyataan ini disokong dengan kajian Abd Wahab dan Abdul Rahman (2020) di mana kedudukan wanita dalam Islam adalah diberi hak untuk mendapatkan pendidikan dan peluang pekerjaan sebagaimana yang telah dijelaskan dalam pelbagai nas syarak. Tambahan pula, kajian oleh Yusof, N. M. (2020) meneliti persepsi wanita Islam terhadap keperluan membina keseimbangan antara kerjaya dan kehidupan keluarga, dengan penekanan kepada prinsip wasatiyyah. Wanita Muslimah perlu memahami dan menjaga prinsip asas syarak dalam memastikan berlaku keseimbangan antara tanggungjawab kerjaya dan rumah tangga seterusnya mewujudkan sebuah institusi keluarga yang harmoni dan bahagia.

Menurut kajian Hassan et al., (2021) penekanan diberikan terhadap pemilihan kerjaya yang bersesuaian dengan fitrah emosi dan spiritual wanita agar mampu menjalankan tanggungjawab kerjaya dan keluarga secara seimbang. Sementara itu, Roziah Omar dan Hamidah Mat (2021) meneliti aspek kepimpinan wanita dalam Islam dan beliau menegaskan bahawa wanita dibenarkan memegang jawatan penting dalam masyarakat selagi mana ia memenuhi prinsip syariah. Mereka memberi contoh kepimpinan Aisyah RA sebagai tokoh wanita yang aktif dalam keilmuan dan pentadbiran.

Isu cabaran yang dihadapi oleh wanita bekerjaya turut dibincangkan dalam kajian ini. Menurut Ahmad dan Mohd Noor (2021) terdapat beberapa cabaran yang dihadapi oleh pekerja wanita Islam di tempat kerja seperti diskriminasi gender, beban kerja berganda dan tekanan sosial. Kajian oleh Nasir dan Johari (2022) memberi fokus kepada aplikasi *maqasid syariah* dalam menangani tekanan kerja serta konflik peranan dalam kalangan wanita Muslimah.Justeru itu, pendekatan *maqasid syariah* dilihat sebagai solusi yang terbaik bagi mengimbangi kepentingan individu dan maslahat umum. Kajian turut menekankan bahawa pekerja wanita Muslimah perlu dilindungi daripada penindasan serta diberi peluang menyumbang secara aktif dan beretika kepada pembangunan masyarakat.

Kajian ini menunjukkan isu-isu berkaitan keluarga, pengurusan masa dan penjagaan anak serta sokongan pasangan turut dibincangkan di dalam sorotan literatur. Menurut Noraini Talib (2023) satu keperluan kepada dasar-dasar sokongan institusi terhadap wanita Islam bekerjaya, seperti fleksibiliti masa bekerja, kemudahan penjagaan anak dan cuti bersalin yang mencukupi. Kajian ini menekankan bahawa faktor mendapat sokongan penuh majikan dan suami serta kerjasama yang erat dari ahli keluarga sangat mempengaruhi kejayaan bagi seorang wanita dalam dunia kerjaya mereka. Hal ini penting untuk menjamin kesejahteraan emosi dan spiritual wanita bekerja Mohamad Fauzi Hamat (2023).

Kajian oleh Ismail dan Hassan (2022) dalam meneliti cabaran etika dalam sektor swasta, dengan mendapati wujudnya konflik budaya korporat dan prinsip syariah. Manakala Ali dan Mansor (2023) meneliti peranan polisi kerajaan seperti Dasar Wanita Negara dalam menyokong wanita bekerja. Seterusnya kajian konseptual oleh Sharifah Halimah et al., (2025) mencadangkan agar dasar kerja dalam sektor awam dan swasta digubal semula agar bersifat mesra Muslimah. Pendekatan secara holistik yang merangkumi aspek spiritual, mental dan fizikal, perlu diterapkan dalam diri wanita bagi melahirkan tenaga kerja yang lebih profesional seterusnya berperanan sebagai ejen penting dalam pembentukan masyarakat madani.
Pemilihan kerjaya perlu dilakukan dengan mengambil kira kesesuaian fitrah wanita dan selari dengan tuntutan Islam. Ini termasuk pertuturan yang sopan, tingkahlaku yang baik, menjaga batas pergaulan, pemakaian menutup aurat, tidak berpakaian ketat dan nipis, memperolehi keizinan wali atau suami, menjaga pandangan mata dan tidak menzahirkan perhiasan mereka secara berlebih-lebihan. Menurut Fatimah Ali (1996) prinsip ini telah diterima oleh kebanyakan masyarakat Islam hari ini sebagai syarat sah untuk wanita bekerja. Wanita yang patuh terhadap etika kerja mampu menjaga maruah diri dan membina imej wanita yang solehah.

Seterusnya, kajian oleh Saadon dan Zainal Abidin (2022) di mana beliau menumpukan kepada nilai dan etika kerja wanita Muslim dalam kerjaya profesional. Dapatan kajian menegaskan bahawa pembentukan budaya kerja berdaya saing dan berakhlak dapat dilihat

jika kepentingan nilai-nilai Islam seperti amanah, sabar, ihsan dan taqwa dapat diterapkan dalam jiwa setiap individu. Pematuhan terhadap garis panduan syarak perlu diutamakan bagi memastikan wanita tidak terlibat dalam pergaulan bebas atau mengabaikan tanggungjawab kekeluargaan. Kajian oleh Zainab dan Nasir (2024) menggariskan bahawa penglibatan wanita Islam dalam sektor profesional dan keusahawanan di Malaysia semakin meningkat, maka perlu diwujudkan kurikulum pembangunan wanita Islam yang merangkumi kefahaman fiqh wanita bekerja, latihan kepimpinan dan pembentukan jati diri Muslimah yang seimbang antara profesionalisme dan keperibadian yang unggul.

3. Dapatan dan Perbincangan

Hasil daripada sorotan literatur yang relevan dan terkini, beberapa dapatan utama telah dikenalpasti berkaitan hak dan peranan wanita Islam bekerjaya. Dapatan ini dirumus berdasarkan pandangan ulama' muktabar dan kajian-kajian ilmiah terdahulu yang mengupas isu ini dari pelbagai sudut termasuk hukum syarak, faktor sosiobudaya, serta dasar negara. Perbincangan ini dibahagikan kepada tiga bahagian iaitu hak wanita Muslimah dalam konteks pekerjaan dan keluarga menurut perspektif Islam, isu dan cabaran utama wanita Islam bekerja dalam konteks Malaysia, serta garis panduan syariah dan etika kerja Islam terhadap penglibatan wanita dalam sektor pekerjaan dan tanggungjawab sosial.

i. Hak Wanita Muslimah Dalam Konteks Pekerjaan dan Keluarga Menurut Perspektif Islam
Secara umumnya, kebanyakan ulama' berpandangan bahawa Islam tidak melarang wanita untuk bekerja selagi mana pekerjaan yang dilakukan tidak menyalahi tuntutan syarak dan menjaga adab serta memenuhi nilai-nilai prinsip Islam seperti penjagaan aurat, batas pergaulan, niat yang betul dan mempunyai rasa tanggungjawab terhadap keluarga. Menurut al-Qaradawi (2009) bahawa Islam mengiktiraf wanita sebagai insan yang berpotensi dan mempunyai tanggungjawab sosial. Dalam karya beliau *Fiqh-Mar'ah al-Muslimah*, beliau menekankan wanita diberi hak untuk bekerja serta bertanggungjawab dalam pembangunan ekonomi dan sosial dengan menjaga batas dan adab-adab Islam seperti aurat, adab pergaulan dan niat yang betul (al-Qaradawi, 2009, hlm.337-341). Kenyataan ini disokong dengan pandangan bekas Mufti Perak, Harussani Zakaria (2010) di mana beliau menjelaskan bahawa Islam tidak melarang wanita bekerja selagi mana mereka tidak mengabaikan peranan sebagai seorang isteri dan sentiasa memberi keutamaan terhadap urusan ahli keluarga.

Menurut M. Dawam (2020) wanita dituntut melakukan pekerjaan yang baik sama seperti lelaki. Bushra Basiron (2022) hak wanita untuk bekerja diiktiraf dalam Islam, terutamanya dalam memenuhi keperluan ekonomi, pendidikan, menjaga ibu bapa serta mencapai kepuasan kendiri, dengan syarat memiliki persediaan dari sudut fizikal, emosi dan spiritual. Manakala Abd Wahab dan Abdul Rahman (2020) berpendapat bahawa Islam mengiktiraf hak wanita untuk mendapatkan pendidikan dan pekerjaan dengan syarat, pemilihan kerjaya harus bertepatan dengan adab Islam dan tidak bercanggah dengan peranan wanita dalam institusi keluarga.

Secara keseluruhannya, kajian lepas menekankan bahawa wanita Islam boleh bekerja, memiliki harta serta menyumbang idea dan tenaga untuk ekonomi keluarga dan negara dengan syarat semua prinsip Islam yang berkait dengan kerjaya dapat difahami dan dipatuhi dengan baik.

ii. Isu dan Cabaran Utama Wanita Islam Bekerjaya Dalam Konteks Malaysia
Tidak dinafikan terdapat beberapa pandangan ulama' yang membataskan wanita untuk bekerja. Menurut Ibn Qayyim al-Jawziyyah (1991) melalui karyanya *Turuq al-Hukmiyyah fi al-Siyasah al-Shar'iyyah,* di mana beliau menegaskan bahawa pekerja wanita Islam boleh terdedah dengan fitnah jika wanita itu keluar dari rumah tanpa keperluan yang mendesak. Beliau berpendapat agar wanita dihadkan daripada pekerjaan yang melibatkan percampuran

antara lelaki dan perempuan yang bukan muhrim atau perkara yang boleh mendatangkan fitnah kecuali pekerjaan itu selamat dan diperlukan.

Pendapat yang sama pernah diutarakan oleh al-Tantawi (1997) dalam penulisan beliau di mana wanita yang terdedah dengan masalah pengabaian tanggungjawab terhadap keluarga dan berlaku pelanggaran syariat, maka adalah menjadi keutamaan bagi wanita itu tidak bekerja. Suami atau lelaki yang berpegang kepada pendapat ini dan tidak bersifat terbuka akan cenderung berpendirian wanita tidak perlu bekerja. Pandangan ini perlu diteliti dan difahami dengan baik supaya tidak berlaku kekeliruan yang boleh menimbulkan permasalahan dalam rumahtangga serta dilema bagi wanita Islam yang berkeinginan untuk bekerja. Jika diteliti, pandangan ini juga masih selari dengan kebanyakan pandangan ulama' yang telah dibincangkan oleh pengkaji sebelum ini di mana wanita Islam boleh bekerja selagi mana adab dan prinsip syariah Islam dapat dipelihara. Pengkaji ingin menegaskan bahawa pandangan kedua-dua ulama' ini secara jelas, tidak menunjukkan larangan wanita Islam untuk bekerja, tetapi terdapat beberapa syarat yang perlu dipatuhi oleh mereka. Pandangan ulama' yang sentiasa mengikuti perubahan zaman dan *maqasid syariah* lebih tepat dan sesuai untuk dipegang dan diaplikasikan dalam kehidupan seharian.

Terdapat juga beberapa cabaran yang dapat dikenalpasti. Menurut kajian Zaidi & Lee (2020) menunjukkan terdapat konflik peranan antara tanggungjawab kerjaya dan keluarga. Seterusnya kajian oleh Ramizu (2021) menyatakan bahawa konflik rumahtangga berlaku apabila wanita sukar mengimbangi peranan di tempat kerja dan di rumah seterusnya memberi kesan terhadap hubungan kekeluargaan.

Secara kebiasaannya, wanita Muslimah yang keluar bekerja akan mengambil tempoh masa antara sembilan jam atau lebih waktu untuk menyelesaikan urusan kerja di pejabat, sebelum menyambung tugasan sebagai seorang isteri dan ibu kepada anak-anak. Kajian oleh Nor Asmah Zakaria (2020) di mana situasi ini menyebabkan mereka mengalami kepenatan fizikal dan tekanan mental yang boleh menjejaskan institusi keluarga, termasuk berlaku penceraian. Menurut Farah Liyana (2024) mencadangkan agar pendekatan berteraskan *maqasid syariah* dilaksanakan bagi memastikan keutamaan terhadap keluarga tidak terabai. Dalam konteks ini, peranan suami sebagai pemimpin dan penyokong dalam institusi keluarga amat penting bagi memastikan keharmonian dan keseimbangan antara kerjaya dan rumah tangga dapat dicapai.

Seterusnya kajian Ahmad dan Mohd Noor (2021) mencadangkan supaya pendekatan *maqasid syariah* dijadikan rujukan dan panduan utama dalam menyelesaikan isu diskriminasi gender, bebanan tugas, dan tekanan sosial terhadap wanita bekerjaya. Manakala Nurul Huda Zakaria (2023) menegaskan bahawa pendidikan hak pekerja dalam kalangan pekerja wanita Muslimah perlu diperkasakan agar mereka dapat memperjuangkan hak mereka di sisi undang-undang buruh Islam atau sivil secara sah dan beretika, malah mereka mampu berhadapan dengan isu diskriminasi halus *(microaggression)* di tempat kerja, terutamanya dalam aspek pematuhan syariah seperti pemakaian tudung, waktu solat dan ruang solat yang terhad.

Masalah di tempat kerja seperti buli, tiada peluang kenaikan pangkat, kesukaran mendapat cuti, gangguan seksual perlu ditangani secara sistematik kerana ia boleh menjejaskan motivasi dan prestasi kerja. Sharifah Halimah et al., (2025) mencadangkan penggubalan dasar kerja yang lebih mesra wanita Islam dengan mengambil kira aspek spiritual, mental dan fizikal pekerja wanita. Selain itu, Noraini Talib (2023) menekankan dasar sokongan majikan diperlukan dalam menilai kewajaran pelaksanaaan waktu kerja anjal, kemudahan penjagaan anak, dan cuti bersalin yang mencukupi bagi tujuan menjaga hasil kerja yang lebih berkualiti dan proaktif.

iii. Garis Panduan Syariah dan Etika Kerja Islam Terhadap Penglibatan Wanita Dalam Sektor Pekerjaan Serta Tanggungjawab Sosial

Penyediaan garis panduan yang berteraskan prinsip Islam untuk wanita yang bekerjaya amat penting bagi memastikan prinsip *maqasid syariah* dapat dicapai. Beberapa prinsip utama dikenalpasti:

a. Melengkapkan Diri Dengan Ilmu dan Takwa

Ilmu pengetahuan menjadi kunci keutamaan dalam meningkatkan ketaqwaan diri kepada Allah. Menurut Ibn Qayyim (2004) di dalam penulisan beliau dalam *kitab Miftah Dar al-Sa'adah* menyatakan kemuliaan bagi seorang hamba adalah ilmu dan ibadah. Tiada amal yang diterima melainkan dengan adanya ilmu dan keikhlasan. Ini bermakna kerjaya yang diceburi mesti berteraskan ilmu supaya segala tindakan berlandaskan kefahaman, bukan sekadar adat atau ikut-ikutan. (Ibn Qayyim, *Miftah Dar al-Sa'adah*, Jil. 1, hlm. 105). Manakala al-Ghazali (2005) menegaskan di dalam penulisan beliau *Ihya' 'Ulum al-Din*, setiap individu lelaki atau perempuan wajib menuntut ilmu. Ilmu merupakan asas kepada setiap amal, setiap amal tanpa ilmu adalah kesesatan. (al-Ghazali, *Ihya' 'Ulum al-Din*, Jil. 1, hlm. 15). Kajian ini menegaskan wanita Islam yang bekerja mesti melengkapkan diri terlebih dahulu dengan ilmu agama supaya wanita tahu batas dan etika dalam pergaulan, pemakaian, pengurusan dan komunikasi. Kajian oleh Nur Aqilah Ramizu dan Adawiyah Ismail (2021) menekankan bahawa ketakwaan dan kefahaman ilmu serta hukum hanya diperolehi melalui bimbingan dan kelas-kelas agama sekaligus membolehkan mereka mengurus kerjaya tanpa mengabaikan tanggungjawab terhadap keluarga.

b. Menjaga Penampilan dan Menghindari Tabarruj

Menurut *Kamus Dewan* terbitan Dewan Bahasa dan Pustaka (2005; 2023), istilah *tabarruj* merujuk kepada perbuatan wanita yang memperagakan kecantikan, perhiasan, atau tubuh badan secara keterlaluan di hadapan lelaki bukan mahram, yang bertentangan dengan adab dan tuntutan Islam. Menurut Zulkifli Mohamad al-Bakri (2019), tabarruj merujuk kepada penampilan wanita yang mencolok mata atau menarik perhatian di khalayak ramai, sama ada melalui pakaian yang berlebihan, solekan, dandanan rambut, pemakaian wangi-wangian, atau percakapan yang lembut dan menggoda. Dalam penulisan lain, Zulkifli (2021) menjelaskan bahawa wanita dibenarkan bekerja dalam pelbagai bidang selagi mana pekerjaan tersebut tidak bercanggah dengan syariat, tidak menimbulkan fitnah, dan tidak mengabaikan tanggungjawab terhadap suami serta anak-anak. Beliau turut menekankan bahawa aspek-aspek seperti penjagaan aurat, adab pergaulan, pemakaian yang sopan, serta suasana tempat kerja perlu diberi perhatian agar kerjaya yang diceburi memperoleh keberkatan dan tidak menjejaskan keharmonian institusi kekeluargaan.

Islam menetapkan garis panduan berpakaian dengan menutup aurat, tidak ketat dan tidak berlebihan dalam berhias. Ini bertepatan dengan firman Allah di dalam al-Quran Surah al-Nur ayat 31: "Katakanlah kepada wanita yang beriman, hendaklah mereka menahan pandangannya, dan kemaluannya, dan janganlah mereka menampakkan perhiasannya, kecuali yang (biasa) nampak dari padanya. Dan hendaklah mereka menutupkan kain tudung ke dadanya, dan janganlah menampakkan perhiasannya kecuali kepada suami mereka, atau ayah mereka, atau ayah suami mereka, atau putera-putera mereka, atau putera-putera suami mereka, atau saudara-saudara laki-laki mereka, atau putera-putera saudara lelaki mereka, atau putera-putera saudara perempuan mereka, atau wanita-wanita Islam, atau hamba-hamba yang mereka miliki, atau pelayan-pelayan laki-laki yang tidak mempunyai keinginan (terhadap wanita) atau anak-anak yang belum mengerti tentang aurat wanita. Dan janganlah mereka memukulkan kakinya agar diketahui perhiasan yang mereka sembunyikan. Dan bertaubatlah kamu sekalian kepada Allah, hai orang-orang yang beriman supaya kamu beruntung."

Menurut Muzayyanah Abdullah (2019) tabarruj atau berhias secara berlebihan boleh membawa kepada fitnah dan perlu dielakkan dalam kalangan wanita Islam yang bekerja. Wanita Islam yang bertabarruj akan berhadapan dengan fitnah terhadap pandangan dan hawa nafsu lelaki seterusnya akan mengundang masalah seperti gangguan seksual, pergaulan bebas, gangguan dalam rumahtangga serta maruah dan kehormatan diri tergadai.

c. Menjaga Ikhtilat Antara Lelaki dan Perempuan yang Bukan Mahram

Menurut *Kamus Dewan Edisi Keempat* terbitan Dewan Bahasa dan Pustaka (2005)**,** *Ikhtilat* merupakan kata pinjaman dari bahasa Arab اختلاط *(ikhtilaṭ)* yang di definisikan sebagai percampuran atau pergaulan antara lelaki dan wanita yang bukan mahram**.**

Ikhtilat juga boleh didefinisikan sebagai pergaulan bebas antara lelaki dan wanita yang bukan mahram dengan melampaui batas syarak. Pergaulan bebas seperti ini boleh mendatangkan dosa kerana tidak dibatasi dengan adab serta hukum Islam. JAKIM (2020). Pergaulan antara lelaki dan perempuan yang bukan mahram perlu dibatasi dengan hukum Islam dan adab. Ini termasuk menundukkan pandangan, menutup aurat, menjaga suara dan elakkan situasi berdua-duaan. Setiap urusan kerja perlu dilaksanakan dengan cermat dan berhati-hati tanpa memberi peluang dan ruang yang boleh menimbulkan fitnah sehingga mengganggu keharmonian rumahtangga. Mendapat keizinan daripada bapa atau suami Wanita Muslimah yang ingin bekerja, perlu terlebih dahulu mendapat persetujuan dari wali seperti bapa atau suami. Mereka merupakan ketua keluarga yang bertanggungjawab terhadap perlindungan dan kebajikan wanita dalam keluarga. Kebenaran ini juga memastikan wanita tidak terdedah dengan perkara–perkara yang bertentangan dengan syariat. al-Qaradawi (2009). Menurut Zainal Abidin (2022) wanita Islam yang ingin bekerja perlu memastikan pekerjaan yang diceburi tidak bercanggah dengan hukum syarak, khususnya dari segi aurat, *ikhtilat* (pergaulan) dan suasana tempat kerja. Beliau menyatakan bahawa kerjaya yang menyokong tanggungjawab terhadap keluarga dan menghindari percampuran bebas antara lelaki dan wanita lebih diberkati dan selari dengan maqasid syariah.

Wanita Islam yang bekerjaya di Malaysia disarankan agar melengkapkan diri dengan ilmu pengetahuan tentang agama kerana ilmu merupakan asas dalam membuat keputusan dalam setiap urusan kerja. Sesuatu ilmu agama bukan hanya sekadar perlu diketahui tetapi perlu difahami dengan baik bagi pelaksanaan serta hukum. Penampilan yang menepati syariat seperti berpakaian sopan, longgar serta tidak ketat dan memakai tudung melepasi dada adalah menjadi tuntutan agama Islam. Unsur *tabarruj* seperti memakai wangian, bersolek, berdandan sehingga mendatangkan tarikan bagi lelaki yang bukan mahram perlu dielakkan bagi menjaga maruah dan mengekalkan identiti pekerja wanita Muslimah. Segala pergaulan di tempat kerja perlu dilaksanakan dengan berpandukan kepada nilai-nilai prinsip Islam seperti tidak melunakkan suara serta bersentuhan antara lelaki dan perempuan yang bukan mahram.

Islam juga menekankan kepentingan dalam meminta izin serta mendapat sokongan wali seperti bapa atau suami terlebih dahulu sebelum membuat keputusan untuk bekerja bagi memastikan kesejahteraan dan keselamatan wanita Islam. Wanita Islam yang bekerjaya juga perlu memastikan keseimbangan antara tugas kerjaya dan peranan dalam institusi keluarga tidak terabai demi menjaga keharmonian rumahtangga. Justeru itu wanita Islam di Malaysia perlu bijak dalam memilih kerja yang bersesuaian dengan kemampuan diri, pengurusan masa, pekerjaan yang memberi manfaat kepada keluarga dan masyarakat serta tidak bercanggah dengan tuntutan Islam seperti dalam bidang pendidikan, kesihatan atau perkhidmatan sosial.

Wanita Muslimah juga diseru melaksanakan kerja dengan mengikut garis panduan Islam, supaya pekerjaan yang dilakukan mendapat keredhaan Allah. Kajian ini menegaskan pentingnya mengetahui penetapan garis panduan Islam supaya prinsip *maqasid syariah* dapat dicapai seterusnya maruah dan martabat wanita dapat dipelihara. Berdasarkan penemuan dan sorotan literatur, terdapat beberapa cadangan kajian lanjutan yang boleh diterokai oleh penyelidik pada masa akan datang. Antaranya ialah:

i. Kajian Wanita Islam Bekerjaya di Malaysia
Kajian lebih mendalam tentang wanita Islam yang bekerja dalam pelbagai sektor pekerjaan berdasarkan pengalaman sebenar atau secara realiti. Fokus kajian boleh diberikan kepada aspek keseimbangan peranan antara kerja dan keluarga, tahap kepuasan kerja, sokongan daripada institusi keluarga dan serta impak terhadap institusi kekeluargaan.

ii. Kajian Pembangunan Model Kerjaya Muslimah
Satu kerangka kerja bersepadu boleh dibangunkan dan dijadikan asas kepada dasar mesra Muslimah dalam sektor awam atau swasta di mana ia merangkumi gabungan prinsip *maqasid syariah*, etika kerja Islam, serta aspek psikososial wanita bekerjaya.

iii. Kajian Analisis Perundangan dan Polisi Mesra Wanita Islam

Kajian tahap keberkesanan undang-undang pekerjaan dan dasar kerajaan dalam melindungi hak wanita Islam, khususnya dalam isu diskriminasi, gangguan seksual, fleksibiliti waktu kerja dan kemudahan penjagaan anak.

iv. Kajian Perbandingan Antara Negara Islam

Mengenal pasti pendekatan terbaik dalam mengurus penglibatan wanita Islam dalam dunia kerjaya dengan melihat kepada konteks budaya, sosial dan perundangan melalui kajian perbandingan antara negara-negara Islam seperti Malaysia, Indonesia, dan Brunei.

Kajian ini memberi beberapa implikasi penting yang relevan kepada individu, masyarakat, institusi, penggubal dasar dan negara.

i. Kesedaran Terhadap Hak dan Batasan Syariah
Kajian ini dapat meningkatkan kesedaran pekerja wanita Islam mengenai hak dan batasan dalam kerjaya berdasarkan perundangan Islam. Ia juga mendorong pekerja wanita untuk menilai semula hala tuju kerjaya agar selari dengan peranan sebagai isteri, ibu dan hamba Allah SWT.

ii. Kepentingan Sokongan Keluarga dan Kerjasama Suami Isteri
Dapatan kajian menekankan kepentingan pembahagian peranan yang adil antara suami dan isteri. Kajian juga dapat memberi kesedaran kepada individu, masyarakat mahupun majikan bahawa keharmonian rumah tangga boleh dicapai dengan adanya sokongan moral, emosi dan fizikal terhadap pekerja wanita Muslimah dalam mengimbangi peranan kerjaya dan tanggungjawab terhadap keluarga.

iii. Keperluan Polisi Kerja yang Mesra Muslimah
Kajian ini menyeru kepada pelaksanaan dasar kerja yang lebih tersusun dan sensitif terhadap keperluan pekerja wanita Muslimah. Antaranya termasuk penggubalan waktu kerja fleksibel, penyediaan tempat solat, dasar pemakaian patuh syariah, serta kemudahan penjagaan anak yang selesa dan selamat.
iv. Peranan Institusi Pendidikan dan Penyelidik
Institusi pendidikan disaran membangunkan satu kerangka modul bersepadu yang memfokuskan kepada etika kerjaya yang berpandukan Syariah dan fiqh wanita bekerja. Penyelidikan lanjut dalam bidang ini dapat memperkaya kefahaman dan menyumbang kepada pembangunan ilmu Islam kontemporari.
v. Pemerkasaan Holistik Wanita Islam
Penglibatan wanita Islam dalam dunia pekerjaan yang merangkumi pelbagai bidang profesional, pendidikan dan pentadbiran sangat memberi impak besar kepada pembangunan masyarakat dan negara. Oleh itu, pemerkasaan pekerja wanita Islam harus digarap secara

holistik yang merangkumi aspek spiritual, psikologi dan sosial, agar peranan mereka dapat dimaksimumkan tanpa mengabaikan identiti dan tanggungjawab agama.

4. Kesimpulan

Kajian ini telah mengenal pasti isu-isu utama berkaitan hak, cabaran dan kedudukan wanita Islam dalam dunia kerjaya berdasarkan perspektif Islam dan konteks sosio-ekonomi Malaysia. Objektif kajian yang menekankan kefahaman terhadap hak wanita Muslimah dalam kerjaya, isu dan cabaran yang dihadapi serta pandangan Islam terhadap penglibatan wanita bekerja telah dianalisis melalui sorotan literatur yang relevan. Antara isu utama yang dikenal pasti termasuklah konflik peranan antara tanggungjawab sebagai pekerja dan ibu atau isteri, diskriminasi gender di tempat kerja, tekanan sosial terhadap imej wanita bekerjaya, serta kekangan institusi seperti kurangnya dasar mesra Muslimah dalam sektor pekerjaan. Cabaran ini semakin ketara apabila wanita berdepan dengan beban kerja berganda, kurang sokongan penjagaan anak dan dilema memilih kerjaya yang sesuai dengan fitrah dan tuntutan syarak.
Namun begitu, dapatan kajian juga menunjukkan bahawa wanita Muslimah mampu mengimbangi antara peranan domestik dan profesional sekiranya mereka diberikan sokongan berstruktur seperti dasar pekerjaan yang inklusif, sistem kekeluargaan yang menyokong, serta pemahaman mendalam terhadap prinsip syariah dalam kerjaya. Pemerkasaan wanita dari sudut spiritual, mental dan emosi amat penting agar mereka mampu berfungsi secara holistik sebagai tenaga kerja yang berkualiti dan ahli keluarga yang seimbang. Secara keseluruhannya, kajian ini menegaskan bahawa Islam tidak menghalang wanita untuk berkerjaya, namun menuntut agar mereka memelihara adab, akhlak dan tanggungjawab syarie. Pendekatan berteraskan *maqasid syariah* dan pembangunan jati diri Muslimah yang bersepadu adalah penting untuk memastikan wanita Islam bukan sahaja mampu menyumbang kepada pembangunan negara, malah kekal berpegang teguh pada nilai agama dan etika kerja Islam serta mampu melaksanakan peranan fitrah sebagai isteri, ibu dan anggota masyarakat yang dihormati.

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THE IMPACT OF FINANCIAL MANAGEMENT, FINANCIAL LITERACY, AND LIFESTYLE ON GENERATION Z'S SAVING BEHAVIOR

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Abstract

Saving behaviour is an important financial habit in building individual economic stability, especially for Generation Z who grew up in the digital and instant era. This study aims to analyse how financial management, financial literacy, and lifestyle influence Generation Z's saving behaviour. This generation is known to be active, adaptive to technology, but also vulnerable to the influence of consumptive lifestyles that encourage impulsive spending. Using a quantitative approach, this study is designed to examine both the simultaneous and partial effects of the three main variables on saving habits. It is hoped that the findings of this study will provide valuable insights for educational institutions, financial institutions, and Generation Z, in order to raise awareness of the importance of financial management from an early age. The findings are also expected to serve as a foundation for developing more effective and relevant financial education strategies for today's youth.
Keywords: Financial management; Lifestyle; Saving behaviour.

1. Introduction

In today's digital era, Generation Z born between 1997 and 2012 has grown up in a very different environment from the previous generations. The rapid development of technology and unlimited access to information has made Generation Z an information-savvy group that is very active in using social media and digital platforms. However, in the midst of this easy access, new challenges arise in terms of personal financial management including saving habits. In addition to financial management, financial literacy is also a crucial aspect. Based on the Financial Services Authority (OJK) report in 2023, the level of financial literacy in Indonesia reached 49.68%, but the level of financial inclusion has reached 85.10%. This figure shows a gap between understanding and the use of financial products. The low financial literacy of Generation Z indicates that many of them do not understand the basic principles of financial management, investment risks and the long-term benefits of saving. On the other hand, the lifestyle influenced by popular culture and social media also affects Generation Z's financial habits. The urge to follow trends, fear of missing out (FOMO), and impulsive consumption are challenges for this generation in forming healthy savings habits. This consumptive lifestyle is often not balanced with their income, especially for those who are still students.These factors highlight the importance of conducting research to examine in greater depth how financial management, financial literacy, and lifestyle influence Generation Z's saving behavior, both jointly and individually.This research is expected to provide a real picture of the current financial condition of the younger generation and provide recommendations that can be used by educational institutions, government and financial institutions in increasing financial awareness among Generation Z.

Individual financial management includes the process of planning, organizing, controlling and monitoring financial resources to achieve personal financial goals. The ability to manage

finances effectively is particularly important for Generation Z, a digital generation with extensive access to financial information and technology. Financial literacy has the strongest influence on Generation Z's financial behaviour, followed by financial technology and financial self-efficacy. This suggests that a good understanding of basic financial concepts, such as budgeting, saving and investing can help Generation Z make wise financial decisions (Ngatno, 2021). Financial literacy is the ability to understand and use a range of financial skills, including personal financial management, budgeting and investing. According to Lusardi and Mitchell (2014), financial literacy includes knowledge of basic financial concepts as well as the skills to apply them in making financial decisions. Financial literacy plays an important role in shaping individual financial behaviour including saving behaviour. Individuals with good financial literacy tend to have a deeper understanding of the importance of saving for future needs. The level of financial literacy among Generation Z varies greatly depending on their educational background, access to information and family upbringing. In today's digital era, Generation Z obtains more financial information through social media, YouTube, and financial apps.

Consumer lifestyle is defined as the way consumers live in spending time, energy and money on everything they consider important (pattern in which people live and spend time and money, Engel, Blackwell, and Miniard, 1995 p. 449). There are people who like to seek entertainment with their friends, some like to be alone, some like to travel with family, shop, do dynamic activities, and some have free time and excess money for social-religious activities. Studying consumer lifestyles is just one way to categorize consumers psycho graphically (Putri Nugraha et al., 2021). A person's view of branded goods. This indicator relates to how a person views, values, and uses branded goods. This includes preference and pride in owning branded goods (Firlianda, 2019). Saving behavior is an area where interventions are often integrated, ensuring that the discussion remains connected rather than isolated. Financial behaviour refers to the way individuals manage, use and treat finances. Individuals who are able to control their financial behaviour can manage their financial resources efficiently through budget planning, saving, controlling spending, investing and repaying loans on time (Cerdas et al., n.d.).

2. Methodology

This research was conducted in the vicinity of the researcher's residence which is located at Jalan Talam No. 17 LK-III Kec. Binjai Utara Kab/Kota Binjai Postal Code 20742. This research is carried out for 6 months, March to August 2025. “Data collection techniques are the accuracy of the methods used to collect data that can be done in various settings, various sources, and various ways" (Sugiyono, 2020). The data collection techniques used by researchers to obtain the necessary data and information are interviews, documentation, questionnaires and bibliographies. The population in this study were adolescents aged 12-27 years around 188 people. Given the total population of 188 individuals, the researcher applied Slovin’s formula to determine the sample size, which resulted in 128 respondents. The sample was selected using a proportional random sampling technique, chosen because it provides all members of the population with an equal opportunity to be included. The data analysis techniques employed in this study include multiple regression analysis, partial testing (t-test), simultaneous testing (F-test), and the coefficient of determination (R^2).

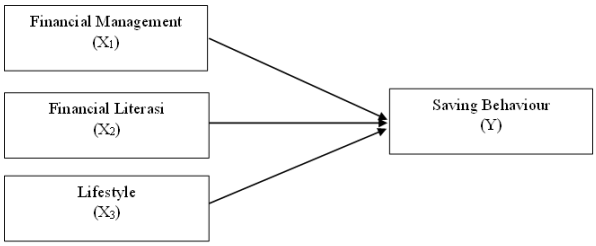

Fig. 1. Saving Behaviour

H1: Financial management has a positive and significant effect on Generation Z's saving behaviour.
H2: Financial literacy has a positive and significant effect on generation Z's saving behaviour.
H3: Lifestyle has a positive and significant effect on generation Z's saving behaviour.
H4: Financial management, literacy and lifestyle together have a positive and significant effect on generation Z's saving behaviour.

3. Results and Discussion

The results of multiple linear regression analysis can be seen in the table below:

Table1. Multiple Regression

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	19,90	4,137		4,811	,000		
	Financial_Management	,488	,119	,671	4,100	,000	,255	3,919
	Financial_Literacy	,334	,124	,540	2,692	,008	,170	5,890
	Lifestyle	,424	,178	,551	2,386	,019	,128	7,818

Multiple linear regression equations were obtained:

$$Y = 19.900 + 0.488\ X1 + 0.334\ X2 + 0.424\ X3 + e \quad (1)$$

Constant (a) = 19.900 shows the constant value, where if the variables of financial management (X1), competence (X2) and motivation (X3) = 0 then performance (Y) = 19.90, meaning that if social support, competence, and motivation are increased then performance will be 19.90. The regression coefficient X1 = 0.488 indicates that financial literacy has a positive effect on performance so that if social support is increased by 1 unit, performance will increase by 0.488. The regression coefficient X2 = 0.334 shows that the competence provided has a positive effect on lifestyle. So that if competence is increased by 1 unit, performance will increase by 0.334.The regression coefficient X3 = 0.424 shows that the motivation provided has a positive effect on saving behaviour. So that if the motivation is increased by 1 unit, the performance will increase by 0.424.

The data processing results show a coefficient of 0.488 for the effect of financial management on saving behavior, indicating that better financial management increases saving behavior, while weaker financial management decreases it. Based on the results of significance (sig), the financial management variable has a sig value of 0.000 or 0.05, this indicates that there is a positive and significant influence between financial management variables on saving behaviour. Based on the comparison of the tcount > ttable value, the tcount value of the social support variable is 4.10 while the ttable is 1.66, then H1 is accepted. Thus, it can be concluded that there is a positive and significant influence between financial management variables on saving behaviour. The results of data processing for the financial literacy test on saving behaviour of 0.334 can be interpreted that financial literacy can increase saving behaviour and conversely a decrease in financial literacy will reduce saving behaviour. Based on the results of significance (sig), the financial literacy variable has a sig value of 0.008 or 0.05, this indicates that there is a positive and significant influence between financial literacy variables on saving behaviour. Based on the comparison of the tcount> ttable value, the tcount value of the financial literacy variable is 2.692 while the ttable is 1.66, then H1 is accepted. Hence, there is a positive and significant influence between financial literacy variables on financial behaviour.

The results of data processing to test the effect of motivation on the performance of young expert statisticians, with a value of 0.424, can be interpreted that motivation can improve the performance of young expert statisticians and vice versa, decreasing motivation will reduce the performance of young expert statisticians. Based on the significance results (sig), the motivation variable has a sig value of 0.019 or < 0.05, which indicates that there is a positive and significant influence of the motivation variable on the performance of young expert statisticians. Based on the comparison of the tcount> ttable value, the tcount value of the motivation variable is 2.386, while the ttable is 1.66, so H1 is accepted. It is therefore concluded that there is a positive and significant influence of motivation variables on the performance of young expert statisticians.

Table 2. F-test or Simultaneous Test

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	97,933	3	32,644	7,469	,000[b]
	Residual	541,942	124	4,371		
	Total	639,875	127			

Based on the significance value (sig), the financial management, financial literacy and lifestyle variables simultaneously have a sig value of 0.000 or 0.05, this shows that there is an influence between the variables of financial management, financial literacy and lifestyle on the saving behaviour variable. This can be seen from the comparison value between the Fcount value and Ftable, the Fcount value of the financial management, financial literacy and lifestyle variables is 7.469 while the Ftable for df (1) = 3 and df (2) is 124 with a one-way significance level of 5% or 0.05 obtained at 1.98. Thus Fhitung Ftabel means that the variables of financial management, financial literacy and lifestyle together have a positive and significant effect on saving behaviour. The coefficient of determination (R2) of the regression results can be seen in the table as below:

Table 3. Coefficient of Determination

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	,730[a]	,533	,521	1,972	2,037

The results of the F ANOVA test in this study showed that lifestyle, financial literacy, and financial management simultaneously influenced Generation Z's savings behavior with a significant value of 0.000, or less than 0.05. This means that with the right lifestyle, effective financial management and increased financial literacy, savings behavior will too increase. Among the three variables, the most influential on savings behavior is financial management. This is evident from the standardized coefficients of financial management in Table 4.7, which is 0.671. This is because financial management is an internal factor originating from within an individual, which can be controlled by the individual themselves to produce better behavior. The processing results obtained a coefficient of determination of 53.3%. This indicates that Generation Z's savings behavior is influenced by 53.3% by lifestyle, financial literacy, and financial management together. While the remaining 46.7% is the influence of other factors not included in this study.

4. Conclusion

Partially, the results indicate that financial management has a positive and significant effect on Generation Z's saving behavior. This finding suggests that changes in the level of financial management directly impact the increase or decrease of saving behavior. Financial literacy is partially proven to have a positive and significant influence on saving behaviour. This means that the higher the level of financial literacy possessed by generation z, the better the saving

behaviour they produce. Partially, lifestyle has a positive and significant effect on Generation Z's saving behavior. This indicates that a higher lifestyle level is associated with higher saving behavior, making lifestyle a strong driving factor for Generation Z's saving practices. Simultaneously, it is found that financial management, financial literacy, and lifestyle together have a positive and significant influence on Gen Z saving behavior. This suggests that, when considered together, these three factors make a substantial contribution to increasing or decreasing Gen Z saving behavior.

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IMPLEMENTATION OF OFFICE MANAGEMENT AT THE NORTH SUMATRA PROVINCIAL DPRD OFFICE

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Abstract

This study analyses the implementation of office management in the Secretariat Division of the North Sumatra Provincial DPRD, specifically focusing on the functions of planning, organizing, implementing, and supervising. The background stems from the important role of office management in supporting legislative and administrative tasks, as well as obstacles such as weak coordination, employee discipline, and the need for competence through training. The research method used a qualitative case study: in-depth interviews with employees at various levels and direct observation of administrative activities. The results showed that the annual work plan (RKT) has been implemented; however, it is often revised due to sudden instructions, which causes confusion among staff. The organizational structure has been established; however, the division of tasks remains unclear, resulting in some employees, particularly the new ones, performing non-specialized tasks. Administrative processes like incoming/outgoing mail management, archiving, and SPPD are still carried out manually, leading to delays, data duplication, and reduced accuracy. Internal oversight remains reactive by sub-division heads, without support from performance indicator-based audits. In conclusion, while basic management principles have been applied, their effectiveness is not yet optimal. Recommendations include administrative digitization, human resource training, clarification of workflows, and the development of a systematic internal oversight and audit system. With these steps, it is hoped that the secretariat will become more efficient, accountable, and professional in line with the demands of bureaucratic reform.
Keywords: Administrative digitization; Legislative; Management.

Introduction

Office management within the Secretariat of the North Sumatra Provincial Legislative Council plays a crucial role in supporting the smooth operation of legislative and administrative tasks. The effectiveness of administrative operations within the General Administration Division of the Secretariat is significantly influenced by the synchronization of activity planning, task execution, and financial management. The application of good governance principles such as transparency and participation has been implemented to enhance efficiency and effectiveness, but various challenges remain, including insufficient coordination, employee discipline, and the need for skill enhancement through training. Office management within legislative institutions like the DPRD plays a strategic role in supporting administrative effectiveness, public service delivery, and policymaking.

At the Secretariat of the North Sumatra Provincial DPRD, office activities ranging from cash administration, correspondence, SPPD, meeting documentation, to asset management are still largely carried out manually. This situation has the potential to cause data duplication, input errors, delays in processes and low service accountability. Office management is the process of planning, organizing, implementing, and supervising office administrative activities with the aim of creating efficiency and effectiveness in an organization (Moleong, 2023). In the context of legislative bodies such as the Regional Representative Council (DPRD), office management functions are crucial because they are directly related to the smooth running of legislative tasks, public services, and timely, data-based decision-making (Adelia et al., 2025).

Office management contributes to improving the quality of administrative services as evidenced through a literature study approach. The results have shown that effective office management includes structured planning, good document management, digital information systems, and human resource competency development, contributing significantly to improving service quality. Additionally, the presence of standard operating procedures and the integration of manual and digital systems also enhance the consistency and reliability of services. At the Secretariat of the Provincial People's Representative Council of North Sumatra, various administrative activities such as managing incoming and outgoing correspondence, archiving, and conducting official trips are still largely carried out manually (Purba & Lubis, 2023).

This situation not only slows down the work process but also increases the risk of errors and data duplication (Harahap & Rahmani, 2022). In addition, weak coordination between units, sub optimal employee discipline, and a lack of training and competency development are major obstacles to the implementation of professional and effective office management (Yanti et al., 2021).After applying office management science in the 4.0 era, the most important thing is to understand the functions of office management science, namely POAC (planning, organizing, acting, controlling), where these functions can be used as indicators of change in the digital business world. Additionally, challenges arising from insufficient human resources and limited understanding of the subject matter act as barriers to the continued implementation of office management within the digital business environment (Nuryadi, 2023).This research was motivated by the need to assess the extent of office management implementation in the North Sumatra Provincial DPRD Secretariat and to provide strategic recommendations to support the improvement of overall administrative performance.

Methodology

The data used in this study are primary and secondary data. Primary data are data obtained directly from primary sources through in-depth interviews with relevant respondents. Interviews were conducted by compiling questions based on predetermined indicators. Meanwhile, secondary data were obtained through literature studies, company documents, internal reports, scientific publications, and other official documents that support the analysis in this study (Izatritakasi, 2025). The research was conducted in the North Sumatra Provincial DPRD office secretariat division from April to June 2025. The population in this study consists of all employees in the Secretariat Division. The sampling technique used was purposive sampling of five informants selected based on their strategic roles in office administration processes (Ultavia et al., 2023). Purposive sampling is a non-random method of selecting research units (individuals, cases, events) based on characteristics relevant to the research question. The aim is to gain in-depth insights from informants who have rich and contextual information (Tajik et al., 2024).

In this study, informants were selected based on their strategic positions in the administrative functions of the Secretariat Division of the North Sumatra Provincial DPRD. The five informants selected were directly involved in office administration processes, including planning, implementation, and control of administrative activities. The first informant is the Head of the Session and Legislation Section, who is responsible for scheduling sessions, managing meeting minutes, and documenting legal products. This function contributes significantly to administrative order in the DPRD's legislative activities. Next, the Head of the General and Personnel Section is in charge of managing human resources and the general administrative needs of the secretariat. This role has a direct impact on the effectiveness of the apparatus through the regulation of work systems, distribution of tasks, and provision of work facilities.

The third informant is the Head of the Administration and Household Subdivision, who handles correspondence, scheduling of internal activities, and management of office facilities and

infrastructure. This function supports the smooth running of daily operations, which has an impact on the quality of administrative services. The Policy Analyst in the DPRD Activity Facilitation Subdivision is responsible for preparing administrative analyses, activity reports, and program evaluations. This position is important in providing an empirical basis for strategic planning and institutional decision-making.

The last informant is the Archives and Documentation Administration Staff, who is responsible for managing archives and documentation systems, both manually and digitally. This function supports information organization, ease of data access, and institutional document security. The five informants provided relevant and comprehensive information in describing the implementation of office management, particularly in the context of local government bureaucracy. The results of the interviews with the informants form an important basis for analysing the effectiveness of the administrative system implemented in the Secretariat of the North Sumatra Provincial DPRD. Data collection techniques included:

a. In-depth interviews, to gain a direct understanding from informants regarding the implementation of office management (Moleong, 2023).
b. Participatory observation, to directly observe work activities, interactions between employees, and administrative processes. (Ultavia et al., 2023).
c. Document analysis, such as RKT reports, SPPD documents, and correspondence archives (Harahap & Rahmani, 2022).

This study uses a qualitative descriptive approach with the aim of understanding and describing the implementation of office management based on the in-depth views and experiences of informants. The data analysis process was carried out through several systematic stages, starting from sample determination to drawing conclusions. First, the researcher determined key informants using purposive sampling, a non-probabilistic sampling method that selects individuals based on specific considerations, such as the relevance of their roles and direct involvement in office administration processes. Five informants were selected because they held strategic positions in the Secretariat Division of the North Sumatra Provincial DPRD, which includes planning, implementation, and supervision of administrative activities.

After the informants were determined, the researcher collected data through in-depth interviews, participatory observation, and document analysis. The interviews were conducted semi-structurally with a set of questions based on office management indicators (POAC) to explore information about the work system, obstacles, and the effectiveness of office administration implementation. Observations were conducted to directly examine work activities, employee interactions, and the use of manual systems in administrative processes. In addition, documents such as the Annual Work Plan (RKT), letter archives, and SPPD reports were utilized to strengthen and validate the findings obtained from interviews and observations.

Next, the data obtained was analyzed through the stages of data reduction, data presentation, and conclusion drawing, as stated by Milles et al. (2021). In the data reduction stage, the researcher filtered and summarized information deemed relevant to the research focus. This stage also includes thematic coding to group information based on office management functions (planning, organizing, implementing, and supervising). At the data presentation stage, the reduced information was organized into descriptive narratives, tables, and direct quotations from informants to facilitate interpretation. Finally, conclusions were drawn based on the patterns that emerged from the analysis. Through this approach, the study provided a comprehensive description of the implementation of office management in the Secretariat Division of the North Sumatra Provincial DPRD, while also identifying the various challenges encountered in its application. Furthermore, this analysis process offers a strong foundation for formulating systematic and contextually relevant recommendations to improve administrative management.

Results and Discussion

Annual planning is carried out through the preparation of an Annual Work Plan (RKT), which is compiled at the beginning of each year (Adelia et al., 2025). However, its implementation is often disrupted by sudden instructions from the leadership (Melky et al., 2024). This situation indicates a lack of synchronization between long-term planning and short-term operational needs (Permana & Juwita, 2024).

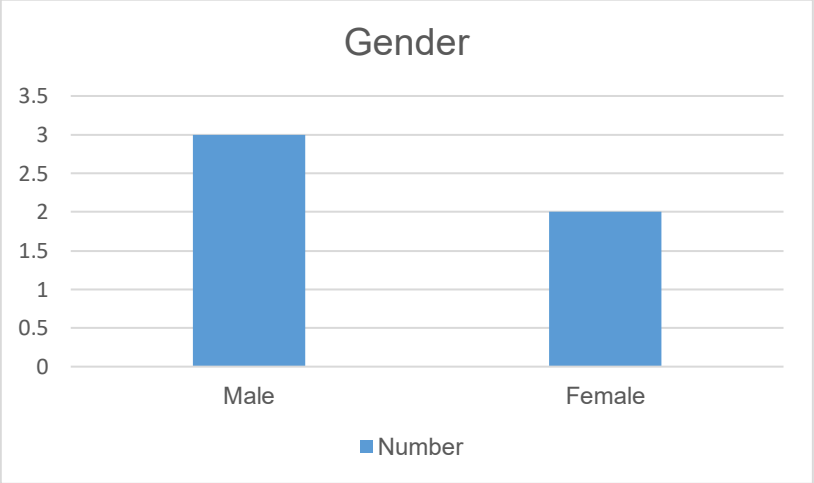

Fig. 1. Characteristics of Respondents

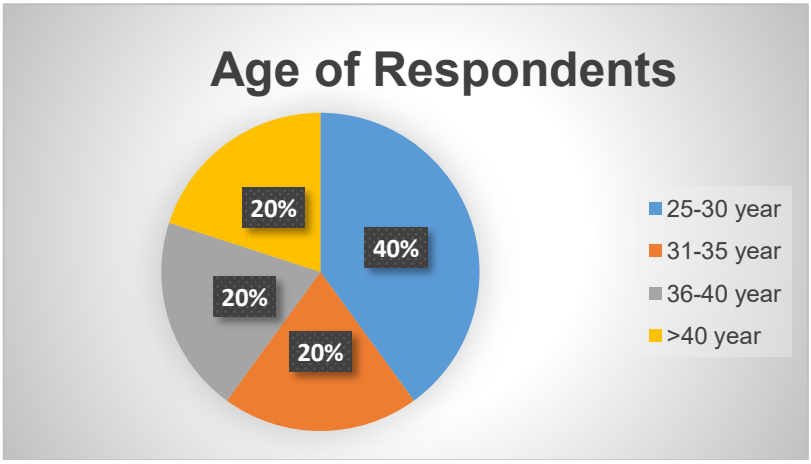

Fig. 2. Age of Respondents

The organizational structure of the DPRD Secretariat has been formally established (Asmarabia & Kristanto, 2023). However, its implementation has not been optimal because many employees still do not clearly understand their respective duties and responsibilities (Yanti et al., 2021). Most informants stated that work planning is carried out at the beginning of the year in the form of an Annual Work Plan (AWP). However, the implementation of these plans is often disrupted by sudden policy changes or instructions from management, which often confuses staff in adjusting their work targets. One senior staff member mentioned that such changes cause inconsistencies between initial planning and implementation in the field. From an organizational perspective, most informants stated that although the organizational structure has been established, the division of tasks is not fully understood by all employees. Some informants, including new employees, reported that they frequently receive tasks outside their areas of responsibility, suggesting a lack of clarity in workflows and ineffective coordination among work units.

Office administration tasks such as correspondence, filing, and SPPD management are still carried out manually (Purba & Lubis, 2023). As a result, delays occur in data processing, and work efficiency is low (Sanjaya & Yahfizham, 2024). In terms of activity implementation, almost all informants agree that routine activities such as managing incoming and outgoing correspondence, archiving, and travel administration (SPPD) are still carried out manually (Mardoni & Arif, 2021). A Travel Order (SPPD) is an official letter issued for formal work purposes, particularly related to government agencies, departments, or office tasks. This manual procedure is considered cumbersome due to its potential to cause delays, recording errors, and data duplication. One archive department staff member emphasized the need for a digital-based information system to expedite and simplify administrative work (Wiranti & Nasution, 2022). Research at the North Sumatra KPU (2024) shows that official travel is still manual, and a web-based monitoring system is needed to improve accuracy and efficiency (Pinka et al., 2024).

Supervision is carried out by the head of the sub-division, but it is still reactive in nature (Yanti et al., 2021). Evaluations are usually only conducted when errors or complaints arise (Permana & Juwita, 2024). There is no performance indicator based supervision system as recommended in modern management systems (Adelia et al., 2025). In terms of supervision, most employees acknowledged that oversight is primarily carried out by the head of the sub-division. However, this supervision is considered inadequate, as it is not supported by a systematic internal audit mechanism. Evaluations or warnings are generally issued only when errors or complaints arise, rather than through structured and regular monitoring.

Overall, the informants' responses indicate that office management in the Secretariat Division of the North Sumatra Provincial DPRD continues to face several challenges, particularly in internal coordination, administrative digitization, and monitoring mechanisms. These findings underscore the need for strengthening human resource capacity, clarifying work systems, and implementing more integrated information technology to enhance the effectiveness of the Secretariat's performance.

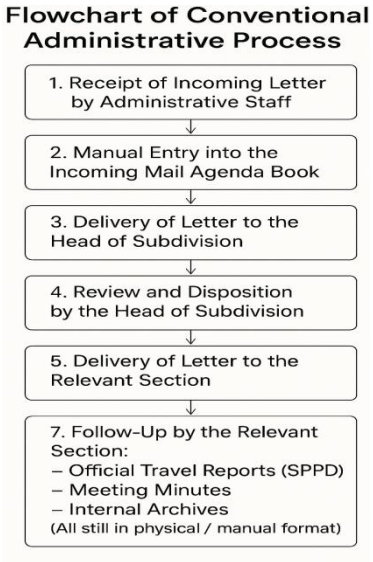

Fig. 3. Flowchart of Conventional Administrative Process

The administrative process at the Secretariat Division of the North Sumatra Provincial DPRD is mostly done manually. Based on observations and in-depth interviews with informants, it was found that the conventional administrative workflow begins with the receipt of letters by administrative staff, which are then recorded manually in an incoming mail logbook. The letters are then forwarded to the Head of the Subdivision for review and written disposition. Letters that have been disposed of are then delivered directly to the relevant department for follow-

up. After the follow-up process is complete, the physical documents are archived in shelves or storage cabinets without a systematic digitization and indexing system.

Similarly, other documents such as official travel reports (SPPD), meeting minutes, and internal archives are still compiled in physical form (hard copy), which are prone to loss, damage, and limited access. This situation causes a number of administrative problems, such as delays in processing, data duplication, recording errors, and difficulty in tracking documents. These problems are exacerbated by the absence of an integrated information system to support electronic document management and disposal. This is in line with the findings of (Purba & Lubis, 2023) and (Wiranti & Nasution, 2022), which identified that manual systems tend to hinder the effectiveness of public administration services.

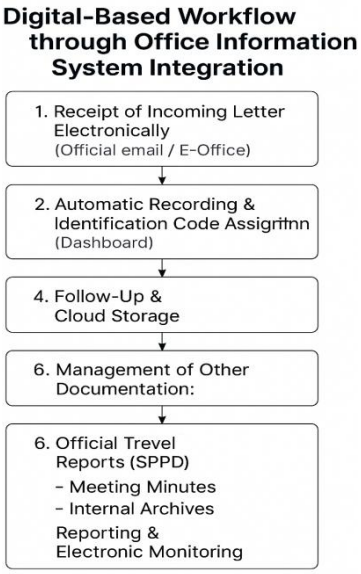

Fig. 4. Digital-Based Workflow

As an alternative solution, this study recommends the implementation of a digital-based workflow through the integration of office information systems. In the digital scheme, incoming letters are received electronically via official email or document management applications (e-office), which are automatically recorded in the system and given an identification code. The Head of Subdivision can give dispositions directly through the system dashboard, and notifications are automatically sent to the implementing unit. Every follow-up action is documented in the system and stored in a cloud-based digital storage system that supports indexing, quick search, and access restrictions based on user rights. Additionally, the management of SPPD and other documentation is conducted electronically with support from performance indicator (KPI)-based reporting features and real-time monitoring. The transformation of workflows from manual to digital systems offers several advantages, such as improved time efficiency, data accuracy, document security, and administrative process transparency. These findings are supported by research (Sanjaya & Yahfizham, 2024) and (Pinka et al., 2024), which state that the implementation of a web-based office information system can accelerate administrative workflows, improve the quality of internal services, and minimize technical errors in data management. Thus, the digitization of administrative workflows is a strategic step toward achieving efficient, professional, and accountable office management within the Secretariat of the Provincial People's Representative Council of North Sumatra, in line with the demands of bureaucratic reform and the application of good governance principles in public service.

In general, the informants' responses indicate that office management in the Secretariat Division of the North Sumatra Provincial DPRD still faces several challenges, particularly in

terms of internal coordination, administrative digitization, and oversight mechanisms. This highlights the need for improved human resource capacity, clearer work systems, and the implementation of more integrated information technology to support the effectiveness of the secretariat's performance.

In general, the best implementation is found in the aspect of work planning, where at the beginning of each year, the secretariat division prepares an Annual Work Plan (AWP) as a guideline for the implementation of activities. This planning serves as the basis for coordination and task allocation, although in practice, its implementation often undergoes revisions due to sudden policy changes from management. This finding aligns with the research findings (Adelia et al., 2025), which state that structured planning can enhance management effectiveness, though flexibility also remains a crucial factor in a bureaucratic environment. On the other hand, sub-optimal implementation is evident in the aspects of execution and supervision. Operational activities such as managing incoming/outgoing correspondence, archives, and official travel administration (SPPD) are still carried out manually. This poses risks of information delays, data duplication, and low work efficiency. This aligns with the findings of Purba and Lubis (2023), which indicate that the use of manual systems in office administrative activities causes delays in report preparation processes and a lack of data accuracy. In terms of supervision, the implementation of control functions still relies on direct supervision by the head of the sub-division. A consistent internal audit system does not support it. This results in an evaluation process that is reactive rather than preventive. However, as explained by Permana and Juwita (2024), effective supervision requires a systematic mechanism based on performance indicators and documented standard procedures.

Conclusion

The implementation of office management at the Secretariat of the North Sumatra Provincial DPRD has been carried out through the functions of planning, organizing, implementing, and supervising (Adelia et al., 2025). However, its effectiveness has not been optimal due to numerous challenges, particularly in the areas of manual implementation (Purba & Lubis, 2023), unclear task structures (Yanti et al., 2021), and inadequate structured supervision (Permana & Juwita, 2024).

Based on the findings, the researcher suggests the following recommendations:

a. Digitalization of Administrative Processes:
The Secretariat Division of the North Sumatra Provincial DPRD is advised to begin transitioning from manual to digital systems, particularly in the management of correspondence, archives, and official travel administration (SPPD). The implementation of an integrated web-based information system will streamline workflows, reduce recording errors, and enhance operational efficiency (Sanjaya & Yahfizham, 2024).

b. Strengthening the Internal Oversight System
A systematic oversight mechanism should be established, such as regular internal audits, measurable performance indicators (Key Performance Indicators/KPIs), and weekly or monthly evaluation reports. With structured oversight, administrative errors can be prevented early on, and work processes become more transparent and accountable.

c. Training and Competency Development for Human Resources
Staff in the Secretariat Division need to be provided with regular training on modern office management, information technology use, and public service ethics. This will strengthen the professionalism of the staff and support the implementation of adaptive and responsive management in line with contemporary developments.

d. Redesigning Task and Function Structures

It is recommended to review the division of tasks and responsibilities among employees. With a clearer work structure, potential overlaps in work can be minimized, and collaboration between units can become more effective.

e. Further Research by Academics

For future researchers, it is recommended that they explore similar topics using quantitative or mixed methods approaches to obtain more comprehensive data. In addition, the research object can be expanded to include other provincial DPRD as a comparison, to obtain a broader and more objective picture of office management implementation.

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UTILIZATION OF HUMAN RESOURCE MANAGEMENT AT HAUSEN COFFEE HOUSE IN RESPONDING TO FEEDBACK ON SOCIAL MEDIA TO INCREASE CUSTOMER LOYALTY

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Abstract

This study aims to explore the use of human resource management (HR) at Rumah Kopi Hausen in responding to feedback received through social media, as well as its impact on customer loyalty. In an increasingly competitive business context, effective interaction with customers through digital platforms is crucial. The research method used is quantitative with a survey method, where data is collected through questionnaires given to customers and disseminated through social media. The results of the study show that Rumah Kopi Hausen has implemented effective HR management strategies, including training employees to respond quickly and empathically. A positive response to customer feedback not only increases satisfaction but also contributes to increased customer loyalty. This research confirms that responsive and adaptive HR management to feedback on social media is key to building long-term relationships with customers. The conclusion of this study emphasizes that the effective use of human resource management in responding to feedback on social media contributes significantly to increasing customer loyalty. The resulting recommendations include the need for further development in employee training and the implementation of improved feedback management systems to maintain good relationships with customers and increase their overall satisfaction. This research is expected to provide insight for Rumah Kopi Hausen and other businesses in managing customer interactions in the digital era.
Keywords: Human resource management; Social media feedback; Customer loyalty.

1. Introduction

Along with the rapid development of the times, people's lifestyles have undergone significant transformations. This change is particularly noticeable, especially among Indonesian teenagers, where the need for a practical and adaptable lifestyle is becoming increasingly prevalent. In their daily lives, which are filled with various activities, both academic and non-academic, there is a need for a space that can support productivity while providing comfort. One form of response to this need is the existence of coffee houses, which are now not only seen as a place to enjoy coffee. Furthermore, the coffee house has evolved into a multifunctional space that supports learning, working, and socializing activities in a calm and enjoyable atmosphere. This phenomenon suggests that coffee houses have become a temporary alternative escape from the saturation of routine, providing space for individuals to refresh their minds and reorganize energy in a supportive atmosphere.

With the changing lifestyles of today's people, coffee shops have transformed into a popular place to gather, not only for relaxing, but also as a meeting place to discuss various matters, including business. The existence of coffee shops is no longer limited to big cities but has spread widely to various regions throughout Indonesia. The rapid growth of the coffee shop industry opens great opportunities for the younger generation to develop a career in this field. This development also encourages the emergence of various creative ideas to create a coffee shop that is unique, comfortable, and able to attract attention from various circles of society. However, in building and managing a coffee shop, there are significant challenges that must

be faced, such as how to retain loyal customers and anticipate the reasons why customers might choose to switch elsewhere. Customer loyalty includes the customer's desire to return to the service provider and also the desire to recommend the supplier's services or goods to others (Srisusilawati et al., 2023). Therefore, business actors compete to provide the best service and satisfactory product quality to create a pleasant experience for their customers.

One example of a coffee shop that has existed and developed in Medan, North Sumatra, is Hausen Coffee Shop. Since its establishment in 2014, Hausen has undergone various updates both in terms of menu and venue design to meet the needs and comfort of its consumers. Consistency in maintaining quality, commitment to service, and the ability to innovate are important factors in maintaining customer loyalty. Positive feedback from consumers is an important capital that not only improves the image of the business but also encourages business growth in a better direction.

In assessing customer satisfaction and loyalty to a coffee shop, there are several important aspects that are interrelated. These factors include product quality, competitive prices, satisfactory service, completeness of supporting facilities, effective promotional strategies, testimonials or tangible evidence of customer satisfaction, and strategic and convenient business locations. All these elements shape the overall consumer experience, which ultimately has a profound effect on creating long-term loyalty. Satisfaction is the extent to which an individual's actual performance or results are in line with their expectations (Iyonda & Yamit, 2023). According to Jahansashi et al. (2011: 255) in Wijaya, 2018, Product quality indicators in the automotive industry consist of:

i. Safety, comfort, and air pollution (safe, convenient, and no air pollution)
ii. Ergonomic requirements (working distance, clearance, weight)
iii. Product design
iv. Functional quality is the ability to move kilometres per litre per-fuel.

Products are not just physical goods, but also include services, symbols, and meanings conveyed by companies to answer customer desires (Setiyaningrum et al., 2015). The nine dimensions of product quality that can create satisfaction in consumers include: aroma, shape, level of maturity, visual appearance, serving temperature, color, taste, texture, and portion size (Adinugraha & Michael, 2014:645) in (Juanda, 2021). On the other hand, quality service is the main responsibility of service providers to be able to provide comfort and satisfaction directly to customers (Supranto, 2006). According to Parasuraman et al. (2008), the quality of service can be measured through five main dimensions, namely physical appearance (tangible), manpower capability (reliability), responsiveness to needs (responsiveness), security assurance (assurance), and personal attention (empathy).

In the business world, retaining customers to continue making repeat purchases is the main hope of every company (Tjiptono, 2020). Customer loyalty is a crucial aspect because it shows the level of consumer satisfaction with the products offered. When customers are satisfied, they tend to not only return to buy, but also recommend the product to others, which ultimately has a positive impact on the development of the business. According to Prasetyo & Endang Yani (2018), consumer loyalty can be interpreted as a form of long-term commitment to a certain brand or provider, which is characterized by a consistent tendency to choose products from the same source. This loyalty not only arises out of mere satisfaction but is also influenced by consumer resistance to move to other products. In the modern era filled with work flexibility and the development of communication technology, the approach to customer relationship management must also be adapted.

Thus, customer loyalty is more precisely understood as behaviour that is reflected through repeated purchases in a conscious and consistent manner. According to Griffin (Sangadji & Sopiah, 2015 in (Manihuruk, 2023)), Consumer behaviour are activities and psychology that

encourage such actions at the time of buying, when buying, using, consuming products and services after doing the above or evaluating activities. Meanwhile, Robinette (in Pratminingsih et al., 2013) mentioned that there are a number of factors that encourage the formation of customer loyalty, such as the attention that companies give to consumers, the level of trust built in the relationship, the sense of security or protection that customers feel, and the satisfaction accumulated from previous experiences.

In marketing activities, price plays an important role because it is the only element that directly generates revenue for the company. It is different from other marketing elements such as products, promotions, and distribution (venues), which incur operational costs. Therefore, pricing cannot be done arbitrarily; The right strategy is needed to be able to attract the attention of potential buyers. In general, price is understood as the exchange rate in the form of money that must be paid by consumers to benefit from the ownership or use of a good or service. If the price offered by the company is felt to be commensurate or in accordance with consumer expectations, this tends to encourage purchase transactions. Furthermore, the compatibility between price and perception of value by consumers can foster a sense of satisfaction and comfort, which ultimately strengthens their loyalty to the product or service.

Based on this description, the hypothesis in this study is formulated as follows: H2 – Price has an influence on customer loyalty. The proliferation of coffeehouses in Medan City reflects the changing lifestyle of urban residents, who increasingly seek comfortable and flexible spaces to relax, work, or socialise. Coffee houses are not only a location to enjoy coffee but have also evolved into a casual and multifunctional social space. This development is inseparable from the influence of technological advances and social media, which play an important role in shaping business promotion strategies. Social media such as Instagram, Facebook, and Twitter are now the main means of introducing products, establishing closeness with customers, and building brand image.

This change shows that social media is no longer just a communication tool but has become an important part of digital marketing strategies, especially for small and medium businesses. One of the real examples of the use of social media in the business world is the Hausen Coffee House in Medan. This coffee house makes intensive use of social media to promote products and reach audiences in a more efficient and cost-effective way compared to conventional methods such as brochure distribution or word-of-mouth promotion. However, the use of this data-based strategy needs to be controlled so as not to ignore humanist values in the management of labour relations. Therefore, this study aims to explore more deeply the social media promotion strategies implemented by Hausen Coffee House, focusing on how they manage human resources in response to customer feedback on social media to increase consumer loyalty.

2. Methodology

The research method employed is quantitative, utilizing a survey approach. This approach was chosen to gain a comprehensive understanding of how human resource management is utilized at Rumah Kopi Hausen in response to social media feedback, with the aim of increasing customer loyalty. Quantitative Research Method is a research approach that prioritizes the collection and analysis of quantitative data, namely data in the form of numbers or numerical variables. This approach aims to measure the relationship between variables or to understand phenomena through statistical analysis (Wajdi et al., 2024). Based on statements made by Putra et al. (2023, quantitative research is a type of research that has a systematic, planned, and organized structure from the beginning to the end of a project. In other words, quantitative research is a type of research that often uses numerical data to collect, analyze, and present results.

In this study, the way to collect data is a questionnaire. The use of questionnaires as a data collection tool in quantitative research has become common and widespread across a wide range of disciplines (Subasman & Aliyyah, 2024). This questionnaire was distributed to customers who had been involved as visitors, with the aim of finding out the extent to which human resources (HR) were used in responding to feedback submitted through social media. Through the dissemination of this questionnaire, the researcher wanted to measure the effectiveness of the role of HR in managing digital interactions as part of efforts to maintain and improve customer satisfaction.

The instrument used included several questions that assessed how well the HR management strategy was in responding to feedback on social media platforms. In addition, this questionnaire also identifies various challenges faced in the process, as well as measures the relationship between the ability to respond to feedback and the level of customer loyalty to the service or product offered. In this study, the authors used open-ended questions and applied the likert scale in a questionnaire. The likert scale has four or more question items combined to form a score/value that represents individual traits, e.g. knowledge, attitudes, and behaviours (Budiaji, 2013). The Likert scale is used to measure the attitudes, opinions and perceptions of a person or a group of people. The questionnaires presented in this study are as follows:

Table 1. Instrument for Assessing the Utilization of Human Resources at Hausen Coffee House

No	Aspect	Component
1.	HR Management Strategies in Responding to Feedback on social media	Employees at Rumah Kopi Hausen are trained to respond quickly to customer feedback on social media
		Employee responses to customer feedback are done with empathy
		Customer feedback on social media is regularly monitored by management
		Hausen Coffee House has procedures or guidelines for handling feedback on social media
		Customer feedback is used as evaluation material to improve services
2.	Challenges in Responding to Feedback on social media	1. Slow response times are often an obstacle in handling customer feedback
		2. The limited number of employees who work on social media is a challenge for Rumah Kopi Hausen
		3. There is difficulty in distinguishing constructive feedback from negative or unclear feedback
		4. The large number of social media platforms makes it difficult for management to respond to all feedback evenly
		5. Not all customer feedback can be acted upon as expected by customers
3.	Customer Loyalty	1. I am satisfied with the service I received at Hausen Coffee House
		2. I am willing to recommend Hausen Coffee House to friends or relatives
		3. I plan to continue visiting Hausen Coffee House in the future
		4. The quick and positive response from the employees made me more loyal to Rumah Kopi Hausen

	5. I feel valued as a customer when my feedback on social media is well responded to

The data collected from the questionnaire in this study were analyzed using quantitative analysis techniques with a survey method. This analysis process is carried out during the processing of questionnaire data. The coding process involves grouping customer responses based on a Likert scale of 1 to 5. This grouping aims to simplify the data so that it can be compiled systematically, which ultimately facilitates the process of analysis and drawing conclusions from the data obtained. In addition, the results of the questionnaire were also analyzed to find out if there was an increase in customer loyalty.

After being analyzed, the data is presented descriptively so that readers can understand more clearly the relationship between feedback on social media and the level of customer loyalty to Rumah Kopi Hausen. Data is collected through a questionnaire in the form of a google form where the results of this analysis are expected to provide insight into how understanding and feedback in customers provide feedback responses in increasing customer loyalty.

3. Results and Discussion

The research aims to gain an in-depth understanding of "the use of human resource management in the Hausen coffee house in responding to feedback on social media to increase customer loyalty". By adopting this approach, it is hoped that a deeper understanding of human resource management (HR) can be gained. So an assessment is made based on the following intervals:

Table 2. Respondent Interpretation Criteria

No.	Interpretasi (%)	Information
1.	0 % - 24,99 %	Less
2.	25 % - 49,99 %	Enough
3.	50 % - 74,99 %	Good
4.	75 % - 100 %	Excellent

In this study, data was analyzed by comparing the scores obtained from respondents' answers to each question item with the highest score that could be achieved. Furthermore, the results of the comparison are converted into a percentage by multiplying it by 100%. The score on each question is calculated based on the result of multiplying the score on the assessment scale with the number of respondents who chose the answer. Meanwhile, the maximum score was determined by multiplying the highest scale value, which was 5 (based on the Likert scale), with a total of 59 respondents. That way, the highest score you can get for each question is 295. This calculation is based on the use of human resources in the hausen coffee house which can be seen in the following table:

Table 3. Assessment of Human Resource Utilization at Hausen Coffee House

No	Aspect	Total Score of Each Question					Total Overall Score of the Question	Highest Score × Number of Questions (295 × 5)
		1	2	3	4	5		
1.	HR Management Strategies in Responding to Feedback on social media	224	228	230	222	233	1137	1475
2.	Challenges in Responding to Feedback on social media	190	196	185	183	186	940	1475
3.	Customer Loyalty	229	238	236	237	242	1182	1475
	Total Score						3259	4425
	Assessment Results = (3259/4425) *100%							73%

Based on the results of the qualitative analysis, the quality of human resources at Rumah Kopi Hausen Medan is generally in the "good" category. It was found that the main challenges faced by human resources related to responding to feedback on social media are important aspect that contributes to increasing customer loyalty. In today's digital era, interactions between businesses and customers are increasingly happening through social media platforms. Therefore, the ability to respond quickly and effectively to feedback is key to building strong relationships with customers.

It was conveyed that the limitation of human resources is the main challenge. This indicates that coffee shops continue to prioritize internal training, despite facing digital challenges. However, for this strategy to be effective across the board, it requires resource support, transformative leadership, and active engagement of all employees. By examining these results objectively and proportionally, this study suggests that Rumah Kopi Hausen Medan has demonstrated good human resource performance and has great potential to continue developing in response to customer feedback.

4. Conclusion

Based on the discussion in the previous section, it can be concluded that strategies that researchers can describe during the research on Hausen Coffee House include: 1) Hausen Coffee House has implemented various HR management strategies that are quite effective in responding to customer feedback on social media. Among them are employee training for quick and empathetic responses, active use of social media and digital platforms, and the development of employees' soft skills in communication and customer service. 2) Some of the challenges faced in managing feedback on social media include a lack of structured training, a limited number of employees, challenges in managing customer feedback, and high industry competition. However, in general, Rumah Kopi Hausen already has a good readiness to utilize human resources to increase customer loyalty. 3) Quick and positive responses to customer feedback on social media have been proven to have a significant influence on customer satisfaction and loyalty. Customers feel valued, are responded to personally, and are more likely to keep visiting and recommend Hausen Coffee House to others.

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THE EFFECT OF SERVICE QUALITY, PRICE PERCEPTION, AND CONVENIENCE ON VEHICLE RENTAL DECISIONS MODERATED BY RENTAL PRICE AT PT. GO RENTAL

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Abstract

This study aims to analyze the influence of service quality, price perception and convenience on rental decisions at PT. Go Rental and to test the role of rental price as a moderator. The study was conducted at PT. Go Rental Medan, from March to July 2025 with a population of company consumers. The sample was determined probability, using the Lemeshow formula and resulted in 100 respondents. The variables include Rental Decision (Y); Service Quality (X1); Price Perception (X2); Convenience (X3); and Rental Price (M) as a moderator. Data was collected through questionnaires and literature studies, tested with validity, reliability, descriptive statistics, classical assumption tests, t-tests, coefficients of determination and moderated regression (MRA). The results show that service quality, price perception and convenience have a significant positive effect on rental decisions, both directly and moderated by rental prices. These findings provide insights into marketing strategies and service improvements at PT. Go Rental.
Keywords: Quality services; Price perception; Rental.

1. Introduction

Transportation is vital in supporting economic activities and societal mobility. In the modern era, with technological developments and changing dynamics, consumer demand has shifted toward transportation services. Society is increasingly demanding fast, convenient, flexible and affordable service. In this context, the motorized vehicle rental service industry, especially for four-wheeled vehicles, is growing rapidly as an efficient and practical alternative for mobility. In Indonesia, this phenomenon is especially evident in big cities like Medan. Limitations in efficient public transportation, combined with the growing demand for flexibility, have led the public to switch to rental-based transportation services. Car rental service providers must be able to offer added value in the form of high-quality service, competitive pricing, and easy transaction processes to retain and attract customers.

A new customer entering a highly competitive market faces significant challenges. Various studies have shown that quality service, perception, price, and convenience have become the main factors that influence consumer decisions in choosing service rental vehicles. For example, Usman et al. (2023) emphasized that quality service and price have a positive influence on the decision to rent. Alfitri et al. (2023) also found that quality service makes a significant contribution to the decision to purchase service rental. However, some significant studies have seen a third factor as separate, without considering variable price rent as a potential moderating factor, strengthening or weakening the connection between the third variable and the decision rent. This research addresses a gap in the literature, as previous studies have not deeply examined how rental price, as a moderating variable, influences the relationship between service quality, price perception, and convenience on rental decision-making. In the real context, consumers not only consider one factor linearly, but also compare the values and benefits they provide with the cost of renting that must be paid when they take it out. Conveyed by Park (1995), relevant research is research that is capable of catching the

complexity between the variables of consumers. Based on the empirical observations at PT. Go Rental, it was found that a significant portion of consumers are dissatisfied with the service quality, price perception, and the convenience provided. In fact, many respondents were not willing to recommend this service to others. This showed that the existence problem is serious in decision rent consumers. Therefore, it is essential to do thorough study to understand a specific way on how third factors interact with price rent as variable moderation to decide rent customers.

2. Methodology

This study was conducted at PT. Go Rental which is located at Jl. Komp. Bumi Asri No.58 Blok F, Cinta Damai, Kec. Medan Helvetia, Medan City, North Sumatra 20123 from March to July 2025. This is a quantitative study. According to Cooper & Schindler, (2018) that results of research in the form of numeric and processed use analysis statistics signify that study. Then the data source in this study is primary data and it is divided into two categories, namely primary data sources and secondary data sources. Primary data sources are obtained through the distribution of questionnaires to respondents in the study. Whereas Secondary data obtained through documentation and study literature with print and electronic media assistance.

Methods of data collection are from field research and library research. The population of this study is PT consumers and customers. Go Rental located in Medan City. The sampling method used in study is *probability sampling.* Based on formula *Lemeshow,* the number of n obtained is 96.04. The sample used in the study is 100 respondents. Data analysis methods used in this study are quantitative studies and quantitative descriptive. The data analysis technique used in study includes instrument testing research (validity and reliability), statistical tests descriptive, assumption test classical (normality, multicollinearity, and heteroscedasticity), analytical tests multiple linear regression, as well as hypothesis testing (t-test, F-test, and coefficient of determination) *Moderated Regression Analysis* (MRA) test. With SPSS version 25 help.

3. Results and Discussion

Table 1. Validity Test Variables Quality Service (X1)

Statement Items	r Count	r Table	Information
X1_1	0.530	0.196	Valid
X1_2	0.574	0.196	Valid
X1_3	0.739	0.196	Valid
X1_4	0.669	0.196	Valid
X1_5	0.662	0.196	Valid
X1_6	0.696	0.196	Valid
X1_7	0.579	0.196	Valid
X1_8	0.681	0.196	Valid
X1_9	0.650	0.196	Valid
X1_10	0.669	0.196	Valid

Validity test results on variables Quality Service (X1) show that each statement item in study This own mark r_{count} is higher from r_{table} that is 0.196 ($r_{count} > r_{table}$).

Table 2. Validity Test Variables Price Perception (X2)

Statement Items	r Count	r Table	Information
X2_1	0.721	0.196	Valid
X2_2	0.691	0.196	Valid
X2_3	0.398	0.196	Valid
X2_4	0.434	0.196	Valid
X2_5	0.382	0.196	Valid
X2_6	0.608	0.196	Valid
X2_7	0.625	0.196	Valid
X2_8	0.747	0.196	Valid
X2_9	0.662	0.196	Valid

Validity test results on variables Price Perception (X2) show that each statement item in study This own mark r_{count} is higher from r_{table} that is 0.196 ($r_{count} > r_{table}$).

Table 3. Validity Test Variables Convenience (X3)

Statement Items	r Count	r Table	Information
X3_1	0.848	0.196	Valid
X3_2	0.856	0.196	Valid
X3_3	0.884	0.196	Valid
X3_4	0.866	0.196	Valid
X3_5	0.876	0.196	Valid
X3_6	0.868	0.196	Valid
X3_7	0.822	0.196	Valid
X3_8	0.801	0.196	Valid
X3_9	0.783	0.196	Valid
X3_10	0.695	0.196	Valid
X3_11	0.848	0.196	Valid
X3_12	0.849	0.196	Valid

Validity test results on variables Convenience (X3) show that each statement item in study This own mark r_{count} is higher than r_{table} that is 0.196 ($r_{count} > r_{table}$).

Table 4. Validity Test Rental Decision Variable (Y)

Statement Items	r Count	r Table	Information
Y_1	0.917	0.196	Valid
Y_2	0.867	0.196	Valid
Y_3	0.900	0.196	Valid
Y_4	0.899	0.196	Valid
Y_5	0.726	0.196	Valid
Y_6	0.869	0.196	Valid
Y_7	0.772	0.196	Valid
Y_8	0.846	0.196	Valid
Y_9	0.870	0.196	Valid

The validity test on the Rental Decision variable (Y) shows that each statement item is in the study. This own mark r count is higher than the r that is 0.196 (r count > r table).

Table 5. Validity Test Rental Price Variable (M)

Statement Items	r Count	r Table	Information
M_1	0.881	0.196	Valid
M_2	0.853	0.196	Valid
M_3	0.846	0.196	Valid
M_4	0.869	0.196	Valid
M_5	0.796	0.196	Valid
M_6	0.859	0.196	Valid
M_7	0.905	0.196	Valid
M_8	0.866	0.196	Valid
M_9	0.859	0.196	Valid
M_10	0.831	0.196	Valid
M_11	0.649	0.196	Valid
M_12	0.838	0.196	Valid

The validity test on the Rental Price (M) variable shows that each statement item in this study's own mark count is higher than the r table, which is 0.196 ($r_{count} > r_{table}$).

Table 6. Reliability Test Variables Quality Service (X1)

Reliability Statistics	
Cronbach's Alpha	N of Items
.898	10

Based on Table 6, the reliability test results show a variable Knowledge (X1) is obtained to mark *Cronbach's alpha* ≥0.60 (0.898 > 0.60).

Table 7. Reliability Test Variables Price Perception (X2)

Reliability Statistics	
Cronbach's Alpha	N of Items
.858	9

Based on Table 7, the reliability test results show variable Knowledge (X1) is obtained to mark *Cronbach's alpha* ≥ 0.60 (0.858 > 0.60).

Table 8. Reliability Test Variables Convenience (X3)

Reliability Statistics	
Cronbach's Alpha	N of Items
.968	12

Based on Table 8, the reliability test results show a variable Convenience (X3) obtained to mark *Cronbach's alpha* ≥ 0.60 (0.858 > 0.60).

Table 9. Reliability Test Rental Decision Variable (Y)

Reliability Statistics	
Cronbach's Alpha	N of Items
.965	9

Based on Table 9, the reliability test results show a variable Rent Decision (Y) obtained to mark *Cronbach's alpha* ≥ 0.60 (0.965 > 0.60).

Table 10. Reliability Test Rental Price Variable (M)

Reliability Statistics	
Cronbach's Alpha	N of Items
.969	12

Based on Table 10, the reliability test results show Rental Price variable (M) is obtained to mark *Cronbach's alpha* ≥ 0.60 (0.969 > 0.60).

Table 11. Normality Test

One-Sample Kolmogorov-Smirnov Test		
		Unstandardized Residual
N		100
Normal Parameters [a,b]	Mean	.0000000
	Std. Deviation	2.57224913
Most Extreme Differences	Absolute	.073
	Positive	.064
	Negative	-.073
Test Statistics		.073
Asymp. Sig. (2-tailed)		.200 [c,d]

Based on the normality test results on the Rental Decision variable (Y), the obtained mark *Asymp. Sig. (2-tailed)* of 0.200.

Table 12. Multicollinearity test

Model		Unstandardized Coefficients		Standardized Coefficients	t	
		B	Std. Error	Beta		Sig.
1	(Constant)	-5,961	1.187		-5.022	.000
	Quality Service	.309	.041	.280	7,492	.000
	Price Perception	.165	.041	.127	4.025	.000
	Convenience	.535	.028	.687	18,917	.000

Multicollinearity test on the Interest variable (Y) is variable Quality Service (X1) own mark *tolerance* as big as 0.525 and the value VIF as big as 1,904, variable Price Perception (X2) has *tolerance* as big as 0.732 and the value VIF as big as 1,366, and the variables Convenience (X3) shows mark *tolerance* as big as 0.555 and the value VIF as big as 1,803.

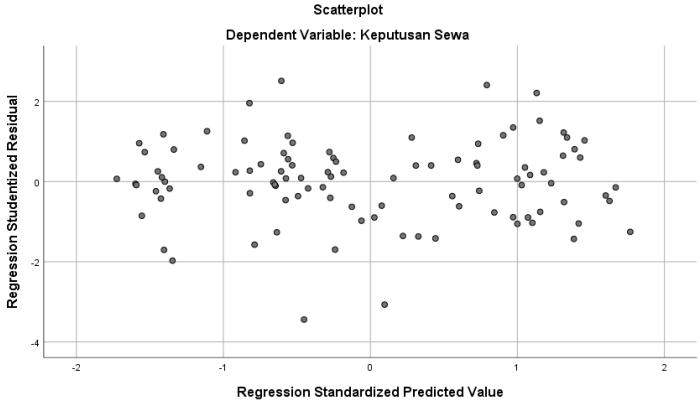

Fig. 1. Results of Heteroscedasticity Scatterplot Test

The heteroscedasticity test in the image shows that the dots are evenly distributed above and below the zero value on the Y-axis, indicating no heteroscedasticity in the equation model regression.

Table 13. Partial Test (t-Test)

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	-5,961	1.187		-5.022	.000
	Quality Service	.309	.041	.280	7,492	.000
	Price Perception	.165	.041	.127	4.025	.000
	Convenience	.535	.028	.687	18,917	.000

Partial test (t-test) in study This is Variables Quality Service (X1) obtained t value of 7.492 and significance of 0.000, Variable Price Perception (X2) has a calculated t value is 4.025 and significance is 0.000, and the variable Convenience (X3) shows the t- t-value is 18.917 and the significance is 0.000.

Table 14. Coefficient Test Results Determination (R2)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.964 [a]	.930	.928	2.61213

Coefficient test results determination in the study. This obtained R-squared value of 0.930.

Table 15. Moderated Regression Analysis (MRA) Test of Equation I

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	24,944	2.199		11,343	.000
	Quality Service	-.702	.127	-.636	-5,516	.000
	X1_M	.020	.002	1,508	13,077	.000

The results of the moderated regression analysis (MRA) test for Equation I are the constant values obtained of 24,944 with mark positive, Coefficient regression variable Quality Service obtained of -0.702 with mark negative, Coefficient regression variable Quality Services (X1_M) to Rental Decision obtained of 0.020 with mark positive, and the results of the moderation test on the variables Quality Service (X1_M) has an effect on rental decisions significant to decision rent Because mark its significance more small from 0.05 (0.000 < 0.05).

Table 16. Moderated Regression Analysis (MRA) Test Equation II

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	25,840	1,541		16,765	.000
	Price Perception	-.779	.079	-.600	-9.825	.000
	X2_M	.022	.001	1,392	22,806	.000

The results of the moderated regression analysis (MRA) test of Equation II are the constant values obtained amounting to 25,840 with mark positive, Coefficient regression variable Price Perception is obtained of -0.779 with mark negative, Coefficient regression variable Price Perception (X2_M) towards Rental Decisions is obtained of 0.022 with mark positive, and the results of the moderation test on the variables Price Perception (X2_M) has an effect on rental

decisions significant to decision rent Because mark its significance more small from 0.05 (0.000 < 0.05).

3.1 Influence on Quality Service Regarding the Rental Decision

Research results about the influence of Quality Service on the Rental Decree show that a mark count of 7,492 with a level of significance of 0.000 and a positive direction coefficient. This shows that the mark count is higher than the table (7.492 > 1.661) and the value significance is smaller than 0.05 (0.000 < 0.05). It can then be concluded that the variable Quality Service (X1) has a positive and significant effect on the Rental Decision (Y). These findings indicate that better-quality services are provided by PT. Go Rental, the higher tendency customer in making decisions to rent vehicles. Excellent quality service plays an important role in forming positive perception, satisfaction, and customer loyalty. Thus, the hypothesis first (H1) is accepted.

3.2 Influence on Price Perceptions on Rental Decisions

Results on the influence of price perception on rental decisions show that mark count of 4,025 with level significance of 0.000 and direction coefficient positive. This shows that the mark count is higher than table (4.025 > 1.661) and the value significance is smaller from 0.05 (0.000 < 0.05). It can be concluded that variable Price Perception (X2) has a positive and significant effect on Rental Decision (Y). The findings show that the more positive a customer's perception of the price, such as viewing it as reasonable, comparable to the quality of service, or aligned with their psychological willingness to pay, the higher their tendency to decide to rent a vehicle. Perception good prices reflect the value perceived by the customer, which ultimately contributes significantly to influence decision they to use a service. Thus, the hypothesis second (H2) is stated to be accepted.

3.3 Influence Convenience Regarding the Rental Decision\

Research results on the influence of Convenience against the Rental Decree shows a mark count of 18,917 with level significance of 0,000 and direction coefficient positive. This shows that the mark count is far bigger than table (18.917 > 1.661) and the value significance is small from 0.05 (0.000 < 0.05). Hence, it can be concluded that variable Convenience (X3) has positive and significant effects on Rental Decision (Y). The findings indicate that the greater the convenience customers feel in accessing and using rental services through procedures, features, and systems, the higher their tendency to decide to rent a vehicle. Designed convenience with good can increase comfort, efficiency and satisfaction in customer service . Thus, the hypothesis third (H3) is accepted.

3.4 Influence Quality Service Against Rental Decisions Moderated by Rental Prices

Moderation test results to variable Quality Service (X1_M) show mark significance of 0.000, which means smaller from the significance limit of 0.05 (0.000 < 0.05). Findings show that interaction between quality services and rental prices as variable moderation is influential significantly regarding Rental Decisions. Thus, it can be concluded that the rental price variable moderate's connection between quality services and rental decisions significantly. This indicates that when the perception of customers to price rent is rated precise and competitively, then influence quality service to decide rental will be strong. In other words, the combination between quality service and reasonable prices will increase the trend of consumers deciding to rent. Thus, hypothesis (H4) is stated and accepted.

3.5 Influence of Price Perceptions on Rental Decisions Moderated by Rental Prices

Moderation test results to variable price perception (X2_M) shows mark significance by 0,000 which is smaller from level significance 0.05 (0.000 < 0.05). Findings indicate that interaction between price perception and rental prices as variable moderation influential in a way significant regarding rental decisions. Thus, it can be concluded that price rent plays a role as strengthening variables' connection between perception of price to decide consumer in do rental. When consumers evaluate the price rent offered in accordance with benefits and quality services obtained, then influence perception price to decide rent will be strong. Therefore, the combination between positive price and price deemed rent competitive can increase the trend of consumers choosing and using service rent. Thus, the hypothesis (H5) is stated and accepted.

4. Conclusion

This study is expected to serve as a reference for other researchers on consumer behavior in the context of rental vehicles, where variables can be expanded to include other factors such as promotion or customer satisfaction, and a qualitative or mixed approach can be considered for data comprehensiveness. The results of this study are strategic input for PT.

Quality Service (X1) has a positive and significant effect on the Rental Decision (Y).
Perception (X2) has a positive and significant effect on the Rental Decision (Y).
Convenience (X3) has a positive effect and is significant to the Rental Decision (Y).
Rental Price (M) can moderate Quality Service (X1), which has a significant effect on the Rental Decision (Y).
Rental Price (M) can moderate Price Perception (X2), which has a significant effect on the Rental Decision (Y).
Rental Price (M) can moderate Convenience (X3), which has a significant effect on the Rental Decision (Y).

Go Rental is enhancing the quality of its services, strengthening its reputation for fair and competitive prices, while ensuring that the rental process remains easy and efficient. In addition, it is essential for the company to set a competitive rent while balancing it with the quality and convenience offered to influence rent in a way that is both positive and sustainable. This research can serve as a valuable reference for scientific learning in the field of marketing and consumer management. The College of Science at Sukma Management is expected to encourage students to study relevant content related to the local business world, as well as conduct research and present their findings. This is a material discussion of academic and development curriculum based on practical, real-world practice.

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RELATIONSHIP BETWEEN THE LEVEL OF CLAIMS PAID BY BPJS AND THE ADMINISTRATIVE PROCESS ON THE SMOOTH FLOW OF CASH AT MITRA SEHAT TANJUNG MORAWA GENERAL HOSPITAL

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Abstract

Mitra Sehat Tanjung Morawa General Hospital frequently encounters challenges in the BPJS claim process, including discrepancies between patient diagnosis codes and a doctor's action, as well as incomplete medical records. These issues disrupt the claim process and cause delays, which in turn affect the hospital's cash flow. The purpose of this study is to analyze the relationship between the level of claims paid by BPJS Health and the efficiency of administrative processes in relation to the smoothness of hospital cash flow. This study uses a quantitative descriptive method, with correlation analysis conducted using SPSS Statistics. The results indicate a very strong positive correlation between administrative processes and cash flow smoothness, indicating a statistically significant relationship. This suggests that the better the administrative processes for claims, the smoother the hospital's cash flow.
Keywords: Claims; Administration; Cash flow.

1. Introduction

In the healthcare industry, particularly for hospitals that collaborate with government programs like BPJS, claim levels and administrative processes are critical for maintaining financial stability and ensuring a smooth cash flow. At Mitra Sehat Tanjung Morawa General Hospital, the claims process frequently faces challenges due to pending documents resulting from administrative issues. The claim is a demand from the insured party to receive financial protection in accordance with an agreed-upon policy and procedures. The claim rate indicates the level of monthly payments made by BPJS to hospitals. A claim is a form of demand from the insured party to receive financial protection rights in accordance with the agreed-upon terms of the policy and established procedures (Handayani, 2020). The claim rate indicates the level of payments made by BPJS to Mitra Sehat Tanjung Morawa General Hospital on a monthly basis.

Previous studies on this topic have yielded varied results. One study analyzed COVID-19 claims from January to October 2021, revealing administrative issues and the need for system improvements. Another evaluated the impact of delayed BPJS Health payments on Al-Islam Hospital in Bandung, finding that such delays affected cash flow, healthcare services, and medical supply procurement. In contrast, the cash receipt procedure for BPJS claims tends to be slower because it depends on a verification and disbursement process that can take weeks to months. These differing results indicate that further research is needed in sectors with distinct characteristics, which this study addresses within the healthcare services industry (Azzam,2021). Conversely, the cash receipt procedure from BPJS claims tends to be slower because it depends on the verification and disbursement process from BPJS, which can take several weeks to months (Amran, 2023). The differing results from these studies indicate that further research is needed in sectors with distinct characteristics, such as in this study within the healthcare services industry. Mitra Sehat General Hospital was chosen as the research subject due to the availability of adequate and relevant financial data for analysis. This study

specifically aims to determine the relationship between claim levels and administrative processes on the smoothness of hospital cash flow.

2. Methodology

This study was conducted at Mitra Sehat General Hospital in Tanjung Morawa, a service industry located at Jl. Sei Merah No. 300, Dusun III, Desa Dagang Kerawang, Tanjung Morawa. This location was chosen because Mitra Sehat Tanjung Morawa General Hospital is a service industry and has reports on BPJS claim payment data, hospital tariffs, and hospital cash flow. This study uses a quantitative correlational approach with a descriptive analysis. The sampling technique employed was purposive sampling, targeting staff who have a thorough understanding of the administrative process and the BPJS claim system, with a total of 30 respondents.
This study involves three main variables: two independent variables and one dependent variable. The independent variables consist of claim levels and administrative processes, while the dependent variable is cash flow smoothness. The data analysis technique used in this study is multiple correlation analysis, which is used to determine the degree of relationship between variables, expressed as a correlation coefficient. The relationship between variables X1 and X2 and Y can be positive or negative. The basis for decision-making to determine significance is as follows:

i. If the significance value is < 0.05, then there is a correlation
ii. If the significance level is > 0.05, then there is no correlation

To determine the degree of relationship between variables, refer to the following table:

Table 1. Interpretation of Correlation Coefficients

Correlation Coefficient Interval	Level of Relationship
0,00-0,199	Very Low
0,20-0,399	Low
0,40-0,599	Moderate
0,60-0,799	Strong
0,80-1,000	Very Strong

Source: Sugiyono (2017)

Data collection techniques were obtained through the distribution of questionnaires to respondents in the finance and administration departments, aiming to gather their perceptions of administrative processes and cash flow. Documentation was conducted to obtain real financial data on financial reports obtained from BPJS claim data and administrative documents from Mitra Sehat Tanjung Morawa General Hospital. The entire data processing was carried out using the latest version of SPSS software.

3. Results and Discussion

		Claim Level	Administrative Process	Cash Flow
Claim Level	Pearson Correlation	1	.425*	.498**
	Sig. (2-tailed)		.019	.005
	N	30	30	30
Administrative Process	Pearson Correlation	.425*	1	.960**
	Sig. (2-tailed)	.019		.000
	N	30	30	30
Cash Flow	Pearson Correlation	.498**	.960**	1
	Sig. (2-tailed)	.005	.000	
	N	30	30	30

Fig. 1. Multiple Correlation Test

From the table above, it can be seen that the significance value of variable X1 on Y is < 0.05, namely 0.005, so that X1 has a relationship with Y. The significance value of variable X2 on Y is < 0.05, namely 0.000, so it can be said that X2 has a relationship with Y. Meanwhile, the level of relationship between variable X1 and Y is moderate, as indicated by the coefficient

value of 0.498, which falls within the coefficient range of 0.40-0.599, and the level of relationship between variable X2 and Y is very strong, as indicated by the coefficient value of 0.960, which falls within the coefficient range of 0.80-0.1000.

When compared to previous studies, this study found a significant positive relationship between BPJS claim payments and the smooth flow of hospital cash flow. A study found that hospitals that receive timely claim payments exhibit more stable cash flow and are better able to meet their financial obligations (Taslim & Meliala, 2024). This study identified several factors contributing to the smoothness of BPJS Health claim payments made to hospitals (Ilyas, 2020). This study also shares similarities with previous research, as the findings found that there are still errors in patient data entry by nurses and doctors, leading to revisions in the documentation process, which causes claims to be delayed, making the process less efficient and taking longer, thereby affecting the hospital's finances and cash flow.

State that the rate of payment delays in obstetric cases is 47.7%, and a 14.47% incidence of payment delays was found. Payment delays impact hospital cash flow (Agiwahyuanto et al., 2021). This study found that the number of claims paid by BPJS has a significant impact on cash flow, particularly in private hospitals. Hospitals with a higher proportion of BPJS patients tend to have better cash flow (Imansyah et al., 2025). Hospitals still face many challenges in billing JKN patient claims. In addition to rates that have remained unchanged since 2016, delays in the payment process were also identified in hospital claims. Delays in JKN claim payments can disrupt hospital cash flow (Anyaprita et al., 2020).

These findings align with and contribute to existing research. For instance, a previous study found that hospitals with timely claim payments showed more stable cash flow and were better able to meet their financial obligations. Another study identified factors that contribute to the smoothness of BPJS Health claim payments. This study also found that errors in patient data entry by nurses and doctors lead to documentation revisions and delayed claims, which, in turn, affect the hospital's finances and cash flow. One study noted that delays in JKN claim payments can disrupt hospital cash flow, especially in private hospitals, and that hospitals with a higher proportion of BPJS patients tend to have better cash flow. These results confirm that claim payment rates and efficient administrative processes have a significant influence on the smoothness of hospital cash flow.

4. Conclusion

Based on the findings, it is concluded that there is a significant relationship between the BPJS claim rate and cash flow. This means that the number of claims paid directly affects the smooth flow of hospital cash flow. Furthermore, there is a very strong positive and statistically significant relationship between the administrative process and cash flow smoothness. In other words, the more efficient the administrative process for claims, the smoother the hospital's cash flow.

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THE INFLUENCE OF SOCIAL MEDIA MARKETING AND PRICE ON CONSUMER PURCHASING DECISIONS (CASE STUDY AT SEMPOA SIP TITIKUNING COURSE CENTER)

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Abstract

This study aims to examine the influence of Social Media Marketing on consumer purchase decisions in Sempoa Sip Titikuning. Social media has become one of the most effective promotional tools to grab consumers' attention. This study employed a quantitative approach, utilizing a survey method, with data collected through a questionnaire distributed to 57 respondents, who were parents of students. The study's results show that Social Media Marketing has a positive influence on purchase decisions. This is reflected in the positive response of consumers to information conveyed through social media, in terms of promotion, content, and ease of access.
Keywords: Social media marketing; Pricing; Purchase decisions.

1. Introduction

The rapid evolution of information technology has reshaped commercial operations, especially in promotional strategies. One of the most prominent transformations is the use of social media as a tool to market products or services. Platforms like Instagram, Facebook, and TikTok have evolved beyond communication tools to become effective promotional channels for businesses, including educational institutions like Sempoa. According to Justasris.com (2019), the number of social media ad viewers was very high in January 2019. Facebook ranks first with 130 million users, followed by Instagram with 62 million. These numbers illustrate the huge potential for companies to optimize social media as a broad promotional medium, an approach known as social media marketing. One example of a company that implements this strategy is PT Pos Indonesia. (Kantor & Pati, 2021). According to (Tobing & Santoso, 2024) social media is defined as a collection of different types of internet programs developed based on Web 2.0 technologies and principles, which allow users to actively create and share content. Social Media's main strengths social media lies in its technological infrastructure, which allows user involvement in the digital production process and information distribution. In the online realm, the terms social media and social networking are often used interchangeably, although they have different meanings. Social networks refer to social media as a tool to establish connections and interact between individuals or groups.

According to Swastha (2021), price is a few values in the form of money set by a company as a form of compensation for products or services offered to consumers. In addition, price can also be interpreted as the total cost that consumers need to incur, including the possibility of additional products, to obtain a certain combination of goods and services provided by the company to meet their needs and desires. (Berliani, 2023). According to Narottama and Moniaga (2022), the development of technology (especially the internet) can help consumers and make it easier to access information quickly and easily.

Price plays a key role in determining buyers' choices. Price is the only element of marketing that generates revenue, other elements incur costs. In other words, price is the value of money that consumers give in exchange for the benefits obtained from a particular product or service.

(Sojali et al., 2021). In daily human activities, it is always related to economic transactions. Generally, before making a purchase, an individual goes through a decision-making process. Prior to the actual purchase, the consumer evaluates options and considers factors that influence their choice. According to Rachmawati and Patrikha (2021), purchasing decisions are a process in determining the choice of products to be purchased by consumers. Meanwhile, Apriani and Bahrun (2021) stated that there are several indicators that can be used to assess purchasing decisions, namely:

1. Preference for products that reflect the consumer's top choices.
2. Habits before making a purchase, such as seeking information or reconsidering.
3. The number of products desired by consumers.
4. Tendency to give recommendations to others after making a purchase.
5. Assessment of product quality compared to the price paid.

(Insani, Sudarwati, & Marwati, 2023)

When consumers make decisions, they have a specific goal or desire that they want to achieve. This process aims to offer answers to the challenges faced. In the initial stage, the first step involves identifying the problem and then evaluating the various alternatives to determine the best option. After evaluation, the purchase decision is realized in the form of real action, where the product or service chosen is used by the consumer, which then becomes a consideration in evaluating future decisions. A purchase decision is the final step in the buying process for any product or service. Garg al (2020) explained that social media marketing is a communication medium that has changed the dynamics of the business environment which also provides opportunities for consumers to share their experiences regarding their needs and desires.

Based on the previous explanation, these results show that marketing through social media has an impact on buying choices. These findings support the results of previous studies that showed a similar direction of influence to (Ramdan, Hendra Saputro, & Herlinawati, 2023) which shows that the Social Media Marketing variable has a t-count value of 6.355 which is greater than the t-table of 1.984, as well as a significance value of 0.00 which is smaller than 0.05. Thus, some Social Media Marketing has a positive and significant effect on purchase decisions. Thus, it can be concluded that Social Media Marketing strategies also play an important role in influencing consumers' decision to buy the product.

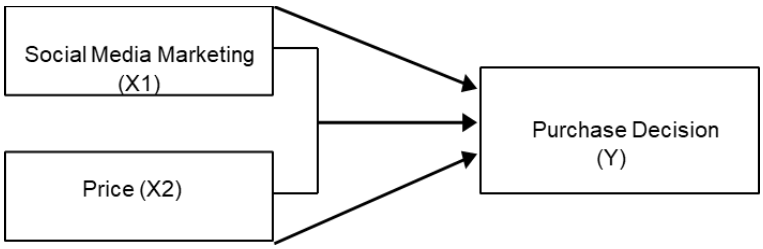

Fig. 1. Conceptual framework

The framework in this study is based on the following assumptions:

i. Social Media Marketing has an influence on consumer purchasing decisions.
ii. Price influences a consumer's Purchase Decision.
iii. Simultaneously, Social Media Marketing and Pricing contribute to consumer purchasing decisions on the Sempoa SIP Titikuning.

2. Methodology

The method used to analyze the data in this study is the quantitative descriptive method, while the analysis model employed is multiple linear regression, where data were collected through the distribution of questionnaires to respondents who are parents of students. According to Mudita et al. (2023), a population is a collection of objects or subjects that have certain characteristics and quantities, which the researcher determines as the focus of the study to be analyzed and used as a basis for drawing research conclusions. The population refers to the entire set of units being studied. A population is a group of individuals characterized by specific traits or attributes. A population is a group of people, events, or things that have certain characteristics. (Iii et al., 2023). The total number of students at Sempoa Sip Titikuning is 130, consisting of 3 classes divided into 2 sessions, namely morning and noon. Therefore, the number of participants in this study is 130, comprising the elders/guardians of the students. According to Suhardi (2023:77), a sample is a part of the population, characterized by its number and properties, or a small subset of population members selected according to a specific procedure, which enables it to represent the population. In this study, the Slovin technique was used with an error tolerance of 10%. The calculation formula is presented as follows:

$$\mathrm{n} = \frac{N}{1 + N(e)^2} \quad (1)$$

Information:
n = number of samples
N = total population
e = error rate (used 10% or 0.1)

Based on the calculations carried out, the result was 5652. By rounding, it was determined that the number of samples used was 57 respondents. The data analysis techniques employed in this study included validity tests, reliability tests, and hypothesis testing using multiple linear regression analysis, all of which were conducted with the aid of IBM SPSS Statistics software. According to (Rosita et al., 2021) Validity tests are used to assess the extent to which an instrument is able to measure what should be measured accurately and consistently. The questionnaire is declared valid if each question item can accurately represent and describe the variables to be studied. The validity of the questionnaire can be seen as proof of the validity of the instrument if each statement item has a count value of r that is higher than the value of the predetermined r-table, so that the instrument is considered suitable for use in the research data collection process. An item is said to be valid if the r-value is calculated ≥ r-table (with bidirectional testing and a significance level of 0.05), indicating that the item has a significant relationship to the total score. (Sanaky, 2021)

According to (Sari & Nainggolan, 2024) Reliability testing aims to determine the extent to which instruments are reliable and produce consistent data even when used at different times. One of the approaches that is often used in measuring reliability is to analyse the value of the Alpha Cronbach coefficient. An instrument is categorized as reliable when the obtained Alpha Cronbach value exceeds 0.6, which indicates that the instrument's internal consistency level is within acceptable limits.

Hypotheses are temporary answers to problems, because they are temporary, so it is necessary to prove their truth through the empirical data collected". (Erlangga, Sunarsi, Faroji, Haryadi, & Ardani, 2023). The hypothesis used as the basis for this study reveals that the relationship between social media marketing and price on consumer purchase choices in the case study of Abacus Sip Titikuning training.

H0=0 Social media marketing and pricing have no impact on purchasing decision-making
H1 ≠0 social media marketing and pricing influence purchasing decision-making.

The hypothesis test was carried out with the F (simultaneous) test to determine the co-influence between brand image and price variables on consumer decisions in making *purchases,* This test was carried out with a significance level of 5% (α = 0.05) or a confidence level of 95%, with the following decision-making criteria:

i. If the F-value is calculated ≤ F-table, then the null hypothesis (H_0) is accepted and the alternative hypothesis (H_1) is rejected. This shows that the independent variables simultaneously have no significant influence on the dependent variables.
ii. Conversely, if F-calculates > F-table, then H_0 is rejected and H_1 is accepted, meaning that the independent variables have a significant effect together on the dependent variables.

The t-test (partial) was carried out to determine the extent of the influence of each independent variable, namely Social Media Marketing and Price, on the dependent variable, namely the Purchase Decision. The decision-making criteria are as follows:

i. If the calculated value t ≤ the t-table, then the null hypothesis (H_0) is accepted and the alternative hypothesis (H_1) is rejected. This suggests that partially, the variables tested did not have a significant influence on purchasing decisions.
ii. Conversely, if the value of t-calculates > t-table, then H_0 is rejected and H_1 is accepted, so it can be concluded that the variable has a significant influence in part on the bound variable.

3. Results and Discussion

Table 1. Validity Test

Instruments	Validity Value		Conclusion
	Calculation	rtable	
Social Media Marketing (X1)	0,893	0,256	Valid
	0,896		Valid
	0,938		Valid
	0,909		Valid
Price (X2)	0,929	0,256	Valid
	0,926		Valid
	0,834		Valid
	0.906		Valid
Purchase Decision (Y)	0.907	0,256	Valid
	0,939		Valid
	0,837		Valid
	0,91		Valid
	0,868		Valid

Based on the information listed in the previous table, the results of the evaluation of the instrument's validity for the variables Social Media Marketing, Price, and Purchase Decision indicate that the calculated r value exceeds the r value in the table, which is 0.256. Therefore, all statement items in the three variables, especially in the Purchase Decision variable, are considered valid and feasible to be used as instruments in this study.

Table 2. Results of the Reliability of Research Instruments

No.	Variable	Cronbach's Values	Conclusion
1	Social Media Marketing	0,929	Reliable
2	Price	0,920	Reliable
3	Purchase Decision	0,935	Reliable

The results of the reliability analysis showed that each variable got an Alpha Cronbach value of more than 0.60. Therefore, it can be concluded that all questions in the Social Media Marketing, Price, and Purchase Choice variables are reliable, so they can be applied in the study.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	1.464	1.177		1.243	.219
	Social Media Marketing	.292	.118	.235	2.471	.017
	Harga	.894	.120	.710	7.479	<,001

Fig. 3. Regression Test Results

The multiple linear regression equation model in this study is as follows:

$$Y = a + b_1X_1 + b_2X_2 + e \quad (2)$$

Information:
Y = Purchase Decision
X_1 = Social Media Marketing
X_2 = Price
a = Constant
b_1 = Regression coefficient of Social Media Marketing variables
b_2 = Variable regression coefficient Price
e = Error of term (other variables not examined)

$$Y = 1.464 + 0.292X1 + 0.894X2 + e$$

As part of the double linear regression analysis, the Purchase Decision constant is obtained as 1.464. This shows that when the value of the independent variables Social Media Marketing (X1) and Price (X2) is 0, then the value of the dependent variable Purchase Decision (Y) is 1.464. The regression coefficient of independent variables is positive, which means that Purchase Decisions can be influenced by Social Media Marketing and Pricing.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.910[a]	.828	.822	1.59634	1.787

Fig. 4. Determination Coefficient Test Results (R2)

The determination coefficient of 0.828 or equivalent to 82.8% shows that the variables Social Media Marketing and Price together can explain the changes that occur in the Purchase Decision variable in Sempoa Sip Titikuning. The remaining 17.2% is motivated by additional elements outside the scope of this study.

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	663.269	2	331.635	130.140	<,001[b]
	Residual	137.608	54	2.548		
	Total	800.877	56			

Fig. 5. Simultaneous Test Results

Based on the information in the figure, the calculated F-value reaches 130.140, which exceeds the value of the table F of 3.17 (with degrees of freedom df1 = 2 and df2 = 54), as well as a significance value of less than 0.001, which is lower than the significance level of 0.05. Thus, the null hypothesis (H_0) is rejected, and the alternative hypothesis (H_1) is accepted. Therefore, it can be concluded that the variables (X_1) and (X_2) provide a mutually beneficial and significant effect on the consumer Purchase Decision variable (Y) in the context of research conducted at Sempoa Sip Titikuning

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.464	1.177		1.243	.219
	Sos	.292	.118	.235	2.471	.017
	Harga	.894	.120	.710	7.479	<,001

Fig. 6. Partial Test Results (t-test)

Based on the table, the following results are obtained:

i. The calculation of t for variable (X1) shows a value of 2.471, which is higher than the t-table of 2.004, while the significance level found is 0.017, which is below the significance level (α) of 0.05. In other words, H_0 is rejected and H_1 is accepted, indicating that individually, the variable (X1) has a significant positive impact on the Purchase Decision.

ii. For variable (X2), a t-calculated value of 7.479 was obtained, which is also greater than the t-table of 2.004, as well as a significance value of 0.000, which is below the significance level of 0.05. Therefore, it can be concluded that H_0 is rejected and H_1 is accepted, meaning that the Price variable partially has a positive and significant influence on the Purchase Decision.

Based on the results of the simultaneous test, an Fcal value of 130.140 was obtained, which is greater than the F-table of 3.17 (with degrees of freedom df1 = 2 and df2 = 54), and a significance value of < 0.001, which is smaller than the significance level of 0.05. Based on these results, H_0 is rejected and H_1 is accepted. Thus, that variable (X1) and (X2) together exert a favourable and considerable influence on consumer purchasing decisions (Y) in the study conducted at Sempoa Sip Titikuning. According to the researchers, the results of this study reveal that the choice to buy-making is a complex process influenced by marketing communication and value perception, and companies can understand both in a balanced way. In the context of educational institutions such as Sempoa Sip Titikuning, the success of attracting consumers does not only come from the quality of service, but also from the way these values are conveyed to potential consumers, especially through *social media* and competitive price quotes.

Research conducted by Juliana (2021) with the title The Influence of Social Media Marketing and Price on Purchase Decisions at Angkringan Coffee Senja Medan which states that Social

Media Marketing variables, and Price have a significant effect on Purchase Decisions. Based on the results of the researcher in this study, it strengthens the validity and relevance of the findings obtained. This shows that the influence of Social Media Marketing and Price on consumer behavior is not only limited to one business sector or one region but can be applied more generally to different types of businesses and different geographical contexts. Both in the educational service sector such as Sempoa Sip Titikuning, and in the food and beverage sector such as Angkringan Coffee Senja Medan. These two factors continue to show a strong influence on consumer purchasing decisions. And it is also an indicator that marketing strategies through social media have become one of the main elements in the modern communication process. Social media is no longer only used as an entertainment channel but also has become a very influential medium in conveying promotions, building trust, and creating emotional connections between consumers.

This at the same time strengthens the theoretical and practical foundation that companies, either large and small, must place these two variables as the main pillars in their marketing strategy to be able to increase competitiveness and attract consumer interest. In the context of educational institutions such as Sip Titikuning, the success of attracting consumers does not only come from the quality of service, but also from the way it conveys these values to potential consumers, especially through *social media* and competitive price quotes.

4. Conclusion

Based on the analysis results and discussions, the following conclusions can be drawn marketing through social media (Social Media Marketing) and price factors simultaneously play an important and positive role in influencing consumers' decisions to buy at Sempoa Sip Titikuning. Separately, social media and prices each have a significant influence on consumer purchasing decisions. Sempoa Sip Titikuning aims to further optimize the use of social media as a promotional tool. Promotions carried out through social media must be delivered in an attractive, informative and consistent manner to increase the interest of potential consumers. In addition, pricing strategies also need to be considered by considering consumer purchasing power, as well as providing special offers such as regular price discounts, to improve purchasing decisions. With proper management of Social Media Marketing and Pricing, it is hoped that consumer purchase decisions will increase.

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A POSTMODERN LOOK INTO THE ‘’ARCA INTELEK’’ SCULPTURE IN POLITEKNIK TUANKU SULTANAH BAHIYAH, MALAYSIA

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Abstract

This study provides a postmodern critique of the "Arca Intelek" sculpture, a stainless-steel monument located at Politeknik Tuanku Sultanah Bahiyah (PTSB), Malaysia. Employing a qualitative visual analysis methodology, the research uses the theoretical frameworks of Jean Baudrillard, Fredric Jameson, and Charles Jencks to analyze the sculpture's aesthetic and symbolic meaning. The findings indicate the sculpture embodies key postmodern characteristics. It employs "double coding" by referencing both regional forms (a stylized tree) and modern industrial materials. The sculpture also engages in hyperreality, presenting an abstract form that is different from its original inspiration, and reflects "depthlessness" by lacking a clear historical narrative. The study concludes that the "Arca Intelek" is a definitive postmodern work that rejects a single fixed meaning, instead reflecting Malaysia's complex, multi-ethnic identity in a global aesthetic context.

1. Introduction

This stainless-steel monument, prominently situated in front of Politeknik Tuanku Sultanah Bahiyah, a government higher education institute in Malaysia, exemplifies a notable instance of postmodern sculptural expression. This sculpture, characterized by its sleek metallic surface, organic yet mechanical design, and strategic positioning amidst flags and tropical landscaping, prompts contemplation of both its aesthetic attributes and its cultural and ideological significance. This study critiques the sculpture from a postmodern perspective, utilizing the theories of Jean Baudrillard, Fredric Jameson, Charles Jencks, and Linda Hutcheon to analyze the semiotic play, spatial politics, and symbolic economy inherent in the sculpture.

This study sheds light on the Malaysian community and how it can be reflected through the sculptures displayed in its government institutions. It sheds light on how Malaysia is no longer a simple modern society where fiction triumphs over form. Given the social relationship between the Malaysian government and its people, it is possible to produce a sculpture that is both a homage to tradition and incorporates artistic hyperreality in its form.

Fig. 1. Arca intelek PTSB, Malaysia

The sculpture is made from stainless steel, with an approximate height of three meters. The span of the sculpture from one end of the leaf to the opposite end is approximately 2.3 meters. There are five main pillars, interconnected and secured with a stainless-steel bracket. Each pillar measures approximately 3 inches in diameter. Five leaf-like blades extend from the sides of the sculpture, and five stainless-steel balls hang from the top on each end of the pillars.

Fig. 2. The commemoration plaque under the sculpture

Figure 2 is the commemorative plaque installed permanently under the structure on the day it was unveiled to the public, Tuesday, 27th March 2007, with no clear indication of the artist or parties responsible for building the sculpture. It only states it was erected for the opening ceremony of Politeknik Tuanku Sultanah Bahiyah by the Sultan of Kedah. This critique's main goal is to use postmodern theory to examine and understand the aesthetic postmodern aspects of modern stainless-steel sculpture in PTSB, Malaysia. To highlight current trends and differences in postmodern public art, this paper specifically aims to:

i. Assess the sculpture's elements based on the concept of postmodernism
ii. Contextualize its symbolic and spatial function using the postmodernism framework within the Malaysian landscape
iii. Determine whether there is a definitive element of postmodernism in the monument

2. Methodology

The critique employs a qualitative visual analysis, using the postmodern theory as the framework. The following components guided the research and critique process. A critique on "David Gerstein's Singapore's Momentum", this vibrant abstract sculpture, which is situated in the city's economic district, represents development and vitality. Such works have been criticized by scholars like Liu Thai Ker [8], for being aesthetically beautiful yet conceptually ambiguous. Despite having different aesthetics, this research uses the critique's method in evaluating the PTSB's sculpture. Through using non-figurative shape to symbolize desire, it mirrors the non-figurative shape of PTSB sculpture. The sculpture incorporates pastiche; elements from diverse sources, styles, or genres are combined. Specifically, the widely known Malaysian coconut tree and the aesthetically beautiful mirror like finish of the sculpture and the ambiguous shape of the leaf and hanging balls.

Fig. 3. David Gerstein's Singapore's Momentum

In 2001, a different researcher criticized "the Millennium Monument in Kuala Lumpur." Crafted to resemble a futuristic obelisk, the monument is engraved with historical events and combines modern design with a clear narrative. Despite employing modern materials to express a forward-looking vision, more recent Malaysian monuments usually lack grassroots significance, according to academics like Raja Nafida. Raja Rafida's method of critique uses a synthesis of scholarly perspectives through literature review and direct observation. This study employs direct observation within the framework of postmodern elements. The study ties the observable elements, such as shape, form, and materials, to elements described within postmodern parameters, including pastiche and simulacra.

Fig. 4. The Millennium Monument in Kuala Lumpur

Postmodern and poststructuralist theories, which question conventional ideas of monumentality, symbolism, and representation, serve as the foundation for the critique. The important theoretical framework consists of:

i. Surface, abstraction, and depoliticization aesthetics in modern public art are analyzed through Fredric Jameson's concept of the "cultural logic of late capitalism."
ii. • The memorial's reflective and non-representational features are critiqued using Jean Baudrillard's theories of simulation and hyperreality.
iii. • Charles Jencks' idea of double-coding and postmodernism is employed to explain the sculpture's open-ended meaning.
iv. • Henri Lefebvre's spatial theory is applied to understand the sculpture's role in its urban and civic context.

A formal visual analysis was conducted based on the sculpture's image, focusing on elements such as material (stainless steel), form (symmetrical and organic), location (landscaped pedestal or traffic island), surroundings (tropical vegetation, building architecture, and flags), and viewer interaction (spatial access, reflected surfaces). This method follows art historical criteria for evaluating public sculpture, as outlined by scholars like Miwon Kwon and Rosalind Krauss.

3. Results and Discussion

Stainless steel is strong, reflective, and industrial. The monument's use immediately places it in the canon of modernistic materials. However, its form and function defy modernist utility or purity. The sculpture appears whimsical and unclear rather than authoritative and didactic. The upward-arching limbs that finish in spherical ends imply an abstraction of vegetation, perhaps a network resembling a stylized tree. One could interpret the semi-organic design as a reference to Malaysia's goal in ecological consciousness, science, and technology. From a postmodern perspective, the sculpture's ambiguous symbolism allows for a variety of readings, exemplifying what Charles Jencks refers to as the "double coding" of postmodern architecture: interacting with both popular or regional references and prestigious artistic traditions simultaneously. In addition to reflecting the surroundings, which literally incorporates the viewer and the environment into the piece, the reflective surface alludes to Baudrillard's idea of hyperreality, representations of reality become so pervasive that they are indistinguishable from, and even more compelling than, actual reality. Its origin is from a coconut tree, but the production of the sculpture can be distinguished from that of a real coconut tree.

The monumentalism of its modernist forebears is often resisted by postmodern public art. This sculpture seems to honour abstraction itself or possibly the concept of futurity itself, rather than a historical figure or hero. The sculpture does not adequately convey the message of unity in variety or tell a readable visual story; even though the multitude of flags representing different Malaysian states emphasizes this idea. This is consistent with Fredric Jameson's criticism of postmodern cultural production, which he defined as lacking historical referentiality and being ''depthless''. Its use in public space is further complicated by the sculpture's clean appearance, which is reminiscent of corporate logos or scientific museum installations. This supports Jameson's finding that postmodernism frequently creates a commodified spectacle aesthetic by obfuscating the distinction between cultures and business. The sculpture's ability to command attention in a conventionally massive sense is further diminished by its placement in a landscaped traffic circle as opposed to a grand plaza. This sculpture encourages visitors to move about and engage with its various angels and reflected surfaces, in contrast to classical monuments that enforce a one-way gaze. This is comparable to Linda Hutcheon's concept of ''Historical metafiction" in postmodern writing. Which is the self-aware blending of past and present, reality and fiction. The sculpture is not rooted in any one period or culture but rather alludes to both the natural world and technological advancement. By layering styles without hierarchy, it engages in a type of artistic pastiche. The blending also created a shape that is non-existent, a hyperreality that is different from the original.

The sculpture's role in its urban and civic setting, as defined by Lefebvre, is clear: the sculpture is not a neutral container, but a product shaped by social relations and power structures. The sculpture is situated within the confines of a government agency, which is known for its tight bureaucracy and governing laws. However, the sculpture reflects the opposite of those ideas. The ideas that the sculpture is not rigid, uniform, nor follows a strict set of laws; a strict sense of how a coconut tree should look. Instead, the oddly placed ball and the mirror-like finish on the sculpture run away from what a coconut tree should look like. The sculpture's performance is increased by the stage-like effect produced by the circular asphalt and manicured border surrounding it. Echoing Miwon Kwon's [6] contention that site-specific art nowadays is more about discursive positioning – how a piece interacts with institutional, social, and ideological contexts- than physical location, it turns into a prop in the public choreography and national identity. As a postcolonial, multiethnic nation-state, Malaysia frequently uses visual culture to negotiate its identity. The abstract modernity of the monument may be seen as an effort to incorporate Malaysia into a global aesthetic conversation about progress and creativity. However, by doing so, it runs the risk of colonial/postcolonial representation that is ''almost the same but not quite'' or what Homi Bhabha [2] refers to as ''mimicry''. The sculpture's shape doesn't seem to allude to Malay, Chinese, or Indian cultural themes, nor does it incorporate

any indigenous artistic traditions or local materials. The monument may thus be interpreted as participating in a postcolonial concern over legitimacy and representation on a global scale.

4. Conclusion

It is a definite postmodern sculpture based on the postmodern characteristic it embodies: The form and materiality adhere to the “double coding’’ of postmodern architecture: interacting with both popular or regional references and prestigious artistic traditions at the same time. The sculpture does not adequately convey the message of unity in variety or tell a readable visual story. This aligns with the postmodern element of lacking historical referentiality and being depthless.

The interactivity and performativity of the sculpture are not a neutral container, but a product shaped by social relations and power structures. It is the self-aware blending of past and present; reality and fiction are closely associated with hyperreality. The Identity and Global Aesthetics is judged to be a mimicry. The sculpture’s shape doesn’t seem to allude to Malay, Chinese, or Indian cultural themes, nor does it incorporate any indigenous artistic traditions or local materials. The monument may thus be interpreted as participating in a postcolonial concern over legitimacy and representation on a global scale.

Many of the conflicts and techniques typical of postmodern public art are embodied in this stainless-steel sculpture located in Malaysia. It embraces artistic hybridity, rejects fixed meaning, and reflects the multiplicities of its setting both literally and figuratively. Its ambiguity may weaken its civic or cultural impact and expose it to criticism of meaningless spectacle, even as it permits pluralistic interaction. In the end, the monument can be interpreted as a successful example of postmodern cultural logic in which form, meaning, and identity are always negotiated, rather than a symbol that has failed. Without firsthand site visits or in-person conversations with the artists, officials or members of the public, the analysis was predicated on a single photograph. There is limited access to publicly accessible information regarding the monument’s commissioning or intended meaning. Studies on the public’s reaction to abstract monuments in Malaysia are still comparatively rare, which restricts the amount of information available for interpretation.

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SIMBOLISME HAIWAN DALAM AL-QURAN: SUATU KAJIAN TAFSIR TEMATIK DAN REFLEKSI NILAI

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Abstrak

Kajian kualitatif ini bertujuan untuk menelusuri makna mendalam dan mesej tematik yang terkandung dalam surah-surah yang dinamakan berasaskan haiwan seperti *Surah al-Baqarah* (lembu betina), *al-An'am* (binatang ternakan), *al-Fil* (gajah), *al-Nahl* (lebah), *al-Naml* (semut), *al-Ankabut* (labah-labah) dan *al-'Adiyat* (kuda perang). Pendekatan tafsir tematik digunakan untuk mengenal pasti peranan haiwan sebagai metafora, peringatan, dan saranan pengajaran dalam wahyu Ilahi. Refleksi nilai akan memberi tumpuan kepada hikmah seperti kepemimpinan (semut), strategi dan perlindungan Ilahi (gajah), keikhlasan dan produktiviti (lebah), serta pengaruh kebergantungan palsu (labah-labah). Kajian ini berhasrat memperkaya pemahaman *tadabbur* masyarakat terhadap al-Qur'an melalui simbol alam yang dekat dengan kehidupan manusia. Dengan ini, kajian tematik memperlihatkan bahawa haiwan dalam al-Quran memainkan peranan penting dalam kisah kenabian sebagai pelajaran tentang ketaatan, kekuasaan, strategi ilahi, serta hubungan harmoni antara manusia dan makhluk lain.
Kata kunci: Tafsir Tematik; Simbolisme Haiwan; al-Quran; Refleksi Nilai; Tadabbur; Surah Bertemakan Haiwan; Metafora Ilhi; Nilai Pendidikan dan Kepemimpinan

1. Pendahuluan

Simbolisme haiwan dalam *al-Quran* merupakan salah satu elemen naratif yang memainkan peranan penting dalam menyampaikan mesej wahyu secara mendalam dan berkesan. Pelbagai kajian terdahulu telah meneliti peranan, makna, serta hikmah penyebutan haiwan dalam *al-Quran* dari pelbagai sudut seperti tafsir, linguistik, dan pendekatan tematik. Sehubungan itu, sorotan kajian ini bertujuan meneliti karya-karya terdahulu yang berkaitan dengan simbolisme haiwan dalam *al-Quran*, khususnya dari perspektif tafsir tematik dan refleksi nilai yang tersirat di dalamnya.

Kajian ini, bertajuk Simbolisme Haiwan dalam al-Quran: Suatu Kajian Tafsir Tematik dan Refleksi Nilai, akan menumpukan kepada analisis surah-surah yang dinamakan berasaskan haiwan seperti *Surah al-Baqarah* (lembu betina), *al-An'am* (binatang ternakan), *al-Fil* (gajah), *al-Nahl* (lebah), *al-Naml* (semut), *al-'Ankabut* (labah-labah), dan *al-'Adiyat* (kuda perang).[1] Surah-surah ini bukan sekadar mengandungi kisah sejarah atau naratif simbolik, malah sarat dengan nilai-nilai spiritual, sosial, dan moral yang masih relevan dalam kehidupan moden.

Pendekatan tafsir tematik digunakan bagi mengenal pasti fungsi haiwan sebagai metafora, isyarat ketuhanan dan instrumen dakwah. Refleksi nilai pula menelusuri hikmah yang tersirat seperti kepimpinan dan kebijaksanaan (semut), strategi dan perlindungan Ilahi (gajah), keikhlasan dan produktiviti (lebah), serta kebergantungan palsu (labah-labah). Kajian ini juga berhasrat memperkaya pemahaman *tadabbur* terhadap *al-Quran* dengan menjadikan simbol alam yang dekat dengan kehidupan manusia sebagai medium kontemplasi dan penghayatan spiritual. Antara sorotan kajian terdahulu yang relevan ialah karya Muhammad Widus Sempo

(2019)[2] bertajuk 27 Haiwan Istimewa dalam *al-Quran*: Tinjauan Tafsir Tematik dan Sosiolinguistik. Dalam karya ini, beliau menggabungkan pendekatan tafsir tematik dan sosiolinguistik bagi menganalisis 27 jenis haiwan yang disebut secara eksplisit dalam *al-Quran*. Kajian ini meneliti konteks penyebutan, frekuensi serta fungsi simbolik haiwan dalam menyampaikan mesej moral dan spiritual. Pendekatan sosiolinguistik turut digunakan untuk memahami gaya bahasa *al-Quran* serta persepsi masyarakat terhadap haiwan dalam konteks budaya dan sosial. Seterusnya, kajian oleh Abd Shakor Borham *et al.* (2018)[3] yang bertajuk Penggunaan Nama Haiwan dalam *Surah al-Quran* dan Hubungan Penciptaannya dalam Kehidupan Manusia turut memberi sumbangan penting. Kajian ini menekankan bahawa penyebutan haiwan dalam *al-Quran* membawa mesej yang berkait rapat dengan peranan serta manfaat haiwan dalam kehidupan manusia. Ia menggariskan hikmah penciptaan dan simbolisme yang tersirat di sebalik nama-nama haiwan tersebut.

Justeru itu, *al-Quran*, sebagai kitab suci umat Islam, mengandungi pelbagai tema yang mencerminkan kebesaran dan kebijaksanaan Allah SWT. Salah satu pendekatan unik dalam penyampaian mesej Ilahi ialah penggunaan haiwan sebagai simbol, perumpamaan, dan bentuk pengajaran yang signifikan. Beberapa surah dalam *al-Quran* dinamakan sempena nama haiwan, antaranya *Surah al-Baqarah* (lembu betina), *al-Fil* (gajah), *al-Nahl* (lebah), *al-Naml* (semut), *al-'Ankabut* (labah-labah), *al-An'am* (haiwan ternakan), dan *al-'Adiyat* (kuda perang). Penamaan ini bukan sahaja bersifat simbolik, tetapi turut membawa mesej mendalam yang perlu diteliti melalui kaedah *tadabbur*.

Dalam konteks ini, *al-Quran* sendiri menyeru umat Islam agar melaksanakan *tadabbur* ayat-ayat-Nya. Antaranya ialah dalam *Surah Sad*, ayat 29: "(Ini adalah) sebuah Kitab yang Kami turunkan kepadamu penuh dengan keberkatan agar mereka *mentadabbur* ayat-ayat-Nya dan agar orang-orang yang berakal berfikir." (ليدّبّروا آياته). Begitu juga dalam *Surah Muhammad*, ayat 24: "Maka apakah mereka tidak *mentadabbur al-Qur'an* ataukah hati mereka telah terkunci?" (أفلا يتدبرون القرآن). Dalam *Surah al-Nisa'*, ayat 82 pula, Allah SWT berfirman: "Tidakkah mereka mentadabbur al-Quran? Sekiranya ia datang daripada selain Allah, pasti mereka akan mendapati banyak pertentangan di dalamnya." [4] .(أفلا يتدبرون القرآن) Jelaslah bahawa konsep *tadabbur* dalam ayat-ayat ini merujuk kepada proses merenung secara mendalam terhadap kandungan *al-Quran*. Ia bukan sekadar bacaan lafaz semata-mata, tetapi melibatkan pemahaman makna, konteks, serta pengambilan iktibar. Justeru, *tadabbur* merupakan suatu tuntutan dalam membina hubungan yang bermakna dengan *al-Quran*, termasuk dalam memahami simbolisme haiwan yang disebutkan sebagai sebahagian daripada strategi penyampaian wahyu yang penuh hikmah.

Seiring dengan itu, penamaan surah-surah ini bukan sekadar simbolik, tetapi membawa mesej tematik serta nilai-nilai yang mendalam. Setiap surah mengandungi pelajaran yang boleh dijadikan panduan hidup, antaranya nilai kepemimpinan, ketekunan, ketundukan kepada perintah Allah, serta kebergantungan mutlak kepada-Nya. Misalnya, *Surah al-Nahl* menggambarkan lebah sebagai makhluk yang menerima ilham Ilahi untuk membina sarang dan menghasilkan madu yang bermanfaat kepada manusia, mencerminkan kepatuhan dan produktiviti tinggi. Kajian terdahulu seperti karya Muhammad Widus Sempo dalam "27 Haiwan Istimewa Dalam al-Qur'an: Tinjauan Tafsir Tematik dan Sosiolinguistik" telah membincangkan isu ini dari sudut linguistik dan sosiolinguistik. [5](Muhammad Widus Sempo,2019) Namun, kajian yang menumpukan tafsir tematik terhadap surah-surah bertemakan haiwan serta refleksi nilai yang terkandung masih terhad. Oleh itu, kajian ini berusaha mengisi lompong tersebut dengan memberikan analisis yang mendalam terhadap kandungan surah-surah berkenaan. Akhirnya, kajian ini turut merumuskan refleksi nilai moral, sosial dan spiritual yang boleh diterapkan dalam kehidupan seharian, selaras dengan matlamat *al-Qur'an* sebagai petunjuk kehidupan umat manusia sepanjang zaman.

Simbolisme haiwan dalam *al-Quran* merupakan antara elemen naratif yang memberikan kesan mendalam terhadap kefahaman mesej wahyu. Pelbagai kajian telah dijalankan oleh para sarjana terdahulu dalam meneliti peranan, makna, dan hikmah penyebutan haiwan dalam *al-Quran*, sama ada dari sudut tafsir, linguistik mahupun pendekatan tematik. Justeru, sorotan kajian ini akan membincangkan hasil penyelidikan yang relevan dalam memahami simbolisme haiwan dalam *al-Quran*, khususnya dalam konteks tafsir tematik dan refleksi nilai yang terkandung di dalamnya.

Sehubungan itu, kajian ini yang bertajuk Simbolisme Haiwan dalam al-Quran: Suatu Kajian Tafsir Tematik dan Refleksi Nilai akan mengupas isu penyebutan haiwan dalam *al-Quran* dengan merujuk kepada karya-karya tafsir klasik seperti *Tafsir al-Jalalayn*[6], *Fi Ẓilal al-Quran* oleh Sayyid Qutb[7], serta tafsir kontemporari seperti *Tafsir al-Munir* oleh Wahbah al-Zuḥayli[8]. Kajian ini turut menelusuri makna mendalam dan mesej tematik yang terkandung dalam surah-surah yang dinamakan berasaskan haiwan seperti *Surah al-Baqarah* (lembu betina), *al-An'am* (binatang ternakan), *al-Fil* (gajah), *al-Naḥl* (lebah), *al-Naml* (semut), *al-'Ankabut* (labah-labah), dan *al-'Adiyat* (kuda perang). Setiap surah ini bukan sahaja membawa unsur sejarah atau simbolik, malah sarat dengan nilai-nilai spiritual, sosial, dan moral yang amat relevan dengan kehidupan kontemporari. Pendekatan tafsir tematik akan digunakan untuk mengenal pasti peranan haiwan sebagai metafora, peringatan, dan pengajaran dalam wahyu Ilahi. Refleksi nilai pula akan menumpukan kepada hikmah seperti kepemimpinan (semut), strategi dan perlindungan Ilahi (gajah), keikhlasan dan produktiviti (lebah), serta pengaruh kebergantungan palsu (labah-labah). Kajian ini juga berhasrat untuk memperkaya pemahaman *tadabbur* masyarakat terhadap *al-Quran* melalui simbol alam yang dekat dengan realiti kehidupan manusia.

Sebagai lanjutan kepada perbincangan ini, karya Muhammad Widus Sempo (2019) menjadi antara rujukan penting yang memperkukuh perspektif tersebut. Dalam konteks ini, antara sorotan kajian yang diperoleh oleh pengkaji adalah karya Muhammad Widus Sempo bertajuk 27 Haiwan Istimewa dalam *al-Quran*: Tinjauan Tafsir Tematik dan Sosiolinguistik (2019). Menerusi karya berbentuk ensiklopedia ini, penulis menghuraikan 27 jenis haiwan yang disebut secara eksplisit dalam *al-Quran* dengan menggunakan pendekatan tafsir tematik (mawdu'i) dan sosiolinguistik. Melalui pendekatan tafsir tematik, penulis menganalisis setiap haiwan berdasarkan ayat-ayat al-Quran yang berkaitan, termasuk konteks penyebutan, kekerapan, serta peranan simbolik haiwan-haiwan tersebut dalam menyampaikan mesej Ilahi. Pendekatan ini membolehkan pembaca memahami bagaimana haiwan digunakan sebagai simbol atau metafora dalam menyampaikan pengajaran moral dan spiritual. Sementara itu, pendekatan sosiolinguistik pula meneliti bahasa dan gaya penyampaian *al-Quran* dalam menyebut haiwan-haiwan tersebut, serta persepsi masyarakat terhadap haiwan-haiwan berkenaan dalam konteks budaya dan sosial. Pendekatan ini memperkayakan pemahaman terhadap maksud dan objektif penyebutan haiwan dalam *al-Quran* secara lebih menyeluruh. Penulis turut menghuraikan setiap haiwan secara terperinci, termasuk konteks penyebutannya dalam *al-Quran* dan pengajaran yang boleh diteladani. Karya ini diakhiri dengan rumusan tentang nilai-nilai kehidupan dan hikmah yang dapat dipetik daripada penyebutan haiwan tersebut. Penggunaan pendekatan interdisiplin, iaitu gabungan antara tafsir tematik dan sosiolinguistik, memberikan dimensi yang komprehensif dalam memahami peranan haiwan dalam teks suci *al-Quran*.

Seterusnya, antara kajian lain yang turut memperkukuh perbincangan ini ialah kajian bertajuk "Penggunaan Nama Haiwan dalam *Surah al-Quran* dan Hubungan Penciptaannya dalam Kehidupan Manusia: Satu Tinjauan oleh Abd Shakor Borham *et al*. (2018)[9], yang meneliti penyebutan nama haiwan dalam *al-Quran* serta kaitannya dengan kehidupan manusia. Kajian ini menekankan bahawa setiap haiwan yang disebut membawa hikmah dan pengajaran yang tersendiri, berkaitan dengan peranan dan sumbangannya dalam kehidupan insan. Selain itu, kajian oleh Risa Naelatus Syifa (2024) yang bertajuk "Nilai Moral pada Kisah Binatang dalam *al-Qur'an*" menggunakan pendekatan tafsir tematik dan analisis hermeneutika Double

Movement Fazlur Rahman. Kajian ini menyoroti bagaimana kisah haiwan dalam *al-Quran* mencerminkan perilaku manusia serta mengandungi pelajaran moral yang relevan dengan kehidupan kontemporari.[10]

Begitu juga, kajian bertajuk "Haiwan dan Ternakan dalam al-Quran: Statistik dan Objektif Penyebutan" oleh Adnan Mohamed Yusoff dan Abdoul Karim Toure (2020)[11] menganalisis statistik penyebutan haiwan serta objektif di sebalik penyebutan tersebut dalam *al-Quran*. Kajian ini memberikan perspektif tematik terhadap peranan haiwan dalam menyampaikan mesej Ilahi. Di samping itu, kajian "Penggunaan Nama Haiwan dalam *Surah al-Quran* dan Hubungan Penciptaannya dalam Kehidupan Manusia: Satu Tinjauan" oleh Abd Shakor Borham, Mikdar Rusdi, dan Nur Zainatul Nadra Zainal (2018)[12] pula meneliti penyebutan nama haiwan dalam surah-surah seperti *al-Baqarah, al-Fil* dan *al-An'am*, serta hubungannya dengan kehidupan manusia. Kajian ini menekankan hikmah penciptaan haiwan dan sumbangannya terhadap kesejahteraan manusia. Tambahan pula, buku "Kisah-Kisah Haiwan dalam *al-Quran*" oleh Ahmad Bahjat (2024)[13] mengetengahkan naratif haiwan yang hidup sezaman dengan para rasul dan wali. Buku ini menyingkap hikmah dan pengajaran yang tersirat dalam kisah-kisah tersebut.

Sehubungan itu, kajian-kajian terdahulu secara kolektif menunjukkan bahawa penyebutan haiwan dalam *al-Quran* bukan sekadar naratif atau kisah sejarah, tetapi mengandungi nilai-nilai ketuhanan, moral dan sosial yang mendalam. Melalui pendekatan tafsir tematik dan *tadabbur* kontekstual, para ulama dan sarjana telah menyoroti peranan haiwan sebagai simbol, perumpamaan, dan instrumen penyampaian mesej Ilahi. Surah-surah seperti *al-Baqarah, al-Fil, al-Nahl, al-'Ankabut* dan *al-Naml* menampilkan haiwan-haiwan tertentu yang menggambarkan konsep ketaatan, keadilan, keteguhan iman, serta kepemimpinan. Sebagai contoh, lembu betina dalam *Surah al-Baqarah* menggambarkan ketaatan terhadap perintah Allah, manakala burung *ababil* dalam *Surah al-Fil* melambangkan pertolongan Ilahi terhadap kezaliman.[14] Tambahan pula, pendekatan tafsir tematik dan *tadabbur* terhadap surah-surah bertemakan haiwan dalam *al-Quran* memberikan pemahaman yang lebih mendalam tentang bagaimana simbolisme haiwan digunakan untuk menyampaikan nilai-nilai ketuhanan dan moral. Kajian-kajian ini menegaskan bahawa haiwan bukan sekadar makhluk ciptaan Allah, tetapi turut berperanan sebagai perantara dalam menyampaikan mesej Ilahi yang kekal relevan sepanjang zaman.*Tadabbur t*erhadap ayat-ayat tersebut juga mengajak manusia untuk merenung kebergantungan terhadap dunia yang bersifat sementara. Ia mengingatkan bahawa kehidupan dunia hanyalah ujian dan tempat persinggahan, manakala kehidupan akhirat merupakan destinasi abadi yang memerlukan persediaan melalui amal soleh dan keimanan yang teguh. Kesimpulannya, kajian terhadap simbolisme haiwan dalam *al-Qur'an* memperlihatkan bahawa haiwan digunakan sebagai metafora Ilahi untuk menyampaikan pelbagai pengajaran berkaitan keimanan, akhlak dan hubungan manusia dengan alam. Justeru, kajian ini akan menggunakan pendekatan tafsir tematik dan refleksi nilai bagi memperkaya kefahaman terhadap peranan haiwan dalam *al-Qur'an* serta hubung kaitnya dengan kehidupan moden.

2. Metodologi

Kajian ini menggunakan pendekatan kualitatif dengan reka bentuk kajian kepustakaan (library research)[15]. Fokusnya ialah tafsir tematik (maudhu'i), yang mengkaji *ayat-ayat al-Quran* yang memiliki tema yang sama dalam hal ini, surah-surah yang dinamakan berdasarkan haiwan.
Data yang digunakan oleh pengkaji adalah berbentuk data primer dan data skunder. Data Primer merupakan al-Quran dan kitab-kitab tafsir utama seperti *Tafsir al-Jalalayn*, *Tafsir Ibn Kathir*[16], *Tafsir al-Maraghi*[17] *Tafsir Fi Zilalil Qur'an* (Sayyid Qutb), dan *Tafsir al-Misbah* (M. Quraish Shihab)[18]. Manakala, data sekunder terdiri daripada jurnal akademik, artikel ilmiah, tesis dan disertasi yang berkaitan dengan *tadabbur*, simbolisme haiwan dalam *al-Quran*, dan nilai pendidikan dari sudut Islam.

Teknik Pengumpulan Data:

Data dikumpulkan melalui analisis teks terhadap ayat-ayat al-Quran dalam surah-surah berikut: *al-Baqarah*, *al-An'am, al-Fil*, *an-Nahl*, *an-Naml*, *al-'Ankabut*, dan *al-'Adiyat*. Penelitian dilakukan oleh pengkaji untuk mengenal pasti mesej tematik dan nilai-nilai reflektif yang terkandung dalam kisah dan simbol haiwan.Tafsiran Tematik (Tafsir Maudhu'i) (al-Farmawi, A. H.,1977). adalah menganalisis ayat-ayat berdasarkan tema haiwan dan menghubungkannya dengan nilai akhlak, sosial, kepemimpinan dan keimanan. Manakala analisis reflektif pula adalah menilai nilai-nilai moral dan spiritual yang dapat diterapkan dalam kehidupan moden. Dan ditambah pula dengan pendekatan sosiolinguistik iaitu meneliti simbol dan bahasa yang digunakan dalam menggambarkan haiwan sebagai isyarat metafora dan makna kontekstual.

Triangulasi dilakukan dengan membandingkan pelbagai kitab tafsir dan pandangan ulama klasik dan kontemporari bagi memastikan interpretasi yang sahih dan menyeluruh. Seiring dengan itu, menurut Prof. Dr. Abdul Hayy al-Farmawi dalam karyanya *al-Bidayah fi al-Tafsir al-Mawḍu'i*,[21] (al-Farmawi, A. H.,1977)[22] merumuskan metodologi tafsir tematik secara sistematik. Beliau menggariskan beberapa langkah bagi kajian ini. Antaranya menetapkan tema kajian, mengumpulkan ayat-ayat yang berkaitan dengan tema tersebut, menganalisis konteks turunnya ayat (asbab al-nuzul) dan mengkaji korelasi antara ayat-ayat tersebut dalam surah masing-masing. Setelah itu akan menyusun pembahasan dalam kerangka yang lengkap. Metodologi ini bertujuan untuk memahami *ayat-ayat al-Quran* secara tematik dan menyeluruh, serta menghindari pemahaman yang tidak menyeluruh. Kesimpulan, melalui pendekatan tafsir tematik dan kajian kualitatif kepustakaan, kajian ini membolehkan peneliti menelusuri mesej tersirat dalam surah-surah yang dinamakan dengan nama haiwan secara mendalam dan menyeluruh. Penggunaan sumber primer dan sekunder yang pelbagai serta analisis berfokus pada dimensi makna, simbolisme, dan nilai reflektif, memastikan tafsiran yang tidak hanya bersifat literal tetapi juga kontekstual. Dengan itu, metodologi ini berupaya menggali nilai-nilai kemanusiaan, ketuhanan dan sosial yang terkandung dalam *al-Quran*, sekali gus memperkukuhkan pemahaman *tadabbur* yang aplikatif dalam kehidupan harian.

3. Dapatan dan Perbincangan

Analisis data oleh pengkaji dijalankan secara sistematik dengan membahagikan perbincangan kepada beberapa bahagian berdasarkan surah-surah yang secara khusus sering dikaitkan dengan haiwan. Surah-surah tersebut termasuk *Surah al-Baqarah, al-Fil*, *al-Nahl, al-Naml, al-A'raf, al-'Adiyat*, dan *al-An'am*. Pendekatan tafsir tematik digunakan untuk meneliti mesej, simbolisme, dan nilai-nilai moral yang terkandung dalam setiap surah, bagi memberikan pemahaman yang mendalam tentang peranan haiwan sebagai metafora dalam *al-Qur'an*. Bani Israil merupakan kaum yang sering kali diberikan pelbagai nikmat oleh Allah SWT, namun mereka kerap mengingkari perintah dan larangan-Nya. Dalam *Surah al-Baqarah,* ayat 67-71, Allah memerintahkan Bani Israil untuk menyembelih seekor lembu betina sebagai ujian keimanan. Lembu betina di sini berperanan sebagai simbol ketaatan, ujian kesabaran, dan pengorbanan dalam mengikuti perintah Ilahi. Bani Israil menghadapi kesukaran mencari lembu betina yang memenuhi syarat-syarat tertentu, dan akhirnya mereka memperoleh seekor lembu milik anak yatim piatu, berwarna kuning, yang tidak pernah diguna untuk bekerja dan dibeli dengan harga yang mahal.

Melalui pendekatan tafsir tematik, lembu betina bukan sekadar haiwan, tetapi menjadi lambang ujian keimanan serta kepatuhan kepada perintah Allah. Nilai utama yang dapat digali adalah ketaatan, pengorbanan, dan kepasrahan kepada kehendak Tuhan. Dalam konteks pendidikan, surah ini mengajar nilai moral dan etika dalam menghadapi ujian dan cabaran hidup. Ibn Kathir menafsirkan *Surah al-Baqarah* sebagai surah Madaniyyah yang membina asas masyarakat Islam. Menurutnya, surah ini membicarakan soal hukum, ibadah, muamalah, dan syariah secara lengkap. Kisah Bani Israil diberi fokus sebagai ibrah. Ia seiring dengan firman Allah SWT dalam *Surah al-Baqarah,* ayat 92 menegaskan peringatan terhadap Bani

Israil yang telah menyembah anak lembu selepas menerima mukjizat daripada Nabi Musa: "Sesungguhnya Musa telah datang kepadamu membawa bukti-bukti kebenaran (mukjizat), kemudian kamu jadikan anak lembu (sebagai sembahan) sesudah (kepergian)nya, dan sebenarnya kamu adalah orang-orang yang zalim." (al-Baqarah: 92). Pendekatan tafsir tematik membantu mengupas makna tersirat perintah ini, bukan hanya sebagai kisah sejarah, tetapi sebagai pengajaran universal. Peristiwa hidupkan mayat yang berlaku selepas pertikaian Bani Israil, serta perintah menyembelih lembu untuk menunjukkan pembunuh, menegaskan hikmah dan fungsi simbol lembu betina (al-Zuhaily, 2014; Ibn Kathir, 2008). Penggunaan istilah *baqarah* (lembu betina) disebut dalam ayat 67 hingga 71 sebagai binatang korban bagi membuktikan kebenaran. Oleh itu, kajian ini menekankan pentingnya memahami simbolisme dalam *al-Qur'an* sebagai medium pendidikan spiritual yang memperkaya kefahaman terhadap ajaran Ilahi dalam kehidupan moden.

Surah al-Fil merujuk kepada peristiwa serangan tentera bergajah (Ashab al-Fil) yang berlaku sekitar tahun kelahiran Nabi Muhammad SAW. Dalam peristiwa ini, tentera Abrahah dari Yaman datang ke Mekah dengan niat untuk menghancurkan Kaabah, namun Allah SWT menghantar burung *Ababil* yang melemparkan batu dari neraka *Sijjil* sehingga mereka dihancurkan seluruhnya. Menurut al-Tabari,[23] surah ini menzahirkan kekuasaan Allah SWT dalam melindungi rumah-Nya (Kaabah) meskipun tiada pertahanan manusia ketika itu. Ia juga merupakan peringatan kepada kaum Quraisy agar tidak bersikap angkuh, kerana keselamatan mereka adalah atas kehendak Allah semata-mata, bukan hasil kekuatan mereka sendiri. Al-Qurtubi pula menafsirkan bahawa burung *Ababil* merupakan tentera Allah dalam bentuk kecil, yang diutus khas untuk membawa batu dari neraka *Sijjil* bagi membinasakan tentera Abrahah. Tafsir ini memperlihatkan bahawa kekuatan fizikal yang dimiliki manusia tidak mampu menandingi kekuasaan Allah SWT. [24](al-Qurtubi, 2013). Sementara itu, al-Razi[24] menyatakan bahawa kisah ini menjadi bukti bahawa Allah mampu menjaga agama dan rumah-Nya tanpa memerlukan bantuan sesiapa. (al-Razi, 2015) Justeru, *Surah al-Fil* bukan sekadar catatan sejarah, tetapi juga sarat dengan mesej tauhid, kebergantungan mutlak kepada Allah, serta peringatan kepada manusia agar tidak berlaku zalim dan sombong.
Dalam konteks ini, tokoh penting yang wujud ketika peristiwa tentera bergajah ialah Abdul Mutallib, datuk kepada Nabi Muhammad SAW. Beliau merupakan pemimpin yang disegani di Kota Makkah, terkenal dengan sifat tegas, mulia, serta dihormati oleh masyarakat Quraisy. Susur galur keturunannya yang berasal daripada Nabi Ibrahim a.s turut menguatkan kedudukannya sebagai penjaga Kaabah (al-Mubarakfuri, 2009)[25] Hubungan ini turut diperkuatkan dengan firman Allah SWT dalam *Surah Ali 'Imran* ayat 96–97 yang menyatakan bahawa *Baitullah* adalah rumah ibadah pertama yang dibina untuk manusia serta menjadi tempat yang diberkati dan penuh petunjuk. Ia juga dijelaskan oleh *surah Ali Imran*, ayat 96 hingga 97, dengan terjemahannya:

(96)Sesungguhnya rumah Ibadat yang mula-mula dibina untuk menusia (beribadat kepada Tuhannya) ialah Baitullah yang memang berkat dan (dijadikan) petunjuk hidayah bagi umat manusia.

(97) Dan situ, ada tanda-tanda keterangan yang nyata (yang menunjukkan kemuliaannya; antaranya ialah Maqam Nabi Ibrahim). Dan sesiapa yang masuk kedalamnya, aman tenteramlah dia. Dan Allah mewajibkan manusia mengerjakan ibadat Haji dengan mengunjungi Baitullah, iaitu sesiapa yang mampu sampai kepadanya. Dan sesiapa yang kufur (ingkarkan kewajipan ibadat Haji itu), maka sesungguhnya Allah maha Kaya (tidak berhajatkan sesuatu pun) daripada sekalian makhluk.

Penglibatan Abdul Mutallib, walaupun tidak secara langsung dalam pertahanan fizikal Kaabah, namun mencerminkan kedudukan *Kaabah* dalam sejarah spiritual keturunan Ibrahim a.s, sekaligus menunjukkan kesinambungan pemeliharaan Allah terhadap rumah-Nya sepanjang zaman. Dengan ini, jelaslah bahawa menerusi *Surah al-Fil,* ayat 1 hingga 5, kisah tentera bergajah yang dipimpin oleh Abrahah merupakan pengajaran penting tentang

kekuasaan Allah SWT yang tidak terbatas. Walaupun tentera tersebut dilengkapi dengan kekuatan dan teknologi ketenteraan yang besar, mereka telah dihancurkan oleh tentera Allah yang tidak kelihatan. Batu-batu yang dibawa oleh burung *Ababil* dilepaskan tepat mengenai sasaran, menyebabkan kekacauan dan kemusnahan. Batu-batu tersebut sangat panas, tajam dan dikatakan membawa penyakit seperti cacar, menyebabkan ramai yang terkorban manakala yang terselamat bertempiaran melarikan diri. Abrahah akhirnya gagal meruntuhkan Kaabah, dan kaum Quraisy di bawah pimpinan Abdul Muttalib mendapat sanjungan kerana kebijaksanaan mereka hingga disebut, "Allah berperang bersama kaum Quraisy menewaskan Abrahah.". Kisah ini memberi peringatan bahawa haiwan, sebagai makhluk ciptaan Allah SWT, boleh menjadi sebahagian daripada tentera-Nya yang sentiasa patuh kepada perintah-Nya. Disebalik kelemahan fizikal yang zahir, tersimpan kekuatan luar biasa yang tidak terjangkau oleh akal manusia apabila diperintah oleh Tuhan. Hal ini dapat dilihat bagaimana burung-burung kecil mampu memusnahkan bala tentera bergajah yang angkuh ingin menghancurkan rumah Allah SWT. Tambahan pula, kisah ini turut menjadi bukti bahawa kekuatan fizikal dan teknologi sehebat mana pun tetap tidak mampu menandingi kekuasaan Ilahi. Melalui perantaraan burung-burung kecil (ababil) yang membawa batu panas dari neraka *Sijjil,* tentera bergajah dihancurkan dengan cara yang mengaibkan. Peristiwa ini mengangkat burung sebagai simbol ketaatan makhluk kepada Allah, memperlihatkan bahawa makhluk kecil pun mampu menjadi instrumen ketentuan Ilahi. *Surah al-Fil* bukan sahaja membawa mesej sejarah, tetapi juga peringatan bahawa keangkuhan manusia boleh dihancurkan dengan cara yang paling tidak disangka. Jelaslah, haiwan, seperti gajah dalam kisah ini, menjadi simbol kekuatan fizikal yang tetap tidak dapat menandingi kekuasaan mutlak Allah SWT. Nilai utama yang dapat diambil daripada *Surah al-Fil* ialah tawakal kepada Allah, kebergantungan sepenuhnya kepada-Nya dalam menghadapi ancaman besar, serta kesedaran bahawa kekuatan sebenar terletak pada ketundukan dan kepatuhan kepada Ilahi. Tafsir tematik terhadap surah ini menunjukkan bahawa haiwan dalam *al-Qur'an* bukan sekadar makhluk ciptaan, tetapi juga alat pengajaran untuk mengingatkan manusia akan kelemahan diri dan perlunya meletakkan sepenuh pergantungan kepada Allah SWT dalam setiap keadaan.

Surah al-Nahl merupakan surah ke-16 dalam *al-Qur'an* yang mengandungi pelbagai petunjuk dan peringatan kepada manusia mengenai kebesaran dan kekuasaan Allah SWT. Dinamakan *al-Nahl* bersempena dengan lebah, ia menjadi simbol keajaiban ciptaan Allah serta manfaat besar yang diberikan kepada manusia, khususnya melalui penghasilan madu yang bersifat penyembuhan. Lebah dalam surah ini menjadi simbol kebijaksanaan, kepatuhan mutlak kepada perintah Ilahi, dan produktiviti yang tinggi. Perkara ini dijelaskan menerusi ayat 68 hingga 69, Allah telah memerintahkan lebah untuk membina sarang di bukit-bukit, pokok-pokok, dan tempat-tempat tinggi yang dibina manusia. Lebah kemudian diarahkan untuk memakan daripada pelbagai jenis buah-buahan dan seterusnya menghasilkan minuman (madu) yang mengandungi unsur penyembuhan bagi manusia. Simbol lebah menggambarkan sistem hidup yang tersusun, kerja berpasukan, dan ketekunan, yang mencerminkan nilai kebijaksanaan serta kepatuhan makhluk kepada Tuhan. Justeru, seperti mana madu berfungsi sebagai penyembuh penyakit jasmani, *al-Qur'an* pula menjadi penyembuh bagi penyakit rohani dan hati. Hal ini selaras dengan firman Allah SWT dalam *Surah al-Isra'*, ayat 82, yang diterjemahkan:

"Dan Kami turunkan secara beransur-ansur daripada al-Quran ayat-ayat yang menjadi penawar dan rahmat bagi orang yang beriman; tetapi al-Quran itu tidak menambahkan kepada orang-orang yang zalim kecuali kerugian."

Menurut Ibn Kathir, ayat 68 hingga 69 yang menyentuh tentang lebah mengandungi petunjuk Ilahi mengenai fungsi dan manfaat makhluk tersebut, termasuk madu sebagai penawar. Hal ini juga disokong oleh sabda Nabi SAW:

“Kesembuhan itu terdapat pada tiga perkara: bekam, madu, dan kay (pembakaran dengan besi panas). Namun aku melarang umatku daripada kay.” (Hadis riwayat Bukhari dan Muslim)

Selain itu, *Surah al-Nahl* turut menekankan nilai tauhid, keadilan, dan kesyukuran atas nikmat Allah. Menurut tafsir al-Alusi dan al-Qurtubi, surah ini mengajak renungan terhadap ciptaan Allah sebagai pengajaran moral dan sosial. Lebah menjadi simbol ketundukan penuh kepada perintah Ilahi, kerana makhluk kecil ini patuh tanpa bantahan. Lebah juga melambangkan kebijaksanaan dan keteraturan melalui sarang yang tersusun rapi serta sistem sosial yang teratur, menunjukkan nilai disiplin, organisasi, dan kerjasama dalam masyarakat. Selain itu, madu yang dihasilkan lebah bukan sekadar makanan, tetapi juga penawar, menggambarkan bahawa segala ciptaan Allah tidak hanya indah tetapi juga bermanfaat jika difahami hikmahnya. Seterusnya, dalam pendekatan tafsir tematik, lebah mewakili tema "pengabdian penuh kepada Allah" dan "hikmah ciptaan Allah". Allah menurunkan wahyu kepada lebah, walaupun ia bukan makhluk berakal seperti manusia, sebagai tanda bahawa setiap makhluk tunduk kepada sistem ketuhanan. Menurut para mufassir seperti Quraish Shihab dalam tafsir al-Jalalayn, ayat ini mengisyaratkan bahawa manusia harus belajar daripada lebah tentang kerajinan, kebersihan, serta kesatuan sosial dalam berkhidmat kepada masyarakat dan menunaikan tugas hidup. Penggunaan kata *al-Nahl* (lebah) dalam *al-Quran* disebut dalam ayat 68. Selanjutnya, aplikasi nilai dalam kehidupan menuntut manusia mematuhi perintah Allah dengan sepenuh hati seperti lebah yang bekerja menurut perintah, memahami kepentingan kerja kolektif dan harmoni dalam masyarakat, menghargai hasil alam seperti madu, serta menjaga kelestarian ciptaan Allah. Pendekatan ini mengajak kita merenung bagaimana sikap dan amalan lebah dapat dijadikan teladan dalam memperkukuh akhlak dan kehidupan bermasyarakat.

Kesimpulannya, *Surah An-Nahl* bukan sahaja menggambarkan lebah sebagai makhluk kecil yang unik, tetapi turut memberi gambaran luas tentang bagaimana umat Islam seharusnya menjalani kehidupan dengan penuh disiplin, taat, produktif, dan memberi manfaat kepada orang lain. Lebah menjadi simbol makhluk yang tenang namun menghasilkan sesuatu yang besar dan penuh rahmat, menggambarkan refleksi dalam membina umat yang patuh dan membawa kebaikan. Secara keseluruhan, *Surah An-Nahl* menyeru kepada pengesaan Allah serta mengandungi petunjuk nilai rohani, sosial, dan kemanusiaan yang sangat relevan untuk diamalkan dalam kehidupan seharian umat Islam. *Surah al-Naml*, yang bermaksud surah Semut, merupakan surah ke-27 daripada 114 surah dalam *al-Quran*. Surah ini dinamakan Semut kerana menceritakan kisah haiwan ini dalam sirah kenabian Nabi Sulaiman a.s..Nabi Sulaiman a.s adalah Raja dan Nabi kepada Bani Israil serta mempunyai pelbagai keistimewaan, antaranya memimpin Bani Israil, menguasai jin dan haiwan. Dengan kemampuan memahami bahasa haiwan, Nabi Sulaiman mendengar arahan ketua semut kepada rakyatnya. Dalam *Surah al-Naml* ayat 18-19, diceritakan bagaimana Nabi Sulaiman mendengar peringatan ketua semut agar berhati-hati ketika melalui lembah mereka. Semut digambarkan sebagai makhluk yang sangat rajin, mempunyai sistem komuniti yang teratur, cepat bertindak, dan sangat mengasihi koloni masing-masing. Ini mencerminkan kepimpinan bottom-up dan nilai komunikasi efektif. Kisah semut ini menunjukkan belas kasihan dan kasih sayang sesama mereka, berbeza dengan manusia yang kadangkala menimbulkan permusuhan walaupun di sebalik hati yang terbuka. Menurut pandangan Ibn Kathir, beliau menafsirkan kisah semut dan Nabi Sulaiman (ayat 18–19) sebagai bukti kelebihan ilmu dan hikmah yang dikurniakan kepada Nabi Sulaiman. Ia juga menunjukkan keprihatinan Nabi Sulaiman terhadap makhluk kecil dan keadilan pemerintahannya. Manakala, al-Qurtubi menekankan bahawa kisah semut memberi teladan tentang kepemimpinan dan komunikasi. Semut yang memberi amaran kepada koloninya mencerminkan kepimpinan bijak dan rasa tanggungjawab. Ia turut disokong oleh al-Alusi [26](al-Alusi, 1994). Beliau melihat semut sebagai simbol sistem sosial yang harmoni dan tersusun, serta mencerminkan nilai kolektif dalam kehidupan manusia.

Malangnya, ada juga manusia yang menggunakan kelebihan yang diperoleh bukan untuk manfaat bersama, tetapi mengambil kesempatan atas kelemahan orang lain demi menambah pangkat dan harta. Justeru, semut dalam surah ini menjadi simbol kebijaksanaan dan kepedulian terhadap persekitaran. Antara ayat lain yang membicarakan kepimpinan adil dan bijaksana, seperti dalam kisah Nabi Sulaiman secara umum (misalnya *Surah Saba'* ayat 12-14). Begitu juga, tanggungjawab terhadap makhluk lain, seperti *Surah al-An'am* ayat 38 dengan terjemahannya:

"Dan tiadalah binatang-binatang di bumi dan burung-burung yang terbang dengan kedua sayapnya, melainkan umat-umat (juga) seperti kamu."

Ayat ini memperkuat mesej bahawa haiwan juga makhluk Allah yang punya sistem dan fungsi sendiri, termasuk semut. Jadi, walaupun semut hanya disebut dalam Surah al-Naml, nilai yang dikandungnya disokong oleh prinsip-prinsip umum *al-Quran* tentang ilmu, kepimpinan, komunikasi, dan belas kasihan. Refleksi nilai dalam surah ini meliputi kepimpinan, komunikasi, kerjasama, kesedaran sosial, serta pentingnya memberi perhatian kepada makhluk yang lebih kecil dan sering diabaikan sebagai pengajaran utama dari simbol semut. Dengan ini, tafsir tematik menunjukkan bahawa meskipun semut dianggap makhluk kecil dan tidak signifikan, mereka mempunyai peranan penting dalam ekosistem dan mengajarkan nilai-nilai kehidupan. Penggunaan semut sebagai simbol mengajak kita merenung kepimpinan yang bijak serta peduli terhadap masyarakat sekitar, yang sangat relevan untuk diaplikasikan.

Surah al-'Ankabut merupakan surah Makkiyyah yang mengandungi 69 ayat dan diturunkan sebelum hijrah. Surah ini menekankan kepentingan kesabaran dalam menghadapi ujian keimanan serta menyeru umat Islam agar tetap teguh memegang pegangan tauhid. Ia juga memuatkan perumpamaan dan kisah umat terdahulu sebagai pengajaran dan motivasi kepada orang beriman. Firman Allah dalam Surah al-'Ankabut, ayat 40, yang bermaksud:

"Maka, masing-masing Kami binasakan disebabkan dosanya, ada yang Kami hantarkan angin ribut menghujaninya dengan batu; ada yang dibinasakan dengan letusan suara yang menggempakan bumi; ada yang Kami timbuskan di dalam bumi; dan ada pula yang Kami tenggelamkan di laut. Dan ingatlah, Allah tidak sekali-kali menganiaya mereka, akan tetapi merekalah yang menganiaya diri sendiri."

Dan dalam *Surah al-'Ankabut*, ayat 41, dengan terjemahannya:

"Misal bandingan orang yang menjadikan benda-benda selain Allah sebagai pelindung (yang diharapkan pertolongannya) adalah seperti labah-labah yang membuat sarang (sebagai tempat perlindungan); padahal sesungguhnya sarang yang paling rapuh adalah sarang labah-labah, sekiranya mereka orang yang berpengetahuan."

Begitulah yang berlaku kepada kaum *'Ad, Thamud, Firaun*, dan *Haman*. Mereka dibinasakan Allah dengan pelbagai cara kerana mereka menzalimi diri sendiri akibat mengingkari dakwah para Rasul. Hanya orang yang tertipu dengan pandangan matanya sahaja yang menjadikan kekayaan dan kekuasaan sebagai matlamat hidup. Sesungguhnya di sisi Allah, yang lebih mulia di kalangan hamba-Nya ialah mereka yang menjadikan segala yang dikurniakan Allah sebagai bantuan dan dorongan untuk mendekatkan diri kepada-Nya. Seterusnya, nilai keikhlasan dalam amal menjadi refleksi penting dalam surah ini. Ia menegaskan bahawa segala usaha dan jihad yang dilakukan sesungguhnya kembali kepada diri sendiri. Allah tidak memerlukan amal manusia, sebaliknya manusia yang memerlukan amal untuk keselamatan dan kebahagiaan di dunia dan akhirat. Oleh itu, umat Islam digalakkan mempunyai motivasi diri untuk beramal dengan penuh keikhlasan dan kesungguhan agar memperoleh manfaat yang hakiki. Hal ini turut disokong oleh Ibn Kathir dalam kitab tafsirnya yang menjelaskan bahawa sesiapa yang berusaha dalam ketaatan kepada Allah, maka manfaatnya akan kembali kepada dirinya sendiri. Allah tidak memerlukan amal hamba-Nya, tetapi Dia tetap

memberi ganjaran yang besar kepada mereka yang beriman dan beramal soleh. Tambahan pula, hadis Rasulullah SAW yang diriwayatkan oleh Imam al-Bukhari dan Muslim menyatakan: “Sesungguhnya Allah tidak melihat kepada rupa dan harta kamu, tetapi Dia melihat kepada hati dan amal kamu.” (Riwayat Muslim)

Hadis ini menegaskan bahawa nilai seseorang di sisi Allah bergantung kepada keikhlasan hati dan amal perbuatannya, selaras dengan tema ayat yang telah dibincangkan. Kesimpulannya, *surah al-‘Ankabut* menekankan pentingnya kesabaran, keikhlasan, dan keteguhan dalam menghadapi ujian hidup serta menyeru umat Islam untuk berpegang teguh pada tauhid. Melalui perumpamaan labah-labah yang rapuh, surah ini mengingatkan manusia agar tidak bergantung kepada selain Allah yang Maha Kuasa. Ia mengajar bahawa segala usaha dan amal mesti dilakukan dengan ikhlas kerana hanya dengan keikhlasan dan ketundukan kepada Allah, manusia akan mendapat ganjaran sebenar. Surah ini juga mengajak umat Islam untuk mencontohi ketabahan dan kekuatan hati dalam menghadapi cabaran dunia, serta menjaga hubungan yang kukuh dengan Allah sebagai pelindung dan penolong yang sebenar. Secara keseluruhannya, surah ini menjadi panduan agar setiap muslim sentiasa berhati-hati dalam memilih tempat berlindung dan sentiasa mengutamakan keimanan dalam setiap aspek kehidupan. Ia disokong oleh firman Allah SWT dalam *surah al-‘Ankabut*, ayat 69, terjemahannya:

"Dan orang-orang yang berjihad untuk (mencari keredhaan) Kami, pasti akan Kami tunjukkan jalan-jalan Kami. Dan sesungguhnya Allah benar-benar beserta orang-orang yang berbuat baik."

Ayat ini menegaskan janji Allah bahawa mereka yang berusaha dengan ikhlas dan sabar akan diberi petunjuk dan pertolongan dari-Nya. Para ulama dan ahli tafsir memberi perhatian khusus terhadap makna dan mesej *Surah al-‘Adiyat* yang menggambarkan kuda perang yang berlari kencang, melambangkan kekuatan, kesetiaan, dan pengorbanan. Dalam *Surah al-‘Adiyat*, ayat 1, Allah SWT bersumpah dengan kuda perang yang berlari pantas dengan nafas terengah-engah:

"Demi kuda perang yang berlari kencang dengan nafas terengah-engah."

Ayat ini menunjukkan betapa besar nilai perjuangan dan pengorbanan. Kuda perang melambangkan kekuatan dan keberanian dalam menghadapi musuh. Ibn Kathir menafsirkan kuda perang (al-‘Adiyat) sebagai simbol kekuatan pasukan jihad yang berjuang di jalan Allah, manakala al-Qurtubi menyatakan bahawa Allah bersumpah dengan kuda perang untuk menonjolkan kemuliaan jihad dan pengorbanan para pejuang Islam. Sayyid Qutb dalam *Fi Zilal al-Quran* menyatakan bahawa surah ini juga merupakan kritikan terhadap manusia yang lalai dan tidak bersyukur walaupun Allah telah memberikan pelbagai nikmat, serta peringatan tentang hakikat akhirat. Dalam tafsir tematik, *Surah al-‘Adiyat* mengajak umat Islam memiliki semangat juang tinggi dan keberanian dalam menghadapi ujian hidup, dengan niat yang ikhlas kerana Allah. Simbol kuda perang mengingatkan kita kepada kekuatan dan keberanian serta keperluan mengekalkan keimanan dan kerohanian dalam setiap perjuangan. Maka, nilai yang dapat diambil daripada simbolisme kuda dalam surah ini ialah kekuatan, ketangkasan, dan kesiapsiagaan dalam menghadapi cabaran hidup. Kuda juga melambangkan hubungan antara manusia dengan makhluk ciptaan Allah yang diberikan kemampuan untuk membantu dalam menjalani kehidupan duniawi dan menguatkan keimanan. Allah SWT menegur manusia yang lalai, tidak bersyukur, serta tidak jujur dalam memikul amanah, walaupun telah menerima pelbagai nikmat. Surah ini juga menyeru manusia agar memberi keutamaan kepada nilai kerohanian dan keimanan berbanding kesenangan dunia yang melalaikan, serta menjadikan perjuangan hidup sebagai satu bentuk ibadah. Dalam pendekatan tafsir tematik, kuda yang berlari pantas melambangkan semangat yang tidak mengenal lelah dalam melaksanakan tanggungjawab, khususnya dalam menegakkan keadilan dan kebenaran yang berpaksikan

syariat Allah SWT. Ia menjadi peringatan bahawa kekuatan sejati terletak pada keikhlasan niat dan kesungguhan dalam perjuangan yang diredhai Allah."

Sementara itu, Ibn Kathir menafsirkan kuda perang (al-'Adiyat) sebagai simbol kekuatan pasukan jihad yang berjuang di jalan Allah. Al-Qurtubi pula menyatakan bahawa Allah bersumpah dengan kuda-kuda perang untuk menunjukkan kemuliaan jihad dan pengorbanan para pejuang Islam. Kuda yang berlari dengan nafas terengah-engah, memercikkan api, dan menyerbu pada waktu pagi menggambarkan semangat yang tinggi dalam perjuangan. Sayyid Qutb dalam *Fi Zilal al-Qur'an* menyatakan bahawa surah ini merupakan kritikan terhadap manusia yang lalai dan tidak bersyukur walaupun telah menerima banyak nikmat Allah. Jelaslah, surah ini juga menyedarkan kita tentang hakikat akhirat. Maka, nilai yang dapat diambil daripada simbolisme kuda dalam *Surah al-'Adiyat* adalah kekuatan, keberanian, ketangkasan, dan kesiapsiagaan dalam menghadapi ujian dan cabaran hidup. Kuda juga menunjukkan hubungan manusia dengan makhluk Tuhan yang telah diberi kemampuan untuk membantu manusia dalam menjalankan tugasnya. Allah menegur manusia yang tidak bersyukur dan tidak jujur dalam memikul amanah, walau telah diberi banyak nikmat. Surah ini mengajak untuk mengutamakan nilai kerohanian dan keimanan. Kenyataan ini seiring juga dengan ayat 19-20, *surah al-Ma'arij* dengan terjemahannya:

"Sesungguhnya manusia itu diciptakan bersifat amat tergesa-gesa. Aku akan tunjukkan kepadamu tanda-tanda (siksa) mereka, maka tahanlah (sabarlah) terhadap siksaan mereka dengan sabar yang baik." (Surah al-Ma'arij, ayat 19-20)

Ayat ini juga mengingatkan kita agar bersabar dan istiqamah dalam menghadapi ujian hidup, seiring dengan semangat perjuangan yang digambarkan dalam *Surah al-'Adiyat.* Dan juga hendaklah menguatkan seruan supaya perjuangan hidup dan amal berlandaskan keikhlasan dan ketundukan kepada Allah SWT. Dan ia disebut dalam *surah al-Bayyinah*, ayat 5, dengan terjemahannya: "Dan mereka tidak disuruh kecuali supaya menyembah Allah dengan memurnikan ketaatan kepada-Nya dalam (menjalankan) agama, serta supaya mendirikan solat dan menunaikan zakat; dan yang demikian itulah agama yang lurus." (Surah al-Bayyinah, ayat 5)

Surah al-An'am merupakan surah Makkiyyah yang bertemakan tauhid, pertentangan dengan orang musyrik, serta penegasan keimanan. Ibn Kathir menyebut surah ini sebagai yang paling panjang membicarakan kesesatan orang Arab Jahiliah, sekaligus menegaskan tauhid dan menunjukkan kekuatan hujah bagi pihak Nabi SAW. Surah ini dinamakan *al-An'am* kerana di dalamnya muncul kalimah *al-An'am* sebanyak enam kali, khususnya pada ayat 136 hingga 142. Dalam konteks ini, *Surah al-An'am* (6:136-142) menyebut beberapa jenis haiwan ternakan seperti kambing, unta, dan lembu, yang digunakan oleh umat manusia untuk pelbagai tujuan termasuk makanan, pakaian, dan pengangkutan. Haiwan-haiwan ini diberi kedudukan istimewa kerana manfaatnya yang besar dalam kehidupan manusia. Nilai yang dapat diambil daripada simbol haiwan ternakan dalam *Surah al-An'am* ialah nilai kebaikan, kesyukuran, dan penghargaan terhadap nikmat Allah SWT. Umat manusia diingatkan supaya tidak hanya menggunakan makhluk ciptaan ini sebagai sumber kehidupan, tetapi juga menghargai dan mensyukuri setiap nikmat yang diberikan Allah. Menurut al-Nasafi, kedudukan haiwan dari sudut kehambaan adalah sama seperti manusia, walaupun mereka tidak diberi kemampuan akal seperti manusia. Hal ini seiring dengan firman Allah SWT dalam *Surah al-An'am*, ayat 38 yang bermaksud:

"Dan tidak ada binatang melata di bumi, dan tidak pula burung yang terbang dengan kedua sayapnya, melainkan umat seperti kamu juga. Kami tidak meninggalkan sesuatu pun dalam al-Kitab, kemudian kepada Tuhanlah mereka akan dihimpunkan."

Selain itu, *Surah al-An'am* juga menekankan pentingnya menggunakan segala nikmat yang diberikan oleh Allah dengan cara yang benar dan bijaksana. Tafsir tematik surah ini mengajak

manusia merenung bagaimana haiwan ternakan menjadi sumber rezeki penting dalam kehidupan. Surah ini mengajak umat Islam untuk bersyukur atas setiap nikmat Allah yang disalurkan melalui sumber alam, sekaligus memperingatkan supaya penggunaan nikmat tersebut dilaksanakan dengan penuh tanggungjawab dan berhati-hati. Ayat ini juga mendorong kita untuk mendekatkan diri kepada Pencipta melalui kesedaran dan penghayatan terhadap setiap ciptaan-Nya. Dengan demikian, *Surah al-An'am* menggunakan simbol haiwan sebagai pengajaran nilai-nilai penting dalam kehidupan manusia secara mendalam dan berkesan. Begitu juga, *Surah al-An'am* mengajarkan tentang nikmat dan kebijaksanaan yang terkandung dalam haiwan ternakan seperti unta, kambing, dan lembu. Melalui tafsir tematik surah ini, kita dapat memahami bahawa *al-Quran* menggunakan haiwan bukan sahaja sebagai makhluk hidup di dunia, tetapi juga sebagai simbol pelbagai aspek kehidupan, termasuk perjuangan, rasa syukur, dan berhati-hati dalam menggunakan nikmat dunia. Penggunaan istilah *al-Na'am/al-an'am/an'am/an'aman/an'amukum/an'amuhum* (binatang ternakan) disebut dalam *Surah al-An'am*, khususnya pada ayat 13, 138 (tiga kali), 139, dan 142. Menurut Ahmad Fuad Basya [27](Basya, 2015), terdapat aspek tauhid yang dapat difahami melalui anatomi unta. Contohnya, bonggol unta (camelus dromedaries dan camelus bactrianus) yang berfungsi sebagai pembekal lemak yang membekalkan makanan secara berterusan ketika lapar, membolehkan unta hidup selama sebulan tanpa makanan dan tiga minggu tanpa air. Selain itu, masyarakat Yahudi telah mengharamkan sebahagian binatang ternakan untuk dimakan, dan perbuatan ini menimbulkan kemurkaan Allah kerana mereka menyandarkan larangan tersebut sebagai syariat Tuhan. Pengharaman memakan sebahagian lembu oleh orang Yahudi disebut dalam *Surah al-An'am*, ayat 144 dan 146 (Quraish Shihab, 2001). Firman Allah SWT dalam Surah al-An'am, ayat 144 dengan terjemahannya:

"Dan sepasang dari unta dan sepasang dari lembu. Katakanlah: apakah dua yang jantan yang diharamkan ataukah dua yang betina, ataukah yang ada dalam kandungan dua betinanya? Apakah kamu menyaksikan di waktu Allah menetapkan ini bagimu? Maka siapakah yang lebih zalim daripada orang-orang yang membuat-buat dusta terhadap Allah untuk menyesatkan manusia tanpa pengetahuan? Sesungguhnya Allah tidak memberi petunjuk kepada orang-orang yang zalim."

Jelaslah, al-Quran mengajak umat Islam untuk mendalami pengajaran al-Quran dan menyalurkan nilai-nilai tersebut dalam kehidupan seharian. Perbahasan mengenai lembu dalam *al-Quran* juga secara tidak langsung memberi implikasi akidah, khususnya dalam menggambarkan syirik dan kufur masyarakat terdahulu yang berkaitan dengan haiwan lembu.

4. Kesimpulan

Kajian ini bertujuan meneliti ayat-ayat dalam surah-surah al-Quran yang dinamakan sempena haiwan seperti *al-Baqarah, al-An'am, al-Nahl, al-Naml, al-Ádiyat, al-An'am*, dan *al-'Ankabut.* Kewujudan nama-nama haiwan yang membawa pelbagai kisah, peristiwa, atau tamsilan menjadi fenomena dalam kitab suci al-Quran yang memberikan iktibar terhadap kebesaran dan kekuasaan Allah SWT. Manusia turut diseru supaya tidak leka dan sentiasa meneliti serta mengkaji unsur-unsur dan nilai-nilai yang membawa kepada refleksi serta koreksi diri dalam usaha meningkatkan kesempurnaan diri sebagai insan kamil. Sehubungan itu, dengan menggunakan pendekatan tafsir tematik (al-tafsir al-mawḍu'i), pengkaji menganalisis mesej utama dan nilai-nilai terkandung dalam surah-surah tersebut bagi mengungkap kefahaman menyeluruh tentang tema yang diketengahkan. Kajian ini merumuskan refleksi nilai moral, sosial, dan spiritual daripada ayat-ayat yang boleh dijadikan pedoman dalam kehidupan harian. Tafsir tematik dalam konteks ini mengajak kita melihat setiap simbol haiwan sebagai alat untuk mengajar nilai-nilai ketuhanan, kepemimpinan, kesedaran sosial, dan pengurusan sumber dengan bijak. Setiap haiwan yang disebut dalam al-Quran bukan sahaja berfungsi sebagai makhluk hidup, tetapi juga sebagai contoh bagi umat manusia untuk mengaplikasikan prinsip Islam dalam kehidupan seharian.

Demikian juga, haiwan dijadikan metafora yang melambangkan pelbagai aspek kehidupan manusia dari ketahanan iman, kepemimpinan, ketundukan, hingga pengajaran tentang kerapuhan duniawi. Setiap surah yang dikaji memberikan tafsiran berbeza bergantung pada peranan haiwan yang digambarkan dan konteks ayat tersebut. Allah SWT telah memuliakan penciptaan manusia dan mengangkat kedudukan mereka sebagai khalifah. Namun, kebanyakan mereka jauh tersasar dari tata susila seorang khalifah yang sentiasa tunduk dan patuh kepada perintah-Nya melalui wahyu yang diturunkan kepada Nabi SAW. Perbuatan serta sikap mereka ini ditempelak oleh Allah SWT, seolah-olah seperti perilaku binatang ternakan yang tiada akal fikiran. Hal ini disebut dalam *Surah al-Furqan,* ayat 43 hingga 44, yang bermaksud:

“Nampakkah (wahai Muhammad) keburukan keadaan orang yang menjadikan hawa nafsunya: tuhan yang dipuja lagi ditaati? Maka dapatkah engkau menjadi pengawas yang menjaganya supaya jangan sesat? Atau adakah engkau menyangka bahawa kebanyakkan mereka mendengar atau memahami (apa yang engkau sampaikan kepada mereka)? Mereka hanyalah seperti binatang ternak, bahkan (bawaan) mereka lebih sesat lagi.”

Berdasarkan kajian ini, pengkaji mencadangkan beberapa kajian lanjut yang lebih spesifik. Antaranya ialah peningkatan pembelajaran tafsir tematik dan pembangunan modul pembelajaran yang memfokuskan pendekatan ini, yang dapat membantu pelajar serta umat Islam memahami makna yang lebih mendalam dalam ayat-ayat *al-Quran*. Selain itu, kolaborasi antara ulama tafsir dan pakar-pakar sains seperti biologi dan ekologi juga dicadangkan agar dapat menggali makna yang lebih komprehensif terhadap fenomena alam yang digambarkan melalui haiwan dalam *al-Quran*. Pendekatan ini bukan sahaja membantu dalam memahami tafsir secara mendalam, malah mendorong umat Islam untuk lebih menghargai ciptaan Allah. Di samping itu, masyarakat Islam perlu diberikan lebih banyak peluang untuk terlibat dalam program pendidikan yang memfokuskan tadabbur al-Qur’an, terutamanya mengenai tafsir tematik dan simbolisme haiwan. Justeru, dengan melaksanakan cadangan-cadangan ini, diharapkan umat Islam dapat menggali dan mengaplikasikan makna serta nilai yang terkandung dalam surah-surah *al-Quran* bertemakan haiwan, sekaligus meningkatkan penghayatan mereka terhadap ajaran Islam secara mendalam. Hal ini selaras dengan firman Allah SWT dalam *Surah al-Baqarah*, ayat 164 yang bermaksud:

“Sesungguhnya dalam penciptaan langit dan bumi, pergantian malam dan siang, kapal yang berlayar di laut dengan membawa apa yang bermanfaat bagi manusia, dan apa yang diturunkan oleh Allah dari langit berupa air yang menghidupkan bumi setelah matinya, serta segala jenis makhluk yang bertebaran di bumi, dan pengaturan angin dan awan yang dikendalikan oleh Allah antara langit dan bumi, sungguh terdapat tanda-tanda (kebesaran Allah) bagi kaum yang menggunakan akal.”

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THE INFLUENCE OF LIVE STREAMING, FLASH SALE, AND PRICE ON IMPULSIVE BUYING AMONG SHOPEE USERS (CASE STUDY AT UNDERPRICE SKINCARE MEDAN CITY)

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Abstract

This study aims to investigate the influence of live streaming, flash sale, and price on impulsive buying among Shopee users, with a case study at Underprice, Skincare in Medan City. The research sample comprises all customers of Underprice, Skincare Medan. Sampling was conducted using a non-probability sampling method with an accidental sampling technique. Data analysis was carried out using multiple linear regression analysis and hypothesis testing through the coefficient of determination (R^2), simultaneous test (F-test), and partial test (t-test). The findings show that the coefficient of determination (R^2), the variables of live streaming, flash sale, and price, explain the variance in impulsive buying. Simultaneous hypothesis testing indicates that live streaming, flash sale, and price have a significant influence on impulsive buying. However, in the partial test, only live streaming and price significantly affect impulsive buying, while flash sale does not.
Keywords: Live Streaming; Flash Sale; Price; Impulse Buying.

1. Introduction

Information and communication technology has played a vital role and continues to evolve significantly over time. When utilized appropriately, technology can produce accurate information and foster effective communication outcomes. Technological advancements in communication have transformed business operations, particularly within the realm of digital marketing. The emergence of electronic commerce has become a central pillar in shaping the present and future landscape of online shopping.

Fig. 1. Channel Belanja Online Terfavorite Warga Indonesia Ramadhan 2024

Based on the data, it is evident that companies that are attuned to contemporary changes are increasingly relying on online platforms to expand and reach consumers more effectively. One of the most favoured platforms among Indonesians during Ramadan 2024, which has rapidly advanced in its marketing strategy, is Shopee. Shopee is a mobile-accessible platform designed to simplify transactions, allowing users to search for, purchase, and sell products directly using their smartphones, without the need for a computer or accessing the Shopee website. Shopee offers a wide range of products and services that cater to the daily needs of the public. Furthermore, Shopee continuously enhances its service features by introducing

Shopee Live, a feature that has successfully gained consumer trust by allowing sellers to present their products in real-time and engage effectively with customers through in-app live streaming. Live streaming has also emerged as one of the most dynamic marketing tools. During these sessions, brand ambassadors can interact directly with their followers, providing audiences with the opportunity to view products in real-time and ask questions. The introduction of Shopee Live has become one of the most popular features among Shopee users.

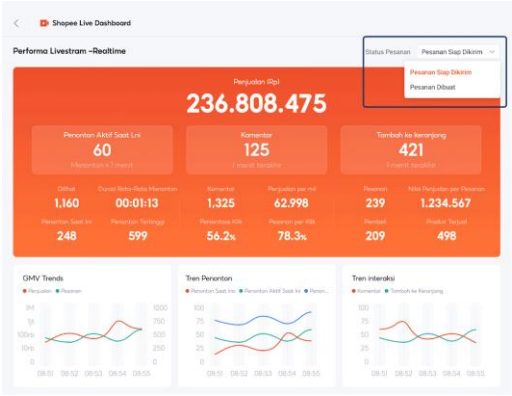

Fig. 2. Shopee Live Dashboard

The statistical data presented above indicate that Shopee's Live Streaming feature has a significant influence on consumer interest and purchasing decisions. Live streaming represents a breakthrough in interactive technology, enabling real-time engagement between streamers and users. Through this feature, users can interact directly by commenting, sending virtual gifts, tapping the screen, and sharing the live session with close contacts. Following the widespread popularity of live streaming, this innovation has also spurred the emergence of other digital business tools, such as the flash sale feature. The introduction of flash sales can trigger an immediate desire to make purchases by spontaneously fostering a sense of ownership. In the context of healthy business competition, this strategy has proven effective in generating substantial sales within a relatively short period. The objective of such a strategy is not only to boost sales rapidly but also to instill a sense of urgency and scarcity, which can emotionally influence consumer behavior. Psychologically, flash sales evoke a fear of missing out (FOMO) among consumers. The constraints of limited time and restricted product availability intensify the psychological urgency to make swift purchasing decisions without much deliberation. This phenomenon is closely related to impulsive buying, which refers to spontaneous purchasing behaviour that occurs without prior planning and is driven by momentary emotional impulses. In addition, pricing strategies play a crucial role in influencing impulsive buying. Among the various determinants, price is considered to have a significant impact on impulsive purchase behaviour. This phenomenon is increasingly observable on major e-commerce platforms such as Shopee, particularly during large-scale promotional events like National Online Shopping Day (Harbolnas), double-date sales, and Pay Day Sales. Consumers are often inclined to purchase items they do not necessarily need, simply due to attractive time-limited offers perceived as highly beneficial. Thus, price becomes a pivotal variable in marketing strategy that can shape perceived value and consumer decision-making. Consumers tend to be more motivated to engage in impulsive purchases when they believe they are acquiring goods at a price lower than their actual value such as through discounts, markdowns, or bundled promotions. Competitive pricing strategies are frequently employed by businesses to capture consumer interest, particularly by creating a sense of urgency that encourages immediate purchase decisions. Prices perceived as "affordable" or "attractive" can stimulate emotional responses in consumers, ultimately prompting purchases made without rational consideration. This aligns with findings from several studies which indicate that consumers' perceptions of price significantly influence the intensity and tendency of Impulsive buying behaviour.

2. Methodology

The data collection methods employed in this study are as follows:

i. Documentation Study: This involved the use of documents obtained from the company Underprice.Skincare in Medan City.
ii. Questionnaire: A list of structured statements was formulated in the form of a questionnaire, which was distributed to respondents selected as the sample.
iii. Observation: This method involved direct observation and data recording at the Underprice Skincare company in Medan City.
iv. Literature Review: Data were gathered through various sources including journals, theses, textbooks on marketing mix and consumer decision-making, as well as online articles relevant to the research topic.

Prior to distributing the questionnaire either directly or indirectly to respondents, the researcher first determined the population from which the sample would be drawn. The population is defined as a group of individuals or objects possessing specific characteristics determined by the researcher for analysis and from which conclusions will be drawn (Sugiyono, 2016). In the context of this study, the population consists of Underprice. Skincare customers in May, totalling 9,000 individuals. This figure is derived from the average number of customers over the past three months. With an estimated daily average of 300 customers, over a 30-day period, the population is estimated at 9,000 for the month of May.A sample refers to a portion of the population (Sugiyono, 2016). The sampling technique used in this research is non-probability sampling with an incidental sampling approach, in which respondents were selected based on those who happened to encounter the researcher and were considered appropriate for inclusion. To determine the sample size, Slovin's formula was applied:

$$n = \frac{N}{1 + N.e^2} \quad (1)$$

Where:

n = Sample size
N = Total population (individuals who have made online purchases at Underprice.Skincare)
e^2 = Margin of error, which is set at 10% in this study.

Based on this formula, the sample size is calculated as follows:

$n = N/1+Ne^2$
n = 9.000/(1+9.000(0.01))
n= 9.000/(1+90)
n= 9.000/91
n= 98,90 Thus, the sample size used in this study is 99 respondents.

This research applies quantitative descriptive analysis, and the analytical model used is multiple linear regression to determine the effect of the independent variables (X) on the dependent variable (Y), both simultaneously and partially. The data were processed using SPSS 22 (Statistical Program for Social Science), employing the following multiple linear regression model:

$$Y = a + b1X1 + b2X2 + b3X3 + e \quad (2)$$

Where:

Y = Impulsive Buying
a = Constant
b_1, b_2, b_3 = Regression coefficients
X_1 = Live Streaming

X_2 = Flash Sale
X_3 = Price
e = Error term (factors not examined in this study)

The coefficient of determination (R^2) test is conducted to assess the extent to which the independent variables explain the variance in the dependent variable. It indicates the proportion of the overall influence of the independent variables on the dependent variable. This test is used to evaluate the combined effect of the independent variables Price and Promotion on purchasing decisions. The test is conducted at a 95% confidence level with a significance threshold of α = 0.05. The criteria are as follows:

If $F_{count} \leq F_{value}$, then H_0 is accepted, meaning the variables do not simultaneously influence the dependent variable.

If $F_{count} \geq F_{value}$, then H_0 is rejected, and H_4 is accepted, indicating a significant simultaneous influence.

Partial Test (t-test)

If $t_{count} < t_{value}$, then H_0 is accepted, and H_1, H_2, and H_3 are rejected, indicating no partial effect.

If $t_{count} > t_{value}$, then H_0 is rejected, and H_1, H_2, and H_3 are accepted, indicating a significant partial effect of the independent variables on the dependent variable.

3. Results and Discussion

The validity test was conducted to evaluate the accuracy of the instruments used in this study. An instrument is considered valid if the calculated correlation coefficient (r_{hitung}) is greater than the critical value (r_{tabel}). The following are the validity test results for each variable instrument employed in this research:

Table 1. Validity instrument live streaming variable (X1)

Instrument	Validity value		conclusion
	r_{count}	r_{value}	
Live Streaming 1	0,854	0,30	Valid
Live Streaming 2	0,596		Valid
Live Streaming 3	0,797		Valid
Live Streaming 4	0,690		Valid
Live Streaming 5	0,870		Valid
Live Streaming 6	0,908		Valid
Live Streaming 7	0,885		Valid
Live Streaming 8	0,873		Valid
Live Streaming 9	0,809		Valid
Live Streaming 10	0,881		Valid

Based on Table 1 results of the validity test, the r-count values for the live streaming items range from 0.596 to 0.908, which means the live streaming variable has been declared valid. This conclusion is drawn from the fact that the r-count values for each item are greater than the r-table value of 0.30, indicating a significant level of validity (Zenianto, 2023).

Table 2. Validity Instrument Flash Sale Variable (X2)

Instrument	Validity Value r count	r value	conclusion
Flash Sale 1	0,893	0,373	Valid
Flash Sale 2	0,903		Valid
Flash Sale 3	0,842		Valid
Flash Sale 4	0,875		Valid
Flash Sale 5	0,835		Valid
Flash Sale 6	0,916		Valid

Flash Sale 7	0,920		Valid
Flash Sale 8	0,898		Valid
Flash Sale 9	0,793		Valid
Flash Sale 10	0,781		Valid

Based on Table 2 result of the validity test, the r-count values for the flash sale items range from 0.781 to 0.920 it means the flash sale variable has been declared valid. This conclusion is drawn from the fact that the r-count values for each item are greater than the r-table value of 0.373, indicating a significant level of validity.

Table 3. Validity Instrument Price Variable (X3)

Instrument	Value Validity r_{count}	r_{value}	conclusion
Price 1	0,869		Valid
Price 2	0,908		Valid
Price 3	0,929		Valid
Price 4	0,785	0,373	Valid
Price 5	0,866		Valid
Price 6	0,868		Valid
Price 7	0,854		Valid
Price 8	0,907		Valid

Based on the Table 3 result of the validity test, the r-count values for the price items range from 0.785 to 0.929, which means the price variable has been declared valid. This conclusion is drawn from the fact that the r-count values for each item are greater than the r-table value of 0.373, indicating a significant level of validity.

Table 4. Validity Instrument Impulsive Buying Variable (Y)

Instrument	Validity Value R_{count}	R_{value}	conclusion
Impulsive Buying 1	0,592		Valid
Impulsive Buying 2	0,872		Valid
Impulsive Buying 3	0,866		Valid
Impulsive Buying 4	0,847		Valid
Impulsive Buying 5	0,844	0,30	Valid
Impulsive Buying 6	0,643		Valid
Impulsive Buying 7	0,785		Valid
Impulsive Buying 8	0,778		Valid
Impulsive Buying 9	0,889		Valid
Impulsive Buying 10	0,876		Valid

Based on the Table 4 result of the validity test, the r-count values for impulsive buying items range from 0.592 to 0.889, which means the Impulsive buying variable has been declared valid. This conclusion is drawn from the fact that the r-count values for each item are greater than the r-table value of 0.30, indicating a significant level of validity (Zenianto, 2023).

The reliability test was conducted to ensure that the instruments used in this study are dependable, consistent, and stable when applied repeatedly over time. An instrument is considered reliable if its Cronbach's Alpha coefficient exceeds the acceptable threshold of 0.60. The results of the reliability test are presented in the following table:

Table 5. Reliability Instrument Test

No	Variable	*Cronbach's alpha* value	conclusion
1	*Live Streaming* (X1)	0,956	Reliability
2	*Flash Sale* (X2)	0,971	Reliability
3	Price (X3)	0,968	Reliability
3	*Impulse Buying* (Y)	0,952	Reliability

The results above demonstrate that all variables exhibit Cronbach's Alpha values well above the minimum threshold of 0.60, confirming the internal consistency and reliability of the research questionnaire. This analysis was conducted to examine the influence of live streaming, flash sale, and price on impulsive buying behaviour among Shopee users, with a case study on underpricing. Skincare in Medan City. The regression results are summarized as follows:

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-5,548	3,049		-1,819	,072
	Live_Streaming	,396	,139	,362	2,855	,005
	Flash_Sale	-,065	,145	-,070	-,450	,654
	Harga	,529	,184	,431	2,870	,005

a. Dependent Variable: Impulsif_Buying

Fig. 1. Multiple Linear Regression Analysis

The resulting regression equation is:

$$Y= -5.548 + 0.396X_1 + (-0.065)X_2 + 0.529X_3 + e \quad (3)$$

In this model, the constant value for Impulsive Buying is -5.548, indicating that when all independent variables (live streaming, flash sale, and price) are equal to zero, the baseline level of impulsive buying is negative. The positive coefficients for live streaming and price imply that increases in these variables are associated with increases in impulsive buying behaviour. Conversely, the negative coefficient for flash sales suggests a non-supportive relationship with impulsive buying in this context.

- Coefficient of Determination (R^2)\, the explanatory power of the model is assessed using the R^2 value, as shown in the table below:

Table 6. Coefficient of Determination Test (r2)

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,686[a]	,471	,454	3,846

a. Predictors: (Constant), Price, Live_Streaming, Flash_Sale

The R^2 value of 0.471 indicates that 47.1% of the variation in impulsive buying can be explained by the three independent variables included in this model. The remaining 52.9% may be attributed to other factors not examined in this study, such as celebrity endorsements, brand trust, product quality, or ease of transaction.

- Simultaneous Test (F-test)

The F-test evaluates the collective influence of all independent variables on the dependent variable. The results are as follows:

Table 8. Simultaneous Test (F-test)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1251,147	3	417,049	28,189	,000[b]
	Residual	1405,479	95	14,795		
	Total	2656,626	98			

a. Dependent Variable: Impulsif_Buying
b. Predictors: (Constant), Price, Live_Streaming, Flash_Sale

- Dependent Variable: Impulsive Buying
  The F-calculated value of 28.189 exceeds the critical value of 2.47, and the significance level of 0.000 is well below the 0.05 threshold. This indicates that live streaming, flash sale, and price collectively have a significant effect on impulsive buying behavior among Underprice.Skincare consumers in Medan.

Table 9. Partial Test

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	-5,548	3,049		-1,819	,072
	Live_Streaming	,396	,139	,362	2,855	,005
	Flash_Sale	-,065	,145	-,070	-,450	,654
	Harga	,529	,184	,431	2,870	,005

a. Dependent Variable: Impulsif_Buying

- Dependent Variable: Impulsive Buying
  The result of the live streaming variable has a t-value of 2.855, which is greater than the t-table value of 1.985, with a significance level of 0.005 < 0.05. Therefore, it can be concluded that live streaming has a positive and significant effect on impulsive buying. This implies that the more frequent and engaging the live streaming activities conducted by underprice. Skincare, the greater the likelihood that consumers will engage in impulsive purchases. The result of the flash sale variable has a t-value of -0.450, which is lower than the t-table value of 1.985, with a significance level of 0.654 > 0.05. Thus, flash sales do not have a significant effect on impulsive buying. This indicates that the flash sale promotions implemented have not been effective in encouraging impulsive buying behaviour. This could be due to the flash sale programs being unappealing, held too frequently, or failing to create a sense of urgency among consumers. The result of the price variable has a t-value of 2.870, which exceeds the t-table value of 1.985, with a significance level of 0.005 < 0.05. This indicates that the price variable has a positive and significant effect on impulsive buying. In other words, competitive pricing, discounts, or other pricing strategies can trigger impulsive buying among underprice. Skincare consumers.

4. Conclusion

The first hypothesis test revealed that the coefficient of determination (R^2) was 0.471, meaning that 47.1% of the variance in impulsive buying behaviour could be explained by the three independent variables: Live Streaming, Flash Sale, and Price. The remaining 52.9% is likely influenced by other external factors not included in this model. The second hypothesis test (F-test) demonstrated that the model is statistically valid. The F-calculated value (28.189) surpassed the F-critical value (2.47), with a significance level of 0.000, thereby confirming that the independent variables jointly have a significant effect on impulsive buying. These findings suggest that Live Streaming, Flash Sale, and Price can indeed impact consumer purchasing

tendencies. For companies such as underprice. Skincare, this insight is crucial for enhancing marketing strategies and achieving sales targets. While current efforts may be effective, continuous refinement is necessary to sustain and elevate performance. The third hypothesis test (t-test) showed that Live Streaming has a significant and positive impact on impulsive buying. This implies that the more frequently and attractively underprice. Skincare conducts live sessions; the more likely consumers are to make spontaneous purchases. However, the Flash Sale variable was found to have no significant effect. This might be attributed to unappealing promotional structures, overuse of flash sale events, or the lack of urgency among consumers. Price, on the other hand, was shown to have a positive and significant influence. Competitive pricing, discounts, and strategic bundling can effectively stimulate unplanned purchases among consumers. In conclusion, this study emphasizes the critical role of digital marketing strategies particularly Live Streaming and Pricing, in shaping impulsive buying behaviour. Live Streaming fosters emotional engagement between consumers and brands, while attractive pricing enhances perceived value. However, Flash Sale promotions may require strategic re-evaluation to optimize their effectiveness.

Future researchers are encouraged to expand upon this study by incorporating additional variables such as viral marketing content, brand ambassadors, and endorsements, which may also influence impulsive buying behaviour. Furthermore, the inclusion of intervening or moderating variables using alternative data analysis models such as Structural Equation Modelling (SEM) is recommended. The scope of the research may also be broadened beyond individual consumers to include distributors or retailers, to obtain more comprehensive and applicable results that can better support the company's marketing strategy. For companies, underprice. Skincare can implement strategies to encourage consumers to purchase products, such as limiting stock availability with a countdown timer. Alternatively, it can be combined with other promotions, such as free shipping or other benefits, to make consumers feel they are getting a better deal with the Flash Sale.

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THE INFLUENCE OF SOCIAL MEDIA CONTENT AND TRENDS ON PURCHASING DECISIONS FOR CHATIME PRODUCTS AMONG GEN Z

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Abstract

This study aims to analyze the influence of social media content and trends on purchasing decisions for Chatime products among Generation Z in Titi Kuning District, Medan Johor.Generation Z is known to be very close to the digital world and actively uses social media such as Instagram as a source of information as well as a trend reference. This study uses a quantitative approach with purposive sampling technique on 100 respondents who are Gen Z consumers. Data was collected through an online questionnaire and analyzed using multiple linear regression. The results showed that social media content and trends simultaneously had a significant influence on purchasing decisions, with an Adjusted R^2 value of 0.642 or 64.2%. This means that the two independent variables can explain 64.2% of the variation in purchasing decisions, while the rest is influenced by other factors. Social media content is considered interesting, informative, and in line with Gen Z's interests, and trends such as virality and support from influences also contribute to purchasing decisions. These findings reinforce the importance of marketing strategies that are relevant to the character of Gen Z, as well as the utilization of creative visual content and ongoing trends to increase consumer attraction and loyalty.
Keywords: Social media; Content, trends; Purchasing decisions.

1. Introduction

Generation Z is a group of consumers born between 1997 and 2012 and has distinctive characteristics that set them apart from previous generations. They grew up in the digital era and are very familiar with the use of technology from an early age, making them a tech- savvy generation. This habit makes them tend to rely on the internet to find information before making a purchase. In addition, Generation Z shows interest in brands that have authenticity, values, and a clear mission, especially those that reflect social responsibility and care for the environment. In addition, Generation Z values personalized and unique experiences over generic products. They want to have an emotional connection with the brand or product they choose. Concern for social issues and sustainability are also important considerations in their shopping decisions. Not only that, Generation Z tends to choose to shop online because it is more practical, offers a variety of choices, and competitive prices compared to physical stores. Generation Z often utilizes social media as the main source for obtaining information about products, social media is a very effective means to reach and build connections with consumers from Generation Z. In this case, social media plays an important role in shaping their consumption behavior patterns, especially in the beverage sector which continues to grow and attract attention. Generation Z utilizes these platforms to search for ideas and follow popular trends, receive recommendations from influencers and peers, and conduct price and product comparisons between brands. They also actively engage in online discussions about products, leave reviews and share their personal experiences. One social media platform that is effectively used for product or service marketing activities is Instagram.

Instagram is a social media platform that is freely available for download on various devices such as iOS, Android, and Windows. This application offers a variety of features such as sharing photos and videos, giving likes, writing comments, and sending private messages via direct message. Instagram offers two types of accounts that users can choose from, namely personal accounts and business accounts. Business accounts are specifically designed for commercial purposes, allowing businesses to market their products or services and analyze content performance through features such as Instagram Insight. With this feature, business owners can recognize the characteristics of their audience and know the type of content that is most in demand. In addition, users can also interact with each other through comment, mention, like, and direct message features. Instagram as a marketing channel is specifically designed for mobile device users, thus offering ease of operation. Instagram has the advantage of focusing on visual content such as photos and videos. Users are also facilitated by additional features such as hashtags, location tags, and push notifications. In an increasingly competitive business competition, these advantages encourage businesses to continue to innovate and maintain their brand existence in the midst of a dynamic market.

As we see today, the growth of the culinary industry in Indonesia is increasingly showing significant development, opening up wide opportunities for beverage businesses to present a variety of flavors and attractive packaging. To maintain customer loyalty amidst intense competition, an effective marketing communication strategy between producers and consumers is needed. Currently, more manufacturers are entering the beverage business, especially in the bubble tea segment. Some well-known brands that are quite popular in Indonesia include Chatime, Kokumi, Xing Fu Tang, and various other brands that have also enlivened the market. Chatime is a popular milk tea drink brand that originated in Taiwan and has successfully expanded its reach to various countries, including Indonesia. The company has a vision to become the most loved and respected tea brand globally. To achieve this goal, Chatime is committed to providing the best service through serving consistently high-quality tea, as well as providing optimal customer experience in their modern outlets. Chatime is an international beverage franchise that has more than 1,000 outlets spread across various countries such as the United States, Australia, Hong Kong, China, the Philippines, Macau, South Korea, and Indonesia. Every day, Chatime can serve up to 400,000 customers worldwide. In Indonesia, Chatime first arrived in February 2011 by opening its first outlet in the Alam Sutera area. The brand carries the slogan "Good tea, good time" which reflects the taste of drinks that are favored by various groups, from children to adults. Chatime's global expansion began with the opening of its first international store in California, USA. By 2013, its store network had reached more than 25 countries, including Indonesia. The success of this expansion is also reinforced by Chatime's achievement which won the top position in the Bubble Drink category based on the 2019 Top Brand for Teens Index survey, with an acquisition of 56.0%. This figure shows significant dominance compared to its competitors such as HipHop (12.5%) and Lup-Lup (11.9%). This is a challenge for Chatime to increase customer satisfaction in order to keep ahead of competitors with the rise of businesses in the field of culinary drinks popping up today.

Table 1. Produk boba

No.	Brand	Year Established	Number of Instagram Followers	Number of Posts in 1 Week March 21 - March 27	Number of Comments in a Week March 21 - March 27
1	Chatime	2005	909Rb	7 posts	327 comments
2	Kokumi	2008	86.9Rb	5 posts	99 comments
3	Xing fu tang	2019	128Rb	7 posts	21 comments

Based on the data in Table 1, it can be seen that Chatime shows dominance in social media activities compared to its competitors. Chatime's official Instagram account has 909k followers

and gets an average of 327 comments a week. In comparison, Kokumi only has around 86.9k followers with 99 comments, while Xing Fu Tang has 128k followers and only achieved 21 comments in the same period. This activeness and high interaction on social media make Chatime one of the important references in shaping consumer purchasing decisions, especially on the Instagram platform.This condition encourages companies to improve their marketing strategies through the creation of interesting content disseminated through social media. This phenomenon is also in line with data on the growth of Instagram users in Indonesia, which in 2022 was recorded to reach second place with a user level of 84.8%

Previous studies have shown that social media and digital lifestyles play an important role in shaping Generation Z's consumption behavior. Research by (Regina,2024) entitled "The Influence of Digital Lifestyle on Generation Z Consumer Behavior" shows that this generation is closely related to the digital world, accustomed to searching for product information online, and prefers authentic brands and has social concerns. Digital lifestyles have proven to significantly influence their purchasing decisions, especially using social media. The study by in their work entitled "The Role of Social Media in the Formation of Gen Z Consumer Identity" states that social media not only functions as a medium of information, but also to form identity and gain social recognition. The active use of social media by Generation Z has proven to influence purchase interest and loyalty to products, especially in the beverage industry such as bubble tea. Research entitled "The Effectiveness of Instagram as a Media for Promoting Beverage Products for Millennial and Gen Z Consumers" revealed that Instagram features such as Insights, visual content, hashtags, and location markers can increase consumer engagement. Their findings prove a significant relationship between attractive visual content strategies and purchasing decisions. In research entitled "Chatime's Brand Positioning Strategy in Indonesia in Increasing Consumer Loyalty", it is explained that Chatime's success in topping the Top Brand for Teens 2019 survey is the result of a consistent and strong digital branding strategy on social media. This research shows that there is a significant influence of digital strategies on consumer purchasing decisions. (Putri,2024) in her research "The Influence of Digital Content on the Attractiveness of Beverage Products among Teenagers" found that attractive visual content and trends on social media significantly influence teenagers' purchase intentions for beverage products.

Meanwhile, through the report "Instagram Usage Trends in Indonesia and Their Implications for Digital Marketing" noted that Indonesia ranks second in the world in the number of Instagram users with 84.8% in 2022. This fact confirms that Instagram is a very potential channel to reach Gen Z consumers in digital marketing activities. Based on previous findings, it appears that social media content and trends play a significant role in influencing purchasing decisions, especially for Chatime products among Generation Z. This study aims to explore more deeply how these two key factors, social media content and trends, contribute to purchasing decisions in the current digital era. Therefore, this study aims to explore more deeply how these two key factors social media content and trends contribute to purchasing decisions in today's digital era. Content marketing is a marketing strategy approach that focuses on creating and disseminating valuable, relevant, and consistent content to attract and maintain a clearly defined audience, thereby ultimately encouraging customers to take profitable actions. The indicators that content marketing must include to measure content are relevance, accuracy, value, ease of understanding, ease of finding, and consistency.

i. Relevance Marketers can provide content with relevant information. The information generated is tailored to meet the needs related to the problems faced by consumers.
ii. Accuracy Marketers can provide accurate information. The information displayed is completely based on facts, in accordance with the reality that occurs
iii. Value Marketers can provide content with information that is useful and helpful to consumers. Creating content that has value is a basic requirement of consumer behavior.

iv. Easy to Understand Marketers provide content that can be easily understood by consumers. Both easy to read and easy to understand
v. Easy to Find Marketers can distribute content through the right media so that the information provided will be easily accessible to consumers.
vi. Consistent Marketers can maintain the quantity of content provided to consumers. Always on time (update) to update information regularly

Meanwhile, a trend can be understood as a direction of development or a pattern of events that has momentum and sustainability. Trends indicate future directions and often provide predictable opportunities. In a social context, trends also reflect a view, idea, or lifestyle that is in demand by the community, and can embrace various age groups, from children to adults. The indicators that can be used to benchmark trends include: the latest models (trendy), different models, showing characteristics, and supporting activities The purchase decision is an important process that consumers go through in choosing a product or service to consume. This stage puts the individual in a position to determine whether to make a purchase or not. This process involves cognitive aspects, including memory, judgment, information processing, and rational evaluation of the various alternatives available. Indicators in purchasing decisions consist of four things, namely the product of choice, the brand of choice, the determination when purchasing, the situation when purchasing.

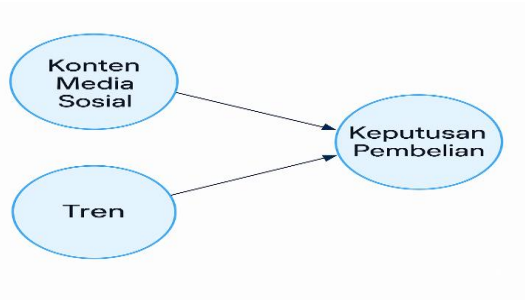

Fig.1. Conceptual framework

Research Hypothesis, Based on the framework, the research hypothesis proposed is:

- H1: Social media content has a significant effect on purchasing decisions for Chatime products.
- H2: Trends have a significant effect on purchasing decisions for Chatime products.
- H3: Social media content and trends simultaneously have a significant effect on Chatime product purchasing decisions.

2. Methodology

This study uses a quantitative approach, which aims to determine the effect of independent variables, namely *social media content* and *trends*, on the dependent variable, namely *purchasing decisions*, both partially and simultaneously. The research was conducted in Titi Kuning District, Medan Johor with the main target of Generation Z who purchase Chatime products. The research implementation time lasted from March to June 2025. The target population in this study are individuals from Generation Z who actively access social media content and have purchased Chatime products in the Titi Kuning Medan Johor District area. This study uses a non-probability sampling method with purposive sampling technique, which is a sampling technique based on certain considerations in accordance with predetermined criteria [11] The selected respondent criteria include:

i. Included in the age range of Generation Z (born in 1997 to 2012) who actively use social media
ii. Have made at least one Chatime purchase in the last three months
iii. Have a fairly good understanding of the use of social media.

Because the population of buyers of chatime products in Titi Kuning District Medan Johor is unknown, the number of samples sought is determined by the formula:

n = 5 x Number of Indicators Used
n = 5 x 14 Indicators
n = 70 respondents

And get the result of 70 respondents, then rounded up to 100 respondents.

The questionnaire is a data collection method carried out by providing a number of questions and written statements to respondents in order to obtain information related to the variables under study. In this study, the questionnaire was prepared to explore data regarding social media content, trends, and purchasing decisions for products. This instrument was made in the form of a *Google Form* and distributed directly to respondents who live in the Titi Kuning District of Medan Johor.

3. Results and Discussion

In this study, researchers used IBM SPSS Statistics 25 as a tool to analyze validity and reliability tests. Based on the calculation results, the calculated r value for all items exceeds the r table value, so that all instrument items in this study are declared valid. In addition, the reliability test results show that the Cronbach's Alpha value is more than 0.70, which means that each statement in the questionnaire has a good level of consistency and is suitable for use in this study. All variable question items (X1), (X2), (Y) are declared valid r count is greater than 0.361 Descriptive statistics are used to provide an overview of respondents' responses to the variables studied, namely social media content (X1), trends (X2), and purchasing decisions (Y).

Table 1. Characteristics of Respondents Based on Age

Age	Number(Person)	Percentage(%)
16-18	33	33
19-21	48	48
22-24	19	19
Total	100	100

It is concluded that generation Z who buys chatime in Titi kuning Medan Johor District is dominated by respondents aged 19-21 years.

Table 2. Characteristics of Respondents Based on Gender

Gender	Number (Person)	Percentage(%)
Male	66	66
Female	34	34
Total	100	100

It can be concluded that the majority of chatime buyers are male-dominated.

Table 3. Characteristics of Respondents Based on Occupation

Jobs	Number (Person)	Percentage (%)
Student	55	55
Public Servant	45	45
Total	100	100

This shows that the majority of chatime buyers are dominated by students. This is because chatime is often an effective way to quench thirst, stress and have more fun with friends and family

Table 4. Characteristics of Respondents Based on Purchase Frequency

Purchase	Number	Percentage (%)
1 time	43	43
2-3 time	38	38
< 3 time	19	19
Total	100	100

This data shows that the majority of respondents are still classified as light to moderate buyers, with a less intense purchase frequency. This could reflect Gen Z's consumption behavior which is influenced by momentary trend factors or occasional interest in beverage products such as Chatime.

Multiple linear regression analysis is applied to determine how much influence the independent variables consisting of social media content (X1), trends (X2), and the dependent variable of purchasing decisions (Y). Based on Table 3, the linear regression equation is obtained as follows.

$$Y= 9.182+ 0.456\ X1+ 0.482\ X2 \quad (1)$$

Table 5. Multiple Linear Regression Analysis Results Coefficients

Coefficients					
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std.Error	Beta		
1 (Constant)	9.182	4.610		-1.992	0.049
Social Media Content	0.456	0.084	0.464	5.419	0.000
Trends	0.482	0.101	0.407	4.745	0.000

a. Dependent Variable: source purchase decision:

Based on the regression equation obtained, it can be described as follows:

i. The constant (β_0) = 9.182 indicates that if the Social Media content variable (X_1), Trends
ii. (X_2), is zero, then the level of purchasing decisions (Y) on chatime buyers in Medan Johor
iii. District is estimated at 9.182, assuming no influence from other variables.

The coefficient (β_1)= 0.456, is positive, which means that Social Media Content has a positive influence on Purchasing Decisions. The higher the Social Media Content, the higher the Purchasing Decision. The coefficient (β_2) = 0.482, also positive, indicates that Trends have a positive effect on Purchasing Decisions. This means that the more frequent exposure to Trends, the more Purchasing Decisions tend to increase. The correlation value R is 0.806, which means that the relationship between Social Media Content (X1), Trends (X2), and Purchasing Decisions (Y) is 80.6%. The Adjusted R2 value or the coefficient of determination is 0.642, which means that 64.2% of the Purchase Decision variable (Y) can be explained by Social Media Content (X1), Trends (X2).

Social media content plays an important role in shaping Gen Z's purchasing interests and decisions. This is in accordance with the Content Marketing theory from (Amalia,2020) which states that content must be relevant, accurate, valuable, easy to understand, easy to find, and consistent. In the context of Chatime, content such as seasonal promotional videos, customer testimonials, and interactions through Instagram Stories and reels are proven to increase engagement and purchase interest. Research also confirms that Instagram features such as visual content, insights, hashtags, and direct interaction can increase Gen Z consumer engagement. Chatime's promotional content such as "Brown Sugar Ramadan Edition" which

received more than 14,000 likes and hundreds of comments shows that visual, emotional, and timely elements can significantly trigger purchasing decisions.

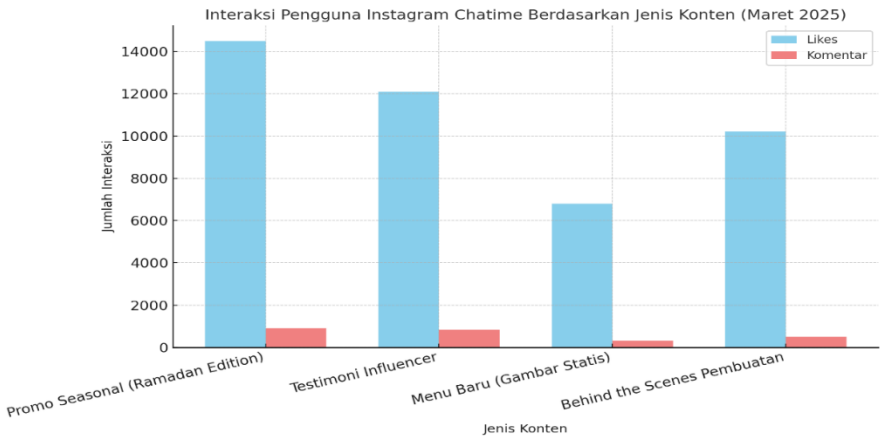

Fig. 2. Chatime Instagram user interaction by content

Here is a graph of Chatime Instagram user interaction by content type during March 2025. This graph shows that:

i. Seasonal promotional content such as "Ramadan Edition" has the highest interaction rate.
ii. Testimonials from influencers also generate significant likes and comments.
iii. Static image content had the lowest engagement, indicating that Gen Z responds more to dynamic content.
iv. Behind-the-scenes attracts attention because it gives a sense of authenticity.

Trends are proven to positively influence purchasing decisions. Gen Z is known as a generation that is easily exposed to viral content and peer influence. This is in line with the Social Influence and Trend Adoption theory which states that individuals tend to follow social trends to gain social recognition or validation. Phenomena such as the emergence of Chatime in FYP TikTok or Instagram reels, as well as support from local influencers and cablegrams, also strengthen the brand's position in the eyes of Gen Z. Research also supports this finding, that viral trends on social media can drive purchase intentions, especially in adolescents and young consumers. Why is the influence only 64.2%? Although social media content and trends make a large contribution, there is still 35.8% influence from external factors that were not studied. Research states that aspects such as taste quality, in-store service, and price also play a role in shaping purchasing decisions. Practically speaking, Gen Z does not rely solely on content display or trends, but also pays attention to other consumer experiences, including product reviews, service speed, and accessibility of Chatime outlets. Therefore, the digital strategy must be supported by improving the quality of offline services. By consistently integrating creative content and popular trends, as well as maintaining product and service quality, Chatime can increase purchase conversion and consumer loyalty among Gen Z more optimally.

4. Conclusion

From the results of the data analysis that has been carried out, it can be concluded that, social media content and trends simultaneously have a significant effect on purchasing decisions for Chatime products among Generation Z. Partially, social media content has a significant effect on purchasing decisions, indicating that the presentation of interesting content can encourage consumer interest. Trends also have a significant partial effect, showing that Gen Z consumer behavior is influenced by things that are going viral or becoming a lifestyle. Based on the above conclusions, the researcher provides the following suggestions, for Chatime, it is

recommended to continue to develop more creative and interesting social media content strategies, such as the use of short videos, interactive promotions, or collaborations with influencers to increase attractiveness among Gen Z. Utilize trends in a timely manner, by presenting seasonal or limited edition product variants that follow current consumer tastes and trends, to remain relevant in the eyes of the target market and for future research, it is recommended to add other variables such as price, product quality, or peer influence, in order to provide a broader picture of the factors that influence Gen Z purchasing decisions.

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PRICING STRATEGY, GROSS PROFIT, AND ITS IMPACT ON THRIFTING BUSINESS COMPETITIVENESS

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Abstract

The increasing demand for sustainable and affordable fashion has contributed to the rapid growth of online thrifting businesses, particularly through social media platforms like TikTok and Instagram. However, the growing competition in this digital marketplace requires business owners to implement effective strategies to maintain competitiveness. Previous studies have emphasized that pricing strategies and financial performance, particularly gross profit, play crucial roles in business sustainability and competitive positioning. This study aims to analyze the influence of pricing strategy and gross profit on the competitiveness of online thrifting businesses in Medan City. A quantitative approach was applied, involving 38 thrift business actors selected through purposive sampling based on their active online sales history. Data was collected using structured questionnaires and analyzed with SPSS version 26.0, including validity and reliability tests, followed by multiple linear regression analysis. The results show that both pricing strategy ($\beta = 0.298$, $p < 0.001$) and gross profit ($\beta = 0.591$, $p < 0.001$) have a significant positive effect on competitiveness. The model explains 69.5% of the variation in business competitiveness ($R^2 = 0.695$). These findings highlight the importance of applying transparent, cost-efficient pricing strategies and effective gross profit management to improve the competitive edge of thrift businesses. This study contributes to existing literature by focusing on MSMEs in the digital fashion sector and provides practical recommendations for thrift entrepreneurs to strengthen their market position.
Keywords: Pricing Strategy; Gross Profit; Competitiveness.

1. Introduction

Thrifting or preloved businesses have experienced significant growth in recent years. These businesses offer secondhand products in good condition, responding to shifting consumer values toward sustainability, affordability, and uniqueness. The popularity of these businesses is especially high among younger consumers who use platforms like TikTok and Instagram to promote and sell thrifted items. The growing interest in thrifting is driven by several factors, such as increased awareness of sustainable consumption, economic pressures that lead consumers to be more selective, and the ease of access to digital platforms like Instagram, TikTok, and various online marketplaces. This model has become an attractive alternative for MSMEs due to its low capital requirements and wide digital reach. However, the growing number of players in the industry intensifies competition and demands stronger positioning efforts. According to pricing and product quality are key variables influencing consumer purchase intention and market competitiveness in the thrift sector. As thrift businesses continue to emerge, competition within the industry has become increasingly intense. At the same time, business owners are also facing economic uncertainty and rising operational costs, making it more important than ever to adopt adaptive and strategic pricing approaches. A poorly designed pricing decision whether setting prices too high or too low can negatively affect consumer trust, profit margins, and long-term business sustainability. In this context, thrift entrepreneurs must consider multiple factors such as acquisition costs, competitor pricing, market demand, product quality, and the purchasing power of consumers. Emphasize that a competitive pricing strategy must be structured and responsive to market conditions,

including the timing of promotions and price flexibility, in order to maintain profitability and competitiveness.
Previous studies have shown that price and product quality significantly influence consumers' purchase intention and the sales volume of thrift stores. A competitive pricing strategy, combined with good product quality and effective promotion, has been proven to substantially enhance business competitiveness. This combination can account for up to 81.8% of changes in sales volume. However, many MSME thrift business owners still apply intuitive pricing without evaluating gross profit or cost structure, which can hinder long-term sustainability. [5] found that MSMEs lacking financial literacy and structured profit monitoring often face challenges in maintaining business continuity and making strategic decisions in a digital business ecosystem. In the face of economic uncertainty and rising operational costs, thrift business owners are required to set prices strategically, taking into account factors such as acquisition costs, competitor pricing, market conditions, and the varying purchasing power of consumers. Strategies that can be employed include price adjustments based on product quality, pricing flexibility, and the implementation of timely and targeted promotions.

Beyond pricing, added value elements such as customer service, transaction convenience, and attractive promotional strategies also influence a business's market position. Therefore, a well-designed pricing strategy can serve as a key factor in enhancing the competitiveness of thrift businesses. This study aims to analyze how pricing strategies and gross profit affect the competitiveness of thrifting businesses. Using a quantitative approach through the distribution of questionnaires to online thrift business owners, this research is expected to provide strategic insights for entrepreneurs in developing more effective and sustainable pricing policies. Although numerous studies have explored pricing strategies and gross profit, quantitative research that specifically examines their relationship with the competitiveness of online thrift businesses in Indonesia particularly those operating on social media platforms like TikTok and Instagram remains limited. Therefore, this study offers novelty by addressing this gap in the literature through an empirical analysis based on data from digital thrifting MSMEs in Medan City.

2. Methodology

This research employs a quantitative approach with survey methods as the main technique for data collection. The quantitative approach is chosen because it allows the researcher to measure and analyze relationships between variables objectively through numerical data [6]. The population in this study includes all online thrift entrepreneurs in Medan who conduct sales through digital platforms such as Instagram and TikTok. Since the exact population size is unknown, the sample was determined using purposive sampling. Respondents were selected based on criteria including having conducted more than one online thrifting transaction and actively operating their businesses. Based on access, time limitations, and relevance to the research criteria, 38 respondents were selected as samples. The research procedure began with designing the questionnaire, which was developed based on the operational definitions of the variables. After validation, the questionnaire was distributed both online and directly to the respondents. The response period was set for 1 - 2 weeks. Completed questionnaires were coded and processed for analysis.

The instrument used was a structured questionnaire with a 5-point Likert scale ranging from strongly disagree to strongly agree. The independent variables are pricing strategy (X_1) and gross profit (X_2), while the dependent variable is business competitiveness (Y). Pricing strategy was measured using indicators such as quality-based pricing, discount and bundling offers, and satisfaction-oriented pricing. Gross profit was measured through indicators such as sales and production cost recording, gross profit ratio calculation, and profit effectiveness compared to set benchmarks. Business competitiveness was assessed based on pricing accuracy, timeliness of service, product quality, and customer service flexibility.

Validity testing was conducted using Pearson's product-moment correlation, and reliability testing was performed using Cronbach's Alpha. Items with Alpha values above 0.60 were considered reliable. Data were analyzed using SPSS version 26.0, including descriptive statistics, classical assumption tests (normality, multicollinearity, heteroscedasticity), and multiple linear regression analysis to determine the effect of the independent variables on business competitiveness. To guide this research, the following hypotheses were developed based on the research objectives and literature review:

H1: Pricing strategy has a significant effect on business competitiveness.
H2: Gross profit has a significant effect on business competitiveness.
H3: Pricing strategy and gross profit simultaneously have a significant effect on business competitiveness.

3. Results and Discussion

Table 1. Descriptive Statistics

Variable	N	Min	Max	Mean	Std. Deviation
Pricing Strategy	38	28	45	35.37	4.116
Gross Profit	38	32	45	37.79	3.378
Business Competitiveness	38	30	45	36.61	3.259

All three variables show high average values close to the maximum score, suggesting that most respondents implement strong pricing strategies, track gross profit effectively, and perceive their businesses as competitive. Before conducting further analysis, it is essential to ensure that the research instrument is both valid and reliable. Validity testing assesses whether the items in the questionnaire accurately measure the intended variables. Reliability testing, on the other hand, determines whether the instrument produces consistent results under similar conditions. Ensuring instrument validity and reliability is critical so that subsequent analyses such as regression and hypothesis testing are based on trustworthy and credible data.

Table 2. Validity Test of Variable (X_1)

Variable	Item	r count	r table	Status
Pricing Strategy (X_1)	X1.1	0.690	0.320	valid
	X1.2	0.621	0.320	valid
	X1.3	0.814	0.320	valid
	X1.4	0.501	0.320	valid
	X1.5	0.634	0.320	valid
	X1.6	0.592	0.320	valid
	X1.7	0.707	0.320	valid
	X1.8	0.584	0.320	valid
	X1.9	0.640	0.320	valid

Table 3. Validity Test of Variable (X_2)

Variable	Item	r count	r table	Status
Gross Profit (X_2)	X2.1	0.594	0.320	valid
	X2.2	0.670	0.320	valid
	X2.3	0.574	0.320	valid
	X2.4	0.560	0.320	valid
	X2.5	0.621	0.320	valid
	X2.6	0.509	0.320	valid
	X2.7	0.529	0.320	valid
	X2.8	0.489	0.320	valid
	X2.9	0.469	0.320	valid

Table 4. Validity Test of Variable (Y)

Variable	Item	r count	r table	Status
Business Competitiveness (Y)	Y1	0.475	0.320	valid
	Y2	0.524	0.320	valid
	Y3	0.596	0.320	valid
	Y4	0.458	0.320	valid
	Y5	0.347	0.320	valid
	Y6	0.603	0.320	valid
	Y7	0.512	0.320	valid
	Y8	0.627	0.320	valid
	Y9	0.564	0.320	valid

All items from the three variables Pricing Strategy (X1), Gross Profit (X2), and Business Competitiveness (Y) have count values greater than r table (0.320**)**. This indicates that each questionnaire item has a strong and significant correlation with its total variable score, thus all items are declared valid.

For X_1, the validity proves that various pricing strategies like discounting, bundling, and pricing flexibility are well captured. For X_2, the indicators effectively measure the respondents' ability to track income, control costs, and calculate gross profit. Meanwhile, the items under **Y** confirm valid measurement of competitiveness factors such as innovation, customer service, and technological adaptation. Therefore, all the research instruments used in this study exhibit strong construct validity and are reliable for further statistical analysis.

Table 5. Reliability Test

Variable	Cronbach's Alpha	Condition	Status
Pricing Strategy	0.821	0.60	Reliable
Gross Profit	0.715		Reliable
Business Competitiveness	0.672		Reliable

Based on the results presented in Table 5, the reliability of all research instruments used in this study meets the accepted standard, with Cronbach's Alpha values exceeding the threshold of 0.60. This indicates that the questionnaire items for each variable are consistent

and reliable in measuring their respective constructs. The Pricing Strategy (X1) variable shows the highest reliability score with a Cronbach's Alpha of 0.821, indicating excellent internal consistency among the items. The Gross Profit (X_2) variable also demonstrates strong reliability with a value of 0.715, which signifies good internal consistency. The Business Competitiveness (Y) variable has a Cronbach's Alpha value of 0.672, which is still above the acceptable limit, indicating that the items used reliably reflect respondents' views on competitiveness. These results collectively confirm that all instruments used in this research are statistically reliable and suitable for further quantitative analysis, such as hypothesis testing through regression and correlation analysis. Multiple linear regression was used in this study to test the effect of pricing strategy and gross profit on business competitiveness. This method also helps determine the direction of the relationship between independent and dependent variables and predict changes in competitiveness when the independent variables change. As stated, multiple regression enables researchers to estimate the conditional mean of a dependent variable based on linear combinations of the predictors, while also evaluating the strength, direction, and statistical significance of those relationships. Following the validation and reliability assessment of all research tools, a multiple linear regression analysis was performed to investigate the direction and strength of the impact of the independent variables on the dependent variable, and to forecast shifts in business competitiveness due to changes in pricing strategy (X_1) and gross profit (X_2).

Table 6. Multiple Linear Regression

Coefficients[a]

Model		Unstandardized Coefficients	
		B	Std. Error
1	(Constant)	3.729	8.394
	Pricing Strategy	.298	.080
	Gross Profit	.591	.098

a. Dependent Variable: Business Competitiveness

Based on the results shown in Table 6, the following regression equation was obtained: $Y = 3.729 + 0.298X_1 + 0.591X_2 + e$.

i. The constant value of 3.729 indicates that if both pricing strategy and gross profit were zero, the predicted level of business competitiveness would be 3.729. This represents the baseline competitiveness in the absence of the independent variables' effects.
ii. The regression coefficient for Pricing Strategy (X_1) is 0.298, meaning that for every one-unit increase in pricing strategy, business competitiveness increases by 0.298, assuming gross profit remains constant. This suggests that pricing strategy has a positive impact on business competitiveness.
iii. The coefficient for Gross Profit (X_2) is 0.591, indicating that each one-unit increase in gross profit results in a 0.591 increase in business competitiveness, assuming pricing strategy is held constant. This confirms that gross profit is the more dominant predictor in influencing competitiveness.

Both variables show significance levels below 0.001 (< 0.05), confirming that they have a statistically significant effect on business competitiveness. Additionally, the VIF value of 1.176 and tolerance of 0.850 indicate that there is no multicollinearity problem between the independent variables.

The t-test is used to evaluate the partial effect of each independent variable on the dependent variable, which is business competitiveness. Based on Table 8, the t table value at degrees of freedom (df) = 38 – 3 = 35 and a significance level of 0.05 is 2.030.

Table 7. T Test

Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	3.729	8.394		1.010	.320
Pricing Strategy	.298	.080	.377	3.723	<.001
Gross Profit	.591	.098	.612	6.052	<.001

a. Dependent Variable: Business Competitiveness

The t calculated value for pricing strategy is 3.723, which is greater than the t table value of 2.030, with a significance level of < 0.001, which is less than 0.05. Therefore, H_0 is rejected and H_a is accepted, indicating that pricing strategy has a partially significant effect on business competitiveness. This suggests that well-implemented pricing strategies enhance business competitiveness.

The t calculated value for gross profit is 6.052, also greater than the t table value of 2.030, with a significance level of < 0.001. Thus, H_0 is rejected and H_a is accepted, meaning that gross profit also partially and significantly affects business competitiveness. In other words, an increase in gross profit contributes positively to a higher level of business competitiveness. These findings confirm that both pricing strategy and gross profit independently and significantly influence the competitiveness of online thrifting businesses.

Table 8. F Test

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	273.300	2	136.650	39.930	.000[b]
	Residual	119.779	35	3.422		
	Total	393.079	37			

a. Dependent Variable: Business Competitiveness

b. Predictors: (Constant), Gross Profit, Pricing Strategy

The F-test is used to examine the simultaneous effect of all independent variables on the dependent variable, which is business competitiveness. Based on the ANOVA table, the calculated F value is 39.930 with a significance level of 0.000. This value is compared to the F table value of 3.27, obtained using $df_1 = 2$ (number of predictors) and $df_2 = 35$ (n – k) at a 0.05 significance level. Since F calculated (39.930) > F table (3.27) and the significance value is < 0.05, H_0 is rejected and H_a is accepted. This indicates that pricing strategy and gross profit jointly have a significant effect on business competitiveness. In other words, the independent variables included in the model make a meaningful and statistically significant contribution in explaining the variation in competitiveness among online thrift entrepreneurs. This highlights that an effective pricing strategy and well-managed gross profit are key factors in enhancing competitiveness in the digital marketplace.

Table 9. Coefficient of Determination Test

Model Summary[b]				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.834	0.695	0.678	1.850

a. Predictors: (Constant Gross Profit, Pricing Strategy
b. Dependent Variable: Business Competitiveness

The table above presents a summary of the linear regression analysis results, including the correlation coefficient (R), coefficient of determination (R Square), Adjusted R Square, and the standard error of the estimate. Based on these results, the R value of 0.834 indicates a very strong relationship between the independent variables, namely Pricing Strategy and Gross Profit, and the dependent variable, Business Competitiveness.
Furthermore, the R Square value of 0.695 shows that 69.5% of the variation in Business Competitiveness can be explained by the two independent variables used in this model. The remaining 30.5% is influenced by other factors outside the regression model, such as broader market competition, external economic variables, or elements of business strategy that were not included in this study. The use of the coefficient of determination (R^2) is essential in this study to measure the explanatory power of the regression model. A high R^2 value signifies that the model can effectively account for changes in the dependent variable based on the independent variables. This contributes to the validity of conclusions drawn from the regression analysis and provides a quantitative basis for strategic recommendations.
Therefore, the regression model used in this research demonstrates a high explanatory power and can be considered suitable as a reference for decision making or strategy formulation for improving competitiveness in the online thrift business sector.

The regression findings show that the pricing strategy (X_1) positively and significantly impacts business competitiveness, exhibiting a regression coefficient of 0.298 and a significance level of < 0.001. This indicates that effective pricing strategies that are responsive to the market play a significant role in enhancing the competitive power of thrift businesses within a crowded online marketplace. Thrift entrepreneurs typically apply various pricing strategies, such as offering discounts, creating bundle packages, adjusting prices based on product quality (grade), and promoting prices through digital platforms like TikTok and Instagram. These findings are supported. Who found that relationship pricing, satisfaction-based pricing, and zone-based price adjustments were effectively used by PT Grab to enhance customer loyalty and perceived value. Although Grab operates in the service industry and employs a qualitative approach, the core pricing principles focused on customer value and satisfaction are evidently transferable and effectively implemented in the second-hand goods trade as well. Similarly, emphasize the importance of cost-based pricing strategies that consider production costs and market demand. MSMEs that applied this approach not only improved their profit margins but also maintained competitive selling prices, ultimately strengthening their position in the market.

The present study also finds that thrift entrepreneurs have adopted fundamental principles of pricing, such as target costing and the use of digital media as a channel for price promotions. Field observations further confirm that many businesses incorporate discounting, bundling, and price anchoring strategies in their promotional content on TikTok and Instagram. Regression analysis shows that gross profit (X_2) is the most dominant factor affecting competitiveness, with a coefficient of 0.591 and a significance level below 0.001. This indicates that higher gross margins are associated with stronger competitive positioning. MSMEs capable of managing production costs and setting appropriate profit margins tend to be more competitive. High gross profits signal operational efficiency and the successful implementation of pricing strategies. Their study emphasized the importance of accurate cost of goods sold (COGS) calculations and structured financial recordkeeping. In the context of thrift businesses, gross profit is especially critical because used goods are resold after

undergoing value-adding processes such as curation, cleaning, and marketing. Entrepreneurs must understand profit margins to ensure they are not simply offering low prices but are also generating sustainable profits and also highlighted that although gross profit is not always a direct predictor of future cash flow, it still holds significance in assessing a business's competitiveness as it reflects operational efficiency in the early stages. For thrift businesses, gross profit is derived from the difference between the selling price and the purchase cost of thrifted items. The ability to source quality items at low prices and resell them with appropriate markups is key to maintaining high gross profits. This underscores the importance of effective sourcing and branding strategies.

The F-test results show that pricing strategy and gross profits jointly exert a significant influence on business competitiveness (F = 39.930; Sig. = 0.000). The R Square value of 0.695 indicates that 69.5% of the variation in competitiveness can be explained by these two independent variables. These findings reinforce the notion that the combination of an effective pricing strategy and efficient gross profit management is fundamental to building competitive advantage. This is echoed in the findings of [5] in the JURPIKAT journal, which emphasize that cost-based strategies using target costing enhance both efficiency and competitiveness of MSME products. Furthermore, argue that accurate financial reporting, particularly in the management of gross profit, is critical for supporting a sustainable competitive strategy. Without sound financial practices, businesses risk being unaware of their cost structure, which may result in setting prices that are not profitable. Hence, the competitiveness of thrift MSMEs is largely influenced by two key elements: how they set prices and how well they manage costs to achieve profit.

The results of this study imply the need for education and training for thrift entrepreneurs in applying data-driven pricing strategies and financial analysis. As shown by [12], basic financial recording using cost accounting principles should be adopted as a foundation for pricing decisions, gross profit calculations, and regular evaluations of competitiveness. These findings offer not only theoretical contributions but also strong practical implications. For thrift entrepreneurs, this study highlights that pricing strategy and gross profit management are foundational and inseparable elements in building sustainable competitiveness. Arbitrary pricing without proper cost and margin analysis can lead to reduced competitiveness and even threaten business continuity. Therefore, it is essential for thrift entrepreneurs to develop awareness of financial recordkeeping, especially in calculating costs and profit margins, to ensure that pricing strategies are not only attractive to customers but also financially viable. Additionally, the use of social media platforms like TikTok and Instagram should be maximized not only to attract customers but also to implement flexible, market-responsive pricing strategies such as discounts, bundling, and flash sales.

4. Conclusion

Based on the results of this study on online thrifting business actors, it can be concluded that pricing strategies and gross profit management play a vital role in shaping and enhancing business competitiveness in an increasingly challenging digital marketplace. Effective pricing strategies such as offering discounts, adjusting prices in accordance with product quality, and creating bundled offers contribute significantly to consumer value perception and purchase intention. These strategies not only increase customer attraction but also create a competitive advantage that distinguishes thrift businesses from their competitors. Furthermore, well-managed gross profit reflects a business’s operational efficiency and its ability to optimize both cost control and revenue generation. A healthy profit margin from each transaction indicates that the applied pricing strategies are not only attractive from a marketing standpoint but also beneficial from a financial perspective.

Gross profit serves as a crucial indicator in evaluating how effectively pricing decisions translate into economic value for the business. When pricing strategy and gross profit are not only managed independently but also harmonized and aligned with each other, business

competitiveness improves significantly. Pricing decisions must always consider target profit margins, and in return, optimal profits are often the result of well-formulated pricing strategies. Thus, the synergy between these two aspects forms a solid foundation for sustaining and strengthening the online thrift business, enabling it to remain resilient and grow amid an increasingly dynamic and digital business environment. For future researchers, it is recommended to include additional variables that may also influence business competitiveness, such as promotional strategies, service quality, or the use of digital technology in business operations. This will help to obtain a more comprehensive understanding of the factors influencing the competitiveness of thrift businesses.

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THE ROLE OF SPRINGATE ANALYSIS IN MAINTAINING BUSINESS SUSTAINABILITY AND AVOIDING BANKRUPTCY RISK

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Abstract

This study aims to analyse the bankruptcy potential of PT Keloria Moringa Jaya during the 2022 to 2024 period using the Springate model. Although this model is generally applied to large companies with standardized financial statements, in this study it is implemented in the context of micro, small, and medium enterprises (MSMEs). The Springate model evaluates financial health through four main ratios: working capital to total assets, earnings before interest and taxes (EBIT) to total assets, earnings before tax (EBT) to current liabilities, and sales to total assets. The analysis results show S scores of 11.073 in 2022, 21.860 in 2023, and 54.609 in 2024, all of which are significantly above the threshold of 0.862. Theoretically, this reflects a healthy financial condition. However, considering that the financial records do not fully comply with accounting standards, particularly in the exceptionally high X3 ratio, these results should be interpreted with caution. This study contributes to the discourse on the relevance and limitations of bankruptcy prediction models within the MSME context in Indonesia. Data were collected through interviews, observations, and documentation of the company's financial reports. Data analysis was conducted using a descriptive quantitative approach with the Springate model as the primary tool for evaluating bankruptcy risk.
Keywords: Springate; Bankruptcy; Financial Analysis.

1. Introduction

The increasingly dynamic nature of the business environment requires companies to adopt adaptive strategies to maintain operational sustainability and avoid the risk of bankruptcy. PT Keloria Moringa Jaya, a company engaged in the processing and distribution of herbal products based on Moringa oleifera leaves, currently operates using a make to order production system. This strategy is considered efficient for inventory control and reducing storage costs. However, it also carries significant risks in the event of a sudden surge in demand. Failure to meet increasing demand due to market fluctuations, seasonal trends, or other external factors may lead to missed sales opportunities, decreased customer satisfaction, and a decline in company revenue. If not properly anticipated, this condition could threaten business sustainability and increase the risk of bankruptcy. To anticipate such risks, the company needs to conduct a comprehensive evaluation of its financial performance. One approach that can be used is the application of bankruptcy prediction analysis, such as the Springate model. This model was developed by Gordon L V Springate in 1978 and aims to predict a company's bankruptcy potential using financial data. The Springate model incorporates four key ratios, namely the ratio of working capital to total assets, the ratio of earnings before interest and taxes to total assets, the ratio of earnings before tax to current liabilities, and the ratio of sales to total assets. The calculation results in a Springate score (S Score), where a value of 0.862 or higher indicates a healthy financial condition, while a value below 0.862 signals potential bankruptcy. Bankruptcy prediction is essential to prevent disruptions to business continuity. Financial statement analysis can also be used to objectively evaluate the efficiency and financial stability of the company.

In addition to the Springate model, other approaches such as financial ratio analysis are also widely used to assess a company's stability. As stated in *W. Wardayani and D. S. Wahyuni*, financial ratios such as Return on Asset (ROA), Current Ratio (CR), and Debt Ratio (DR) can provide an initial overview of a company's financial condition, particularly in supporting strategic decision making. Meanwhile, *R. Simbolon and W. Wardayani* explains that prediction methods such as the Altman Z Score are also effective in detecting potential financial distress in large companies, although their level of accuracy highly depends on industry characteristics and the quality of financial reporting used. The effectiveness of bankruptcy prediction models, particularly the Springate model, has been tested in various previous studies. As explained in *B. Dharma and S. F. Harahap*, the application of this model to PT Garuda Indonesia Tbk provided an early warning of potential bankruptcy, with score fluctuations reflecting the company's financial dynamics from year to year. The research *in N. Yuniarti, B. P. Rininda, Y. Fitriyani, and M. R. Abdillah* supports this finding, where consistently low S scores below the threshold indicated prolonged financial pressure. The study in *M. Thoharoh, M. I. Maulana, Nurman, A. Ramli, and Anwar* also demonstrated the Springate model's ability to identify changes in financial condition, as seen in the case of PT Saranacentral Bajatama Tbk, which experienced an increase in its score following a crisis period.

Based on the background, an analysis of the financial condition of PT Keloria Moringa Jaya using the Springate model becomes essential. This study aims to assess the company's bankruptcy potential during the 2022 to 2024 period, while also evaluating the relevance of the Springate model within the context of micro, small, and medium enterprises. Considering that financial records in MSMEs are not yet fully standardized, this research is expected to contribute to the development of more appropriate financial analysis methods for the small and medium business sector in Indonesia.

2. Methodology

This study employs a descriptive qualitative method with a case study approach on PT Keloria Moringa Jaya. The qualitative method was chosen because this research aims to gain a deep understanding of the company's financial condition through data interpretation, rather than hypothesis testing or statistical analysis. The data used are primary data obtained directly from the company's internal management in the form of financial reports from 2022 to 2024. Although financial statements are generally classified as secondary data, in this study they are considered primary because they were not taken from public sources, but from internal documents provided directly by the company. Data collection was also conducted through interviews, direct observations, and recording of the company's financial activities.

The financial statements obtained did not fully follow accrual-based accounting standards, so the data were reformatted to meet the calculation requirements of the Springate model. However, the original values were not altered to ensure they still reflect the company's real financial condition. The Springate model itself was developed by Gordon L.V. Springate in 1978 to predict the risk of corporate bankruptcy. This model uses four financial ratios: (1) working capital to total assets (X_1), (2) earnings before interest and taxes to total assets (X_2), (3) net profit before tax to current liabilities (X_3), and (4) sales to total assets (X_4). The calculation is performed using the following formula:

$$S = 1.03X1 + 3.07X2 + 0.66X3 + 0.4X4 \quad (1)$$

The result is then compared to a threshold score of 0.862, where a value below this figure indicates potential bankruptcy. In this study, the Springate model is not used for statistical analysis, but rather as a supporting tool to describe the company's financial condition narratively and contextually in line with the qualitative approach.

3. Results and Discussion

The following is the bankruptcy calculation using the Springate method for PT. Keloria Moringa Jaya in the period 2022-2024:

Table 1. Summary of Financial Statement Components for 2022

Information	Year 2022
Total Asset	125.000.000
Sales	369.486.461
Working Capital	38.487.500
EBIT (Earnings Before Interest and Taxes	159.704.552
EBT (Earnings Before Taxes)	159.260.108
Current Liability	18.600.000
Tax	0,5% x 369.486.461 = 1.847.432

Springate Calculation 2022:
Springate Formula:

$$S = 1{,}03X1 + 3{,}07X2 + 0{,}66X3 + 0{,}4X4 \quad (1)$$

X_1 = Working Capital / Total Assets
= 38.487.500 / 125.000.000
= 0,308

X_2 = EBIT / Total Assets
= 159.704.552 / 125.000.000
= 1,278

X_3 = EBT / Current Liability
= 159.260.108 / 18.600.000
= 8,562

X_4 = Sales / Total Assets
= 369.486.461 / 125.000.000
= 2,956

S = 1,03X1 + 3,07X2 + 0,66X3 + 0,4X4
= 1,03(0,308) + 3,07(1,278) + 0,66(8,562) + 0,4(2,956)
= 0,317 + 3,922 + 5,651 + 1,182
= 11,073

Table 2. Summary of Financial Statement Components for 2023

Information	Year 2023
Total Asset	657.777.975
Sales	1.156.359.013
Working Capital	491.215.250
EBIT (Earnings Before Interest and Taxes	507.777.975
EBT (Earnings Before Taxes)	507.777.975
Current Liability	18.600.000
Tax	0,5% x 1.156.359.013 = 5.781.795

Springate Calculation 2023:

X_1 = Working Capital / Total Assets
= 491.215.250 / 657.777.975
= 0,747

X_2 = EBIT / Total Assets
= 507.777.975 / 657.777.975
= 0,772

X_3 = EBT / Current Liability
= 507.777.975 / 18.600.000
= 27,300

X_4 = Sales / Total Assets
= 1.156.359.013 / 657.777.975
= 1,758

S = 1,03X1 + 3,07X2 + 0,66X3 + 0,4X4
= 1,03(0,747) + 3,07(0,772) + 0,66(27,300) + 0,4(1,758)
= 0,769 + 2,370 + 18,018 + 0,703
=21,860

Table 3. Summary of Financial Statement Components for 2024

Information	Year 2024
Total Asset	1.091.262.651
Sales	1.749.290.835
Working Capital	916.808.047
EBIT (Earnings Before Interest and Taxes	976.591.820
EBT (Earnings Before Taxes)	976.591.820
Current Liability	12.800.000
Tax	0,5% x 1.749.290.835 = 8.746.454

Springate Calculation 2024:

X_1 = Working Capital / Total Assets
= 916.808.047 / 1.091.262.651
= 0,840

X_2 = EBIT / Total Assets
= 976.591.820 / 1.091.262,651
= 0,895

X_3 = EBT / Current Liability
= 976.591.820 / 12.800.000
= 76,296

X_4 = Sales / Total Assets
= 1.749.290.835 / 916.808.047
= 1,603

S = 1,03X1 + 3,07X2 + 0,66X3 + 0,4X4
= 1,03(0,840) + 3,07(0,895) + 0,66(76,296) + 0,4(1,603)
= 0,865 + 2,747 + 50,356 + 0,641

= 54,609

S-Score Value for 2022-2024, The classification of healthy and bankrupt companies is based on the S-Score value of the Springate method, namely:

- A value of less than 0.862 (S < 0.862) means the company is categorized as unhealthy.
- The value exceeds or is equal to 0.862 (S > 0.862), then the company is included in the classification of a financially healthy company.

Table 4. S-Score Value for 2022-2024

Year	S-Score	Information
2022	11,073	Healthy
2023	21,860	Healthy
2024	54,609	Healthy

3. Result and Discussion

Based on the calculation results of the four main ratios (X1 to X4), PT Keloria Moringa Jaya shows a very high and steadily increasing S Score each year. Theoretically, this indicates that the company's financial condition falls into the healthy category and is far from risk bankruptcy. In 2022, the value of X1, or the ratio of working capital to total assets, was 0.308, indicating that the company's working capital was equivalent to 30.8 percent of its total assets. This suggests that the company had sufficient liquidity to support short-term operations. X2, or the ratio of EBIT to total assets, was 1.278, showing a very high level of efficiency in generating operating income from its assets. Meanwhile, X3, or the ratio of earnings before tax to current liabilities, stood at 8.562, reflecting a strong ability to meet short term obligations using generated profits. X4, or the ratio of sales to total assets, was recorded at 2.956, indicating that the company's assets were quite productive in generating sales. With these values, the resulting Springate score was 11.073, which is far above the threshold of 0.862, meaning that the company was in a healthy financial condition. In 2023, X1 increased to 0.747, indicating that the company had working capital amounting to 74.7 percent of its total assets. This reflects a significant improvement in liquidity. The X2 ratio declined to 0.772 but still demonstrated good efficiency in generating profit from assets. X3 rose sharply to 27.300, indicating that the company's earnings before tax were nearly 27 times its current liabilities. This signifies a very strong financial position in meeting short-term obligations. X4 decreased to 1.758, showing a slight decline in asset efficiency in generating sales compared to the previous year. Nevertheless, the S Score increased to 21.860, which still indicates a very healthy financial condition.

In 2024, X1 increased again to 0.840, indicating that working capital accounted for 84 percent of total assets. This condition reflects very strong liquidity. X2 also rose to 0.895, demonstrating improved operational efficiency. The X3 ratio surged sharply to 76.296, indicating that the company's earnings before tax were nearly 76 times greater than its current liabilities. This figure shows that the company had an exceptional ability to meet its short-term obligations. The X4 ratio slightly declined to 1.603 yet still indicated that the company's assets were being used efficiently to generate sales. With this combination of ratios, the S Score increased significantly to 54.609, the highest value recorded during the research period. Although the Springate score mathematically indicates a very healthy financial condition, it is important to note that some ratios, particularly X3, have extremely high values that are uncommon among typical companies. The X3 value of 76.296 in 2024 warrants further analysis, as it may reflect an imbalanced financial structure. This ratio is most likely driven by the relatively small amount of recorded current liabilities rather than purely by high earnings before tax. This could lead to a distorted interpretation if not considered in the context of the company's financial reporting practices.

This condition is commonly found in micro, small, and medium enterprises, where the financial recording systems remain simple, unstandardized, and do not fully adhere to accrual-based accounting principles. According to [8], disorganized financial recording is the main cause of the low transparency and accuracy of MSME financial statements. Reference [9] also emphasizes that the results of the Springate model are highly dependent on the quality of the data used. Therefore, in the context of MSMEs, the resulting scores may be subject to significant bias. This is reinforced in [10], which states that unstructured financial reports can lead to analysis results that do not reflect the actual financial reality. When compared with the results of similar studies, such as those on PT Garuda Indonesia Tbk or PT Omni Inovasi Indonesia Tbk [4], the Springate scores obtained by PT Keloria Moringa Jaya appear to be significantly higher. For example, the highest score recorded by Garuda Indonesia in 2022 was only 0.876, while Omni Inovasi Indonesia scored only 0.573. This substantial difference may lead to the assumption that the financial data of the research subject have specific characteristics that require further investigation, rather than being simply interpreted as an absolute advantage. Thus, although the Springate model provides a signal that the company is in a very healthy financial condition, the results must be interpreted with caution. The MSME context should be a primary consideration when analysing the results to avoid drawing incorrect conclusions. The Springate model remains useful as an early warning tool, but it should be complemented with other approaches that consider the specific characteristics of MSME financial reporting.

4. Conclusion

Based on the results of the bankruptcy analysis using the Springate model on PT Keloria Moringa Jaya during the 2022 to 2024 period, several key conclusions can be drawn as follows:

i. In general, the financial condition of PT Keloria Moringa Jaya shows a highly positive trend. The S Score obtained was 11.073 in 2022, 21.860 in 2023, and 54.609 in 2024, all of which are well above the bankruptcy threshold of 0.862. This increase reflects improvements in liquidity, operational efficiency, and the company's ability to meet its short-term obligations as indicated by the Springate model.

ii. The four ratios in the Springate model (X1 to X4) indicate positive performance, but there is an anomaly in the X3 ratio (EBT to current liabilities), which shows an unusually high value not commonly found in most companies, particularly in 2024 when it reached 76.296. This suggests a possible imbalance in the financial structure, primarily due to the low amount of current liabilities rather than high earnings alone. Therefore, interpretation of the Springate score must be carried out with caution to avoid biased conclusions.

iii. This study also highlights that the financial recording of PT Keloria Moringa Jaya, as an MSME, does not fully comply with accrual-based accounting standards. The recording system remains simple and unstructured, which may affect the validity of financial data and pose a risk of distortion in the analysis results. Therefore, although the Springate score indicates a very healthy financial condition, this result should be viewed in the context of the limitations of MSME financial reporting systems.

Considering these factors, the Springate model remains relevant as an early detection tool for bankruptcy risk, but it should not be used as the sole indicator in assessing business sustainability, especially for MSME scale enterprises. This study is expected to serve as a starting point for encouraging the adoption of more holistic financial analysis methods and emphasizing the importance of improving financial recording systems in MSMEs so that financial analyses more accurately reflect the actual condition of the company. These findings are supported by previous research stating that bankruptcy prediction can help companies respond to risks at an early stage. In addition, data quality greatly influences the accuracy of financial analysis results, particularly in the MSME context', predictive models such as Springate are also considered relevant in detecting a company's financial condition if applied with care.

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THE INFLUENCE OF BRAND IMAGE AND FASHION LIFESTYLE ON THRIFT PURCHASE DECISION (CASE STUDY ON GEN Z TANJUNGBALAI CITY)

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Abstract

This study aims to analyze the effect of brand image and fashion lifestyle on purchasing decisions for thrift clothing among generation Z in Tanjungbalai. The method used is quantitative approach with purposive sampling technique, involving 100 respondents who are users of thrift clothing. Data was collected through questionnaires distributed online. Data analysis was carried out using multiple linear regression with the help of SPSS software. The results showed that brand image has a positive and significant effect on purchasing decisions with a regression coefficient of 0.581, while fashion lifestyle also has a positive and significant effect with a regression coefficient of 0.623. Simultaneously, these two variables have a significant influence on purchasing decisions, with a value of R = 0.750 which indicates a strong relationship, and R^2 = 0.563, meaning that 56.3% of brand image and fashion lifestyle variables contribute to purchasing decisions. The remaining 43.7% is influenced by other factors outside this research model. This finding indicates that brand image and fashion lifestyle are dominant factors in shaping the purchase decision of thrift clothing in Gen Z.
Keywords: Brand Image; Fashion Lifestyle; Purchasing Decisions; Thrift Clothing; Gen Z.

1. Introduction

The fashion industry is experiencing rapid development along with changes in trends and lifestyles in society. One trend that is increasingly popular among young people, especially the gen Z generation, is the phenomenon of thrift clothing. Thrifting is the main choice for many individuals who want to look fashionable, at an affordable price, and have concern for the environment through the concept of sustainable fashion. Preloved and thrift clothing are often seen as similar, but there are actually some fundamental differences between the two. According to information released by Popbela.com, thrift refers to thrifted clothing from overseas that is packed in large bales and sold in retail or wholesale. Meanwhile, preloved means selling items from personal collections, both from international and local brands. Preloved clothing is clothing that has been previously used, but is still in good condition and worth wearing, these clothes will then be transferred to new owners or other people in need (Sukri et al., 2024). Well-known branded goods usually have relatively high prices, so only people with sufficient wealth can afford them. This makes it difficult for many Indonesians, especially those from the lower middle class, to afford such items. As a result, they prefer the more affordable option of buying thrifted items. Most middle-income earners face challenges in buying new branded clothing, making preloved clothing a more realistic option. Thrifting is in demand due to environmental reasons and the desire to save money, with 67% of Millennials and Generation Z buying thrifted clothing. Limitations in financial accessibility often prevent them from getting the clothes they want, and this is why preloved branded clothes are increasingly in demand by young people who want to fulfill their clothing needs.

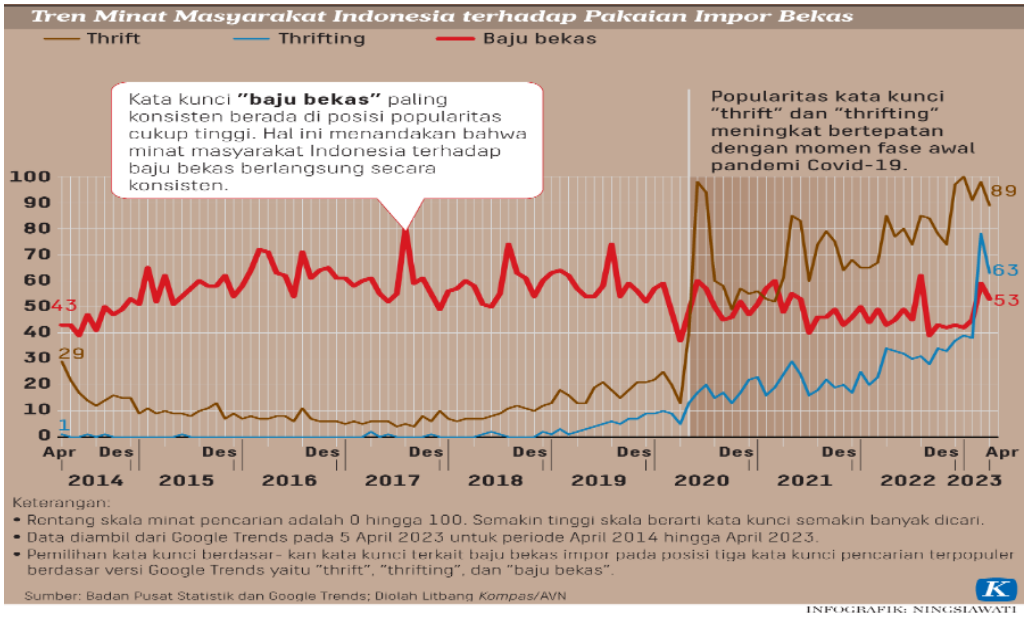

Fig. 1. Central Statistics Agency and Google Trends; processed by Kompas/AVN Research and Development

This phenomenon is also strongly influenced by advances in information innovation and online media. The development of digital media today encourages people to seek openness in obtaining various things, including the latest fashion and lifestyle trends. From this, there is a need to always look up to date and follow the development of a trending lifestyle. Tanjungbalai city as one of the cities that has a dynamic community of young people, also experienced an increase in interest in thrift clothing. Currently the existence of thrift clothing sellers known as monza has mushroomed in various big cities, including Tanjungbalai. It is estimated that thrift clothing has existed in Northern Tanjungbalai since 1980. However, no one knows exactly when and how thrift clothing from abroad began to enter the monza market in Tanjungbalai.

Monza market itself is a place that specializes in selling thrift clothing, which is better known by the local community as TPO (Point of Sale) tax. Aside from being an economic center for local merchants, monza market also contributes to creating jobs for many people. Many merchants depend on the sale of thrift clothing in this market for their livelihoods. However, on the other hand, with the prevalence of the thrifting trend, the government is now banning thrifting activities in 2023, according to the Minister of Trade Regulation number 40 point IV of 2022 which is a revision of the Minister of Trade Regulation Number 18 of 2021 regarding the export and import ban of prohibited goods and other thrift clothing (Ariana, 2022) . From there, various debates emerged regarding the legality and economic impact of the imported thrift clothing trade. Some argue that the thrift clothing trade can hinder the growth of the domestic textile industry as people prefer to buy thrift clothing at low prices rather than new local products. In some countries, the import of thrift clothing has even been banned to protect the domestic textile industry (Ekonomika et al., 2022).

Despite this, interest in thrift clothing continues to rise. Apart from the more affordable price factor, the exclusivity aspect is also an attraction. Many thrifted clothes come from well-known brands and are hard to find in the market, which gives more value to the buyers. In addition, thrift clothing often has unique designs and high quality, as many fashion products from the past were made to a better standard than today's fast fashion products (Nuriah et al., 2024) . The thrifting phenomenon has also created new business opportunities. Many businesses are now focusing on the thrift shop business, both offline and online. Some even curate their thrift clothing collections carefully to attract consumers who are looking for vintage or branded

clothing at more affordable prices. Some also repackage thrifted clothes with more interesting concepts, such as washing, ironing, and mixing and matching clothes before reselling them at a higher price.

In the context of thrifting, cultural factors include shifting fashion trends that prioritize sustainability and the aesthetic value of vintage clothing. Social factors involve the role of communities and social media that encourage consumptive behavior towards thrift clothing. Personal factors include individual motivation in choosing thrift as an economic alternative as well as self-expression. Meanwhile, psychological factors are related to consumer perceptions regarding the value of exclusivity, quality, and price of thrift clothing compared to new fashion products. Based on Kotler's theory, it can be concluded that the decision to buy thrift clothing by Generation Z is not only driven by financial aspects but also by social and psychological factors that shape their lifestyle and identity in modern society. In this study, researchers focus on measuring lifestyle in the context of fashion trends. Fashion trends reflect a person's lifestyle that is manifested through the way they dress. The increasing popularity of thrift clothing among generation Z, especially in Tanjungbalai city, indicates a significant change in consumer behavior that needs further research.

Based on the description above, researchers are interested in examining, "The influence of brand image and fashion lifestyle on purchasing decisions for thrift clothing in generation Z of Tanjungbalai city". With this title, the author focuses on measuring lifestyle in the context of fashion trends that reflect a person's lifestyle which is manifested through dressing. And the increasing popularity of thrift clothing among generation Z, especially in Tanjungbalai city, shows a significant change in consumer behavior. Therefore, the author wants to research more deeply so that it can be useful for the author and readers who read this thesis.

Brand image can be interpreted as a picture or impression that appears in our minds about a brand (Nuriah et al., 2024) . The main function of a brand is to distinguish goods or services from one seller or group of sellers from products or services offered by competitors. Brands also play a role in identifying other products or sellers in the same group. Consumer confidence in a product or service is often based on the assumption that the product can not only meet their needs but also provide a higher level of satisfaction. In this case, the brand plays an important role because it can help establish a relationship between the seller and the consumer. A well-managed brand image will have a positive impact, one of which is increasing awareness of various customer behaviors related to the decision-making process when buying. According to (Primara et al., 2021), Brand image is consumers' perceptions of a brand as a reflection of the associations that exist in consumers' minds. In addition, (Kotler et al., 2016) also states that brand image is the impression obtained according to one's understanding of something. Meanwhile, Kotler, P., & Keller, (2016) (Pradana et al., 2018) mentions several important factors that contribute to brand image, namely the superiority of brand associations, the strength of brand associations, and the uniqueness of brand associations.

Lifestyle is the way a person lives that is reflected in his activities, interests, and opinions (Kotler et al., 2018) . Fashion lifestyle refers to an individual's tendency to express themselves through dressing, following fashion trends, and choosing a lifestyle that is closely related to aesthetics and appearance. Fashion trends reflect a person's lifestyle that is manifested through the way they dress, the use of accessories, to the chosen hairstyle. Trend is the direction of tendency or style that is developing or changing in general (Putri et al., 2020) . Something can be considered a trend if many people show similarities in choice or style, for example when we see 5-25 people who have the same characteristics in public places or shopping centers. Etymologically, the term fashion comes from the Latin "factio" which means "to do". Over time, this word was absorbed into English as "fashion" which refers to the style of dress that is popular in a culture. These styles of dress can change rapidly with the times, and each has its own identity and characteristics.

This research is based on the theory of consumer behavior put forward by Philip Kotler. Kotler & Keller, L, explains that consumer purchasing decisions are influenced by cultural, social, personal, and psychological factors. Purchasing decisions are the process of selecting a product or service by consumers after evaluating various alternatives. This research is based on the theory of consumer behavior put forward by Philip Kotler. Kotler & Keller, L, (2018) explains that consumer purchasing decisions are influenced by cultural, social, personal, and psychological factors. Purchasing decisions are a process where consumers study the masses, seek information about certain products or brands and evaluate each alternative to solve problems, thus leading to a purchase decision (https://journal.uny.ac.id/index.php/ptbb/article/view/, 3646).

Research from Ambardi, Nur Aini, Husnayeti and Helmi (2023) (Kotler et al., 2018) : The Impact of Brand Image, Fashion Lifestyle and Price on Purchasing Decisions for Branded Preloved Clothing at Online Shops "Journal of Maneksi Vol. 12 No. 1 Equations: Have similarities in brand image and fashion lifestyle variables. Differences: this research lies in the object of research, the number of samples, and the data analysis techniques used. In addition, the difference between this research and the author's research is in the use of a sharia business perspective. Then from the results of this study concluded that brand image and fashion lifestyle have a positive and significant influence on purchasing decisions. The strength of this study lies in the broad scope of variables, but it does not focus on certain demographic characteristics such as generation Z or specific regions.

Research from Putri Adilla and Christiawan Hendratmoko (2023) (Tjiptono, 2015) : The influence of Brand Image, Price, Product Quality and Content Marketing on purchasing decisions for Thrift goods via Instagram in Solo Raya RAYA. "National Seminar on Tourism and Entrepreneurship (SNPK). Vol. 2: Has variable X1 Brand Image. Besides that this study uses purchasing decisions as variable Y. Difference: There are no variables of product quality and content marketing in the author's research and the object of research lies in the object of research, namely Instagram. The results of this study indicate that brand image and fashion lifestyle have a significant influence on purchasing decisions for preloved clothing. However, this study emphasizes the power of social media in shaping consumer perceptions. This research contributes to understanding the role of digital media, but has not explored the lifestyle aspect thoroughly.

Research from Vica Nadila Narvatinova, Fitriani Latief, and Andi Ircham Hidayat (2023) (Ambardi et al., 2023), entitled the influence of brand image, price and fashion lifestyle on purchasing decisions for clothes in online thrift shops in Makassar city (Study on Consumers @Thriftbuy. Me Makassar City). Similarities: have brand image variables, fashion lifestyle and purchasing decisions. Differences: there is no price variable in the author's research and the object of research lies with consumers @ thriftbuy. Me Makassar city. The results of this study indicate that brand image and fashion lifestyle have a significant - partial and simultaneous influence on clothing purchasing decisions. This research is relevant because it includes variables that are also used in this study, but its focus is on online consumers and has not specifically explored generation Z or the locality aspect of the thrift market.
From these three studies, it can be concluded that brand image and fashion lifestyle variables consistently play an important role in shaping thrift clothing purchase decisions. However, no study has specifically highlighted the local context (Tanjungbalai city) and the vintage or branded clothing at more affordable prices. Some also repackage the thrifted clothes generation Z segment, which has unique consumption characteristics and is highly influenced by trends. In addition, most of the previous studies combine many variables at once, which obscures the understanding of how much the specific contributions of brand image and fashion lifestyle are. Therefore, this research is here to narrow the focus and fill the study void by deeply analyzing these two main variables in generation Z in Tanjungbalai City, in order to produce sharper and more applicable findings in the context of local marketing.

Based on this theory, the research framework can be created accordingly. Systematically as follows:

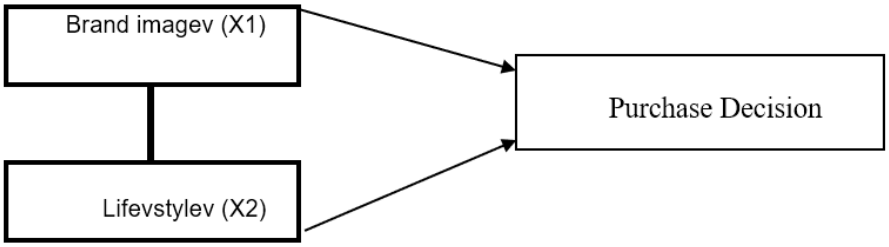

Fig. 2. Framework of thinking

Based on the framework that has been developed, the hypothesis of this study can be formulated as follows:

i. Brand image significantly influences the purchase decision of thrift clothing
ii. Fashion lifestyle significantly influences the decision to purchase thrift clothing
iii. Brand image and fashion lifestyle simultaneously have a positive and significant effect on purchasing decisions for thrift clothing.

2. Methodology

This study uses a quantitative approach to analyze the effect of brand image and fashion lifestyle on purchasing decisions. The quantitative research method is an approach based on the philosophy of positivism (Adilla et al., 2023) . This method is used to explore a specific population or sample through sampling which is usually done randomly.
The subject of this research is generation Z who are consumers of thrift clothing products. In sampling, researchers used a purposive sampling method. Because the population size cannot be known with certainty, researchers apply the Lemeshow formula for unknown populations, which is as follows:

$$n = \frac{0{,}9604}{0{,}01}$$

$$N = 96{,}04$$

Information :

n = number of samples
z = Z Score at 95% confidence = 1,96
p = maximum estimate =0,5
d = alpha (0,10) or sampling error 10%

$$n = \frac{Z^2 \times p\,(1-p)}{d^2}$$

$$N = \frac{(1{,}96)^2 \times (0{,}5)\,(1-0{,}5)}{(0{,}1)^2}$$

$$n = \frac{3{,}8416 \times (0{,}5) \times (0{,}5)}{(0{,}01)}$$

$$N = \frac{3{,}8416 \times (0{,}25)}{(0{,}01)}$$

So based on this formula, n is obtained 96.0. In order for the sample obtained to be representative, the researcher then distributed questionnaires to 100 respondents. The participants involved the generation born in 1997-2012 which is known as generation Z. According to (Narvantinova et al., 2023), data collection can be done in various settings, sources, and methods. In terms of setting, there are variations in the approach used. Meanwhile, based on data sources, information collection can be done by utilizing primary

and secondary sources. In this study, the technique used to collect data was a questionnaire. The data obtained in this study were obtained directly through filling out questionnaires by respondents or consumers.

The data obtained were analyzed using descriptive and inferential statistical approaches using SPSS software with validity and reliability testing and multiple linear regression analysis tests used to determine the relationship between the independent variables, namely brand image and fashion lifestyle and the relationship with the dependent variable, namely purchasing decisions.

3. Results and discussion

The validity test is intended to determine the level of validity of a questionnaire used in data collection. Indicators of a variable are said to be valid if they have a correlation coefficient with r count> r table. In addition, the research instrument is said to be reliable if it has an Alpha Cronbach α coefficient ≥ 0.60.

The validity test results show that all items on the brand image, fashion lifestyle, and purchasing decision variables have a correlation value (r count) greater than r table (0.195), with a value range between 0.556 to 0.866, which means that all items are valid. Furthermore, the reliability test using Cronbach's Alpha resulted in a value of 0.929 for brand image, 0.938 for fashion lifestyle, and 0.946 for purchasing decisions. All of these values are above the minimum limit of 0.60, which indicates that all instruments are reliable. Therefore, each variable in this study is declared reliable or the reliability requirements are met. Multiple regression analysis was performed to determine the effect of the Brand Image (X1) and Fashion Lifestyle (X2) variables on the Purchasing Decision (Y) variable. The following are the results of multiple linear regression

a. Simultaneous Significance Test (F Test)

Table 1. Simultaneous significance test (F Test)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4082.955	2	2041.477	62.396	.000[b]
	Residual	3173.635	97	32.718		
	Total	7256.590	99			

a. Dependent Variable: Keputusan Pembelian (Y)
b. Predictors: (Constant), Fashion lifestyle (X2), Brand Image (X1)

Based on the results of the F Test, the calculated F value was 62.396 with a significance of 0.000. So it can be concluded that the Brand Image (X1) and Fashion Lifestyle (X2) variables simultaneously have a significant effect on the Purchase Decision variable (Y).

b. Individual Parameter Significance Test (t-Statistic Test)

Table 2. Significance test of individual parameters (t-Statistic Test)

Coefficients[a]						
		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	14.780	4.166		3.547	.001
	Brand Image (X1)	.581	.144	.400	4.039	.000

Fashion lifestyle (X2)	.623	.152	.405	4.088	.000

a. Dependent Variable: Keputusan Pembelian (Y)

Regression equation:Purchase Decision (Y) = 14.780 + 0.581 Brand Image (X1) + 0.623 Fashion Lifestyle (X2) + e

From the test results above, several things can be concluded as follows:

i. The influence between Brand Image (X1) on Purchasing Decisions (Y) obtained a coefficient value of 0.581 with a significance value of 0.000, because the significance value <0.05, there is a significant influence between Brand Image (X1) on Purchasing Decisions (Y). Given that the coefficient is positive, it indicates that the relationship between the two is positive, meaning that the respondent perceives Brand Image (X1), the higher the Purchasing Decision (Y), and vice versa.

ii. The influence between Fashion Lifestyle (X2) on Purchasing Decisions (Y) obtained a coefficient value of 0.623 with a significance value of 0.000, because the significance value <0.05, there is a significant influence between Fashion Lifestyle (X2) on Purchasing Decisions (Y). Given that the coefficient is positive, it indicates that the relationship between the two is positive, meaning that the higher the respondent perceives Fashion Lifestyle (X2), the higher the Purchasing Decision (Y), and vice versa.

- Test Coefficient of Determination

c. The coefficient of determination (R2) is used to determine the value of the contribution or influence between the independent variables, namely Brand Image (X1) and Fashion Lifestyle (X2) on the dependent variable, namely the Purchasing Decision variable (Y). The coefficient of determination (R2) is as follows:

Table 3. Test Coefficient of Determination

Model Summary [b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.750[a]	.563	.554	5.71996

a. Predictors: (Constant), Fashion lifestyle (X2), Brand Image (X1)

b. Dependent Variable: Purchase Decision (Y)

The table above is part of the results of the multiple linear regression test which can be referred to as the Coefficient of Determination Analysis ($R^{2)}$. This analysis is used as a measure of the influence of Brand Image (X1) and Fashion Lifestyle (X2) on the dependent variable, namely the Purchasing Decision variable (Y). The table above shows that the R Square ($R^{2)}$value is 0.563 which can be concluded that Brand Image (X1) and Fashion Lifestyle (X2) have an influence of 56.3% while the remaining 43.7% is influenced by other variables not examined by the researcher.

Based on the results of the partial test effect of Brand Image, the t test is obtained (4.039)> t table (1.984) and sig (0.01) < (0.05). So H0 is rejected. Ha is accepted from this explanation that brand image has a positive and significant effect on purchasing decisions. The results of the analysis show that brand image has a positive and significant effect on purchasing decisions for thrift clothing among generation Z in Tanjungbalai City. This finding is consistent with the theory put forward by (Sugiyono et al., 2013) that positive perceptions of a brand can increase consumer purchasing intentions. In the context of thrift clothing, brand image reflects not only quality, but also status symbols, exclusivity, and certain values such as sustainability and eco-friendly lifestyles.

i. The theoretical implications of these findings suggest that although thrift clothing is a thrift item, the symbolic value of the brand remains a major factor in shaping young consumers' perceptions and purchasing decisions. This reinforces the notion that consumer behavior theory holds true even in the *secondhand market*, where brand perception remains highly influential.
ii. The practical implication is that thrift businesses should not only focus on low prices or product quantity, but also pay attention to strong brand selection, conveying a positive image through online promotion, and emphasizing exclusivity and quality. This can increase selling points and consumer trust, especially in the Gen Z segment, which tends to pay attention to image and social identity.

This research is in line with Narvantinova and hidayat (2023) which explains that the brand image variable has the most positive effect on purchasing decisions. This shows that the image of a brand can encourage consumers to purchase products.

Based on the results of the partial test effect of fashion lifestyle, the t test is obtained (4.088)> t table (1.984) and sig (0.000) < (0.05). So H0 is rejected. Ha is accepted, from this explanation, that fashion lifestyle has a positive and significant effect on purchasing decisions for thrift clothing for gen Z in Tanjungbalai city . These results indicate that generation Z in Tanjungbalai makes thrift clothing part of their lifestyle and self-expression. With the growing influence of social media, global trends, and digital celebrities, this generation is more responsive to changing trends and more open to alternative fashion choices that are unique and characterized. According (Sugiyono et al., 2014) lifestyle is a person's pattern of life that is reflected in his activities, interests, and opinions. Lifestyle greatly influences how a person chooses products, brands, and distribution channels, because purchasing decisions are not only influenced by functional needs, but also by the search for symbolic and social meanings. In the context of fashion, lifestyle reflects an individual's attempt to form a self-identity and show affiliation with a particular social group.

i. The theoretical implication is that lifestyle in the context of fashion is not just a personal factor, but a dynamic social construct, formed from the interaction of popular culture, digital communities and current aesthetic norms. This finding reinforces the role of lifestyle as an important determinant in purchasing decisions that are no longer functional, but symbolic and emotional.

ii. The practical implication is that thrift retailers need to understand that Generation Z is not only buying clothes out of necessity, but also out of a desire to appear socially relevant. Therefore, marketing strategies should adjust to an updated visual communication style, brand storytelling, and social media content that reflects the lifestyle of potential consumers.

This statement is in line with research conducted by Ambardi, Nur Aini, Husnayeti and Helmi (2023) "The Impact of Brand Image, Fashion Lifestyle and Price on Purchasing Decisions for Preloved Branded Clothing at Online Shops". The findings of the study indicate that lifestyle related to fashion has a significant impact on purchasing decisions for thrift clothing in Tanjungbalai city.

Based on the results of the simultaneous test effect, it shows that the calculated f value is 62.396 with a significant 0.000 and the F table value is 3.09. Thus, it can be concluded that F count (62.396) > F table (3.09), meaning that there is a simultaneous influence between brand image and fashion lifestyle on purchasing decisions for thrift clothing in Tanjungbalai city. The simultaneous test shows that brand image and fashion lifestyle together have a significant influence on purchasing decisions. This means that consumer decisions to buy thrift products cannot be separated from the combination of brand perception and lifestyle orientation. This

is in line with the holistic approach in consumer behavior theory, where purchasing decisions are the result of the integration of various psychological, social, and symbolic factors.

i. Theoretically, the findings confirm that modern consumers no longer make decisions in a linear fashion (based on price or function), but rather through a complex process involving image perception and personal identity. Thus, classic consumer behavior models need to be adapted to different cultural and generational contexts.

ii. Practical implications, these results provide a strategic basis for thrift businesses in Tanjungbalai and other cities to design marketing strategies based on lifestyle segmentation and brand image strengthening. Managing a positive brand image and adjusting offerings to emerging fashion trends can be a competitive advantage, even though the products sold are thrift clothing.

This is in accordance with the consumer behavior approach Kotler & Keller, L, (2018) , which explains that purchasing decisions are not only influenced by rational factors such as price or product function, but also by psychological and social factors, including perceptions of brands and lifestyles. As for this statement put forward by Brama Kumbara (Kotler et al., 2009) confirms that the stages that consumers go through in determining the product that is considered the best of various choices based on certain interests and by choosing the most profitable option for them. This is in line with research conducted by Ambardi et al., (2023) states that the fashion lifestyle brand image simultaneously affects purchasing decisions.

4. Conclusion

This study aims to determine how much influence and relationship between brand image and fashion lifestyle on purchasing decisions for thrift clothing among generation Z in Tanjungbalai City. This study involved 100 respondents who were all part of generation Z in Tanjungbalai city. Based on the results of data processing, it is known that the majority of respondents are female as many as 76 people or 76%, while male respondents amounted to 24 people or 24%. This finding shows that interest in thrift clothing among generation Z is more dominant in women. In terms of age, the distribution of respondents shows that the largest age group is in the range of 19-25 years, as many as 91 people (91%). Furthermore, 7 people (7%) were aged 26-28 years, and only 2 people (2%) were in the 13-18 years age group. This indicates that the early adulthood age group is the most active demographic in the thrift clothing buying trend.

Based on the results of quantitative analysis conducted on 100 respondents using multiple linear regression through SPSS, the following conclusions were obtained:

1. Brand Image Has a Positive and Significant Effect

Brand image has a positive and significant influence on purchasing decisions with a regression coefficient of 0.581 and a significance value of 0.000 <0.05. This means that the stronger the brand image of a thrift product, the more likely generation Z consumers are to make purchases. Brand images serve as a representation of the value, quality, and prestige that young consumers are looking for, even though the product is a thrift item.

2. Fashion Lifestyle Has a More Dominant Influence

Fashion lifestyle has a greater influence than brand image, with a regression coefficient of 0.623 and a significance value of 0.000 <0.05. This shows that a lifestyle that follows fashion trends, the drive to be fashionable, and the influence of social

media and digital celebrities greatly influence Gen Z's decision to buy thrift clothing. For this generation, thrift purchases are not only to fulfill functional needs, but also a means of self-expression and social identity.

3. Significant Simultaneous Influence

The results of the simultaneous test (F test) show that brand image and fashion lifestyle together have a significant effect on purchasing decisions (F count = 62.396> F table = 3.09; significance 0.000). This means that purchasing decisions are not only influenced by one aspect alone, but are the result of a combination of brand perception and consumer lifestyle orientation.

4. Strong Relationship between Variables

The coefficient of determination (R^2) value of 0.563 indicates that 56.3% of the variation in purchasing decisions is explained by brand image and fashion lifestyle, while the remaining 43.7% is influenced by other factors outside this study, such as price, quality, promotion, or social influence. The R value of 0.750 indicates that the relationship between these three variables is strong and positive.

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STUDENT PERCEPTIONS OF FINANCIAL TECHNOLOGY (FINTECH) AND THEIR INFLUENCE ON PERSONAL FINANCIAL MANAGEMENT: A TAM-BASED QUANTITATIVE STUDY

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Abstract

The increasing use of financial technology (fintech) among students provides convenience in transactions, yet its impact on personal financial management remains unclear. Prior studies have suggested that the effectiveness of fintech depends not only on its accessibility and usefulness, but also on users' financial literacy. This study aims to analyze student perceptions of fintech and its influence on personal financial management, using a quantitative approach based on the Technology Acceptance Model (TAM). The research involved 35 active D3 and S1 students in Medan who had used at least one fintech application (e.g., OVO, ShopeePay, DANA, GoPay) for over six months. Data were collected through a Likert-scale questionnaire and analyzed using multiple linear regression in SPSS. The findings reveal that while perceived ease of use, usefulness, and trust show high average scores, only financial literacy significantly affects students' financial management behavior ($p = 0.003$). Other variables show no significant partial influence These results highlight that positive perceptions of fintech alone are insufficient to foster effective financial management without strong financial literacy. This underscores the crucial role of digital financial education in optimizing fintech use among students.

Keywords: Financial Technology, Fintech, Financial Literacy, TAM, Students, Personal Financial Management

1. Introduction

The development of financial technology (fintech) has changed people's behavior patterns, especially the younger generation, in managing personal finances. Students as part of the digital native generation are very familiar with various fintech services such as e-wallets (ShopeePay, OVO, DANA, GoPay) and paylater platforms. Ease of access, transaction speed, and integration with various consumptive needs make fintech the main tool in students' daily financial activities. However, this phenomenon leaves an important question: does the high use of fintech really encourage students to have healthier and more structured financial management behavior.

Previous research shows mixed results. A study by (Apriani et al., 2023) in Bengkulu Province revealed that the use of fintech does not have a significant influence on students' financial management behavior. Instead, financial literacy and lifestyle are more decisive factors. This finding highlights the importance of balancing the use of technology with adequate financial understanding, so that the ease of transactions does not actually encourage consumptive behavior.

A similar study in Surakarta by (Juliyanti et al., 2023) even showed a negative relationship between the intensity of fintech use and the quality of financial management, where the more often students use fintech, the tendency to impulsive buying increases. On the other hand, (Sahabuddin et al., 2024a) through their research on 250 Makassar State University students found that the combination of financial literacy and fintech utilization can encourage better

financial management behavior. However, the regression results state that about 67% of the variation in financial behavior is still influenced by other factors that have not been explained in the research model. This leaves room for further research to include additional variables, such as digital literacy or self-control, to strengthen the theoretical and predictive framework of students' financial behavior.

In the current context, digital literacy is an increasingly relevant aspect. Research by (Putra Utama & Sumarna, 2024) among Gen-Z Indonesians emphasizes that students' ability to understand how fintech works, read digital risks, and manage data privacy and security contribute significantly to their financial decisions. This indicates that financial literacy alone is not enough. A cross-sectoral understanding that combines technological and financial aspects in one integrated approach is needed, namely financial digital literacy.

Interestingly, a recent study conducted in Medan City by (Utami et al., 2025) showed that fintech payments tend to encourage impulse purchases among university students, while financial literacy did not show a statistically significant effect on consumption control. This result confirms that the trust, benefits, and convenience aspects of fintech do play a role in financial decisions, but the long-term effects on personal financial management remain largely determined by students' level of financial awareness and knowledge.

Looking at the various findings above, there is a clear research gap. There are still minimal studies that specifically analyze student perceptions of fintech in relation to personal financial management, while considering moderating factors such as digital literacy. Therefore, this study is here to analyze students' perceptions of ease of use, benefits, and trust in fintech, and test their influence on personal financial management behavior. In addition, this study also aims to identify the role of financial literacy and digital literacy in strengthening or weakening the influence of these perceptions.

It is expected that the results of this study can contribute to the development of digital financial literacy among students, as well as become the basis for application developers and educational institutions in designing more targeted financial education strategies. Theoretically, this study also enriches our understanding of the technology acceptance model (TAM) in the context of digital-based personal financial management.

2. Methodology

This study employed a quantitative approach using a descriptive and associative design to analyze the relationship between students' perceptions of fintech and their personal financial management behavior. The framework was based on the Technology Acceptance Model (TAM), integrating variables such as perceived ease of use, perceived usefulness, trust, and financial literacy.

The population consisted of active undergraduate and diploma students in Medan who had used at least one fintech application for more than six months. A purposive sampling technique was employed, targeting students aged 18–25 who were familiar with e-wallet platforms like ShopeePay, OVO, DANA, and GoPay. A total of 35 valid responses were collected through online and offline surveys.

Data were gathered using a structured Likert-scale questionnaire, which underwent validity and reliability testing. Validity was tested using Pearson Product-Moment, while reliability was assessed using Cronbach's Alpha, with all constructs achieving $\alpha > 0.6$. The collected data were analyzed using SPSS software. The analysis included descriptive statistics, classical assumption tests, and multiple linear regression to examine the effect of independent variables on students' personal financial management behavior.

3. Results and Discussion

This study involved 35 active diploma and undergraduate students in Medan City who have used at least one fintech application (e.g., ShopeePay, OVO, DANA, GoPay) for more than six months. The demographic distribution is summarized in Table 1.

Table 1. Respondents' demographic profile

Category	Sub-category	Frequency	Percentage
Gender	Male	9	25.7%
	Female	26	74.3%
Age range	18-20 years	12	34.3%
	21-23 years	20	57.1%
	Above 23 years	3	8.6%

Table 2 displays the descriptive statistics of the main variables studied. The average values indicate students' general perceptions and behavior toward fintech use and personal financial management.

Table 2. Descriptive statistics of research variables

Variable	Mean	Std.dev	Min	Max
Perceived ease of use	4.27	0.64	2.50	5.00
Perceived usefulness	4.17	0.65	3.00	5.00
Trustworthiness	3.91	0.85	1.67	5.00
Financial literacy	4.03	0.66	2.67	5.00
Financial management	3.63	0.88	1.67	5.00

The data show that students generally have high perceptions of ease and usefulness of fintech, but their actual financial management behavior remains moderate.

Multiple linear regression was conducted to determine the influence of perceived ease of use, perceived usefulness, trust, and financial literacy on personal financial management.

Table 3. Regression output

Independent variable	Coefficient	Sig. (p-value)	Description
Perceived ease of use	-0.095	0.770	Not significant
Perceived usefulness	0.167	0.605	Not significant
Trustworthiness	-0.010	0.959	Not significant
Financial literacy	0.847	0.003	significant

Model Summary:

1. $R^2 = 0.433$
2. Adjusted $R^2 = 0.357$
3. F-value = 5.720
4. Sig. F = 0.001

The results show that only financial literacy has a statistically significant influence on personal financial management behavior among students. Other variables—though showing high mean scores in the descriptive analysis—do not significantly affect financial behavior. This suggests that while students perceive fintech as useful and easy to use, such perceptions alone do not guarantee disciplined financial practices without the support of sufficient financial knowledge.

The finding reinforces prior studies by (Sahabuddin et al., 2024) and, (Putra Utama & Sumarna, 2024) which highlight that financial literacy remains a key determinant in behavioral outcomes despite rapid adoption of fintech tools. Furthermore, it supports the argument that

digital financial behavior must be paired with education to avoid misuse, impulsive buying, or excessive spending enabled by fintech platforms.

However, it is important to note that although the R^2 value obtained in this study is 0.433, this does not indicate bias in the data. In behavioral and social science research, R^2 values between 0.30 and 0.50 are common due to the multifactorial nature of human decision-making. A 43.3% explanatory power is statistically meaningful and reflects that the model explains nearly half of the behavioral variance. The remaining variation could be attributed to other unmeasured factors, such as peer influence, self-control, financial anxiety, or social pressure. Similar R^2 values were also found in research by Juliyanti et al. (2023), further supporting the acceptability of this model within behavioral fintech literature.

4. Conclusion

This study aimed to analyze the influence of students' perceptions of fintech, represented by perceived ease of use, perceived usefulness, and trust, along with financial literacy, on personal financial management behavior. Based on the results of multiple linear regression analysis, it was found that only financial literacy had a statistically significant effect on personal financial management. Meanwhile, the other variables, despite showing relatively high mean scores, did not have a significant direct influence.

These findings highlight a critical insight: positive perceptions of fintech alone are insufficient to shape responsible financial behavior among students. Even though students view fintech platforms as useful, trustworthy, and easy to use, these perceptions do not necessarily translate into wise financial practices. Instead, the presence of strong financial literacy plays a more vital role in influencing how students manage, budget, and control their finances.

From a theoretical perspective, this research reinforces the notion that financial literacy serves as a moderating or even dominant factor in the context of fintech usage behavior. It aligns with previous studies suggesting that the effectiveness of digital financial tools is contingent upon users' ability to understand and manage their own financial decisions.

In practical terms, the findings suggest that universities, policymakers, and fintech service providers should not only promote the adoption of digital financial services but also design targeted interventions to strengthen students' financial education. This may include workshops, gamified learning platforms, or integration of financial literacy modules into general education curricula. The growing reliance on fintech in daily transactions necessitates a parallel growth in users' ability to assess financial risks, avoid overspending, and plan long-term savings.

For future research, several directions are worth exploring. First, future studies are encouraged to involve larger and more diverse populations covering different regions, socio-economic backgrounds, and academic disciplines to improve generalizability. Second, the model can be expanded to include psychological, emotional, or behavioral factors such as digital self-control, impulsive buying tendencies, or financial anxiety, which might explain the remaining variance in financial behavior. Third, a mixed-method approach combining quantitative analysis with qualitative insights could uncover deeper motivations and challenges students face in managing their finances through fintech.

Overall, while fintech has revolutionized the way students interact with money, this research underscores that the human factor of knowledge, discipline, and awareness remains the foundation of financial well-being.

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THE INFLUENCE OF FINANCIAL LITERACY AND FINANCIAL INCLUSION ON THE BUSINESS SUSTAINABILITY OF CULINARY MSMES IN SEI LIMBAT VILLAGE, LANGKAT REGENCY

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Abstract

The sustainability of Micro, Small, and Medium Enterprises (MSMEs) in Indonesia, especially in rural areas, is crucial to reduce unemployment and poverty. However, their development is often hindered by low financial literacy and limited financial inclusion. Previous studies show that financial literacy and financial inclusion play an important role in supporting business performance and sustainability. This study uses a quantitative approach with primary data collected through questionnaires distributed to 71 culinary MSME actors in Sei Limbat Village, Langkat Regency. The sampling technique used was random sampling, and the data were analyzed using multiple linear regression. The study aims to analyze the effect of financial literacy and financial inclusion on the business sustainability of culinary MSMEs. The results show that financial literacy and financial inclusion each have a positive and significant effect on business sustainability, both partially and simultaneously.
Keywords: Financial literacy; Financial inclusion; Business sustainability; Culinary; MSMEs.

1. Introduction

Micro, Small, and Medium Enterprises (MSMEs) are one of the main factors in Indonesia's economic resilience, particularly in rural areas where access to employment is limited. Until 2025, the development of MSMEs remains a strategic priority for the government due to their substantial role in reducing unemployment and poverty. According to data from the Central Statistics Agency (BPS) 2024, the open unemployment rate in Indonesia stood at 5.42% as of August 2023, highlighting the urgent need to create accessible job opportunities. MSMEs, particularly in the culinary sector, offer practical solutions by fostering entrepreneurship and increasing community income in rural areas, as demonstrated in Sei Limbat Village, Langkat Regency.

Data from the Ministry of Cooperatives and SMEs in 2024 show that MSMEs contribute approximately 61.5% to the national Gross Domestic Product (GDP) and absorb around 97% of the workforce. Meanwhile, the Central Statistics Agency (BPS) 2024 reported that as of August 2024, the national unemployment rate had decreased to 4.91%, with 7.47 million people recorded as unemployed. This reflects the significant contribution of MSMEs in addressing employment challenges. However, the sustainability of MSMEs continues to face several obstacles, particularly in terms of financial management and access to formal financial services. A lack of financial literacy and limited access to an inclusive financial system hinder MSME actors from maintaining and growing their businesses in a sustainable way.

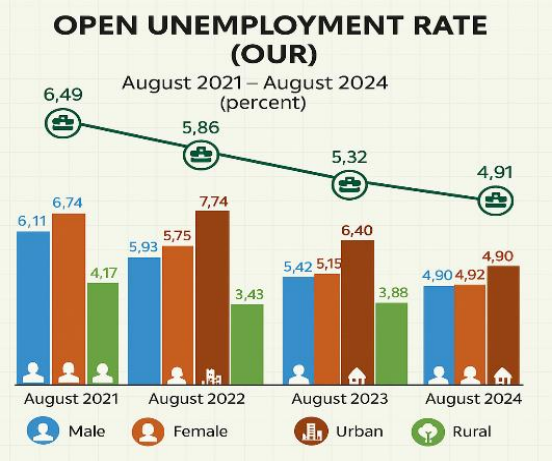

Fig. 1. Unemployment Rate

Data from the Ministry of Cooperatives and SMEs in 2024 show that MSMEs contribute approximately 61.5% to the national Gross Domestic Product (GDP) and absorb around 97% of the workforce. Meanwhile, the Central Statistics Agency (BPS) 2024 reported that as of August 2024, the national unemployment rate had decreased to 4.91%, with 7.47 million people recorded as unemployed. This reflects the significant contribution of MSMEs in addressing employment challenges. However, the sustainability of MSMEs continues to face several obstacles, particularly in terms of financial management and access to formal financial services. A lack of financial literacy and limited access to an inclusive financial system hinder MSME actors from maintaining and growing their businesses in a sustainable way.

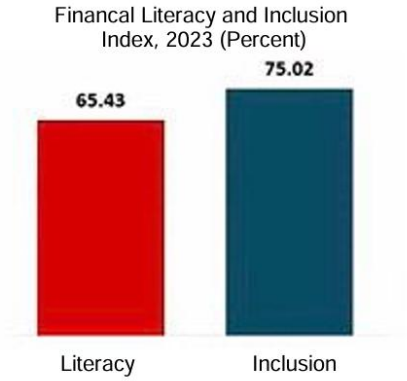

Fig. 2. Financial Inclusion and Literacy Index

To maximize the role of MSME businesses in reducing unemployment and poverty, strategic steps are needed to increase the competitiveness and sustainability of their businesses in Indonesia. The main challenge faced by MSMEs today lies in the capital and marketing aspects. One of the solutions that can be applied to overcome this problem is through the implementation of a financial inclusion system (A. et al., 2024).

Business continuity refers to the ability of a business to survive, grow, and remain competitive in the long term, despite economic challenges, competitive pressures, and market changes. This concept includes the financial, operational, and strategic dimensions that overall determine whether a business can continue to run in a healthy and sustainable manner.

Research conducted by (A. et al., 1599) shows that there are several factors that affect the sustainability of MSMEs, including financial literacy, financial inclusion, and business risk. This is also strengthened by research (E. et al., 2022) which concludes that financial literacy and financial inclusion have an effect on the sustainability of MSME businesses.

The knowledge, abilities, and convictions that impact people's attitudes and actions when they make decisions and handle their money to attain success are known as financial literacy (OJK, 2023). A high degree of financial literacy enables MSME players to minimize financial risks, manage resources as efficiently as possible, and enhance the long-term viability of their company (I. et al., 2023) knowledge, attitudes.

Actions related to finances are all part of financial literacy (M. et al., 2020) Financial knowledge is essential and has a great influence on business decision-making by micro and small entrepreneurs. Research conducted by (M. et al., 2022) claims that the sustainability of MSMEs is significantly impacted by financial literacy. However, a different finding was conveyed by (M. et al., 2021) who stated that neither fintech nor financial literacy have a significant effect on the sustainability of MSMEs.

Financial inclusion is the ease of access and utilization of formal financial products and services by Micro, Small, and Medium Enterprises (MSMEs), which include banking, financial technology (fintech), insurance, and other financing institutions. Forms of financial inclusion for MSMEs can be realized through banking services such as People's Business Credit (KUR), as well as in the form of digital payment systems such as QRIS, digital wallets (e-wallets), and online transactions to support business activities.

In the research variable (R. et al., 2022) it is stated that financial inclusion has a positive effect on the sustainability of MSME businesses in the culinary sector, while in the study (Sugiyono et al., 2019) it is stated that financial inclusion actually has a negative and significant effect on business sustainability.

This study attempts to address three primary problem formulations in light of this background. First, to determine whether the viability of culinary MSME companies in Sei Limbat Village, Langkat Regency, is impacted by financial literacy. The second goal is to determine whether financial inclusion has an impact on the long-term viability of MSME enterprises in Langkat Regency's Sei Limbat Village. Third, to determine whether the viability of MSME enterprises in Sei Limbat Village, Langkat Regency, is impacted concurrently by financial inclusion and financial literacy. This study is anticipated to offer useful insights that can improve the financial management skills of MSME practitioners at the regional level by comprehending the connection between financial literacy, financial inclusion, and company sustainability.

A hypothesis is a temporary answer to the formulation of a research problem, where the formulation of a research problem has been stated in the form of a question sentence. Thus, it can be hypothesized as follows:

i. Ho1: There is no effect of financial literacy on the sustainability of MSME businesses in the culinary sector of Sei Limbat Village, Langkat Regency.
   Ha1: There is an influence of financial literacy on the sustainability of MSME businesses in the culinary sector of Sei Limbat Village, Langkat Regency.
ii. Ho2: There is no effect of financial inclusion on the sustainability of MSME businesses in the culinary sector of Sei Limbat Village, Langkat Regency.
   Ha2: There is an influence of financial inclusion on the sustainability of MSME businesses in the culinary sector of Sei Limbat Village, Langkat Regency.
iii. Ho3: There is no simultaneous effect of financial literacy and financial inclusion on the sustainability of MSME businesses in the culinary sector of Sei Limbat Village, Langkat Regency.
   Ha3: There is a simultaneous effect of financial literacy and financial inclusion on the sustainability of MSME businesses in the culinary sector of Sei Limbat Village, Langkat Regency.

2. Methodology

The type of research used in this study is quantitative research. Quantitative research is a type of approach that has systematic, planned, and structured specifications from the initial stage to the creation of the research design. Quantitative research methods, as stated by (T. et al., 2021) are: "Research methods based on the philosophy of positivism, used to research on certain populations or samples, data collection using research instruments, quantitative or statistical data analysis, with the aim of testing the hypothesis that has been determined".

The types of data used in this study are primary data and secondary data. Primary data obtained directly from respondents through questionnaires conducted on MSME businesses in the culinary sector that have been running their businesses for at least one year. Meanwhile, secondary data is obtained from other sources, such as literature, scientific journals, books, and articles.

The data sources used in this study are internal data sources and external data sources. Internal data sources obtained from MSME businesses in the culinary sector that have been running their businesses for at least 1 year. Meanwhile, external data sources are obtained by conducting previous research on the topic to be researched.

Data collection methods are ways to obtain information and information needed in research. This research uses the Field Research method, which involves collecting data directly from the source. The data collection techniques used in this study are as follows:

i. Observation is this technique that is carried out by observing the object being studied directly. The researcher observes activities and conditions relevant to the study to obtain accurate and contextual data.
ii. Questionnaire (Questionnaire) This technique involves giving a set of written questions to the respondents to be answered. The type of questionnaire used is a closed questionnaire, which is a questionnaire that provides an answer option that can be chosen by the respondent.

Each answer choice in this questionnaire is given a different value, generally consisting of five choices with a clear scale, this can be seen in the following table 1:

Table 1. Likert Scale Instrument Five Alternative Answers

No	Question	Score
1	Strongly agree (SS)	5
2	Agree (S)	4
3	Neutral (N)	3
4	Disagree (TS)	2
5	Strongly Disagree (STS)	1

To assess the influence between variable X and variable Y, the analysis used is based on the average of each variable. The average value for each variable is obtained by summing all the data in each variable, then dividing it by the number of respondents. This process was carried out to get an overview of the respondents' perception of each variable studied. After obtaining the average value of each variable, the value is then compared to the criteria predetermined by the author. The criteria are based on the range of lowest and highest scores obtained from the results of the questionnaire. By comparing the average value of the variable with these criteria, the extent of the influence of variable X on variable Y can be known.

All MSME business actors in Sei Limbat Village, Langkat Regency's culinary industry who have operated their enterprises for at least a year make up the study's population. There are 250 MSMEs in the population set. The random sampling technique, which gives every person

of the population an equal chance of being chosen as a sample, was employed in this study's sample withdrawal procedure. The MSME business actors in the culinary industry based in Sei Limbat Village, Langkat Regency, made up the chosen sample. The Slovin formula with a 10% standard error rate was employed by the researchers to calculate the number of samples.

The following is the formula:

$$n = N / (1+(N \times e^2)) \quad (1)$$

Information:

n = Number of samples
n = population size
e = Standard *error* used (10%)

With a population of 250, the number of samples in the study is as follows:

$$n = \frac{N}{(1 + N.(e)^2)}$$
$$n = \frac{250}{(1 + 250.(0{,}10\%)^2)}$$
$$n = \frac{250}{(1 + 250.(0{,}01)^2)}$$
$$n = \frac{250}{(1 + 2{,}5)}$$
$$n = \frac{250}{3{,}5}$$
$$n = 71{,}4$$

From the results of the calculation above, a sample of 71 MSMEs was obtained in this study.

To answer the hypothesis, this study employs several data analysis techniques using SPSS software to process the information collected through questionnaires. The analysis consists of the following steps:

i. Validity Test: Used to determine whether the questionnaire items accurately measure the intended variables. Each item is valid if the r-count exceeds the r-table value at a 5% significance level.
ii. Reliability Test: Conducted using Cronbach's Alpha. A variable is considered reliable if the alpha value exceeds 0.6.
iii. Multiple Linear Regression Analysis: Used to assess the effect of financial literacy (X_1) and financial inclusion (X_2) on business sustainability (Y). The regression model used is :

$$Y = a + b_1X_1 + b_2X_2 + e \quad (1)$$

Where:

Y = Business sustainability
X_1 = Financial literacy
X_2 = Financial inclusion
a = Constant
b_1, b_2 = Regression coefficients
e = Error term

iv. T-tes t : To examine the individual significance of each independent variable toward the dependent variable.
v. F-test : To test the simultaneous influence of financial literacy and financial inclusion on business sustainability.

vi. Coefficient of Determination (R^2) : To measure how much of the variance in business sustainability can be explained by financial literacy and financial inclusion.

3. Results and Discussion

A total of 71 responses from MSMEs were obtained by applying the Slovin formula to determine the study's sample size. The respondents are MSME actors or business owners who have operated their enterprises in Sei Limbat Village, Langkat Regency, for a minimum of one year. The respondents were given 71 questions in all, and the results were processed before being shown as descriptive data.

Table 2. Respondent demographics

Characteristics		Frequency	Percent
Gender	Man	14	19,7
	Woman	57	80,3
	Amount	71	100
Age	< 20 Years	20	28,2
	20-25 Years	34	47,9
	26-35 Years	13	18,3
	> 35 Years	4	5,6
	Amount	71	100
Type Of Business	Food	51	71,8
	Drink	20	28,2
	Amount	71	100
Long Running Business	1-2 Years	26	36,6
	2-4 Years	32	45,1
	4-6 Years	8	11,3
	> 6 Years	5	7
	Amount	71	100
Monthly Revenue	< Rp. 5 Million	20	28,2
	Rp.5 Milion - Rp.10 Million	32	45,1
	Rp.10 Million - Rp.15 Milion	12	16,9
	> Rp.15 Million	7	9,9
	Amount	71	100

This study describes the characteristics of MSME business respondents based on several categories. The results of the data recapitulation show that the businesses run by MSME actors are mostly engaged in the food sector as much as 71.8% and those engaged in the drink sector as much as 28.2%. The majority of the MSME business sample is 45.1% that has been operating for 2-4 years, 36.6% that have been operating for 1-2 years, 11.3% that have been operating for 4-6 years and have been operating for a long time >6 years as much as 7%. The most dominant income group is 45.1% generating income of Rp.5,000,000-Rp. 10,000,000, 28.2% generating income <Rp.5,000,000, 16.9% generating income of Rp.10,000,000-Rp.15,000,000, and the remaining 9.9% generating income >Rp.15,000,000. Business owners and managers who were actively involved in and accountable for the organization were the respondents who completed the questionnaire. One respondent made an attempt to respond to each questionnaire question, which is the questionnaire statement. The following is the breakdown of contributory respondents: Male respondents make up 19.7% of the sample, while female respondents make up 80.3%. Conversely, 28.2% of respondents were under 20, 47.9% were between 20 and 25,18.3% were between 26 and 35, and the remaining 5.6% were beyond 35.

Five statements were utilized in this study's financial literacy variable were given to participants. However, only 71 respondents' responses were collected by the researchers. The following table displays the findings of the financial literacy-related responses :

Table 3. Financial Literacy Respondent Answers (X1)

No	Statement	Respondents' answers										Amount
		SS		S		N		TS		STS		
		F	%	F	%	F	%	F	%	F	%	
1.	I know how to manage the initial capital so that it is enough to run a business.	22	31%	35	49%	14	20%	0	0%	0	0%	71
2.	I understand the importance of keeping track of business income and expenses.	25	35%	41	58%	5	7%	0	0%	0	0%	71
3.	I always set aside part of my business to save.	20	28%	33	46%	15	21%	3	4%	0	0%	71
4.	I know how to calculate the profit and loss of my business	23	32%	35	49%	13	18%	0	0%	0	0%	71
5.	I have an understanding of making financial planning for businesses in the short and long term efficiently.	13	18%	34	48%	24	32%	0	0%	0	0%	71
	Average		29%		50%		20%		1%		0%	100%

Based on Table 2, it shows that the understanding of financial literacy among MSMEs in the culinary sector in Sei Limbat Village is quite good, with a total of 79% of respondents answering yes (50%) or strongly agreeing (29%) to the statements given. This means they generally understand how to manage capital, record transactions, plan finances, save, and calculate profit and loss. However, there are still 20% who are neutral and 1% who disagree, indicating that there is a need to improve financial literacy education for some business actors.

Table 4. Financial Inclusion Respondent Answer Summary (X2)

No	Statement	Respondents' answers										Amount
		SS		S		N		TS		STS		
		F	%	F	%	F	%	F	%	F	%	
1.	I have a bank account that is used for business purposes.	18	25%	41	58%	12	17%	0	0%	0	0%	71
2.	I use digital financial services such as mobile banking, e-wallets, and QRIS for business.	10	14%	35	49%	23	32%	3	4%	0	0%	71
3.	I often get information about financial services from social media	15	21%	30	42%	23	32%	3	4%	0	0%	71
4.	I take advantage of bank and e-wallet facilities to store business income.	17	24%	38	54%	16	23%	0	0%	0	0%	71
5.	I use financial services to pay business bills (electricity, rent, internet) in a non-cash manner.	19	27%	44	62%	8	11%	0	%	0	0%	71
	Average		22%		53%		23%		2%		0%	100%

With 53% of respondents agreeing and 22% strongly agreeing with items pertaining to financial inclusion, Table 3 demonstrates that the majority of MSME players have utilized formal financial services. This suggests that most of them already have a particular business account, have access to financial institution credit facilities, and actively use a range of digital financial services, including QRIS, e-wallets, and mobile banking. Additionally, they believe that the demands of small businesses have been sufficiently met by the financial services that

are now available. Nonetheless, 23% of respondents expressed no opinion, and 2% disagreed, indicating that there are still issues with fair access to financial services.

Table 5. Recapitulation of Business Continuity Respondents' Answers (Y)

No	Statement	Respondents' answers										Amount
		SS		S		N		TS		STS		
		F	%	F	%	F	%	F	%	F	%	
1.	Over the past year, my business income has increased.	13	18%	41	58%	17	24%	0	0%	0	0%	71
2.	I feel that my business is able to compete with other culinary MSME business actors in this region.	16	23%	30	42%	24	34%	1	1%	0	0%	71
3.	I have a reserve of funds to anticipate emergencies in my business.	14	20%	42	59%	15	21%	0	0%	0	0%	71
4.	I use digital marketing like social media to increase sales.	16	23%	37	52%	18	25%	0	0%	0	0%	71
5.	I always strive to improve the quality of products and services to sustain my business.	17	24%	28	39%	26	37%	0	0%	0	0%	71
	Average		21%		50%		28%		0%		0%	100%

The results in table 4 show that the level of sustainability of culinary businesses in Sei Limbat Village is quite good, with 71% of respondents (21% agree and 50% strongly agree) indicating the ability to survive and develop. Factors such as increased income, competitiveness, market adaptation, emergency funds, and business networks are indicators. However, 28% of respondents who were neutral (disagree) indicated that some businesses still face sustainability constraints that need guidance and attention.

Validity test is a procedure to assess whether the measuring tool used in the study really measures what you want to measure. Validity also reflects the precision of the measuring instrument; A valid instrument is able to carry out its measurement function accurately and with high precision. Based on data from 71 respondents, the results of the validity test for the variables of financial literacy, financial inclusion, and MSME business sustainability are as follows :

Table 6. Financial Literacy Validity Test (X1)

Variable	Questionnaire Item	r calculate	r table	Description
Financial Literacy (X1)	X1.1	0,619	0,2335	*Valid*
	X1.2	0,640	0,2335	*Valid*
	X1.3	0,671	0,2335	*Valid*
	X1.4	0,443	0,2335	*Valid*
	X1.5	0,762	0,2335	*Valid*

Table 7. Financial Inclusion Validity Test (X2)

Variable	Questionnaire Item	r calculate	r table	Description
Financial Inclusion (X2)	X2.1	0,737	0,2335	*Valid*
	X2.2	0,631	0,2335	*Valid*
	X2.3	0,774	0,2335	*Valid*
	X2.4	0,493	0,2335	*Valid*
	X2.5	0,532	0,2335	*Valid*

Table 8. Business Continuity Validity Test (Y)

Variable	Questionnaire Item	r calculate	r table	Description
Business Continuity (Y)	Y1	0,739	0,2335	*Valid*
	Y2	0,783	0,2335	*Valid*
	Y3	0,750	0,2335	*Valid*
	Y4	0,667	0,2335	*Valid*
	Y5	0,792	0,2335	*Valid*

Each statement item's correlation strength can be assessed based on the findings of the validity test mentioned above. To determine the significance of this relationship, the r calculated value is compared to the r able value. With the number of respondents (n) as many as 71, the degree of freedom (df) was calculated using the formula n−2, which is 71−2 = 69. Referring to the r-table with a real level of 5% (0.05), the r table value is 0.2335. All items pertaining to the variables of financial literacy (X1), financial inclusion (X2), and business continuity (Y) have computed values that surpass the critical value in the table, according to the findings displayed in the validity test table. Consequently, it can be said that every statement item employed in this validity test is regarded as legitimate.

The reliability test evaluates the extent to which an instrument consistently measures the intended construct. Reliability is typically expressed numerically, most often as a coefficient. A higher coefficient indicates stronger reliability. An instrument is considered reliable if the *Cronbach's Alpha* (α) value is greater than 0.60; conversely, if the value is below 0.60, the instrument is deemed unreliable.

Table 9. Reliability Test

Variable	*Cronbach's Alpha*	Condition	Reliability Levels
Financial Literacy	0,610	>0,60	Reliable
Financial Inclusion	0,632		Reliable
Business Continuity	0,800		Reliable

The results above in Table 8 *of the Case Processing Summary* show that the data from all 71 respondents (100%) are valid and fully used in the analysis, with no data being excluded. Furthermore, in the *Reliability Statistics* table, *Cronbach's Alpha* (α) values obtained for the variables of financial literacy, financial inclusion, and business continuity based on questionnaire items and 71 respondents were all greater than the standard > 0.60. These findings confirm that the instruments used to measure the three variables are reliable.

Table 10. Multiple Linear Regression Test

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error
1	(Constant)	1.410	2.339
	FINANCIAL LITERACY	.282	.128
	FINANCIAL INCLUSION	.630	.126

a. Dependent Variable: BUSINESS CONTINUITY

A multiple linear regression equation showing the link between the variables under study was produced by the analysis. Y = a + b1X1 + b2X2 + e is the regression equation in its general form. The precise equation for this study, taking into account the computed coefficients, is Y = 1.410 + 0.282X1 + 0.630X2 + e.

i. Constant (a): A constant value of 1.410 indicates that if the value of financial literacy (X_1) and financial inclusion (X_2) is considered zero, then the level of business continuity (Y) is estimated to remain at 1,410 units. This indicates that there are other factors outside of

financial literacy and financial inclusion that also affect business sustainability, such as the availability of capital, innovation, and market conditions.

ii. Financial literacy regression coefficient (b_1): A coefficient value of 0.282 means that every one unit increase in the financial literacy variable (X_1), assuming the financial inclusion variable (X_2) is fixed, will increase business continuity (Y) by 0.282 units. This positive coefficient value shows that the higher the level of financial literacy, the better the ability of business actors to manage and plan finances, thus supporting their business continuity.

iii. Financial inclusion regression coefficient (b_2): A coefficient value of 0.630 indicates that every one unit increase in the financial inclusion variable (X_2), assuming financial literacy (X_1) remains constant, will increase business continuity (Y) by 0.630 units. This indicates that access to formal financial services has a stronger influence on business sustainability.

Table 11. T Test (Partial)

Coefficients[a]						
		Unstandardized Coefficients		Standardized Coefficients		
	Model	B	Std. Error	Beta	T	Sig.
1	(Constant)	1.410	2.339		.603	.427
	FINANCIAL LITERACY	.282	.128	.236	2.211	.030
	FINANCIAL INCLUSION	.630	.126	.534	5.006	<.001
a. Dependent Variable: BUSINESS CONTINUITY						

a) The effect of the financial literacy variable (X1) on the business continuity variable (Y).

This variable's t-value, as determined by the analysis, was 2.211. The crucial t-value from the table is 1.99547 at a significance level of α = 0.05 and degrees of freedom (df) of 68 (which is 7−2−1). The first hypothesis is accepted since the computed t-value (2.211) is more than the critical value (1.99547) and the significance level is 0.03, which is less than 0.05. This suggests that business continuity (Y) is strongly influenced by financial literacy (X1).

b) The effect of the financial inclusion variable (X2) on the business continuity variable (Y).

The analysis showed a calculated t-value of 5.006 for financial inclusion. Using the same significance level (α = 0.05) and degrees of freedom (df = 68), the critical t-value remains 1.99547. The significance threshold of 0.001 is significantly below 0.05, and the computed t-value (5.006) is significantly higher than the critical value (1.99547). As a result, the second hypothesis is approved, demonstrating that business continuity (Y) is significantly impacted by financial inclusion (X2). The main goal of this test is to determine how much independent factors can influence dependent variables when they are present simultaneously. The purpose of this simultaneous test is to evaluate the hypothesis that, in multiple linear regression models, all independent variables (X) taken together significantly affect the dependent variable (Y).

Table 12. F Test (Simultaneous)

ANOVA[a]						
	Model	Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	240.498	2	120.249	32.451	<,001[b]
	Residual	251.981	68	3.706		
	Amount	492.479	70			
a. Dependent Variable: BUSINESS CONTINUITY						
b. Predictors: (Constant), FINANCIAL INCLUSION, FINANCIAL LITERACY						

The F test value is 32.451, according to the analysis of the F test findings. This figure is contrasted with the Ftable of 3.13 (for α=5%, df1=2.df2=68). The third hypothesis (Ha3) is supported since Fcal (32.451) > Ftabel (3.13), and its significance value is 0.001 (less than 0.05). This indicates that business sustainability (Y) is significantly impacted by both financial inclusion (X2) and financial literacy (X1).

The determination coefficient serves to show the large contribution of the free variable in explaining the bound variable. A higher value indicates a better ability of variable X to explain variable Y. If the value of R2 is close to 1, the influence of variable X on business continuity is considered large. In this study, the value of the *R square column* was used for the analysis of the determination coefficient, arguing that the value was considered stable against the addition of an independent variable.

Table 13. Determination coefficient test

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,699[a]	,488	,473	1,924

a. Predictors: (Constant), FINANCIAL INCLUSION, FINANCIAL LITERACY
b. Dependent Variable: BUSINESS CONTINUITY

The value of the determination coefficient (R^2) shown in Table 12 is 0.488 or 48.8%. This value shows that the variables of financial literacy (X_1) and financial inclusion (X_2) together are able to explain the variation in the business continuity variable (Y) by 48.8%. Thus, the contribution of these two independent variables to business sustainability can be categorized as quite strong and provide a meaningful picture of the influence of both in supporting the sustainability of MSMEs.

Meanwhile, the remaining 51.2% was explained by other variables that were not included in this study model. These variables can be in the form of internal and external factors, such as business capital, innovation, marketing strategy, market conditions, management quality, and government policy support. The existence of these other factors shows that business continuity is a complex phenomenon and is influenced by various aspects beyond financial literacy and inclusion.

The R^2 value obtained still makes an important contribution in demonstrating the extent to which financial literacy and financial inclusion play a role in supporting business sustainability, while opening up opportunities for further research to add other variables to obtain a more comprehensive picture.

The first hypothesis, which examines the relationship between financial literacy (X1) and business continuity (Y), is supported by the data. The test results show a calculated t-value of 2.211. With a significance level of 5% (α = 0.05) and degrees of freedom (df) equal to 68 (71−2−1), the critical t-value from the table is 1.99547. Since the calculated t-value (2.211) exceeds the critical value (1.99547) and the significance level is 0.03, which is below 0.05, it can be concluded that the first hypothesis is accepted. This indicates that financial literacy (X1) has a statistically significant effect on business continuity (Y).

Based on the responses of the respondents, it is evident that Sei Limbat Village's culinary MSME business actors who possess a solid grasp of finance including the capacity to keep financial records, plan a budget, and distinguish between personal and business funds are better equipped to handle money. This undoubtedly gives MSME company players more financial decision-making wisdom, the ability to steer clear of financial hazards, and a better chance of sustaining and growing their companies over the long haul.

This is in line with research (W. et al., 2022), which states that financial literacy has a positive and significant effect on business sustainability; research (Z. et al., 2022) also states that financial literacy has a positive effect on business sustainability.

The second hypothesis, which pits the business continuity variable (Y) against the financial inclusion variable (X2), is accepted. The tcal value for this variable is 5.006, as determined by the table of analysis findings. The value of the table that served as the comparison was 1.99547 with a degree of freedom (df) of 71−2−1=68 and a significance level of α=5%. The comparison's findings demonstrate that the tcal value (5.006) is unquestionably higher than the ttable value (1.99547). A significance value of 0.001, which is significantly less than 0.05, further supports this conclusion. The second hypothesis is thus accepted, indicating that there is a significant relationship between the financial inclusion variable (X2) and the business continuity variable (Y).

In line with the research above, research (Sugiyono et al., 2019) states that financial inclusion affects the sustainability of MSME businesses. These results show that easy access to formal financial services such as business savings, capital loans, and digital payment systems have an important role in supporting the operational continuity of MSMEs. From a management perspective, financial inclusion simplifies the financing process, accelerates transactions, and expands markets through financial technology. This certainly provides advantages for business actors in managing and developing their business more efficiently. This encourages MSME business actors to be more efficient operationally and have better adaptability to market dynamics.

The third hypothesis is accepted, the influence of financial literacy variables and financial inclusion on business sustainability (Y). It is known that the results of the F test show the Fcal value of 32.451. This value is compared to Ftabel (for α=5%, (df) of 71−2−1=68) of 3.13. Given that Fcal (32.451) > Ftable (3.13) and its significance value is 0.001 (lower than 0.05), then the third hypothesis (Ha3) is accepted. This means that financial literacy (X1) and financial inclusion (X2) together have a significant effect on business sustainability (Y).

This means that the two variables complement each other in forming a strong foundation for business actors to maintain and develop their businesses. MSME actors who not only understand how to manage finances well, but also have access to formal financial services, will be better prepared to face business challenges such as financial crises, capital limitations, or changes in consumer behavior. From a management perspective, this simultaneous influence shows that business sustainability is not enough to be supported by just one aspect, but requires a combination of internal capabilities (such as financial literacy) and external support (such as financial inclusion). Effective business management requires a thorough understanding of how to plan, control, and utilize available financial resources. In other words, MSME business actors who have adequate financial understanding and are able to make optimal use of financial facilities will have a greater competitive advantage to maintain their business sustainably. This certainly makes MSME business actors able to run their businesses more professionally, independently, and sustainably, and have higher competitiveness at the local level.

The results of this study are in line with the results of the study (R. et al., 2022) which also indicates that financial literacy and financial inclusion together have a positive influence on business sustainability, strengthened by the results of the study (A. et al., 2024) which also concludes that there is a positive impact of financial literacy and financial inclusion on business sustainability.

4. Conclusion

Based on the results of a study that examines the impact of financial literacy and financial inclusion on the sustainability of MSME businesses in the culinary sector of Sei Limat Village, Lalat Regency, it can be concluded that financial literacy and financial inclusion simultaneously have a significant influence on the sustainability of MSME businesses in the area. In addition, the individual financial literacy variable showed a positive and significant influence on the sustainability of MSMEs in the culinary sector of Sei Limbat Village, Lalat Regency. Similarly, financial inclusion also shows a positive and significant impact on the sustainability of these businesses. In line with the above explanation, the results of the study (Sugiyono et al., 2019) show that financial literacy and financial inclusion have a positive and significant effect on the sustainability of MSME businesses. This means that the higher the level of financial literacy and inclusion, the higher the level of business sustainability of MSMEs. MSME business actors with a better level of financial literacy will have better ability to manage finances, which has a positive impact on business stability.

On the other hand, access to formal financial services through financial inclusion also plays a role in supporting business operations and expanding business opportunities. However, it should also be noted that the influence of financial literacy and financial inclusion only covers a portion of the factors that affect business sustainability. Thus, the results provide an understanding that although the financial aspect is important, the sustainability of MSMEs is also influenced by other factors such as product competitiveness, marketing strategies, and surrounding socioeconomic conditions. The results of this study emphasized the importance of increasing financial literacy and financial inclusion in supporting the sustainability of MSME businesses, especially in the rural culinary sector. Therefore, the active role of various parties, including the government, financial institutions, and educational institutions, is needed in providing education and access to inclusive financial services for micro and small business actors. The suggestions that can be given are as follows:

i. For the next researcher, it is hoped that they will be able to conduct research with a wider scope, both in terms of the number of respondents, diverse business sectors, and different geographical locations, as well as adding other variables outside of this research such as business digitalization or government support for MSMEs.

ii. For MSME actors, business continuity does not solely depend on aspects of financial literacy and inclusion. Other factors such as the ability to innovate in products, the effectiveness of marketing strategies, and the capacity to adapt to the development of digital technology also play a crucial role. Therefore, MSME entrepreneurs are urged to continue to improve their competence in various fields so that their businesses are able to compete, survive, and continue to grow.

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THE INFLUENCE OF FINANCIAL LITERACY AND FINANCIAL BEHAVIOR ON THE FINANCIAL MANAGEMENT OF CULINARY MSMES IN STABAT CITY

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Abstract

MSMEs (Micro, Small, and Medium Enterprises) in the culinary sector in Stabat City have a significant role in the local economy, however, they continue to face significant challenges in financial management. One of the main causes is low levels of financial literacy and less supportive financial behavior. Based on the literature, financial literacy makes a positive contribution to financial management, while the influence of financial behavior varies but remains significant. The objective of this study is to analyze the influence of financial literacy and financial behavior on the financial management of culinary MSMEs, both separately and simultaneously. The method used is a quantitative approach with a *purposive sampling* technique involving 65 respondents of MSME actors. Data were collected through questionnaires and analyzed using multiple linear regression with the help of SPSS 27. The findings indicate that financial literacy has a positive and significant influence on financial management, while financial behavior has a negative but still significant effect. Simultaneously, these two variables contributed 84.1% to the effectiveness of financial management. These findings emphasize the importance of increasing financial literacy and improving financial behavior to support the competitiveness and sustainability of culinary MSMEs in Stabat City.
Keywords: Financial literacy; Financial Behavior; Financial Management; Culinary; MSMEs

1. Introduction

The history of the development of MSMEs (Micro, Small, and Medium Enterprises) in Indonesia is inseparable from social, political, and economic changes that occur at the national level. After Indonesia became independent in 1945, the MSME sector began to receive greater attention. The newly formed government realizes the importance of MSMEs in recovering the economies of large industrial countries. MSMEs have an important role in the Indonesian economy because they contribute to job creation and national economic development. Culinary MSMEs are one of the flexible business models because they can be launched with little funding and on a small scale. This culinary business includes various types of food and beverages, ranging from traditional snacks to modern foods that follow the latest trends.

Culinary MSMEs are a vital part of the creative economy, contributing to economic growth through innovation, local culture-based products, and technological adaptation. By creating value-added products and utilizing digitalization, culinary MSMEs encourage community economic growth, create new business opportunities, and improve the welfare of their business actors (D. et al., 2019).

A previous study entitled "Analysis of the influence of financial literacy and financial behavior on the financial management of food MSMEs in the city of Magelang" stated that the results of the influence of financial literacy and financial behavior have a positive effect on financial management (D., 2003). According to data obtained from the Ministry of Cooperatives and SMEs (Ministry of Cooperatives and Small and Medium Enterprises) in 2022 (satudata.kemenkopukm.go.id), Approximately 99.6% of MSMEs in Indonesia are individually

owned; the remainder operate as CVs or firms. According to the Ministry of Cooperatives and SMEs, as stated in Law Number 20 of 2008, MSMEs are defined as productive business entities owned by individuals or organizations that meet the legal requirements of micro enterprises. The potential of MSMEs in Indonesia is huge and can be improved again to have a greater impact on the economy.

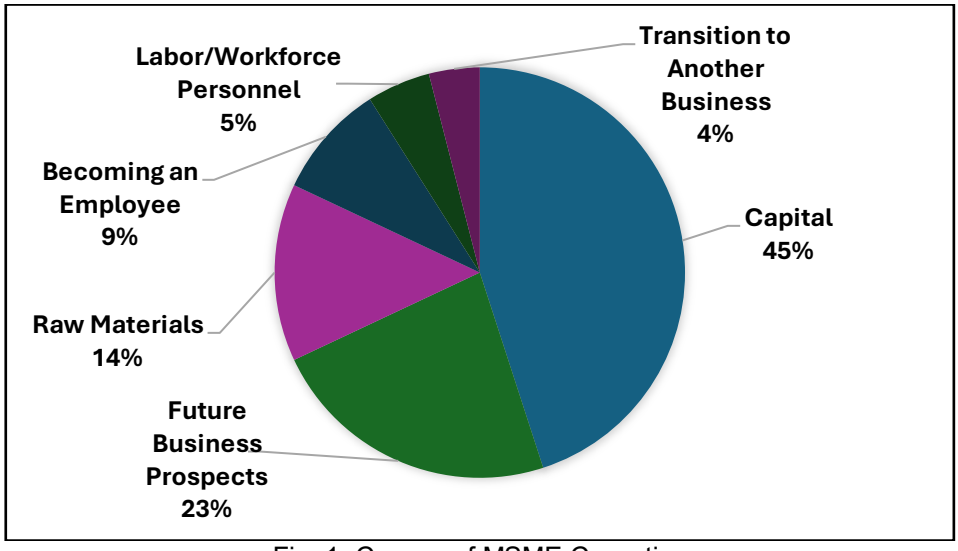

Fig. 1. Causes of MSME Cessation

From the image above, according to the databox source in 2021, in Indonesia as many as 7.1% of micro, small, and medium enterprises (MSMEs) have stopped operating. As many as 45% of respondents, capital problems are the main cause of business closures. As many as 23% of respondents said they closed their business because they thought the prospects for their future MSMEs were less promising. In addition, trading activities were also affected by the COVID-19 outbreak. Around 9% of respondents switched professions to labor, and 14% of respondents admitted that they had stopped their business due to difficulties in obtaining raw materials. However, most MSME actors as many as 84.8% have started running their businesses normally, while 8.1% are still running their businesses on a limited basis. In 2022, a number of MSMEs only survive in the first 3 months.

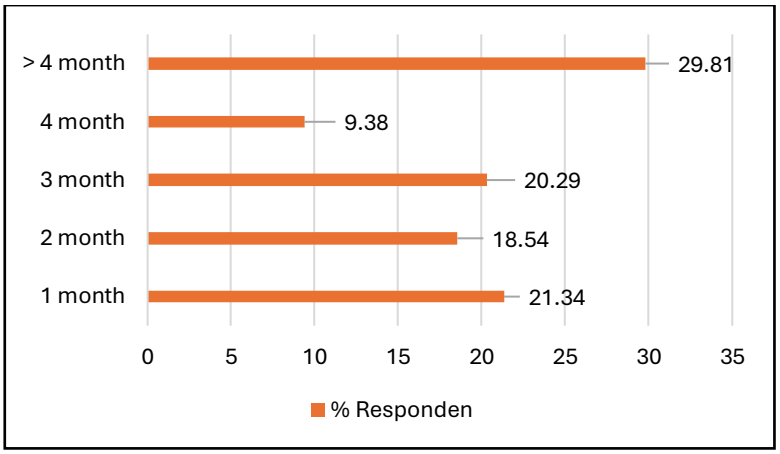

Fig. 2. The Ability of MSMEs to Survive with Capital

According to the latest Situation Survey sourced from the 2022 databox, MSMEs can survive with capital as much as 60.2%, MSMEs can only survive for three months or less with available funds. In fact, 21.34% of MSMEs have only enough capital to survive for a maximum of one month. Of the total MSMEs, 20.29% can survive up to three months, while 18.54% are able to survive for two months with existing capital. In addition, 9.38%. Therefore, business owners

need to have comprehensive skills to manage their business. Responsibility in managing personal finances is a process that involves managing finances and assets productively, including in terms of budget management, purchasing goods, and paying off obligations. Good and proper financial management is essential to increase income and manage various aspects such as liabilities and expenses.

MSMEs have enough capital to last up to four months. Lastly, 29.81% of companies have enough liquidity to last more than four months. Therefore, business owners need to have comprehensive skills to manage their business. One of the most important skills is the ability to manage finances, which plays a crucial role in maintaining business continuity and performance. Financial management encompasses all aspects of management related to finance, not just limited to the issue of resources and their use.

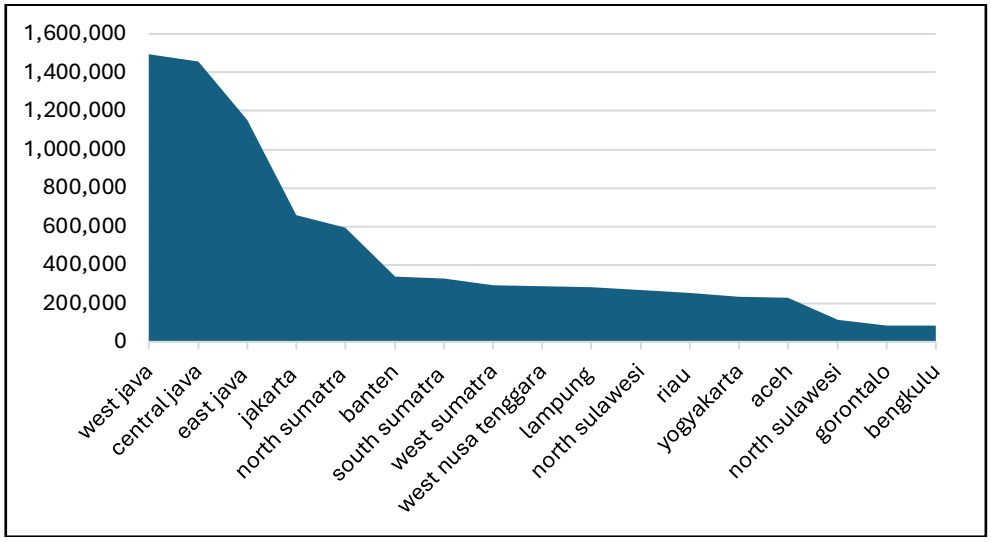

Fig. 3. List of MSME Growth in Each Province

According to Indonesian MSME data sources in 2022, North Sumatra is in fifth position in terms of MSME growth among all provinces and plays an important role in encouraging economic development, especially in Stabat City, Langkat Regency. According to the Regional Secretary of Langkat Regency, Amril, currently there are more than 43 thousand MSME actors in the region, covering other sectors and around 180 MSMEs in the culinary sector are research populations. However, many of these MSMEs face challenges in less effective financial management, which has the potential to cause them to cease operations due to a lack of financial literacy and financial behavior towards their financial management. Lack of proper understanding of financial literacy will hinder smart and sustainable financial management (E. et al., 1821).

Previous research has shown that financial literacy has a significant impact on MSME financial management, contributing to 32.4%. However, the level of financial literacy among MSME operators remains low, highlighting the need to increase knowledge to improve financial management in business (E. et al., 2023).
The level of financial literacy of MSME operators is influenced by several factors, including their level of education, access to information, and their age (E. et al., 2023). Advances in technology and easy access to information make people vulnerable to a consumptive lifestyle, which has an impact on irregular financial management. As a result, financial behavior becomes unwise, such as the use of business income for excessive spending, debt for personal needs, and a lack of emergency funds, which worsen the financial condition of MSMEs.

Financial literacy is the ability to manage finances to achieve a better life. This includes analysis, smart decision-making, and financial planning, so that individuals can recognize risks and choose appropriate financial products (F. et al., 2024).
Previous research has shown that the relationship between financial behavior and financial management is insignificant and does not have a positive impact, meaning that the level of financial knowledge possessed by business actors does not directly affect the way they manage their business finances (F. et al., 2018).

Previous research indicates that financial literacy does not have a significant effect on the financial management behavior of MSMEs, which means that the level of financial knowledge possessed by business actors does not directly affect the way they manage their business finances (I. et al., 2018).

Previous research on financial management has been significantly influenced by financial literacy, especially in terms of basic knowledge of finance, savings and credit, and insurance. However, investment literacy does not show a significant influence, showing that MSMEs' understanding of investment still needs to be improved to support more optimal financial management (I. et al., 2023).

Financial management is one of the crucial aspects in business development which includes the process of recording, budgeting, separation of personal and business assets, as well as the preparation of financial statements that accurately reflect the financial condition of the business (M. et al., 2022).

Financial literacy plays an important role in MSME financial management which shows that the higher the level of financial literacy of business actors, including understanding of basic financial knowledge, savings and credit, investment, and insurance, the better their financial management will be (M. et al., 2022). However, research that specifically explores the relationship between financial literacy, financial behavior, and financial management in culinary MSMEs in this area is still very limited.

Based on the above phenomena and results, the author is interested in conducting a study on the Influence of Financial Literacy and Financial Behavior on the Financial Management of Culinary MSMEs in Stabat City. The results of this research are expected to encourage the birth of financial education programs that are more relevant to the needs of MSMEs, as well as deepen understanding of the relationship between financial literacy, financial behavior, and financial management.

Based on this background, this study aims to answer three main problem formulations. First, to find out the influence of financial literacy on financial management. Second, to determine the influence of financial behavior on financial management. Third, to determine the influence of financial literacy and financial behavior on financial management. By understanding the relationship between financial literacy, financial behavior and financial management, it is hoped that the results of this study can make a practical contribution in improving the quality of financial management of culinary MSME actors in Stabat City.

A hypothesis is a temporary conclusion or answer formulated in quantitative research with a deductive approach (Mursalim et al., 2024). Even if a hypothesis is considered true, it still needs to be empirically proven. The hypothesis also reflects the researchers' initial conjecture about the relationship between two or more variables, which will be tested through the data collected.
a) H01: There was no significant effect between financial literacy on financial management.
H11: There is a significant influence between financial literacy on financial management.

b) H02: There was no significant influence between financial behavior on financial management.
H12: There is a significant influence between financial behavior and financial management.

c) H03: There was no simultaneous significant effect between financial literacy and financial behavior on financial management.
H13: There is a significant influence between financial literacy and financial behavior on financial management.

2. Methodology

Data collection methods are defined as procedures or approaches used to collect information for research, with the aim of using data to evaluate hypotheses that have been developed. Questionnaires were used as a data collection method in this study. Questionnaires are a data collection technique in which participants are given a list of written statements or questions to fill out, and the data management tool uses SPSS 27. The researcher personally distributed the questionnaires to collect primary data, so that the source of data collection is primary data, data collected directly from the research object or respondent, both individuals and groups, called primary data. The primary data source was a questionnaire completed by culinary MSME owners in Stabat City.

Research on a specific population or sample is carried out using quantitative research methods. (Nurlela et al., 2024). Research instruments are used for data collection, and quantitative or statistical methods are used for data analysis to challenge presumptions. To collect accurate and reliable data and allow for generalization of findings, this method is structured, methodical, and objective. The data collection methods to be studied include:

a) Observation: includes the data collection method used by researchers to observe the object being studied directly.

b) Questionnaire or survey: with the data collection technique carried out by the researcher a carefully designed list of questions using the Likert Scale to collect data. The scale known as the Likert Scale is obtained from the total opinions of respondents when answering questions about the indicators of the topic or variable being studied. It is distributed in online and offline.

Table. 1. Likert Scale Instrument

Valuation	Score
Strongly agree (SS)	5
Agree(s)	4
Neutral	3
Dissent (TS)	2
Strongly Disagree (STS)	1

The resulting questionnaire will then be examined to determine the average of each variable, and the results will be compared with the criteria that the author has set based on the lowest and highest values.

The data collection tool in this study used a closed questionnaire prepared in Indonesian, according to the language used by the respondents. However, because this research will be presented in an English-language forum, the statements in the questionnaire contained in the results section have been translated into English. The translation process is carried out by maintaining the meaning and substance of each statement so that it still reflects the original content of the questionnaire.

The term population describes all subjects or research items that have specific characteristics and are selected by researchers for analysis and conclusions. Depending on the purpose of the research, populations can include people, objects, events, or ideas. Population is a data source that represents the issue studied in quantitative research (Nurlela et al., 2024). The population in this study is 180 MSME owners in Stabat City as the research population.

A sample is a part of the quantity and attributes that make up a population. Since it is impossible to know the entire population directly, especially if the population is very large then samples are taken, thus, thorough sample selection is necessary to ensure that the research findings can be applied widely and that the samples are accurate (Nurlela et al., 2024). purposive sampling is used to select research samples. purposive sampling is a sampling technique that collects a certain number of samples for examination by considering various factors depending on predetermined criteria or conditions.

The population in this study consists of 180 MSMEs operating in the culinary sector. Therefore, the researcher used the Slovin formula in sampling as follows:
Slovin Formula:

$$n = \frac{N}{1 + N.e^2} \quad (1)$$

Information:
n = number of samples
N= population size
e= standard *error* used of 10%

$$n = \frac{N}{1 + N.e^2}$$

$$n = \frac{180}{1 + 180.(10\%)^2}$$

$$n = \frac{180}{1 + 180.(0{,}01)}$$

$$n = 65$$

Based on the above results from 180 MSMEs taken as a population, the number of samples needed is 65 MSMEs in the culinary sector in the city of Stabat.

A statistical method called multiple linear regression analysis is used to examine the relationship between two or more independent variables and one dependent variable. The goal is to measure how financial behavior and financial literacy, two independent factors, affect financial management, dependent variables. The multiple regression formula is as follows:

Multiple Linear regression equations using the formulation (R., 2507) :

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + e \quad (2)$$

Information:
- Y : Financial Management
- β_0 :Constant
- β_1 : Financial Literacy Coefficient
- β_2 : Financial Behavior Coefficient
-X_1 : Financial Literacy
-X_2 : Financial Behavior
-e : Error Term.

The evaluation of the research model's ability to explain the variation of dependent variables was carried out using the Determination Coefficient test (R^2). Regression to the total variable

(3)

is used to describe the percentage of variance that can be explained. The following formula can be used to calculate the coefficient of determination:

$$r = \frac{n(\sum xy) - (\sum x)(\sum y)}{\sqrt{\left[n\sum x^2 - (\sum x)^2\right]\left[n\sum y^2 - (\sum y)^2\right]}}$$

Information:
r : correlation coefficient
R^2 : coefficient of determination
n : the number of samples in the regression equation
Xi : a variable independent of the regression equation
x : the mean of the independent variable of the regression equation
Yi : dependent variable of the regression equation
y :average dependent variable of the regression equation
σx : standard deviation of independent variables
σy : standard deviation of dependent variables

This test is used to find out whether an independent variable simultaneously affects a dependent variable. The simultaneous test criterion is Fcount > Ftable with a significance level of 0.05.according to (R. et al., 2020) The results taken in this test are as follows:

a) If the significant value is less than 0.05, then Ha is accepted and H0 is rejected. This means that all independent variables have a co-effect on the dependent variables.

b) If the significant value is more than 0.05, then Ha is rejected and H0 is accepted, indicating that all independent variables have no influence together on the dependent variables.
The following is the formula for doing it by determining the *degrees of freedom*:

$$Df = n-k-1 \quad (4)$$

Information:
k = number of independent variables
n = number of samples

The T statistical test aims to measure the extent of the influence of one individual explanatory or independent variable in explaining variations in dependent variables. It is used to test the influence of each independent variable (financial literacy and financial behavior) on the dependent variable (financial management), individually (R. et al., 2020). The t-value is determined using a significance level of 0.05, where if the significance is greater than 0.05, the hypothesis is rejected, and if the significance is less than 0.05, the hypothesis is accepted. Here's the formula for the work:

$$Df = n-k-1$$

Information:
k = number of independent variables
n = number of samples

3. Results and Discussion

Based on data obtained from the study with 65 respondents and their characteristics. The results of the respondents' characteristics research can be seen in descriptive data that serves as an overview of culinary MSME business actors in the city of Stabat. Here are some of the characteristics of respondents:

Table 2. Respondent Characteristics

Characteristics		Frequency	Percentage
Gender	Download	25	38,5%
	Women	40	61,5%
	Amount	65	100%
Age	<20 years old	8	12,3%
	20-35 years old	32	49,2%
	35-50 years old	25	38,5%
	Amount	65	100%
Education	SD	0	0%
	JUNIOR	12	18,5%
	High School / Vocational School	29	44,6%
	D3/ S1	24	36,9%
	Amount	65	100%
Long Running Business	>3 mounths	24	36,9%
	1-5 years	26	40,0%
	>10 years	4	6,2%
	Amount	65	100%
Income	< Rp 3 million	28	43,1%
	Rp. 3. million - Rp. 5 million	26	40,0%
	IDR 5 million - IDR 10 million	9	13,8%
	> Rp 10 million	2	3,1%
	Amount	65	100%

According to the characteristic data of 65 respondents, the majority were women (61.5%) and most were in the age group of 20-35 years (49.2%), followed by the age category of 35-50 years (38.5%). In terms of education, most of the respondents have a high school/vocational education background (44.6%), followed by D3/S1 graduates (36.9%), while the rest are junior high school graduates (18.5%). None of the respondents had education up to the basic level.

In terms of the length of time they have been running, most respondents have been operating for 1-5 years (40.0%), followed by those who have only started a business for less than 3 months (36.9%). Regarding income, the majority of respondents have an income below IDR 3 million per month (43.1%), while 40% earn between IDR 3-5 million. The rest have revenues between IDR 5-10 million (13.8%) and more than IDR 10 million (3.1%). This data shows that most of the respondents are young women with a middle to secondary level of education, who are just starting a business, and have relatively low to medium incomes.

a) Financial Literacy Respondent Answers (X1)

Based on the results of the collection of financial literacy respondents' answers using 10 statements, it can be explained through the table below regarding the statements or indicators in each statement.

Table 3. Financial literacy respondents

No.	Statement	Respondent's Answer										Sum
		SS		S		N		TS		STS		
		F	%	F	%	F	%	F	%	F	%	
1	Gender does not affect the ability to manage finances.	19	29%	32	49%	14	22%	0	0%	0	0%	65
2	Gender is not a barrier in managing finances.	23	35%	37	57%	5	8%	0	0%	0	0%	65
3	Education helps to understand financial management.	17	26%	30	46%	15	23%	3	5%	0	0%	65

4	Knowledge from education is useful for daily finance.	24	37%	31	48%	10	15%	0	0%	0	0%	65
5	Age affects how you manage your finances.	11	17%	30	46%	24	37%	0	0%	0	0%	65
6	Age adds awareness of the importance of finances.	12	18%	36	55%	17	26%	0	0%	0	0%	65
7	Experience makes financial recording easier.	15	23%	26	40%	23	35%	1	2%	0	0%	65
8	Experience boosts confidence in finance.	13	20%	38	58%	14	22%	0	0%	0	0%	65
9	The business has been running for a long time to improve financial management.	13	20%	34	52%	18	28%	0	0%	0	0%	65
10	The length of time it takes to form a habit of keeping track of finances	16	25%	25	38%	24	37%	0	0%	0	0%	65
	Average		25%		49%		25%		1%		0%	100%

Based on the above results, it can be concluded that the majority of respondents, namely 49%, gave a positive response to the statements submitted. Furthermore, 25% of respondents gave very agreeable and disagreeable answers, while the lowest percentage, which is only 1%, was found in very disagreeable answers. From these findings, it can be concluded that the majority of MSME business actors have a fairly good understanding of financial literacy. Some business actors still do not understand the basics of financial literacy, so more intensive education and mentoring efforts are needed.

b) Financial Behavior Respondent Answer Recapitulation (X2)

Based on the results of the collection of repetition of financial behavior using 8 statements, it can be explained through the following table:

Table 4. Financial Behavior Respondent Recapitulation

No.	Statement	Respondent's Answer										Sum
		SS		S		N		TS		STS		
		F	%	F	%	F	%	F	%	F	%	
1	Business expenses are only for what is needed.	16	25%	37	57%	12	18%	0	0%	0	0%	65
2	Expenses are limited so as not to exceed income.	10	15%	30	56%	22	34%	3	5%	0	0%	65
3	Business bills (electricity, rent, and debt, etc.) are paid on time.	12	18%	28	43%	22	34%	3	5%	0	0%	65

4	Finances are arranged so as not to be late in paying business needs.	16	25%	34	52%	15	23%	0	0%	0	0%	65
5	A long-term financial plan is important for businesses.	17	26%	40	62%	8	12%	0	0%	0	0%	65
6	Have financial targets for business progress.	20	31%	31	48%	14	22%	0	0%	0	0%	65
7	Set aside your income for savings every month.	23	35%	37	57%	5	8%	0	0%	0	0%	65
8	Important cash reserves for sudden business needs	18	28%	30	46%	14	22%	3	5%	0	0%	65
	Average		25%		51%		22%		2%		0%	100%

Based on the results above, it can be seen that most respondents answered in agreement as much as 51%, then an average of 25% strongly agreed, then answered neutrally as 22% and the lowest answer disagreed as much as 2%. From the results of this study, it can be seen that many MSME business actors are quite familiar with financial behavior. A small number of business actors do not understand and need education about financial behavior for business sustainability.

c) Summary of Financial Management Respondents' Answers (Y)

Based on the results of the repetition of the respondent's answers to statements related to financial management variables. The purpose of each statement is to measure how much respondents understand about good financial management, which can be seen from the table as follows:

Table 5. Financial Management Respondent Restructuring

No.	Statement	Respondent's Answer										Sum
		SS		S		N		TS		STS		
		F	%	F	%	F	%	F	%	F	%	
1	Create a monthly money plan for the business.	12	28%	17	55%	17	26%	0	0%	0	0%	65
2	Keep track of all business income and expenses on a regular basis.	15	23%	23	40%	23	35%	1	2%	0	0%	65
3	Have a dedicated book to record all the business's financial transactions.	13	20%	38	58%	14	22%	0	5%	0	0%	65
4	Create simple reports to evaluate business performance.	13	20%	34	52%	18	28%	0	0%	0	0%	65
5	Use financial statements to plan business steps.	16	25%	25	38%	24	37%	0	0%	0	0%	65
6	Compare the money coming in and out with	13	20%	38	58%	14	22%	0	0%	0	0%	65

	the plan to save expenses.											
7	Act immediately if anything doesn't match the financial plan.	13	20%	34	52%	18	28%	0	0%	0	0%	65
	Average		21%		51%		28%		0%		0%	100%

Based on the average results above, it can be seen that most of the respondents answered in agreement with the result of 51%, then 25% answered strongly agree, and 22% answered disagree. So, it can be concluded that MSME business actors already have a good understanding of financial management.

In this study, a multiple linear regression analysis was employed to assess the impact of each variable. The purpose of this analysis is to understand not only the strength of the relationship between variables, but also the role of each independent variable in influencing the dependent variable. Therefore, in the next section, the results of the regression analysis will be presented in detail to show the extent to which Financial Literacy and Financial Behavior can contribute significantly to supporting more effective Financial Management practices.

Table 6. Multiple Linear Regression Test Results

		Coefficient	
		Unstandardized coefficients	
	Type	B	Std. Error
1	(Constant)	-.722	1.841
	Financial Literacy	.934	.079
	Financial Behavior	-.283	.107
	a.Dependent Variable: Financial Management		

Source: SPSS 27 data processing results.

Based on the above results, the multiple linear regression equation is obtained as following the formulation (R., 2507) $Y = \beta 0 + \beta 1X1 + \beta 2X2 + e$, which means $Y = -0.722 + 0.934X1 + (-0.283X2)$

Performance:

a) The value of constant (a) of -0.722 indicates that if Financial Literacy (X1) and Financial Behavior (X2) are equal to zero, then the value of Financial Management (Y) is estimated to be -0.722. However, since this value is theoretical, its meaning in a real context needs to be further analyzed to determine whether it is relevant or not.

b) The value of the regression coefficient of Financial Literacy (X1) (b_1) is 0.934, which can be interpreted as meaning that every increase of one unit in Financial Literacy (X1) will increase Financial Management (Y) by 0.934, assuming other variables are constant.

c) The value of the regression coefficient of Financial Behavior (X2) (b_2) is -0.283, which shows that every one unit increase in this variable is actually correlated with a decrease in Financial Management (Y) by 0.283 (assuming other variables are constant). This suggests that the aspect of Financial Behavior (X2) measured in this study may not align with the principles of effective financial management. For example, it may indicate consumptive tendencies or a lack of discipline in financial matters.

The determination coefficient R^2 is used to evaluate the degree of influence exerted by independent variables on dependent variables. Larger coefficient values indicate that variable X is more successful at explaining variable Y, as shown in the table below.

Table 7. Results of Determination Coefficient Test R^2

		Model Summary[b]		
Type	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.917	.841	.836	1.49530
	a. Predictorsr: (constant), x2, x1			

b. Dependent Variable: y

Based on the table above, it can be seen that the value from R Square is 0.841 or 84.1%. This indicates that Financial Literacy (X1) and Financial Behavior (X2) affects the Financial management (Y) by 84.1%. So that this value was obtained by 15.9% influenced by other variables. This study is in line with previous research and the results state that financial management benefits from financial behavior and financial literacy (D., 2003).

The F test is performed to determine the suitability of the model used in the study. Below is a table that presents hypothesis testing in a statistical format.

Table. 8. F Test Results (Simutan)

Anovaa						
	Type	Sum of Squares	Df	Mean Square	F	Sig. 1
1	Regression	733.526	2	366.763	164.031	<.001
	Residual	138.628	62	2.236		
	Total	872.154	64			

a.Dependent Variable: Y
b.Predictors: (Constant), x1,x2

The decision criteria taken in this test are as follows:
a) If the significant value < 0.05, then Ha is accepted and H0 is rejected.
b) If the significant value > 0.05, then Ha is rejected and H0 is accepted,
Based on the table above, Fcal has a value of 164.031 with a significant rate of 5% (0.05) and df = n-k-1 which means df = 65-2-1=62 then the F valueof the table is 3.14. From the above explanation, it can be seen that the value of $F_{calculated}$ (164.031)> F_{table} (3.14) and the significance value is <0.001, so we can conclude that the hypothesis of the three variables is accepted and has a significant influence on the whole.

It is used to test the influence of each independent variable (financial literacy and financial behavior) on the dependent variable (financial management), individually. Here's the table:

Table. 9. T Test Results (Partial)

Coefficients								
		Unstandardized coefficient		Standardized coefficient			Collinearity statistics	
	Type	B	Std. Error	Beta	t	Sig.	tolerance	VIVID
1	(Constant)	-.722	1.841		-.392	.696		
	X1	.934	.079	1.122	11.757	.000	.282	3.551
	X2	-.283	.107	-.253	-2.654	.010	.282	3.551

a. Dependent Variable: Y

The decision criteria taken in this test are as follows:
a. If the significance value > 0.05 or the tcal value ≤ table, then the hypothesis is accepted**.**
b. If the significance value < 0.05 or the tcal value > table, then the hypothesis is rejected**.**

It is known that the significant value of financial literacy (X1) is 0.00 < 0.05, so it can be concluded that the first hypothesis is rejected and tcount 11,757> ttable 1.66940, then financial literacy has a positive and significant influence on the financial management of MSME business actors in the culinary city of Stabat City. The results of this study are the same as the results of the research conducted by (E. et al., 2023) which states that financial literacy affects financial management and has a significant relationship. This research shows that the

financial literacy owned by culinary MSME business actors in Stabat City affects the way they manage their business finances. The higher the level of financial literacy of MSME business actors, the better they will be in planning good financial management.

Financial behavior (X2) has a negative but significant influence on financial management in culinary MSME business actors in Stabat City. This is shown by the value of financial behavior signs of 0.010<0.05 which shows that the first hypothesis and the value of tcount -2,654> ttable 1,66940 then has a negative but significant effect on the financial management of culinary MSME actors in Stabat City. This research is in line with research conducted by (E. et al., 1821) Risk attitudes also have a significant effect, but in a negative direction, MSMEs are less careful in managing their finances because they are more daring to take risks. This study shows that the financial management of culinary MSMEs in Stabat City deteriorates with worse or more erratic financial behavior, such as uncontrolled spending, lack of financial planning, or the absence of savings.

It is known that the value of financial literacy is 0.00<0.05, so it can be concluded that the first hypothesis is rejected and tcount 11,757> ttable 1.66940, financial literacy has a positive and significant effect on the financial management of MSME business actors in culinary cities. The results of this study are the same as the results of previous research which stated that financial literacy affects financial management and has a significant relationship (E. et al., 2023). This research shows that the financial literacy owned by culinary MSME business actors in Stabat City affects the way they manage their business finances. The higher the level of financial literacy of MSME business actors, the better it will be in planning good financial management.

These findings are in line with the Planned Behavior Theory (TPB), hence the results of this study. Consistent with the theory, showing a relationship between perceived control of behavior and interests that are not influenced by subjective attitudes and norms. A summary of respondents' answers regarding financial literacy reveals that many MSME entrepreneurs are aware of the importance of financial literacy in their business. This research is also in accordance with the research conducted by (M. et al., 2022).

That financial literacy has a positive impact on financial management, and research shows that financial literacy has a substantial impact on financial management from (T. et al., 3495).

Financial behavior has a negative but significant influence on financial management in culinary MSME business actors in Stabat City. This is shown by the value of financial behavior signs of 0.010 <0.05 which shows that the first hypothesis is accepted and the t-value$_{of}$ -2.654 > table 1.66940 has a negative but significant effect on the financial management of culinary MSME actors in Stabat City.

This research is in line with research that has been conducted that risk attitudes also have a significant effect, but in a negative direction, MSMEs are less careful in managing their finances because they are more daring to take risks (E. et al., 1821). Nonetheless, this relationship remains significant despite having a detrimental impact, which shows that it is very relevant and powerful. Although poor financial practices usually adversely affect the financial management of MSMEs, this influence is significant enough to be taken into account when evaluating the financial management of culinary MSMEs in the city of Stabat, in relation to the philosophy of personal financial planning, which focuses on how people organize and manage their money to achieve long-term goals. Based on the table above, the Fcal value is obtained at a significance level of 5% (0.05) and the F_{table} value is 3.14 with df = n-k-1, df = 65-2-1= 62 then the F value of the table is 3.14. From the above description, it can be concluded that the hypothesis of the three variables is accepted and has a significant combined influence, because the value of $F_{calculated}$ (164.031)> F_{table} (3.14) and the significance value is less than 0.001. This research is in line with the research that has been carried out Based on the results of the study, the benefits of financial management from financial behavior

and financial literacy (D., 2003). This study also shows that the financial management of culinary MSME entrepreneurs in Stabat City as a whole is influenced by their financial behavior and financial literacy. The financial literacy and financial behavior of MSME actors are increasing along with the increasing focus on planning, documenting, and evaluating the financial of their businesses. According to the resource-based perspective hypothesis, a company's competitive advantage comes from the management of its internal resources, especially its financial resources. This hypothesis can be used to show how important it is for MSMEs in Stabat to be able to manage their financial resources effectively to achieve strong company performance.

4. Conclusions

It is known that the Financial Literacy variable has a positive and significant impact on financial management in the city of Stabat. This research shows that the better MSME actors are at managing their finances through regular recording, separation of business and personal funds, and careful financial planning, the higher their understanding of basic financial concepts such as budgeting, debt management, and investment. This impact encourages MSME actors to make wiser financial decisions, increase opportunities to grow their businesses, facilitate access to formal financing, and create a more professional and competitive business ecosystem at the local level. This research is also in line with research that has been conducted that financial literacy has a positive impact on financial management, and research shows that financial literacy has a substantial impact on financial management from (W. et al., 2018). It is known that the Financial Behavior variable has a negative but significant influence on the financial management of MSME business actors in the city's culinary city. Despite the negative influences, this relationship is still significant, which means it is quite strong and relevant. This means that negative financial behavior in the financial management of MSMEs in Stabat City can have a serious impact on business sustainability. The impacts include inefficient use of capital, merging personal finances with businesses, and lack of adequate financial record-keeping and planning. As a result, access to financing becomes difficult, resilience to crises becomes weak, and business growth slows. This tends to lead to ongoing losses that could potentially lead to bankruptcy. This research is in line with research that has been conducted that risk attitudes also have a significant effect, but in a negative direction, MSMEs are less careful in managing their finances because they are more daring to take risks (E. et al., 1821). It is clearly known that the three variables of financial literacy, financial behavior, and financial management have a substantial combined impact. Although hypothetical results show that financial behavior has a significant negative influence on financial management, it suggests the existence of unhealthy habits, such as impulsive spending or lack of discipline in fund management, which can hinder the effectiveness of MSME financial management. However, when financial behavior is analyzed in conjunction with financial literacy and financial management, these three variables collectively have a significant impact on financial management. The impact of this situation is that although negative financial behaviors still exist, increasing financial literacy and implementing good financial management can reduce these negative effects. Thus, MSMEs can still manage finances more effectively, increase access to formal financing, strengthen business resilience to risks, and encourage more sustainable business growth in Stabat City. Therefore, an emphasis on improving financial literacy and management is essential to balance and correct suboptimal financial behaviors. This research is in line with the research that has been conducted Based on the results of the research, the benefits of financial management from financial literacy and financial behavior (D., 2003).Based on the research that has been concluded, the following suggestions can be made:

a) i. For Further Researchers:
ii. It is recommended that researchers use a longitudinal approach to explore the long-term impact of financial literacy and behavior on MSME financial management, as well as consider

demographic factors as moderation variables. Researchers can also add aspects of financial or fintech digitalization.

b) iii. For MSME actors:
iv. MSME actors are expected to improve financial literacy through training and guidance from the government or financial institutions. They need to change impulsive financial behavior by implementing simple financial management, such as transaction logging, budget planning, and fund segregation. With a good understanding, MSMEs can increase business resilience and expand development opportunities.

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PEMBANGUNAN ASET 3D GASING PANGKAH BAGI MENGEKALKAN PERMAINAN WARISAN MASYARAKAT MELAYU MENGGUNAKAN APLIKASI WORLDCAST

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Abstrak

Gasing Pangkah merupakan permainan tradisional Melayu yang kian dilupakan akibat kemajuan teknologi dan kurangnya pendedahan dalam kalangan generasi muda. Justeru, projek ini bertujuan untuk mendokumentasikan proses pembuatan Gasing Pangkah serta memelihara warisan tersebut menerusi penerapan teknologi *Augmented Reality* (AR). Ketepatan maklumat disokong melalui pendekatan pelbagai sumber, merangkumi kajian literatur, dokumentasi tapak, lawatan ke Gelanggang Gasing Pangkah di Kampung Bukit Kapar, Selangor, serta sesi temu bual bersama pengusaha berpengalaman. Pendekatan komprehensif ini memastikan ketepatan data dan keberkesanan dalam pembangunan aset 3D Gasing Pangkah untuk tujuan pendidikan dan pemuliharaan warisan budaya. Selain itu, maklum balas turut diperoleh daripada golongan muda bagi menilai penerimaan mereka terhadap teknologi AR yang digunakan. Aset 3D yang dibangunkan secara terperinci telah digabungkan dalam e-book interaktif dan dipersembahkan menerusi simulasi AR yang realistik dan menarik. Daripada 30 responden muda yang terlibat, sebanyak 45.5% menyatakan penerimaan positif terhadap penggunaan AR sebagai medium penyampaian maklumat berkaitan permainan ini. Kajian lanjutan disarankan bagi meneroka potensi teknologi *Virtual Reality* (VR) ke arah perkongsian maklumat dan pengalaman yang lebih imersif.

Kata kunci: Gasing Pangkah; *Augmented Reality* (AR); Permainan tradisional.

1. Pengenalan

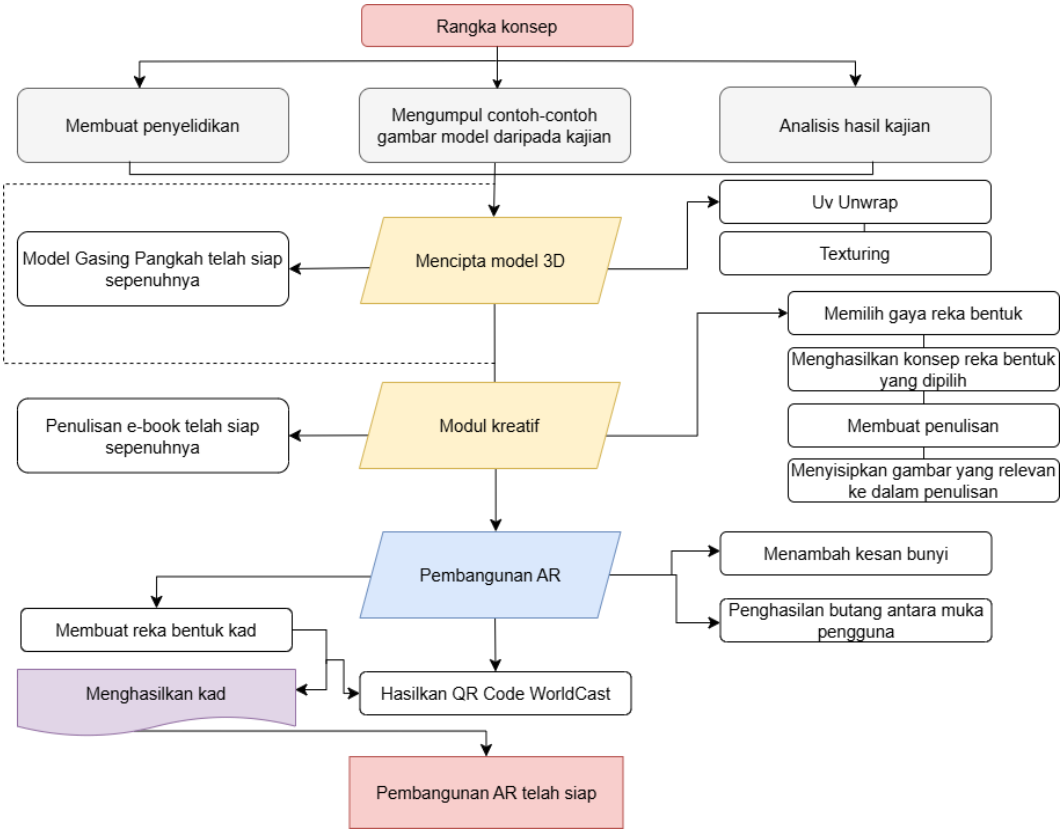
Gasing Pangkah merupakan salah satu permainan tradisional Melayu yang sangat popular di Malaysia, terutamanya di negeri Pahang dan Selangor (Mohd Shamsul, 2021). Permainan ini bukan sekadar aktiviti hiburan, tetapi juga simbol warisan budaya yang mencerminkan kecekapan, kemahiran, dan semangat kesukanan dalam kalangan masyarakat tradisional. Meskipun begitu, seiring dengan kemajuan teknologi moden dan perubahan zaman, seni pengetahuan dalam merawat gasing kian terabai dan kurang mendapat perhatian.

Permainan tradisional seperti Gasing Pangkah yang dahulunya popular, terutama dalam kalangan penduduk di pantai timur, kini semakin lenyap akibat kemajuan teknologi dan kecenderungan kanak-kanak terhadap permainan komputer (Norashikin Leman, 2016). Situasi ini membimbangkan kerana penerimaan masyarakat terhadap seni warisan semakin merosot. Dalam konteks pemuliharaan warisan budaya, kajian ini memberi penekanan terhadap pemodelan aset 3D dalam mendokumentasi dan memelihara maklumat terperinci mengenai struktur warisan seni bina. Oleh itu, penghasilan dokumentasi aset Gasing Pangkah dalam bentuk Augmented Reality (AR) dilihat sebagai usaha berinovatif memelihara permainan tradisional ini agar lebih menarik dan interaktif, khususnya untuk golongan muda. Kurangnya promosi serta pengenalan daripada pihak berwajib turut menyebabkan ramai rakyat Malaysia tidak menyedari kewujudan permainan ini, sekali gus mengurangkan minat masyarakat terhadapnya (Nurul Aqillah, 2021; S. Mahfuz, 2023).

Pembangunan modul kreatif seperti e-book dan Augmented Reality (AR) dicadangkan sebagai medium digital interaktif untuk menyampaikan maklumat mengenai Gasing Pangkah kepada masyarakat, khususnya golongan muda. Pendekatan ini bertujuan memperkenalkan sejarah, teknik permainan, dan proses pembuatan Gasing Pangkah secara lebih menarik dan mudah difahami, sekali gus menangani cabaran kekurangan dokumentasi digital serta dominasi hiburan skrin elektronik dalam kalangan generasi muda. Kajian oleh Nurul Aqillah Zaini (2021) menekankan bahawa permainan tradisional ini semakin dilupakan, terutamanya dalam kalangan generasi muda yang kurang mengenali mahupun mengetahui kewujudan serta kaedah pembuatannya. Kecanggihan teknologi dan minat terhadap permainan komputer turut menyebabkan permainan tradisional seperti Gasing Pangkah semakin terpinggir.

Tambahan pula, kekurangan promosi dan pendedahan daripada pihak berwajib menyumbang kepada kejahilan masyarakat tentang permainan ini sebagai warisan budaya. Oleh itu, projek ini bertujuan menghasilkan aset 3D Gasing Pangkah serta dokumentasi dalam bentuk AR yang lebih menarik dan interaktif bagi menarik minat golongan muda. Usaha ini diharapkan dapat memelihara dan memartabatkan semula permainan tradisional ini agar tidak terus dilupakan oleh generasi akan datang. Di samping itu, kajian ini memberi sumbangan signifikan dalam aspek pendidikan melalui penghasilan bahan bantu mengajar berasaskan warisan budaya, dalam aspek budaya melalui usaha pendigitalan seni tradisional, dan dalam aspek teknologi dengan menerapkan kaedah interaktif seperti AR dalam pemuliharaan warisan tempatan.

2. Metodologi



Rajah 1. Carta Alir proses pembangunan projek

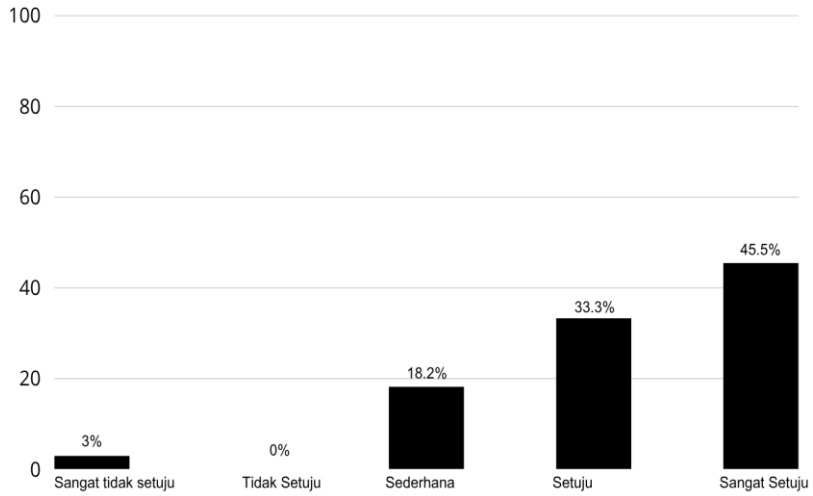
Pengumpulan data dilaksanakan melalui kajian literatur menggunakan *Google Scholar* dan soal selidik atas talian melibatkan 30 orang golongan muda. Data kuantitatif dianalisis secara deskriptif menggunakan Google Form dan Excel bagi mendapatkan peratusan dan taburan

respon. Kajian lapangan turut dilaksanakan melalui lawatan ke Kampung Bukit Kapar, Selangor, termasuk temu bual bersama tokoh gasing pangkah yang direkod menggunakan rakaman audio. Data temu bual dianalisis secara analisis tema untuk mengenal pasti pandangan berkaitan warisan dan teknologi. Pembangunan aset 3D dijalankan menggunakan ibisPaint, 3Ds Max, dan Substance Painter, manakala bahan interaktif dibina dengan Canva. Teknologi *Augmented Reality* (AR) dibangunkan menerusi WorldCast.io dan dipersembahkan melalui laman sesawang dan saluran YouTube. Penilaian oleh tokoh dan pakar 3D dilakukan secara atas talian, di mana dokumen penilaian disediakan melalui Google Docs dan dihantar kepada mereka untuk semakan berdasarkan panduan tidak formal yang menilai aspek ketepatan bentuk, elemen budaya, dan visual. Tempoh pengumpulan data dan penerimaan maklum balas penilaian telah dilaksanakan dalam jangka masa 14 minggu bagi menyiapkan keseluruhan projek..

3. Dapatan dan Perbincangan

Rajah 2. Pembangunan AR

Soal selidik telah dijalankan ke atas golongan muda untuk mengkaji pengetahuan dan minat mereka terhadap permainan gasing pangkah. Proses pengumpulan data dikumpul melalui *Google form.* Kajian awal mendapati seramai 50% golongan muda yang tinggal di bandar dan luar bandar tidak pernah mendengar tentang gasing pangkah dan mereka mengatakan bahawa gasing pangkah sudah tidak mempunyai ramai pengikut mengikut *trend* semasa. 100% daripada responden bersetuju untuk melihat perubahan jika gasing pangkah ini dimodenkan. Hasil tinjauan mendapati bahawa 50% responden pernah mendengar tentang gasing pangkah, namun hanya 20% yang pernah bermain permainan tersebut. Walaupun 80% responden tidak pernah bermain, terdapat minat yang tinggi untuk melihat permainan ini dihidupkan kembali, dengan 100% responden menyatakan bahawa mereka akan lebih berminat untuk mencuba jika gasing pangkah diubah suai untuk menjadi lebih moden. Ini menunjukkan bahawa walaupun permainan ini kurang popular di kalangan golongan muda, terdapat potensi untuk menarik minat mereka melalui pendekatan yang lebih inovatif dan relevan dengan zaman *modern*. Rajah 2 menunjukkan bahawa 45.5% responden memperoleh pengetahuan baharu mengenai Gasing Pangkah selepas menggunakan teknologi AR. Dapatan ini selari dengan kajian Gonzalez Vargas et al. (2020) dan Logical Choice (2011) yang menunjukkan AR meningkatkan kefahaman serta memberikan pengalaman pembelajaran yang lebih interaktif. Ini membuktikan potensi AR dalam membantu generasi muda memahami kandungan warisan budaya secara lebih berkesan.



Rajah 3. Tahap kesedaran terhadap pembelajaran mengggunakan teknologi *Augmented Reality* (AR)

Dalam sesi perbincangan bersama pakar, pelbagai pandangan dan cadangan telah dikemukakan untuk mempertingkatkan kualiti produk serta penyampaian maklumat melalui teknologi 3D dan AR. Menurut Wak Ajis, seorang pengusaha gasing pangkah di Selangor, bentuk gasing yang terlalu tebal boleh mengurangkan kelancaran putaran, namun memberi kelebihan kepada pemangkah kedua. Pandangan ini menunjukkan bahawa aspek bentuk fizikal bukan sahaja mempengaruhi estetika model 3D, tetapi juga fungsinya dalam konteks permainan sebenar, sejajar dengan prinsip dalam rekaan berasaskan fungsi. Sementara itu, Muaz, pakar 3D dan alumni Program Diploma in Games Art, menyatakan bahawa model yang dihasilkan terlalu “high poly” untuk digunakan secara efektif dalam enjin permainan. Namun, beliau mengiktiraf bahawa tekstur yang digunakan sudah memadai untuk tujuan penyampaian visual. Pandangan ini seiring dengan dapatan Hairul Fadli et al. (2022) yang menekankan kepentingan pengoptimuman model 3D bagi memastikan prestasi masa nyata dalam aplikasi Augmented Reality (AR), khususnya bagi platform mudah alih yang mempunyai had pemprosesan grafik. Dalam aspek penyampaian kandungan, Khairul, seorang penggiat gasing pangkah, memberikan maklum balas positif terhadap ketepatan dan susun atur maklumat dalam projek. Beliau menyatakan bahawa struktur pembangunan kandungan adalah kemas dan menarik. Dapatan ini selaras dengan kajian oleh Khor dan Mubin (2024), yang menunjukkan bahawa persembahan kandungan budaya melalui AR yang disusun secara logik dan sistematik dapat meningkatkan pemahaman serta minat pengguna terhadap warisan tempatan, seperti dibuktikan melalui aplikasi AR di Muzium Negara Malaysia.

4. Kesimpulan

Hasil tinjauan ini telah menghasilkan prototaip aset 3D Gasing Pangkah dan modul e-book interaktif bagi memperkaya pengetahuan serta mengekalkan warisan budaya Melayu dalam bentuk digital yang responsif. Demonstrasi melalui platform WorldCast membuktikan pendekatan ini berkesan dalam menarik minat pengguna, khususnya generasi muda. Walaupun terdapat cabaran seperti jurang akses teknologi antara kawasan bandar dan luar bandar, strategi pelaksanaan yang inklusif dapat mengurangkan kesan tersebut. Kajian ini memberi sumbangan penting dalam pemuliharaan permainan tradisional melalui teknologi moden dan disarankan agar kajian lanjutan dilaksanakan dengan menambah variasi reka bentuk gasing serta membangunkan persekitaran maya menggunakan teknologi VR untuk pengalaman pembelajaran yang lebih imersif dan menarik.

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THE APPLICATION OF DIGITAL TECHNOLOGY IN IMPROVING CREATIVE INDUSTRY MSME INCOME MSME CASE STUDY IN MEDAN AMPLAS DISTRICT

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Abstract

The purpose of this study is to determine the effect of the application of technology (digital marketplace and digital payment) on the partial and simultaneous increase in the income of creative industry MSMEs in Medan Amplas District. Respondents in this study are 68 creative industry MSMEs who use digital technology. The data analysis method used is a descriptive quantitative method with a multiple linear regression analysis model and performs a classical assumption test, determination coefficient test (R^2), partial test (T test) and simultaneous test (F test) using the SPSS 27 application. The results of the study partially show that the marketplace has a positive and significant effect on increasing the income of creative industry MSMEs in Medan Amplas District, then digital payments also have a positive and significant effect on increasing the income of creative industry MSMEs in Medan Amplas District. The results of the simultaneous test showed that the marketplace and digital payment had a significant effect simultaneously or together on the income of creative industry MSMEs in Medan Amplas District.
Keywords: Marketplace; Digital Payment; MSME Income.

1. Introduction

The economic sector of Micro, Small, and Medium-Sized Enterprises (MSMEs) has a significant potential to boost Indonesia's economic growth. Based on their yearly sales, quantity of assets, and economic magnitude, businesses are divided into three categories: micro, small, and medium-sized enterprises. The 2008 law No. 20 states that MSMEs are profitable companies that are owned by private persons or corporate entities. Since they employ a significant number of people, promote economic fairness, and serve as a source of innovation and creativity, micro, small, and medium-sized enterprises (MSMEs) are crucial to the Indonesian economy. Businesses in various fields, including trade, the culinary arts, and the creative sector, are operated by several MSMEs. The Ministry of Cooperatives and Small and Medium Enterprises (Kemenkop UKM) provides data on the development of MSMEs and Large Enterprises (UB) in Indonesia. This data includes the number of business units, absorbed labor, contribution to Gross Domestic Product (GDP), value of non-oil and gas exports, and investment.

According to Muslihah and Ginting (2024), MSMEs need to be developed with various government support, ranging from legal support, such as ease of legality, training to improve skills, as well as additional support, such as technological innovation, to increase competitiveness with the aim of improving the economic sector for MSMEs. Digitalization technology has been widely used since the pandemic, namely in 2020 because of the quarantine period that made direct activities reduced, judging from data from the Ministry of Cooperatives and Small and Medium Enterprises, namely 83.8% of MSMEs are digitizing by utilizing technology to support businesses to survive during the pandemic. From data from the Ministry of Cooperatives and Small and Medium Enterprises in 2021, it is known that 70.2% of MSMEs experience obstacles when utilizing digital technology. These obstacles are in the form of capital difficulties, the availability of raw materials, and difficulties in using technology

due to lack of understanding. The pandemic has led to the closure of some MSMEs in Indonesia due to a decline in the public's purchasing power. But this situation has made MSME actors start using marketplaces, social media, and digital financial applications to compete with other MSMEs (Indrajaya, Primasyah, Yulianti, Rosmiati, & Sova, 2022). In today's era, most people use digital technology, from payments to product purchases, which have been done online. Some technologies that can be considered as examples are marketplaces (go food, grab food, and shopee food), in addition to marketplaces, there are digital payments (dana, ovo, qris, bank transfer).

The following are the percentages of marketplace applications and payment methods that are most used in Indonesia for the 2023 period:

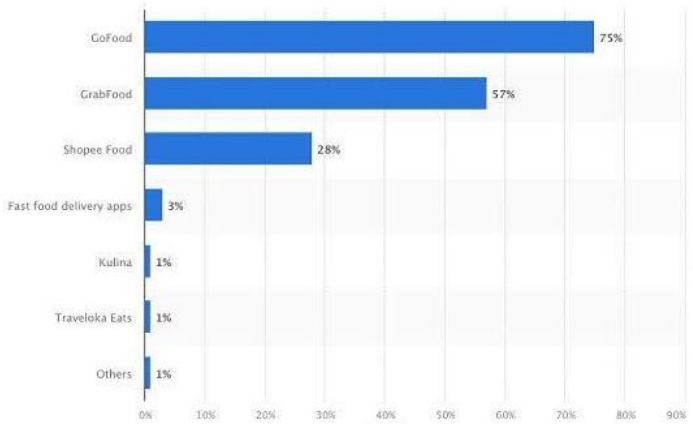

Fig. 1. Percentage of MarketPlace Users in Indonesia in 202

As shown in Figure 1, the marketplace users such as GoFood, GrabFood, and ShopeeFood are among the most popular. This indicates that many people use GoFood, GrabFood, and ShopeeFood to order and purchase available products.

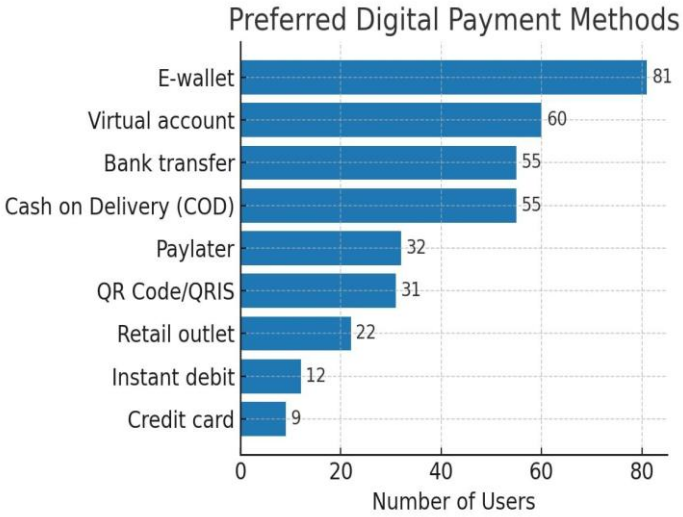

Fig. 2. Percentage of Payment Method Users in Indonesia in 2023

Figure 2 illustrates that E-Wallet or digital payment stands at 81, surpassing other payment methods. This indicates that digital payment users or digital payments are extensively utilized in Indonesia.

Table 1. MSME Income Before and After Using Technology

Ting One Drink MSME Financial Report /6 months		
Moon	Before	After
January	IDR 2,500,000,00	IDR 3,000,000,00
February	IDR 3,000,000,00	IDR 3,300,000,00
March	IDR 3,000,000,00	IDR 3,500,000,00
April	IDR 2,700,000,00	IDR 3,000,000,00
May	IDR 3,200,000,00	IDR 3,500,000,00
June	IDR 2,900,000,00	IDR 3,200,000,00
Seblak Jontor MSME financial report /6 months		
Moon	Before	After
January	IDR 2,500,000,00	IDR 2,700,000,00
February	IDR 2,900,000,00	IDR 3.100.000.00
March	IDR 2,750,000,00	IDR 3,000,000,00
April	IDR 2,700,000,00	IDR 2,900,000,00
May	IDR 3,000,000,00	IDR 3,300,000,00
June	IDR 2,900,000,00	IDR 3,200,000,00
Financial statements of MSMEs Cunkali Dimsum /6 months		
Moon	Before	After
January	IDR 2,800,000,00	IDR 3,000,000,00
February	IDR 2,500,000,00	IDR 2,800,000,00
March	IDR 2,700,000,00	IDR 2,700,000,00
April	IDR 2,900,000,00	IDR 3,000,000,00
May	IDR 2,850,000,00	IDR 3,000,000,00
June	IDR 2,600,000,00	IDR 2,900,000,00

It can be seen from table 1. that MSME income increases after using digital technology, where the average increase is Rp 100,000 to Rp 500,000. This means that the use of digital technology can increase the income of MSMEs. Income can be defined as revenue that is valued by the unit of currency a person generates in each period. Thus, it can be concluded that income is a part of the amount of income obtained from the return for services or production factors that are incurred. The factors that affect income are the amount of production owned sourced from deposits and inheritances or gifts, the unit price of each production and the results of activities (Hardilawati, 2020).

The results of the research (Primary, 2023) explained that the combined Grabfood, Gofood, and Shopee Food accounts showed an increase in sales of the Martabak Den Bagoes culinary business because more and more customers were using the marketplace to buy. The business owner also said that he had a positive impact on the marketplace by experiencing an increase in sales volume, which resulted in quite a profit. However, in the study (Musvira, Natsir, & Asizah, 2022) inversely proportional, where the marketplace partially has a positive but not significant effect on the income of MSMEs in the city of Kendari.

In research (Erika, Wahyudi, Maharani, & Nofirda, 2023) It was found that the application of digital payments in micro, small and medium enterprises (MSMEs) has a positive influence on users. MSME actors are satisfied with the ease of use of digital payments and can increase income, it is increasingly clear that many people choose to use digital payments or digital payments. But research (Alifia, Permana, & Harnovinsah, 2022) stating that digital payments have no effect on income, because the internet connection is unstable, consumers do not have an internet quota, little public interest in using digital payments is the reason why consumers prefer to pay cash compared to digital payments.

How many MSMEs use technology in their business, namely MSMEs in the field of food and beverage creative industries, areas where there are quite a lot of MSMEs in the food and beverage creative industry, namely in Medan Amplas District, there are along the MSME road that are lined up to operate businesses that are still starting to be run from those who are just starting to old ones, besides that in terms of age the MSME owners also vary from young to

old, With this, a study was conducted to find out whether the application of digital technology used can affect the income of creative industry MSMEs in Medan Amplas District
The formulation of the problem in this study is whether digital technology (digital payment) and (market place) affect in increasing the income of creative industry MSMEs in Medan Amplas District. The purpose of this study is to find out that digital market place technology and digital payment can affect the increase in the income of creative industry MSMEs in Medan Amplas District. The benefit of this research is that this research provides a real picture of how digital technology can improve the efficiency, marketing, and income of MSMEs. The results of this research can be a reference in making decisions related to business digitalization and business development.

2. Methodology

The data analysis method used by the author in this study is a descriptive quantitative method. According to (Ghozali, 2018) Descriptive quantitative is a method of data analysis obtained from the results of respondents that have been obtained, after which statistical analysis is carried out and presented with characteristics through a table. The data collection method used in this study is by using a questionnaire, according to (Scott, 2022) Questionnaire is a technique to collect data that is used by answering several questions or written statements. The technique used by the author is by going directly to the MSME place and giving a questionnaire. The types of data used are primary and secondary data, where primary data is data directly obtained from creative industry MSMEs through questionnaire answers, while secondary data is financial statement data for creative industry MSMEs in Medan Amplas District.

The total population of creative industry MSMEs in Medan Amplas District is six hundred five (605) culinary MSME units. This data was obtained from statistical data from the Medan city government in 2021. Because the sample criteria in this study are food and beverage MSMEs, after a field survey was carried out, there were two hundred and ten (210) creative industry MSME units that had used digital technology in Medan Amplas District. The sample selection technique through the Purposive Sampling approach is sample selection by considering criteria relevant to the research Sampling is carried out from the number of creative industries MSME populations in Medan Amplas District by considering certain criteria. By using the Slovin formula and a standard error rate of 10%, as many as 68 respondents of creative industry MSMEs who use digital technology in Medan Amplas District were obtained. The analysis model used in this study uses the SPSS 27 application, while the analysis model used is multiple linear regression. The data tests carried out in this study are as follows:

a. Test multiple linear analysis with the formula: $Y= \alpha + \beta X1 + \beta X2 + e$.
b. Validity test is a tool used to measure the validity or invalidity of a questionnaire. A questionnaire can be said to be valid if the questions on the questionnaire can convey something measurable. The validity test was carried out by comparing the calculation and table for degrees of freedom (df=n-2), where n is the number of samples (Ghozali, 2018).

c. A reliability test is a tool used to measure questionnaires, which are indicators of research variables. Questionnaires are considered reliable if the answers to the questions are stable and consistent (Ghozali, 2018). The variable can be said to be reliable if the Cronbach Alpha value is at > 0.60

d. Determination coefficient (R2) test, The value of the determination coefficient ranges between 0 and 1, which indicates that the ability of independent variables to explain the variation of dependent variables is very limited and the value of R2 that is close to 1 means that the independent variable provides all the information needed to predict the variation of independent variables (Ghozali, 2013)

e. Simultaneous test (F test), if the significant value f is less than 0.05 and the value of fcal is greater than the F-table, then the independent variables affect simultaneously or jointly the dependent variables. The test is performed at a 95% confidence level or an error rate of α= 0.05%.
f. Passary test (t-test)
   If $t_{calculates} > t_{of\ the\ table}$ or the sig. value < 0.05, then the hypothesis is acceptable, this indicates that the independent variable has a significant effect on the dependent variable partially.
   If $t_{calculates} < t_{of\ the\ table}$ or the value of sig. > 0.05 then the hypothesis is not accepted or rejected, this shows that the independent variable has no effect and is not significant on the dependent variable partially (Ghozali, 2013).

3. Results and discussion

This research was conducted on MSMEs in the creative industry of Medan Amplas District with a total of 68 MSMEs, from the results of the survey by distributing questionnaires to MSMEs in the creative industry of Medan Amplas District, namely digital market place technology and digital payment can increase MSME income because digital technology can increase sales transactions, increase the number of customers, and make it easier for customers to transact with MSME actors. The characteristics of the respondents, namely MSMEs in the field of culinary creative industries and digital technology used, can be seen in the table below.

Table 2. Characteristics of respondents by gender

Gender					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Man	29	42.6	42.6	42.6
	Woman	39	57.4	57.4	100.0
	Total	68	100.0	100.0	

In Table 2. Above, the answer to the questionnaire distributed to 68 respondents, namely creative industry MSMEs in Medan Amplas District, the results of the questionnaire have the same percentage, namely 29 male respondents with a percentage value of 42.6%, and 39 respondents with a percentage value of 57.4%.

Table 3. Respondent characteristics based on the type of business

Type of Business					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Food	43	63,2	63,2	63,2
	Drink	25	36,8	36,8	100,0
	Total	68	100,0	100,0	

In Table 3. Above, the answer to the questionnaire distributed to 68 respondents, namely creative industry MSMEs in Medan Amplas District, the results of the questionnaire have the same percentage, namely food for 43 respondents with a percentage value of (63.2%) and drinks for 25 respondents with a percentage value of (36.8%).

Table 4. Characteristics of respondents based on digital technology

Digital technology used					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Marketplace (Gofood, Grab food, Shopee food)	17	25,0	25,0	25,0
	Digital payment (Qris, Dana, Ovo, Transfer bank)	12	17,6	17,6	42,6

Marketplace dan Digital payment	39	57,4	57,4	100,0
Total	68	100,0	100,0	

In table 4. above, the questionnaire answers distributed to 68 respondents, namely creative industry MSMEs in Medan Amplas District, it is known that some respondents use marketplaces and digital payments as many as 39 respondents with a percentage value of (57.4%), use digital payment alone as many as 12 respondents with a percentage value of (17.6%) and those who use marketplaces only 17 respondents with a percentage value (25%). Based on the respondents' answers to the statement item about the research variables given in the research questionnaire, as follows:

a. Variable respondent answer recapitulation (X1)
The following results of respondents' answers to the statement on the marketplace variable are presented in the table below.

Table 5. Market Place Variable Recapitulation (X1)

No	Statement	Respondent's Answer										total
		SS		S		N		TS		STS		
		F	%	F	%	F	%	F	%	F	%	
1.	I feel good about using MarketPlace to sell	21	31%	33	49%	13	19%	1	1%	0	0%	68
2.	I use Marketplace to increase sales	25	37%	32	47%	11	16%	0	0%	0	0%	68
3.	My customers have grown after using MarketPlace	27	40%	36	53%	5	7%	0	0%	0	0%	68
4.	Before using MarketPlace I had trouble getting customers	29	43%	25	37%	14	21%	0	0%	0	0%	68
5.	MarketPlace helps my clients to more easily order my sales	27	40%	37	54%	4	6%	0	0%	0	0%	68
6.	I find it easier to promote my sales through MarketPlace	18	26%	27	40%	23	34%	0	0%	0	0%	68
	Average		36%		47%		17%		0%		0%	100%

From the table above, those who answered agreed as much as 47%, those who answered strongly agreed as much as 36%, this can be interpreted that digital marketplace technology is able to simplify the MSME sales process, the marketplace is able to increase sales volume and increase MSME customers. This shows that the marketplace plays a role and has a positive influence in supporting the sales and sales performance of creative industry MSMEs in Medan Amplas District.

b. Variable respondent answer recapitulation (X2)
The following results of respondents' answers to statements on the Digital Payment variable are presented in the table below.

Table 6. Digital Payment Variable Recapitulation (X2)

No	Statement	Respondent's Answer										total
		SS		S		N		TS		STS		
		F	%	F	%	F	%	F	%	F	%	
1.	I use DigitalPayment for ease of sales transactions	21	31%	37	54%	10	15%	0	0%	0	0%	68
2.	Some of my customers choose to use digital payments	17	25%	39	57%	12	18%	0	0%	0	0%	68
3.	I find it easier to record transactions with Digital payments	10	15%	32	47%	23	34%	3	4%	0	0%	68
4.	I feel that customers are more satisfied because there is a digital payment	14	21%	29	43%	22	32%	3	4%	0	0%	68
5.	I get more customers after using digital payments	16	24%	36	53%	16	24%	0	0%	0	0%	68
6.	I have no difficulties or obstacles in using digital technology	18	26%	42	62%	8	12%	0	0%	0	0%	68
	Average		24%		53%		22%		1%		0%	100%

From the table above, those who answered on average agreed with 53% and those who answered on average strongly agreed with 24%. This can be interpreted that digital payment technology is able to facilitate MSME sales transactions, and customers also prefer digital payments compared to cash payments. MSMEs get more customers after using digital payments. MSMEs do not have difficulties in using digital technology. This shows that digital payments have a positive effect on improving the sales performance of MSMEs in Medan Amplas District.

c. Recapitulation of variable Y respondent answers

The following results of respondents' answers to the statement on the MSME Income variable are presented in the table below.

Table 7. Recapitulation of MSME Income Variables (Y)

No	Statement	Respondent's Answer										total
		SS		S		N		TS		STS		
		F	%	F	%	F	%	F	%	F	%	
1.	My income increased significantly after using digital Technology	13	19%	38	56%	17	25%	0	0%	0	0%	68
2.	After using technology, there is a percentage increase in sales by 20-50%	16	24%	28	41%	23	34%	1	1%	0	0%	68
3.	My income increased by IDR 300,000->500,000 after using digital technology	13	19%	40	59%	15	22%	0	0%	0	0%	68
4.	My sales transactions have increased after using digital technology	15	22%	35	51%	18	26%	0	0%	0	0%	68
5.	My business profits have increased compared to before	17	25%	27	40%	24	35%	0	0%	0	0%	68
6.	I feel that digital technology has a positive impact on the growth of my business	29	43%	32	47%	7	10%	0	0%	0	0%	68
	Average		25%		49%		25%		0%		0%	100%

From the table above, the average answer is 49% in agreement, and the answer strongly agrees by 25%. This can be interpreted that MSME income increases significantly after using digital technology, MSME income also increases by IDR 300,000 to > 500,000 after using digital technology, and MSME sales transactions increase after using digital technology. Meanwhile, the average neutral answer of 25% indicates that some MSMEs remain unconvinced and do not fully recognize the direct benefits of digital technology.

The linear regression analysis in this study aims to find out the extent of the determinants of the variables of marketplace (X1), digital payment (X2), and MSME Revenue (Y). The results of the multiple linear regression analysis test using SPSS 27 are as follows:

Table 8. Multiple Linear Regression Analysis Results

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Recorded)	2,495	2,857		0,873	0,386
	Market Place	0,304	0,121	0,266	2,508	0,015
	Digital Payment	0,579	0,120	0,512	4,828	0,000

a. Dependent Variable: MSME Income

$$Y = a + \beta X1 + \beta X2 + e$$
$$Y = 2,495 + 0,304\ X1 + 0,579\ X2 + e$$

From the above equation, it can be explained as follows:

a. The constant value (α) obtained is 2.495; then, it can be interpreted that if the independent variable is 0 (constant), then the dependent variable of MSME income (Y) is 2.495.

b. The value of the positive market regression coefficient X1 of 0.304 can be interpreted that if the other variable is of fixed value and the marketplace variable (X1) increases by 1 rupiah, then the MSME income variable (Y) will also increase by 0.304. The positive coefficient indicates a positive relationship between the marketplace variable (X1) and MSME income (Y). This means that if the use of the marketplace increases, the income of MSMEs will also increase.

c. The value of the digital payment regression coefficient (X2) with a positive value of 0.579 can be interpreted that if the other variables remain constant and the digital payment variable (X2) increases by 1 rupiah, then the MSME income variable (Y) will also increase by 0.579. The positive value of the coefficient indicates a positive relationship between the digital payment variable (X2) and MSME income (Y). This means that if the use of digital payments increases, MSME income will also increase.

In this study, the number of samples was 68 respondents, so the value (df) = n-2 or (df) = 68-2, then the result was 66, rtable 66 was 0.238. The results of the variable validity test, conducted using SPSS version 27 for Windows, are presented in the table below. Results of the validity test of the Market Place variable (X1)

Table 9. Marketplace Variable Validity Test Results (X1)

No.	Total Correlation/r hitung	R table	Criterion
1.	.546	0.238	Valid
2.	.701	0.238	Valid
3.	.595	0.238	Valid
4.	.477	0.238	Valid
5.	.615	0.238	Valid
6.	.648	0.238	Valid

The item from the marketplace variable statement produces a calculation value that is greater than the rtable value of 0.238. So can be concluded that statistically each indicator of the marketplace variable is valid and suitable for use for research data.

b. Results of the validity test of the digital payment variable (X2)

Table 10. Validity Test Results of Digital Payment Variable (X2)

No.	Total Correlation/r calculate	R table	Criterion
1.	.539	0.238	Valid
2.	.783	0.238	Valid
3.	.592	0.238	Valid
4.	.718	0.238	Valid
5.	.471	0.238	Valid
6.	.470	0.238	Valid

It can be seen that the item of the digital payment variable statement produces a calculation value that is greater than the rtable value of 0.238. So can be concluded that statistically each indicator of the digital payment variable is valid and suitable for use for research data.

c. Results of the validity test of the MSME Income variable (Y)

Table. 11. Results of the Validity Test of MSME Income Variables (Y)

No.	Total Correlation/r calculate	R table	Criterion
1.	.679	0.238	Valid
2.	.779	0.238	Valid
3.	.712	0.238	Valid
4.	.664	0.238	Valid
5.	.788	0.238	Valid
6.	.358	0.238	Valid

The item of the MSME income variable statement produces a calculation value that is greater than the rtable value of 0.238. It can be concluded that statistically, each indicator of the MSME Income variables is valid and feasible to use for research data.

This study measured reliability by calculating Cronbach's alpha. A variable is said to be reliable if it has a coefficient value of more than 0.60 (Ghozali, 2013). The results of the reliability test are presented in the following table.

Table. 12. Reliability Test Results

No	Variable	Criterion	Cronbach's Alpha	N Of Item	Conclusion
1.	Market Place (X1)	0.60	0.629	6	Reliable
2.	Digital Payment (X2)	0.60	0.639	6	Reliable
3.	MSME Income (Y)	0.60	0.756	6	Reliable

The results of the marketplace variable table have a Cronbach's alpha value of 0.629, the next digital payment variable has a Cronbach's alpha value of 0.639, and the last variable, MSME income, has a Cronbach's alpha value of 0.756. All Cronbach values of variables have a value greater than the Cronbach alpha criterion of 0.60. It can be concluded that all variables are reliable and suitable for use in research data.

According to (Ghozali, 2013) A determination coefficient test to measure how capable the model is at mitigating the variation of dependent variables. The value of the coefficient of determination ranges between 0 and 1, which indicates the ability of independent variables to explain the variation of very limited dependent variables and the value of R^2 That is close to 1

means that the independent variable provides all the information needed to predict the variation of the independent variable.

Table 13. R Square Test Results (R2)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1. Regresi Residual	.692a	0,479	0,463	2,08887

A. Predictors: (Constant), Digital Payment, Market Place
B. Dependent Variable: MSME Income

From the table above, the value of R in the regression model is obtained as 0.479. It can be said that the independent variables used in this study can explain the variation in MSME income by 47.9%, and the remaining 53.1% is influenced by other factors that are not included in this regression model, such as business capital factors, product innovation, business location, business duration, and other factors.

The F-test, also known as a simultaneous test, determines whether all the independent variables studied in this study collectively affect the dependent variables (Ghozali, 2013). If the significant value f is less than 0.05 and the value of f_{count} greater than F_{table} then independent variables affect simultaneously or together the dependent variables. The test is performed at a 95% confidence level or an error rate of α= 0.05%.

Table. 14. Simultaneous Test Results (F)

ANOVA

	Model	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	261,247	2	130,624	29,936	.000b
	Residual	283,620	65	4,363		
	Total	544,868	67			

A. Dependent Variable: MSME Income
B. Predictors: (Constant), Digital Payment, Market Place

From table 14. It is known that the value of Fis calculated as 29.936 > from Ftable, which is 3.14, where df = k = number of independent variables = 2, and df = n-k-1 68-2-1= 65, then Ftable = 3.14, while the significant value is 0.000 < 0.05. Therefore, from these results, it can be concluded that all independent variables of the marketplace and digital payment have a simultaneous or joint effect on the dependent variable income of MSMEs. A partial test or t-test is performed to find out whether there is an influence of each independent variable individually on the dependent variable that is tested with a significance level of 0.05 (Ghozali, 2013). The conditions for acceptance and rejection of hypotheses are as follows:

a. If $t_{calculates} > t_{of\ the\ table}$ or the sig. value < 0.05, then the hypothesis is acceptable, this indicates that the independent variable has a significant effect on the dependent variable partially.
b. If $t_{calculates} < t_{of\ the\ table}$ or the value of the sig. > 0.05, then the hypothesis is not accepted or rejected, which indicates that the independent variable has no effect and is not significant on the dependent variable partially

Table. 15. Partial Test Results (T)

	Model	Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	2.495	2.857		0.873	0.386
	Market Place	0.304	0.121	0.266	2.508	0.015
	Digital Payment	0.579	0.120	0.512	4.828	0.000

The results of the t-test or hypothesis test can be seen and interpreted as follows:

a. The marketplace variable (X1) can affect the MSME Income variable (Y). From the table, the result of the calculated t-value is 2.508, with a constant value of 5% t of the table (5%:68-1-2) = 65) then the$_{\text{t-value of the table}}$ is obtained of 1.9971. From these results, tcalculates 2.508 > t_{table} 1.9971 and the sig. value is 0.015 < 0.05, so it can be interpreted that the marketplace variable (X1) has a significant effect on the MSME Revenue variable (Y).
b. The digital payment variable (X2) can affect the MSME Income variable (Y). From the table, the result of the calculated t-value is 4.828, with a constant value of 5% t of the table (5%:68-1-2) = 65) then the$_{\text{t-value of the table}}$ is obtained of 1.9971. From these results, tcalculates 4.828 > t_{table} 1.9971 and the sig. value is 0.000 < 0.05, so it can be interpreted that the digital payment variable (X2) has a significant effect on the MSME Revenue variable (Y).

Marketplace variables can affect the income of creative industry MSMEs, where the results of the partial test show that the calculated t value of 2.508 is greater than the table t of 1.9971, with a significant value of 0.015 less than 0.05. This means that the marketplace has a positive and significant effect on MSME income. These results clearly demonstrate that the marketplace enhances the income of creative industry MSMEs. This is in line with (Astuti & Wulandari, 2023) research from the results of the survey said that the use of marketplace technology can increase MSME business income and MSMEs easily market their products widely.

The digital payment variable can affect the income of creative industry MSMEs, where the results of the partial test show that the $_{\text{t-value}}$ of 4.828 is greater than the t-table of 1.9971, with a significant value of 0.000 less than 0.05. This means that digital payments have a positive and significant impact on MSME income. This result explains that digital payments can increase the income of creative industry MSMEs. This is in line with research (Handayani & Soeparan, 2022) which says that the benefits of using digital payment can increase sales turnover, provide payment options, ease of recording transactions and be able to increase payment efficiency and effectiveness. The results of this study align with the findings of previous research (Alifiyah & Purwanti, 2024). The results obtained stated that the use of marketplaces and digital payments had a positive effect on increasing MSME income in the city of Malang.

4. Conclusion

Based on the results of data analysis and research discussions that have been conducted, it can be concluded that the marketplace variable has a positive and significant effect on the income of micro, small and medium enterprises in the creative industry, and the digital payment variable also has a positive and significant effect on the income of micro, small and medium enterprises in the creative industry. When the marketplace variable and the digital payment variable are tested together, they show results that have a simultaneous or joint positive and significant effect on the income of micro, small, and medium enterprises in the creative industry.

It can also be concluded that if the use of digital technology, such as marketplaces and digital payments, increases, then MSME income will rise significantly. The greater the use of digital technology, the more MSME income will increase. This result is in line with the results of the research conducted (Nugroho, 2024). He explained that the use of digital technology can affect business income and transactions for buyers; the higher the use of digital technology, the higher the level of MSME income. The results of the regression test and the hypothesis carried out show that the hypothesis H3 is accepted.

From the theory of the Technology Acceptance Model (TAM), ease of use gives confidence that the marketplace and digital payment used simultaneously can provide convenience for MSMEs in the creative industry of Medan Amplas District, with small businesses. The use of

this technology includes what is felt by MSMEs who can benefit by using both technologies at the same time. When MSMEs feel that using both technologies is easy and not difficult, MSMEs will tend to want to use and apply them to increase income.

From the results of this study, it is hoped that the creative industry MSMEs in Medan Amplas sub-district can increase their understanding and knowledge of the use of digital technology, as well as good business management, to be able to significantly increase income in the long term. MSMEs can optimize the use of the marketplace by consistently using digital payments to increase transaction efficiency, providing convenience to consumers, and creating attractive online promotions with product photos, short videos, and customer testimonials to reach a wider audience. Conduct periodic evaluations by recording income digitally, such as using BukuWarung, Bukuku, Financial Records, or Excel applications, to measure the impact of technology on business profits.

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PEMBANGUNAN PERMAINAN E-PASAR KARAT UNTUK PEMELIHARAAN WARISAN PASAR KARAT DI CHINATOWN, KUALA LUMPUR

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Abstrak

Pasar Karat di Lorong Petaling, Kuala Lumpur merupakan tapak warisan budaya penting yang kini terancam akibat pemindahan lokasi dan tekanan pembangunan. Kajian ini membangunkan permainan digital E-Pasar Karat dalam bentuk persekitaran maya 3D bagi memelihara elemen budaya Pasar Karat serta meningkatkan kesedaran masyarakat mengenainya. Pendekatan kuantitatif digunakan melalui dokumentasi visual, pembangunan aset 3D menggunakan Blender dan Substance Painter, serta integrasi ke dalam Unreal Engine 5.5. Penilaian melibatkan 34 responden menggunakan soal selidik skala Likert. Dapatan menunjukkan bahawa permainan ini berjaya meningkatkan pemahaman dan minat pengguna terhadap warisan Pasar Karat. Sebanyak 97.1% responden melaporkan peningkatan pemahaman selepas bermain. Hasil ini menunjukkan potensi besar pendekatan digital interaktif sebagai medium pemeliharaan budaya secara moden dan berkesan. Kajian ini mencadangkan penambahbaikan seperti integrasi naratif audio, elemen gamifikasi dan realiti maya (VR) dalam versi akan datang.
Kata kunci: Pasar karat; Pemeliharaan digital; Persekitaran maya 3D.

1. Pengenalan

Pasar Karat yang terletak di Lorong Petaling, Kuala Lumpur merupakan sebahagian daripada warisan budaya tidak ketara Malaysia. Ia bukan sahaja menjadi lokasi jualan barangan terpakai dan antik, tetapi juga mencerminkan sejarah sosial, ekonomi dan gaya hidup masyarakat tempatan. Namun, pemindahan pasar ini ke lokasi baharu yang kurang strategik akibat pembangunan bandar telah menjejaskan daya tarikan asalnya dan mencetuskan risiko kehilangan nilai budaya yang terkandung. Pemindahan ini turut dilaporkan dalam media arus perdana yang menyorot kebimbangan peniaga terhadap lokasi baharu yang kurang strategik (Lim, 2024).

Kajian terdahulu menunjukkan bahawa pemeliharaan warisan melalui teknologi digital seperti pemodelan 3D, realiti maya (VR), dan permainan serius (serious games) berupaya merekod dan mengekalkan elemen budaya yang semakin terancam (Wan Isa et al., 2018). Contohnya, Suaib et al. (2020) membuktikan bahawa teknologi seperti pemodelan 3D, realiti tambahan (AR) dan permainan digital berpotensi memelihara warisan ketara dan tidak ketara sambil meningkatkan kesedaran masyarakat. Begitu juga, kajian oleh (Ibrahim & Azmi, 2013) menunjukkan bahawa pemodelan 3D bagi bangunan warisan, seperti Rumah Tok Su, berupaya mendokumentasikan butiran seni bina secara terperinci dan memudahkan akses global kepada warisan tersebut melalui platform digital. Walau bagaimanapun, aplikasi pendekatan ini dalam konteks pasar warisan seperti Pasar Karat masih kurang diteroka di Malaysia.

Kajian ini bertujuan untuk membangunkan permainan digital interaktif berasaskan persekitaran 3D yang dikenali sebagai E-Pasar Karat. Ia direka untuk menyampaikan suasana, elemen budaya dan naratif Pasar Karat kepada pengguna secara maya. Kajian ini

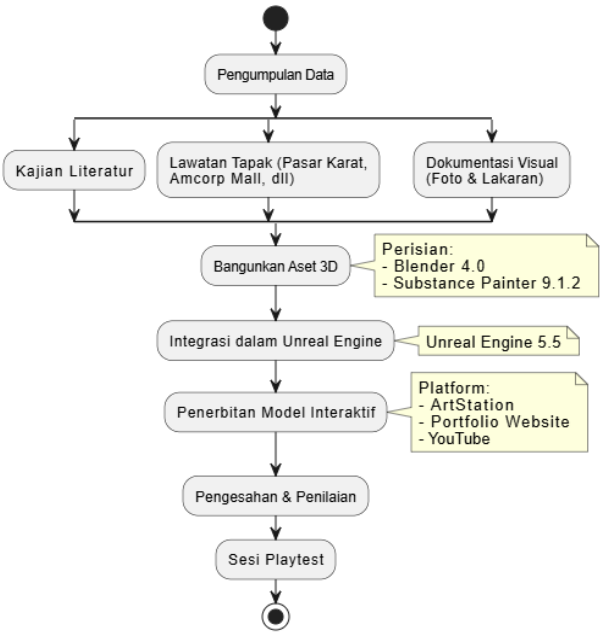
turut menilai keberkesanan pendekatan tersebut dalam meningkatkan kesedaran masyarakat terhadap kepentingan pemeliharaan warisan budaya tempatan.

2. Metodologi

Kajian ini menggunakan pendekatan kuantitatif secara berfasa bagi membangunkan permainan digital E-Pasar Karat. Proses dimulakan dengan pengumpulan data melalui kajian literatur dan dokumentasi visual di lokasi sebenar Pasar Karat, termasuk fotografi, lakaran visual, rakaman audio ambience serta pengumpulan naratif lisan daripada peniaga tempatan.

Data ini dijadikan asas kepada reka bentuk persekitaran maya. Pembangunan aset 3D dilaksanakan menggunakan perisian Blender dan Substance Painter, manakala integrasi ke dalam Unreal Engine 5.5 membolehkan pembentukan dunia maya interaktif. Elemen tambahan seperti pencahayaan, navigasi, objek interaktif dan info warisan turut dimasukkan untuk memperkayakan pengalaman pengguna.

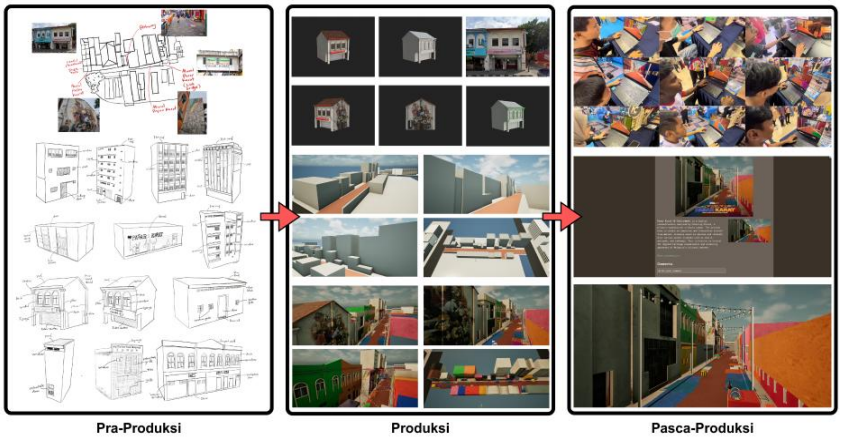
Proses pembangunan permainan ini diringkaskan dalam Rajah 1.



Rajah 1. Carta alir proses pembangunan permainan E-Pasar Karat

Selepas pembangunan prototaip selesai, soal selidik digunakan untuk mengumpul data maklum balas pengguna. Kebolehpercayaan instrumen soal selidik pasca-pengalaman diuji menggunakan pekali Cronbach's Alpha dan mencatatkan nilai $\alpha = 0.983$, menunjukkan tahap kebolehpercayaan yang sangat tinggi. Kajian ini menggunakan reka bentuk pasca-ujian sahaja. Namun, bagi menilai perbezaan secara signifikan antara kumpulan, kajian lanjutan boleh menggunakan kaedah statistik inferensi seperti ujian Mann-Whitney bagi membandingkan tahap kefahaman antara kumpulan pra dan pasca yang berbeza.

Selain itu, pembangunan permainan ini juga melalui tiga fasa utama: pra-produksi, produksi dan pasca-produksi. Fasa pra-produksi melibatkan lakaran awal, perancangan elemen budaya dan penyusunan reka bentuk visualFasa produksi merangkumi pembangunan aset digital dan penyusunan dunia maya dalam Unreal Engine. Fasa pasca-produksi pula melibatkan penalaan prestasi permainan serta penyediaan bahan dokumentasi. Gambaran keseluruhan bagi ketiga-tiga fasa ditunjukkan dalam Rajah 2.



Rajah 2. Fasa Pra-Produksi, Produksi dan Pasca-Produksi dalam Pembangunan Permainan

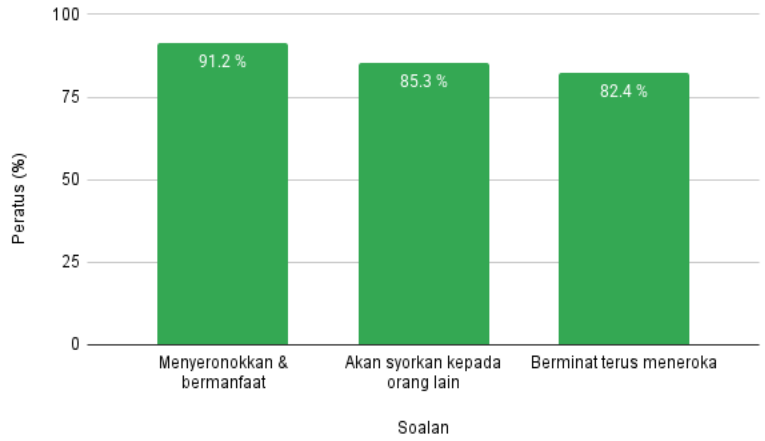
3. Dapatan dan Perbincangan

Hasil kajian menunjukkan bahawa seramai 34 orang responden telah terlibat dalam sesi uji main (playtest) permainan digital E-Pasar Karat yang dijalankan secara fizikal. Responden terdiri daripada pelajar dan orang awam yang mempunyai pengetahuan asas tentang permainan digital dan minat terhadap budaya tempatan.

Dari segi demografi, majoriti responden adalah lelaki (61.8%), manakala selebihnya adalah perempuan (38.2%). Dari aspek umur, 67.6% responden berumur bawah 18 tahun, diikuti 20.6% berumur antara 18 hingga 24 tahun, manakala selebihnya berumur 25 tahun ke atas. Sebanyak 67.6% responden pernah mengunjungi Pasar Karat secara fizikal, manakala 61.8% mengetahui tentang kewujudannya sebelum sesi pengalaman maya dijalankan.

Melalui soal selidik skala Likert, aspek kepuasan pengguna menunjukkan respon yang sangat positif. 47.1% responden menyatakan mereka sangat berminat untuk terus meneroka persekitaran maya yang dibangunkan, manakala 44.1% merasakan pengalaman tersebut menyeronokkan dan bermanfaat. Tambahan lagi, 55.9% menyatakan kesediaan tinggi untuk mencadangkan pengalaman ini kepada orang lain yang berminat terhadap warisan budaya tempatan.

Rajah 3 menunjukkan tahap kepuasan hati pengguna terhadap pengalaman permainan ini.



Rajah 3. Tahap Kepuasan Pengguna terhadap Permainan E-Pasar Karat

Dari aspek kesesuaian tema dan kandungan, 47.1% responden menyatakan mereka kini lebih yakin untuk mengenali elemen budaya tempatan seperti Pasar Karat, manakala 41.2% bersetuju bahawa pengalaman ini membantu mereka menghargai budaya dengan lebih baik.

Reka bentuk visual dan elemen interaktif permainan juga dianggap sesuai dengan tahap umur dan pemahaman pengguna.

Kajian ini menggunakan pendekatan statistik deskriptif untuk mengenal pasti tahap kepuasan dan kefahaman pengguna. Tambahan pula, analisis lanjut boleh mengenal pasti hubungan antara faktor demografi seperti umur atau jantina dengan tahap kepuasan, pemahaman, dan kesediaan untuk mencadangkan pengalaman ini kepada orang lain.

Seterusnya, dalam aspek kesedaran budaya, 97.1% responden menyatakan bahawa pemahaman mereka terhadap Pasar Karat bertambah selepas mengalami permainan ini, dan tiada responden yang tidak bersetuju. Hal ini membuktikan bahawa pendekatan digital interaktif seperti E-Pasar Karat berkesan dalam menyampaikan nilai budaya tempatan secara menarik dan mudah diakses oleh generasi muda.

Peningkatan pemahaman yang dilaporkan oleh responden sejajar dengan Teori Pembelajaran Pengalaman (Experiential Learning Theory) yang dikemukakan oleh Kolb (1984). Teori ini menyatakan bahawa pembelajaran berlaku secara berkesan apabila individu terlibat secara aktif dalam pengalaman yang membolehkan mereka membuat pemerhatian, refleksi, dan pengaplikasian konsep. Dalam konteks ini, permainan E-Pasar Karat menyediakan pengalaman maya yang interaktif yang membolehkan pengguna meneroka elemen budaya secara langsung. Selain itu, teori kehadiran (Presence Theory) turut menyokong keberkesanan pendekatan ini, di mana perasaan kehadiran dalam persekitaran maya meningkatkan keterlibatan emosi dan pemahaman terhadap kandungan budaya. Namun begitu, kajian ini turut mempunyai keterbatasan seperti bilangan sampel yang kecil dan penggunaan kaedah penilaian kendiri, yang perlu diambil kira dalam penafsiran dapatan.

4. Kesimpulan

Kajian ini membuktikan bahawa pendekatan digital melalui permainan interaktif E-Pasar Karat berupaya menjadi medium yang berkesan dalam memelihara dan menyebarkan elemen warisan budaya tempatan. Melalui dokumentasi visual, pembangunan aset 3D, dan integrasi ke dalam enjin Unreal Engine, prototaip permainan ini berjaya menampilkan suasana sebenar Pasar Karat secara maya (Rajah 4).

Penilaian pengguna menunjukkan peningkatan signifikan dalam tahap pemahaman dan kesedaran terhadap nilai budaya pasar warisan. Majoriti responden memberi maklum balas positif terhadap pengalaman visual, interaktif dan mesej budaya yang disampaikan.

Kajian ini mencadangkan beberapa penambahbaikan untuk versi akan datang, antaranya termasuk integrasi watak bukan pemain (NPC) dengan dialog budaya, elemen gamifikasi seperti kuiz dan ganjaran, serta penggunaan teknologi realiti maya (VR) dan versi mudah alih untuk capaian lebih luas. Selain itu, kerjasama dengan komuniti dan pakar warisan juga penting bagi memperkukuh kandungan.

Secara keseluruhan, E-Pasar Karat menunjukkan potensi besar sebagai alat pendidikan budaya yang inovatif. Pendekatan ini bukan sahaja menyumbang kepada pemeliharaan warisan tetapi juga menghubungkan masyarakat moden dengan identiti sejarah negara secara lebih relevan dan menarik.

Rajah 4. Paparan persekitaran maya E-Pasar Karat dalam Unreal Engine 5.5

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PEMBANGUNAN ASET 3D KERIS SELATAN BAGI PEMULIHARAAN WARISAN BUDAYA MELAYU MENGGUNAKAN APLIKASI REALITI TERIMBUH (AR) DALAM KALANGAN GENERASI MUDA

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Abstrak

Warisan budaya Keris Selatan semakin pudar dalam masyarakat moden, terutamanya dalam kalangan generasi muda yang kurang memahami adab dan fungsi keris akibat kekurangan pendedahan di media sosial. Kajian ini bertujuan mengenal pasti adab dan fungsi Keris Selatan serta membangunkan aplikasi Realiti Terimbuh (AR) lengkap dengan penerangan proses pembuatan bagi meningkatkan kesedaran dan minat generasi muda terhadap warisan budaya ini. Projek pembangunan AR Karissa melibatkan reka bentuk model 3D menggunakan perisian 3ds Max dan Substance, penghasilan video penerangan, serta integrasi kandungan ke dalam aplikasi AR melalui platform WorldCast. Kajian ini menilai tahap kefahaman, keberkesanan, pengalaman pengguna, dan kesesuaian kandungan AR Karissa dalam kalangan generasi muda berumur 13 hingga 26 tahun. Kajian mencadangkan pengembangan kandungan interaktif dan penggunaan media sosial secara meluas sebagai strategi pemuliharaan warisan Keris Selatan.
Kata kunci: Keris, Warisan Budaya Melayu, Realiti Terimbuh (AR), Model 3D, Pemuliharaan Budaya

1. Pengenalan

Keris adalah warisan budaya Melayu yang penting sebagai senjata tradisional dan simbol identiti. Namun, pembuatan dan nilai keris semakin dilupakan akibat kurangnya pendedahan dan kekurangan tenaga mahir (Pak Mazin, 2020; Siti Nadhirah, 2021). Fungsi keris juga berubah dalam masyarakat moden dan sering disalah tafsir (Nor Afian Yusof et al., 2022). Selain itu, generasi muda kurang berminat kerana kurang kesedaran melalui media sosial dan pendidikan (Abdul Hannan Ismail, 2025).

Kekurangan pendedahan mengenai pembuatan Keris Selatan yang berkualiti berpunca daripada warisan yang semakin dilupakan (Pak Mazin, 2020), kesukaran menguasai ilmu besi tradisional (Shuhairimi et al.), kekurangan tenaga mahir (Siti Nadhirah, 2021), dan cabaran mendapatkan bahan besi yang semakin sukar (Mohd Rusdy, 2025). Nilai dan fungsi keris dalam masyarakat moden semakin pudar, sering disalah tafsir, hilang adab penggunaannya, serta kini hanya dianggap sebagai artifak sejarah dan terhad penggunaannya dalam seni silat (Nor Afian Yusof et al., 2022). Simbolik keris semakin kabur dalam kalangan generasi muda (Mohd Rusdy, 2025), manakala amalan mandi keris yang kerap dikaitkan dengan kepercayaan mistik, menyebabkan warisan ini semakin terasing. Kurangnya pendedahan dalam media sosial dan institusi pendidikan turut menyumbang kepada penurunan minat pelajar terhadap keris sebagai warisan budaya yang perlu dipelihara (Abdul Hannan Ismail, 2025; Anissa Afni Ahmad Shohor et al., 2022).

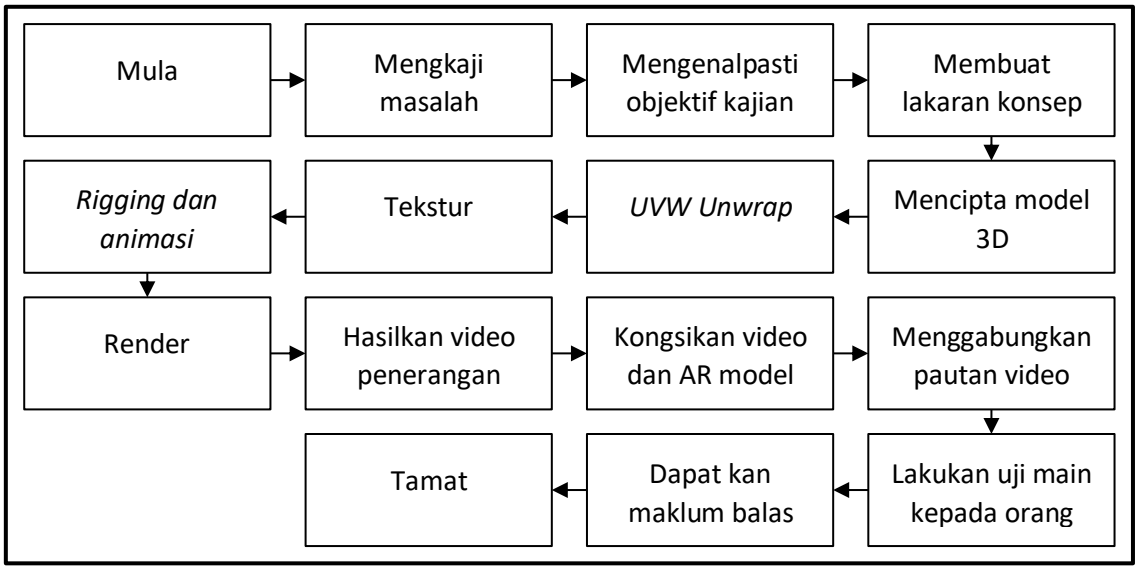
Kajian ini bertumpu kepada persoalan mengenai bagaimana adab dan fungsi Keris Selatan dapat dikenal pasti dalam konteks masyarakat moden, sejauh mana keberkesanan penggunaan Realiti Terimbuh (AR) Keris Selatan dengan penerangan proses pembuatannya dalam usaha meningkatkan kesedaran generasi muda terhadap seni pembuatan keris, serta

bagaimana penggunaan AR dan video penerangan yang dikongsi di media sosial dapat memberi impak terhadap minat pelajar sekolah dalam menghargai dan memelihara warisan Keris Selatan.

Kajian ini bertujuan untuk mengenal pasti adab dan fungsi Keris Selatan bagi memberi kesedaran kepada masyarakat moden, menghasilkan Realiti Terimbuh (AR) Keris Selatan dengan penerangan proses pembuatannya sebagai usaha meningkatkan kesedaran generasi muda terhadap seni pembuatan Keris Selatan, serta menganalisis keberkesanan penggunaan AR dan video penerangan yang dikongsi di media sosial untuk meningkatkan minat pelajar sekolah terhadap warisan ini.

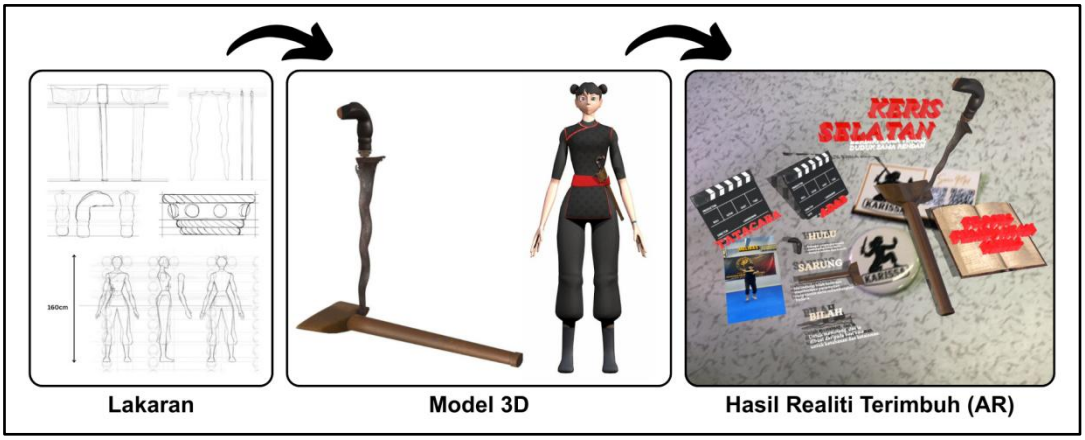
2. Metodologi

Kajian ini menggunakan pendekatan kualitatif dan kuantitatif secara berfasa, bermula dengan analisis artikel, temu bual pakar, dan soal selidik bagi merumuskan objektif pembangunan AR Karissa. Proses pembangunan melibatkan fasa praproduksi (lakaran konsep), produksi (model 3D, tekstur, animasi), dan pascaproduksi (penyatuan video dan AR dalam WorldCast). Seramai 30 responden, majoritinya pelajar sekolah di Selangor, dinilai menggunakan soal selidik Likert lima mata, dengan respons skala 4 dan 5 dikira sebagai persetujuan positif. Penilaian kualitatif turut melibatkan tiga pakar 3D untuk mendapatkan maklum balas teknikal dan visual produk.



Rajah 1. Carta Alir Proses Pembangunan Projek

Rajah 1 menunjukkan proses pembangunan 'Projek AR Karissa' yang dimulakan dengan mengenal pasti masalah melalui artikel, temu bual, dan soal jawab, diikuti dengan merumuskan objektif kajian untuk menyelesaikan masalah tersebut. Projek ini dirancang dengan membuat lakaran konsep serta gaya visual aset 3D sebelum mencipta model 3D menggunakan perisian 3ds Max, diikuti proses UVW Unwrap dan penambahan tekstur pada model. Seterusnya, rigging karakter 3D serta animasi aset 3D Keris Selatan dan karakter dilakukan, sebelum merender animasi untuk menghasilkan video tatacara penggunaan keris. Video penerangan tentang adab dan cara pembuatan keris juga dihasilkan berdasarkan rujukan yang dikaji. Setelah video siap, ia dikongsi di media sosial bersama model AR 3D Keris Selatan yang dibangunkan menggunakan WorldCast. Setelah semua objektif kajian berjaya disiapkan, pautan video dan model AR 3D Keris Selatan digabungkan dalam WorldCast sebagai menu utama 'AR Karissa'. Ujian main AR Karissa dilakukan melibatkan 30 orang awam serta 3 orang pakar 3D, dan maklum balas diperoleh daripada mereka.



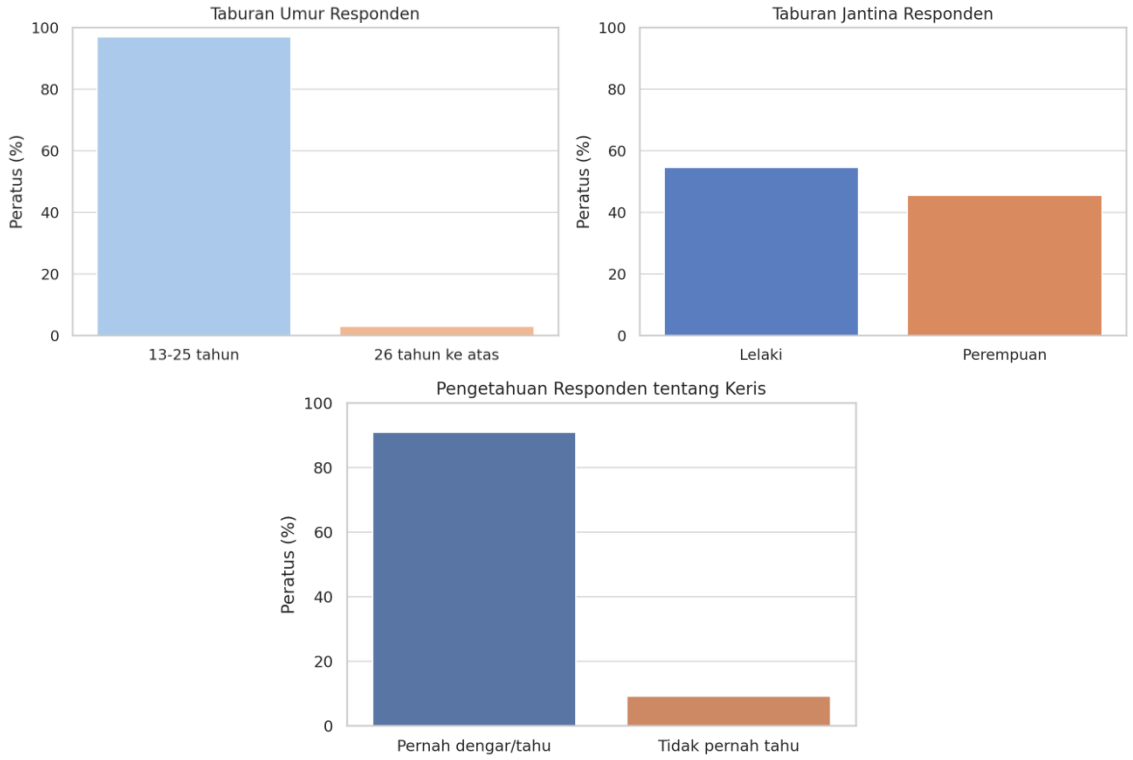
Rajah 2. proses AR Karissa

Rajah 2 menunjukkan lakaran aset Keris Selatan dan karakter yang digunakan bagi penghasilan model 3D untuk kegunaan dalam AR dan video.

Projek AR Karissa dibangunkan melalui beberapa peringkat, bermula dengan mengenal pasti masalah berkaitan keris menerusi kajian artikel, temu bual pakar dan soal selidik orang awam, diikuti dengan perumusan objektif kajian. Fasa praproduksi melibatkan lakaran konsep, perancangan visual, dan penciptaan reka bentuk Keris Selatan. Model 3D poligon rendah dan tinggi dihasilkan menggunakan 3ds Max, diikuti proses UVW Unwrap, tekstur, rigging, dan animasi. Video penerangan berkaitan keris turut dihasilkan dan digabungkan bersama model AR dalam platform WorldCast. Produk AR Karissa kemudian diuji oleh pengguna awam dan pakar untuk mendapatkan maklum balas bagi penambahbaikan. Rajah 1 menunjukkan lakaran aset Keris Selatan dan karakter sebagai asas penghasilan model 3D untuk kegunaan dalam video dan Realiti Terimbuh (AR).

3. Dapatan dan Perbincangan

Kajian ini dijalankan bagi menilai keberkesanan produk AR Karissa yang mempersembahkan model 3D Keris Selatan dalam usaha memelihara dan mempromosikan warisan budaya kepada golongan muda. Kajian ini melibatkan analisis demografi audiens sasaran, maklum balas pengguna terhadap kefahaman dan interaksi dengan produk, serta penilaian teknikal oleh pakar 3D bagi memastikan kualiti visual yang autentik. Melalui pelbagai aspek penilaian, dapatan kajian memberikan gambaran menyeluruh tentang tahap penerimaan, kefahaman, dan kesediaan audiens terhadap penggunaan teknologi Realiti Terimbuh dalam mengenali keris sebagai salah satu simbol penting dalam budaya tempatan.



Rajah 3: Carta bar Analisis demografi responden dari kajian AR Karissa

Analisis demografi menunjukkan 97% responden berumur 13–25 tahun dan 3% berumur 26 tahun ke atas, dengan agihan jantina seimbang antara lelaki (54.5%) dan perempuan (45.5%). Sebanyak 90.9% responden pernah mengetahui tentang keris, manakala 9.1% tidak pernah mengetahuinya. Kajian turut melibatkan tiga pakar 3D untuk menjamin ketepatan visual model, menunjukkan bahawa audiens memiliki pendedahan asas terhadap keris, namun pemahaman mereka masih terhad.
Tiga individu berpengalaman dalam industri dan akademik memberikan maklum balas positif terhadap reka bentuk AR 3D Keris Selatan. Ts. Abdul Hanan Bin Ismail menilai reka bentuk sebagai baik tanpa isu besar, manakala Sakinah Binti Mazuki mencadangkan variasi persembahan seperti keris disilangkan dengan sarung dan menasihatkan agar latar putih atau hitam dielakkan. Muhammad Arif Bin Mohd Othman pula menegur kepadatan poligon pada hulu keris yang menjejaskan topologi, mencadangkan rujukan bentuk kunai agar bilah lebih seimbang, serta menekankan kepentingan menyesuaikan penggunaan poligon mengikut tujuan projek. Secara keseluruhan, mereka menyarankan penambahbaikan dari aspek teknikal dan visual.

Dapatan kajian menunjukkan AR Karissa berjaya mempromosikan warisan budaya secara interaktif melalui teknologi Realiti Terimbuh, dengan majoriti responden muda menunjukkan kefahaman dan minat yang tinggi selepas mengimbas kod QR serta menonton video dan model 3D. Responden turut memberikan maklum balas positif dari segi motivasi dan pengalaman pengguna yang menyeronokkan. Penilaian pakar industri dan akademik mengesahkan asas reka bentuk model 3D kukuh, namun mencadangkan penambahbaikan dari aspek teknikal dan visual. Secara keseluruhan, AR Karissa berpotensi sebagai medium digital yang efektif dalam pendidikan dan promosi budaya, dengan ruang penambahbaikan untuk menjadikannya lebih relevan dan berdaya saing.

Cadangan bagi penambahbaikan projek AR Karissa adalah menumpukan kepada pengoptimuman topologi model 3D untuk menghasilkan visual yang lebih halus dan lancar, penghasilan video penerangan interaktif yang memperjelas proses pembuatan Keris Selatan, serta memperkasakan promosi melalui media sosial bagi menarik minat pelajar dan

masyarakat muda terhadap warisan budaya ini. AR Karissa menghadapi beberapa kekangan teknikal seperti kepadatan poligon, kesukaran tekstur, dan isu prestasi peranti rendah, namun kekuatannya terletak pada pendekatan kaedah campuran, penglibatan pakar 3D, dan ujian pengguna sebenar, serta berpotensi besar untuk dikembangkan sebagai alat pendidikan interaktif dan pemuliharaan warisan budaya melalui integrasi dalam kurikulum dan promosi digital.

4. Kesimpulan

Secara keseluruhannya, projek AR Karissa telah mencapai kejayaan yang memberangsangkan dalam memperkenalkan dan memelihara warisan budaya keris kepada golongan muda melalui teknologi Realiti Terimbuh (AR) yang interaktif dan mudah difahami. Maklum balas daripada 30 orang awam, khususnya pelajar sekolah di zon Selangor, menunjukkan tahap kefahaman, keseronokan, dan motivasi yang tinggi dalam menggunakan produk ini untuk mendalami warisan budaya tempatan. Penilaian oleh tiga pakar 3D daripada latar belakang industri dan akademik mengesahkan kualiti visual dan teknikal model 3D Keris Selatan yang dihasilkan, serta memberikan cadangan bernas yang menyokong penambahbaikan produk. Keberhasilan ini menandakan AR Karissa sebagai alat pendidikan dan platform promosi budaya yang inovatif, relevan, dan menarik minat generasi muda di era digital masa kini. Dengan sokongan maklum balas positif daripada pengguna dan pakar, projek ini membuka peluang luas untuk pembangunan lanjut yang berkualiti dan berimpak tinggi pada masa hadapan.

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DEVELOPING EDUCATIONAL VISUAL NOVEL GAME TO-DAY FOR PRIMARY SCHOOL STUDENTS IN KEPONG, KUALA LUMPUR

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Abstract

This project aims to develop a digital educational game as a visual novel to assist Malaysian primary school students in improving essential English language skills, particularly in reading, spelling, grammar, and vocabulary. The main issue addressed is the lack of student interest in traditional teaching methods and the challenges many children face when learning English through conventional classroom approaches. The objective is to design a fun and engaging educational game that boosts motivation and supports language acquisition among young learners while evaluating its effectiveness in enhancing English proficiency. Developed using Ren'Py Studio, the game incorporates engaging 2D visual assets and interactive storytelling to create an accessible and enjoyable learning experience. Data is collected through surveys and literature reviews, and the game's impact is assessed through playtesting sessions with students. Findings suggest that the game has a positive effect on improving language skills and increasing learner motivation. It is recommended that the game be further developed into a mobile version to enhance accessibility and introduce a tiered level system, allowing students to progress gradually and systematically in their English language learning journey.
Keywords: Visual Novel Game; Game-based learning; 2D visual.

1. Introduction

Mastering English remains a significant challenge for many Malaysian primary school students, despite policies requiring up to 50% of instruction in English (Saradha, 2021). Common difficulties include weak vocabulary, grammar, pronunciation, and sentence construction, often worsened by dull teaching methods, limited practice, and teachers' lack of confidence. Many students prioritise their mother tongue in a multilingual setting, leading to poor English foundations and low motivation.

Research by Rozana Abdul Rahim and Hamidah Abdul Hamid (2021) shows that students struggle to recall or pronounce English words due to ineffective teaching. Siva Selan (2021) found that limited speaking opportunities lower students' confidence, while Tara Thiagarajan (2018) noted that some students lack motivation, believing Bahasa Melayu is sufficient. These factors contribute to low engagement and poor English performance.

Traditional classroom methods fail to engage today's digital-native learners. Without interactive, student-centered tools, students lose interest in reading, vocabulary, spelling, and speaking practice. Studies suggest early exposure, engaging visuals, and active learning environments can improve language skills and boost motivation (Rahim & Hamid, 2021; Selan, 2021; Thiagarajan, 2018). This study examines the challenges faced by Malaysian primary students in learning English and explores whether an educational video game can improve their proficiency. The game focuses on reading, vocabulary, grammar, spelling, and speaking through visual storytelling and interactive gameplay, while evaluating its impact on student motivation and engagement.

2. Methodology

The study began with a literature review of academic journals, educational articles, and Malaysian curriculum guidelines on English language learning. This helped identify learning challenges and effective teaching methods. Data were collected from 30 primary Kepong students aged 7–12 through face-to-face playtesting, followed by a feedback form. The students represented various backgrounds to ensure a broader perspective on English learning experiences.

The development process started with defining the game's concept, goals, and framework, guided by early research and analysis. A Game Design Document (GDD) outlined the gameplay and learning flow. Visual and audio assets were created and refined through sketching, design iteration, and user testing. Feedback from playtests helped shape the final assets, which were prepared for game integration.

The game was developed using Ren'Py, beginning with scriptwriting and narrative planning based on Bloom's Taxonomy. Visuals were digitally illustrated, sound effects were added, and coding was done to track learning progress. After testing and debugging, the final version was polished and packaged as a complete educational visual novel.

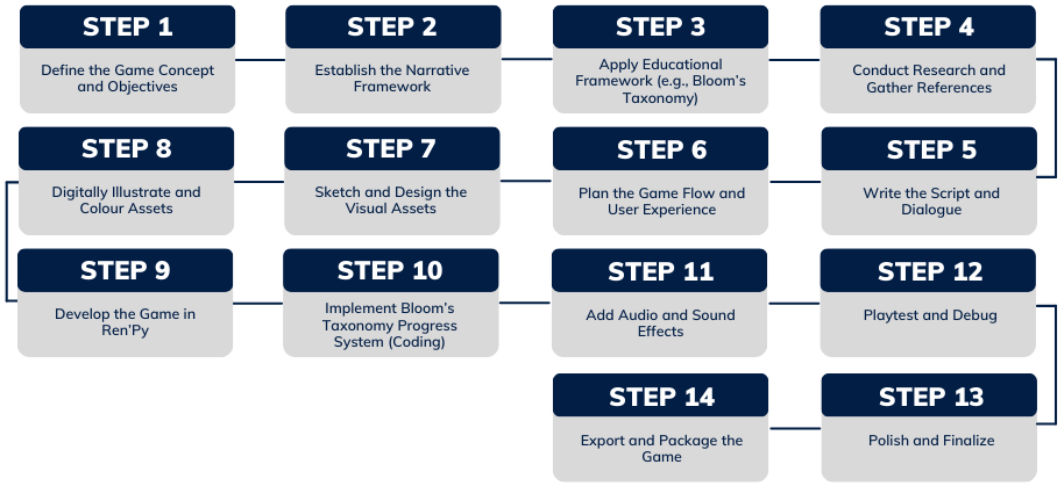

Fig. 1. Game Development Flowchart

The development of the educational visual novel game began with defining its core concept, narrative, and learning objectives, guided by Bloom's Taxonomy. Research supported the scriptwriting process, while visual assets were sketched, illustrated, and colored to fit the game's theme. The game was built in Ren'Py, with coded systems to track player progress through Bloom's six cognitive levels. Players engage in interactive scenes that combine story-driven dialogue with English learning tasks, including multiple-choice and open-ended questions. Simple navigation, added sound effects, and clear feedback make the game accessible and engaging for primary school students.

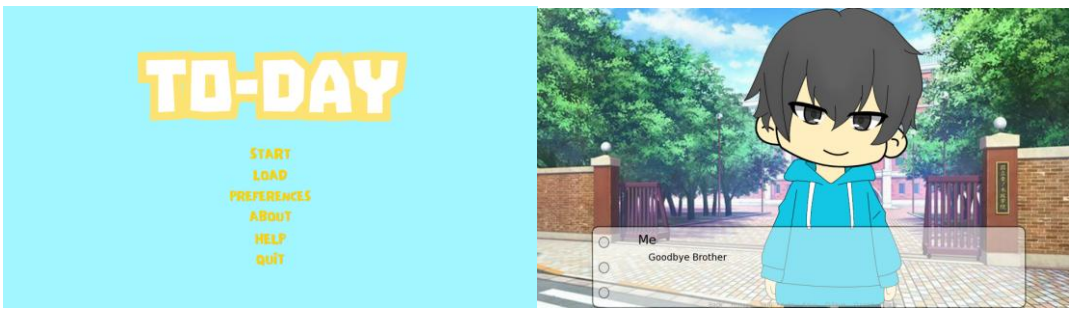

Fig. 2. In-game Screenshot

3. Results and discussion

Respondents overall showed positive acceptance of this game, averaging 70% strongly agreeing that it was fun, beneficial, and appropriate for their level. This is in line with the studies of Rahim and Hamid (2021), Selan (2021), and Thiagarajan (2018), which emphasise the effectiveness of interactive, engaging tools in enhancing English language learning among young students. This suggests that game-based learning can improve core language skills and increase student motivation and enjoyment in the learning process.

A Google Form containing questions about the challenges of learning English was distributed, and 22 respondents aged 7 to 12 participated. The highest number of respondents was 10 and 11 years old (22.7% each), followed by 9 and 8 years old (13.6% each) and both 7 and 12 years old (13.6% each).

When asked about reading difficulties, 54.5% of students said they read slowly, 40.9% did not understand the words, and 31.8% could not say the words correctly. This shows that fluency and vocabulary are key challenges. For spelling, 68.2% said some words were too hard to spell, and 40.9% often forgot spellings. Another 36.4% struggled with spelling rules and recognising letter sounds. These results suggest the need for phonics-based support and interactive spelling activities.

In writing, 59.1% did not know what to write about, 50% struggled with spelling, 45.5% had trouble starting sentences, and 40.9% found it hard to make long sentences. Writing prompts, sentence-building tasks, and scaffolded exercises can help students express themselves more effectively. Regarding learning preferences, 72.7% preferred learning through games, 63.6% through videos, and 59.1% through music. Only 31.8% preferred reading books, and just 4.5% enjoyed writing stories. These results support the use of a novel visual format with interactive elements, animation, and audiovisual aids to match students' interests.

The second study involved a playtest survey with 30 students from seven schools, with the largest group from SK Kepong Baru (33.3%). Most participants were male (60%), and while 50% had occasionally played educational games, 43.3% had never played one before, highlighting a low level of exposure to such tools.

The majority of students responded positively to the game. A significant number, 63.3%, strongly agreed that they felt motivated to continue playing. Regarding the game's enjoyment and usefulness, 100% of respondents strongly agreed that the game was both beneficial and enjoyable. In terms of building confidence in using English, 93.3% strongly agreed that they felt more confident after playing. Lastly, 93.3% of respondents indicated they would recommend the game to others. These results suggest that the TO-DAY visual novel was well-received and positively impacted on students' motivation, enjoyment, and willingness to recommend it to others.

Feedback on the content was somewhat varied. While 30% of respondents strongly agreed that the content was appropriate for their age and skill level, 23.3% disagreed. Regarding the effectiveness of the game in helping solve language-related problems such as grammar and vocabulary, 53.3% of respondents strongly agreed that the game was helpful. In terms of improving their skills in the targeted problem areas after playing the game, 50% of respondents strongly agreed that they had experienced improvement, while 13.3% agreed. These findings suggest that the game was largely effective in supporting language learning.

Based on the findings, most respondents agreed that the game's goals and objectives were easy to understand, with 80% strongly agreeing and 6.7% agreeing. In terms of the gameplay experience, 80% of respondents also strongly agreed that the game ran smoothly and was not confusing, with 10% agreeing. This indicates a generally positive reception towards the

game's clarity and functionality. A high percentage, 86.7%, of respondents strongly agreed that they understood what to do before starting the game, and 3.3% agreed. The results suggest that most students found the game's onboarding process clear and accessible.

4. Conclusion

In conclusion, the visual novel-based educational game is an effective and engaging method for supporting English language learning among Malaysian primary school students. By incorporating Bloom's Taxonomy into its structure, the game successfully addressed different levels of cognitive learning, from remembering to creating. Most students reported that they enjoyed the experience, understood the objectives, and felt more confident in their English skills after playing. Additionally, the game encourages active participation, problem-solving, and critical thinking in a fun and age-appropriate format. These findings underscore the potential of game-based learning as a valuable complement to traditional classroom methods, particularly for young learners who benefit from interactive and story-driven content.

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PEMBANGUNAN PERMAINAN DIGITAL UNTUK MENGEJA SUKU KATA TERTUTUP (KVK) DALAM KALANGAN MURID TAHAP 1 SEKOLAH RENDAH DI KUALA LUMPUR

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Abstrak

Pelajar sekolah rendah sering menghadapi kesukaran dalam mengeja suku kata tertutup (KVK) dalam bahasa Melayu. Isu utama yang dikenal pasti ialah kurangnya minat terhadap kaedah pembelajaran tradisional serta kesukaran dalam mengenal dan mengeja perkataan berbentuk KVK. Bagi mengatasi isu ini, satu permainan digital pendidikan yang dinamakan *"Sugar Smash"* telah dibangunkan bagi membantu pelajar menguasai kemahiran mengeja suku kata tertutup dengan lebih menyeronokkan. Objektif kajian ini adalah untuk membangunkan permainan digital berbentuk pendidikan berasaskan KVK, meningkatkan minat dan motivasi pelajar sekolah rendah dalam pembelajaran ejaan serta menilai keberkesanan permainan dalam membantu penguasaan kemahiran tersebut. Permainan ini dibina menggunakan elemen visual 2D dan 3D yang menarik serta dibangunkan dengan enjin permainan *Unity*. Kaedah pengumpulan data melibatkan soal selidik dan kajian literatur, manakala keberkesanan permainan dinilai melalui sesi ujian permainan (*Playtest*). Kajian menunjukkan majoriti murid memberikan maklum balas positif terhadap permainan Sugar Smash yang menggunakan aset 2D dan 3D, membantu mereka menguasai kemahiran mengeja suku kata tertutup (KVK) dengan lebih yakin dan meningkatkan minat serta pencapaian akademik. Kajian turut mencadangkan pembangunan versi mudah alih permainan ini, dengan pelbagai peringkat kesukaran serta integrasi teknologi pengenalan suara untuk membantu murid mengeja dan menyebut perkataan secara interaktif dan berkesan.
Kata kunci: Kemahiran Mengeja; Suku Kata Tertutup (KVK); Permainan Digital.

1. Pengenalan

Masalah penguasaan kemahiran mengeja dalam kalangan murid sekolah rendah, terutamanya bagi perkataan yang mengandungi suku kata tertutup (KVK), semakin membimbangkan. Kajian oleh (Rashidah Elias dan Senana Sulaiman, 2020) mendapati bahawa murid menghadapi kesukaran dalam membunyikan serta mengeja perkataan seperti *teratak* dan *sekolah*. Tambahan pula, pengaruh penggunaan telefon bimbit dan kecenderungan terhadap kandungan digital menyebabkan kaedah pembelajaran tradisional yang berasaskan buku teks dan pengajaran sehala kurang berkesan serta membosankan (Azura dan Zakaria, 2009), sekaligus menjejaskan penguasaan asas literasi.

Beberapa kajian lampau turut menunjukkan bahawa murid belum mencapai tahap kemahiran membaca dan mengeja yang memuaskan (Nurul Amisya Nabila Jaafar & Munirah Mohd Yusof, 2024). Hal ini dipercayai berpunca daripada pendekatan pengajaran konvensional yang kurang interaktif serta melemahkan motivasi murid untuk belajar (Azura dan Zakaria, 2009). Seiring dengan perkembangan teknologi, pendekatan pembelajaran berasaskan permainan digital dilihat mampu meningkatkan pencapaian akademik dan minat belajar murid (Chang et al., 2012; Meluso et al., 2012; Siew et al., 2016). (Cheung dan Slavin, 2013) juga menyokong penggunaan teknologi pendidikan untuk memperkukuh kemahiran literasi, manakala Mohd Khalil bin Mohammad Noor dan Hammadah bin Abdul Rahman mendapati

bahawa permainan seperti puzzle interaktif boleh membantu meningkatkan penguasaan perkataan KVK.

Oleh itu, kajian ini dijalankan bagi mengenal pasti tahap penguasaan murid sekolah rendah dalam mengeja perkataan KVK serta menilai keberkesanan permainan digital *Sugar Smash* sebagai satu pendekatan interaktif dalam membantu penguasaan tersebut. Kajian ini juga bertujuan menghasilkan aset permainan digital yang direka khas untuk merangsang minat dan meningkatkan kemahiran mengeja dalam kalangan murid Tahap 1 sekolah rendah.

2. Metodologi

Sugar Smash ialah permainan digital yang dibangunkan untuk membantu murid Tahap 1 (berumur 7 hingga 9 tahun) meningkatkan kemahiran mengeja, khususnya perkataan dengan suku kata tertutup (KVK) dalam Bahasa Melayu. Kajian ini menggunakan dua set soal selidik – sebelum dan selepas pembangunan permainan – bagi mengenal pasti masalah ejaan serta menilai keberkesanan pendekatan digital dalam pembelajaran. Projek ini dibahagikan kepada tiga fasa utama: Pra-Pembangunan, Pembangunan, dan Pasca-Pembangunan.

Beberapa perisian digunakan dalam pembangunan permainan. *Blender* digunakan untuk membuat model 3D, manakala *Substance 3D Painter* digunakan untuk menambah warna dan tekstur pada model. Elemen grafik seperti ikon dan butang direka menggunakan *Adobe Illustrator*. Semua elemen kemudiannya digabung dalam Unity, iaitu enjin permainan utama yang digunakan untuk membina dan menguji permainan.

Dalam Fasa Pra-Pembangunan, soal selidik awal digunakan untuk mengenal pasti masalah ejaan murid. Kajian rujukan turut dijalankan bagi merancang reka bentuk awal permainan. Fasa Pembangunan melibatkan pembinaan model 3D dan antara muka pengguna. Model diratakan melalui proses unwrap bagi membolehkan tekstur disusun dengan betul. Fasa Pasca-Pembangunan melibatkan ujian permainan bersama murid serta soal selidik akhir menggunakan Google Form. Maklum balas yang diterima digunakan untuk menambah baik permainan.

Cara bermain *Sugar Smash* bermula dengan pemain berada di skrin utama dan menekan butang “Mula” untuk memulakan permainan. Pemain perlu menaip perkataan yang dipaparkan di skrin sambil menghadapi musuh yang bergerak ke arah mereka. Pemain mempunyai lima nyawa dan setiap kesalahan menaip perkataan akan mengurangkan nyawa tersebut. Sekiranya musuh sampai kepada pemain atau semua nyawa habis, permainan akan tamat dan pemain kalah. Sebaliknya, jika pemain berjaya menaip semua perkataan dengan tepat sehingga perkataan terakhir, mereka akan menang dan permainan berakhir dengan kemenangan.

Rajah 1. Paparan Antaramuka Menu Utama *Sugar Smash*

Rajah 2. Paparan Antaramuka Dalam Permainan *Sugar Smash*

3. Dapatan dan Perbincangan

Kajian melibatkan 16 murid berumur antara 7 hingga 9 tahun yang menghadapi cabaran dalam mengeja perkataan suku kata tertutup (KVK), di mana sebahagian besar mengakui perkataan sukar dibaca dan memerlukan bantuan untuk mengingati ejaan. Soal selidik kedua yang dijalankan melalui sesi *Playtest* melibatkan 30 murid Tahap 1 daripada lapan buah sekolah menunjukkan bahawa majoriti murid belum pernah bermain permainan pendidikan sebelum ini. Namun selepas bermain permainan *Sugar Smash*, mereka menunjukkan keyakinan yang lebih tinggi dalam mengeja serta kemampuan yang bertambah baik untuk mengenal pasti perkataan yang mengandungi suku kata tertutup (KVK). Berdasarkan hasil soal selidik yang menggunakan skala Likert 1 hingga 5. Sebanyak 49.6% responden sangat bersetuju bahawa permainan *Sugar Smash* berkesan membantu mereka menguasai kemahiran mengeja, manakala hanya 6.1% responden sangat tidak bersetuju.

Maklum balas positif yang diperoleh daripada soal selidik menunjukkan bahawa penggunaan aset 2D dan 3D dalam permainan Sugar Smash berjaya menarik minat murid serta membantu mereka mengatasi kesukaran mengeja suku kata tertutup, sejajar dengan penemuan Salbia Hassan (2016) dan (Rashidah Elias dan Senana Sulaiman, 2020) yang menegaskan bahawa bunyi vokal dalam suku kata tertutup sukar dibunyikan dan dieja. Kejayaan ini turut menyokong kajian terdahulu oleh (Azura dan Zakaria, 2009) dan Chang et al. (2012) yang menunjukkan bahawa pembelajaran berasaskan permainan digital dapat meningkatkan motivasi dan minat murid dalam pembelajaran. Penggunaan aset 3D memberikan elemen interaktif dan visual yang menarik, meningkatkan pengalaman pembelajaran secara holistik walaupun cabaran reka bentuk perlu diambil kira (Cheung dan Slavin, 2013).

4. Kesimpulan

Kajian ini menunjukkan bahawa permainan *Sugar Smash* berkesan membantu pelajar sekolah rendah menguasai kemahiran mengeja suku kata tertutup (KVK) dalam Bahasa Melayu. Majoriti responden memberikan maklum balas positif terhadap peningkatan kemahiran, motivasi, dan kefahaman mereka. Penggunaan aset 2D dan 3D yang jelas dan menarik memudahkan pembelajaran secara menyeluruh. Cadangan seperti pembangunan versi mudah alih dan pembahagian peringkat kesukaran dapat memperluaskan capaian dan mengekalkan minat murid, manakala integrasi teknologi pengenalan suara berpotensi meningkatkan kemahiran sebutan secara interaktif. Walaupun terdapat cabaran seperti kebergantungan kepada komputer, versi mudah alih dijangka mengatasi halangan ini serta menyumbang kepada inovasi dalam permainan pendidikan Bahasa Melayu yang relevan dengan gaya hidup pelajar masa kini.Kajian ini membuktikan bahawa integrasi elemen gamifikasi mampu menyokong literasi awal dan menyumbang kepada inovasi pedagogi digital dalam pendidikan rendah.

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KAJI SELIDIK PERSEPSI AHLI DAN BUKAN AHLI DH TERHADAP PERANAN KESATUAN BERKAITAN KEBAJIKAN PEGAWAI DALAM GRED DH

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Abstrak

Kajian ini dijalankan untuk meninjau persepsi ahli dan bukan ahli terhadap peranan Kesatuan DH dalam aspek kebajikan pekerja, khususnya dari sudut keselamatan dan kesihatan pekerjaan (KKP). Kesatuan DH yang ditubuhkan pada 22 Oktober 2010 memainkan peranan sebagai penghubung antara pekerja dan pihak pengurusan, serta memperjuangkan kebajikan, keselamatan, dan kesejahteraan ahlinya. Kajian ini menggunakan pendekatan gabungan kuantitatif dan kualitatif (explanatory design). Seramai 142 responden terlibat dalam soal selidik, manakala lima orang informan ditemu bual bagi memperkukuh data. Dapatan kajian menunjukkan bahawa tidak terdapat perbezaan ketara dalam persepsi antara ahli dan bukan ahli terhadap peranan kesatuan, sokongan pihak berkepentingan serta isu keselamatan dan kesihatan pekerjaan. Namun, maklum balas responden dan temubual menunjukkan bahawa kesatuan berperanan penting dalam menyuarakan isu tempat kerja termasuk aspek keselamatan fizikal, kesihatan mental dan persekitaran kerja. Kajian ini menyimpulkan bahawa kesatuan sekerja masih relevan dan signifikan dalam mewujudkan persekitaran kerja yang lebih selamat, sihat, dan kondusif. Kerjasama strategik antara kesatuan dan pihak pengurusan perlu terus diperkukuh demi kesejahteraan warga kerja institusi.
Kata kunci: Keselamatan dan Kesihatan Pekerjaan; Peranan Kesatuan; Kebajikan Pekerja.

1. Pengenalan

Kesatuan merupakan elemen asas dalam sesebuah organisasi tanpa mengira saiz atau jenisnya kerana ia merangkumi perpaduan dan kerjasama dalam kalangan anggota ke arah pencapaian matlamat bersama (Gaong et al., 2022). Dalam era globalisasi yang penuh dengan cabaran dan persaingan, kesatuan dilihat sebagai salah satu tunjang utama kejayaan organisasi, khususnya dalam membina suasana kerja yang produktif dan harmoni. Kehadiran kesatuan mampu meningkatkan produktiviti, mengurangkan konflik dalaman, dan mewujudkan persekitaran kerja yang kondusif melalui sokongan serta kolaborasi antara anggota (Mafakhir, 2021). Seterusnya, apabila ahli organisasi bekerjasama secara aktif, pelbagai kemahiran dan kepakaran dapat digabungkan sekaligus merangsang inovasi dan pencapaian yang lebih berkesan (Fadillah et al., 2017). Di Malaysia, kesatuan sekerja memainkan peranan penting dalam melindungi hak dan kepentingan pekerja melalui tindakan kolektif, bertindak sebagai pengantara antara pekerja dan majikan serta memperjuangkan aspek kebajikan, keselamatan dan kesejahteraan (Ismail, 2022).

Berdasarkan kepentingan tersebut, kajian ini dijalankan bagi meneliti secara khusus peranan kesatuan sekerja dalam menangani isu kebajikan yang mempengaruhi tahap kepercayaan dan penglibatan pekerja terhadap kesatuan. Selain daripada aspek perlindungan hak, kesatuan turut berperanan dalam membentuk identiti dan budaya organisasi. Melalui kesatuan yang mantap, nilai-nilai dan visi organisasi dapat disampaikan dengan lebih jelas dan berkesan, menjadikan setiap individu dalam organisasi lebih terikat kepada matlamat kolektif. Ini secara tidak langsung dapat meningkatkan tahap motivasi, kepuasan kerja dan penglibatan anggota dalam menjayakan objektif organisasi.

Kesatuan Kebangsaan Pegawai Pendidikan Pengajian Tinggi (KKPPPT) telah ditubuhkan pada 22 Oktober 2010 oleh sekumpulan pegawai pendidikan dalam sektor pengajian tinggi awam sebagai badan sah yang memperjuangkan hak, kebajikan, dan kepentingan profesional warga pendidik (Manual Kesatuan KKPPPT, 2011, hlm. 2). Penubuhan kesatuan ini adalah selaras dengan keperluan mewujudkan satu entiti kolektif yang mampu menjadi suara rasmi kepada pegawai dalam isu-isu berkaitan perkhidmatan, termasuk keselamatan, kesihatan pekerjaan, pembangunan kerjaya dan hubungan majikan-pekerja. Antara objektif utama penubuhan kesatuan ini adalah untuk melindungi kepentingan ahli dalam hal berkaitan perkhidmatan mereka dan memastikan layanan adil serta saksama dalam sistem pekerjaan sektor awam (Manual Kesatuan KKPPPT, Versi 1.0, hlm. 4).Melalui tindakan kolektif dan rundingan rasmi, KKPPPT bukan sahaja menjadi pengantara antara ahli dan pihak atasan, malah juga berfungsi sebagai mekanisme semak dan imbang dalam memperjuangkan keadilan dalam aspek seperti beban kerja, peluang kenaikan pangkat, penyediaan kemudahan kerja, dan perlindungan terhadap diskriminasi. Peranan aktif kesatuan ini membolehkan suasana kerja yang lebih positif, produktif dan berteraskan nilai bersama.

Keselamatan dan kesihatan pekerjaan merupakan aspek penting dalam menjamin kesejahteraan dan produktiviti tenaga kerja, terutamanya dalam persekitaran kerja yang kompleks dan berisiko. Di Malaysia, tanggungjawab ini bukan sahaja digalas oleh majikan dan pihak berkuasa, tetapi turut diperkukuh melalui peranan aktif kesatuan sekerja dalam memperjuangkan hak pekerja. Dalam konteks ini, kesatuan dilihat bukan sekadar badan sokongan, tetapi sebagai entiti strategik yang memperjuangkan keperluan sistematik terhadap standard keselamatan, kesedaran kesihatan, serta perlindungan terhadap risiko pekerjaan. Beberapa kajian terdahulu turut menekankan pentingnya peranan kesatuan dalam menyuarakan kepentingan ahli berkaitan isu keselamatan dan kesihatan di tempat kerja.

Menurut kajian oleh Omar et al. (2019), kesatuan berfungsi sebagai agen penyuarakan suara pekerja terhadap isu-isu tempat kerja yang berisiko, termasuk keadaan persekitaran kerja, penggunaan peralatan yang selamat, serta pelaksanaan latihan keselamatan secara berkala. Kajian (Rahim & Halim, 2020) kesatuan turut terlibat dalam rundingan dengan pihak majikan berkaitan standard keselamatan kerja, penyediaan insurans kemalangan, serta keperluan pemeriksaan kesihatan berkala. Dalam kajian oleh Shamil dan Nasir (2020), didapati bahawa pekerja yang menjadi ahli kesatuan lebih cenderung untuk menyuarakan kebimbangan mereka terhadap risiko keselamatan, kerana mereka merasakan adanya saluran rasmi yang akan melindungi hak mereka daripada sebarang tindakan balas majikan. Ini memperkukuh lagi fungsi kesatuan sebagai pelindung kepada kebajikan fizikal dan mental ahli di tempat kerja. Selain itu, kesatuan juga terbukti memainkan peranan proaktif dalam memberi kesedaran tentang hak pekerja melalui bengkel, risalah dan advokasi berterusan (Gaong et al., 2022), yang memberi impak positif terhadap tahap pematuhan keselamatan dalam organisasi. Oleh itu, peranan kesatuan bukan sekadar bersifat reaktif terhadap insiden, tetapi juga strategik dalam mencegah kemalangan dan memastikan kesejahteraan jangka panjang ahli mereka.

Objektif khusus penulisan ini adalah untuk melihat beberapa perkara iaitu meninjau persepsi ahli dan bukan ahli terhadap peranan kesatuan berkaitan ahli kesatuan, mengenal pasti sokongan pihak berkepentingan terhadap isu keselamatan dan kesihatan pekerjaan dalam membantu kesatuan dan mengenal pasti risiko dan isu kebajikan yang melibatkan masalah keselamatan dan kesihatan pekerjaan.

2. Metodologi

Kajian ini terdiri daripada gabungan kaedah kuantitatif dan kualitatif. Kaedah gabungan ini membabitkan reka bentuk ‘explanatory’ (explanatory design). Creswell (2012) menyatakan bahawa maklumat yang diperoleh daripada kualitatif dapat menyokong dapatan yang

diperoleh dalam kuantitatif. Gabungan kaedah ini juga membolehkan penyelidik memperoleh maklumat secara lebih terperinci dan boleh dipercayai (Creswell, 2012). Dalam reka bentuk ini data kuantitatif dikumpul terlebih dahulu dan diikuti oleh data kualitatif.

Kaedah kuantitatif dipilih untuk menjawab persoalan kajian pertama hingga tiga. Tujuannya adalah untuk meninjau persepsi ahli dan bukan ahli terhadap peranan kesatuan, sokongan pihak berkepentingan dan risiko serta isu yang ada di tempat kerja. Manakala kaedah kualitatif untuk menyokong menjawab persoalan tersebut. Data kualitatif ini juga dianalisis secara mendalam bagi mendapatkan maklumat yang lebih terperinci.

Populasi kajian ini terdiri daripada 942 orang pensyarah di institusi pengajian tinggi awam. Berdasarkan kekangan masa dan sumber, seramai 142 orang pensyarah telah dipilih secara rawak sebagai sampel kajian. Kaedah pensampelan rawak mudah digunakan bagi memastikan setiap individu dalam populasi mempunyai peluang yang sama untuk terlibat dalam kajian ini. Walaupun saiz sampel ini lebih kecil daripada jumlah yang dicadangkan dalam Jadual Krejcie dan Morgan (1970), ia dianggap memadai bagi kajian ini.

Kaedah pensampelan rawak mudah telah digunakan, di mana setiap individu dalam populasi mempunyai peluang yang sama untuk terpilih. Ini bertujuan untuk mengelakkan bias dan memastikan keterwakilan sampel terhadap populasi. Instrumen soal selidik dibina berdasarkan penyesuaian dan adaptasi daripada kajian lepas yang berkaitan dengan kesatuan sekerja, persepsi pekerja dan sokongan organisasi (Ahmad & Nasir, 2018; Noor, 2017). Kesahan muka dan kandungan telah disemak oleh dua orang pakar dalam bidang pengurusan sumber manusia dan metodologi kajian. Kajian rintis telah dijalankan ke atas pensyarah dari tiga buah politeknik di utara Semenanjung Malaysia. Tujuan utama kajian rintis ini adalah untuk melihat kefahaman responden terhadap item soal selidik serta menilai kebolehpercayaan dalaman menggunakan ujian Alpha Cronbach. (Lampiran).

Instrumen soal selidik ini mengandungi 15 item tertutup menggunakan skala Likert 5 mata (1 = Sangat Tidak Setuju, 5 = Sangat Setuju). Instrumen dibahagikan kepada tiga konstruk utama seperti dalam Jadual 1.

Jadual 1. Konstruk item yang digunakan dalam kajian

Konstruk	Bil	Penjelasan Item
Persepsi ahli dan bukan ahli terhadap peranan kesatuan	1	Pihak kesatuan sentiasa mendengar masalah ahli kesatuan/bukan ahli
	2	Pihak kesatuan sentiasa memperjuangkan kebajikan dan kepentingan ahli kesatuan / bukan kesatuan
	3	Pihak kesatuan menyediakan platform untuk cadangan / aduan
	4	Pihak kesatuan memperjuangkan keselamatan dan kesihatan ahli/bukan ahli mengikut akta dan undang-undang
	5	Pihak kesatuan menjadi perantaraan ahli/bukan ahli dengan pihak berkepentingan dalam menjaga kebajikan
Sokongan pihak berkepentingan	6	Pihak majikan sentiasa mendengar masalah pekerja
	7	Pihak majikan menyediakan tempat kerja yang kondusif
	8	Pihak majikan menyediakan tempat kerja yang selamat
	9	Pihak majikan mengutamakan keselamatan dan kesihatan pekerjaan
	10	Pihak majikan memberi sokongan kepada kesatuan dalam menambah baik kesatuan sekerja
Risiko dan isu dalam kebajikan pekerja	11	Tempat kerja sangat selamat dan dapat menarik minat pekerja
	12	Teknologi terkini sentiasa dikemas kini dalam organisasi
	13	Langkah-langkah pencegahan keselamatan sangat diutamakan dalam organisasi
	14	Keadaan tempat kerja serta peralatan diselenggarakan secara sistematik

15	Penyeliaan oleh pihak majikan dilaksanakan secara berkala

Jadual 2. Konstruk dan penjelasan item soal selidik

Konstruk	Bil Item	Penjelasan Item
Persepsi ahli dan bukan ahli terhadap peranan kesatuan	1–5	Kesatuan mendengar isu, memperjuangkan kebajikan, menyediakan platform aduan, menjaga keselamatan, menjadi perantaraan.
Sokongan pihak berkepentingan	6–10	Majikan dengar masalah pekerja, sediakan tempat kerja kondusif dan selamat, beri sokongan kepada kesatuan.
Risiko dan isu dalam kebajikan pekerja	11–15	Tempat kerja selamat, teknologi dikemas kini, penyelenggaraan sistematik, penyeliaan berkala.

Untuk melengkapi data kuantitatif, kajian ini turut melibatkan data kualitatif melalui temubual separa berstruktur. Informan yang dipilih terdiri daripada pihak pengurusan dan wakil kesatuan.

Jadual 3. Maklumat informan temubual

Kaedah	Kategori Informan	Bilangan
Temubual separa berstruktur	Pengarah	1
Temubual separa berstruktur	Presiden Kesatuan	4
Jumlah	–	5

Pengumpulan data berlangsung dari Julai hingga Disember 2024**.** Soal selidik diedarkan secara fizikal dan atas talian kepada responden yang telah dikenalpasti. Temubual dijalankan secara temu janji dengan pihak pengurusan yang bersetuju untuk menjadi informan.Data kuantitatif dianalisis menggunakan perisian SPSS melibatkan statistik deskriptif seperti min, sisihan piawai dan peratusan, serta statistik inferensi untuk menguji hipotesis. Data kualitatif dianalisis secara tematik untuk mengenal pasti corak dan tema berkaitan isu dan persepsi pekerja terhadap kesatuan dan tempat kerja.

3. Dapatan dan Perbincangan

Data yang diperoleh dianalisis menggunakan statistik deskriptif dan inferensi. Semua item mempunyai nilai Cronbach Alpha melebihi 0.7, dan skor min corrected item-total correlation melebihi 0.3. Hal ini menandakan item yang digunakan mempunyai konsistensi dalaman dan kebolehpercayaan yang baik. Nilai Cronbach Alpha untuk keseluruhan item (α=0.944).

Jadual 4. Keputusan ujian kebolehpercayaan ujian rintis

Jadual 3.1: Keputusan Ujian Kebolehpercayaan Ujian Rintis Konstruk	Alpha Cronbach (α)	Bil soalan	Keputusan
Persepsi ahli dan bukan ahli terhadap peranan kesatuan	.972	5	Amat baik
Sokongan pihak berkepentingan	.926	5	Amat baik
Risiko dan isu dalam kebajikan pekerja	.913	5	Amat baik

Ujian statistik deskriptif dan inferensi mudah telah digunakan untuk menganalisis data kajian seperti min dan sisihan piawai sahaja. Data yang diperoleh dianalisis dengan menggunakan teknik yang berbeza bergantung kepada objektif dan persoalan kajian. Bagi instrumen temu bual pula, transkrip temu bual yang telah dibuat, disusun kembali untuk dijadikan data verbatim. Data verbatim ini disusun secara manual untuk dianalisis bagi membina tema dan

sub tema dengan memfokuskan sokongan, risiko dan isu berkaitan kebajikan KKP di tempat kerja. Analisis Deskriptif Dalam kajian yang melibatkan 142 responden, jumlah lelaki dan perempuan adalah berbeza, masing-masing sebanyak 86 orang perempuan dan 56 orang lelaki. Peratus responden perempuan adalah 60.6% perempuan dan 39.4% adalah lelaki. Status perkahwinan bagi responden adalah 133 orang yang berkahwin dengan peratus sebanyak 93.7%, tiga orang janda/duda dengan 2.1% manakala yang masih belum mendirikan rumah tangga adalah enam orang dengan 4.2%. Dari segi umur, 20 orang responden berada dalam kumpulan umur 51 tahun ke atas dengan peratus 14.1%, seramai 20 orang, 70.4% dalam kumpulan umur 41-50 tahun dengan 100 orang, seramai 21 orang iaitu 14.8% dalam kumpulan umur 31-40 tahun. Hanya seorang Sahaja yang berumur 30 tahun ke bawah iaitu 0.7%. Dari segi pendidikan, 0.7% 22 mempunyai kelulusan sekolah menengah, 0.7% memiliki diploma, 42.3% mempunyai ijazah sarjana muda, dan 52.1% memiliki ijazah sarjana dan PhD 4.2 %. Akhir sekali, dari segi tempoh perkhidmatan, 31.7% responden yang bekerja melebihi 21 tahun, 43.7% telah bekerja selama 16-20 tahun. Manakala yang bekerja dari 11-15 tahun adalah 16.9% sementara 4.9% bekerja 6-10 tahun dan hanya empat orang sahaja iaitu 4.9% yang bekerja di bawah lima tahun.

Dapatan demografi ini memberikan gambaran yang jelas mengenai ciri-ciri populasi yang terlibat dengan kesatuan sama ada ahli kesatuan mahupun bukan ahli kesatuan. Demografi responden mencatatkan 60.6% iaitu seramai 86 orang responden telah menyertai kesatuan DH di antara tahun 2019 hingga 2025. Manakala 56 orang responden iaitu 39.4% tidak menyertai kesatuan.

Dapatan Objektif Kajian 1: Meninjau persepsi ahli dan bukan ahli terhadap peranan kesatuan berkaitan ahli kesatuan. Berdasarkan analisis data, berikut adalah dapatan mengenai persepsi ahli dan bukan ahli terhadap peranan kesatuan dalam keselamatan dan kesihatan pekerjaan.

Jadual 5. Keputusan skor min bagi setiap item bagi konstruk persepsi

	Keahlian	N	Min	Sisihan Piawai
PERSEPSI	Ahli	86	3.409	.610
	Bukan Ahli	56	3.207	.765
F = 2.524	Sig .114			

Bagi mengenalpasti persepsi staf akademik di politeknik terhadap peranan kesatuan berkaitan ahli kesatuan, ujian Levene's Test for Equality of Variances telah dilakukan. Berdasarkan Jadual 5, min bagi ahli adalah 3.409 manakala bukan ahli adalah 3.207. Keputusan yang diperoleh daripada ujian tersebut menunjukkan tiada perbezaan persepsi yang ketara di antara ahli dan bukan ahli terhadap kesatuan DH. Secara kesimpulannya, persepsi terhadap peranan kesatuan dalam kalangan ahli dan bukan ahli adalah dalam julat yang sama. Hal ini adalah berdasarkan nilai yang tertera di dalam Jadual 5, iaitu nilai F=2.54 iaitu lebih besar >0.05.

Dapatan Objektif Kajian 2: Mengenal pasti sokongan pihak berkepentingan terhadap isu keselamatan dan kesihatan pekerjaan dalam membantu kesatuan. Berdasarkan analisis data, berikut adalah dapatan mengenai sokongan pihak berkepentingan terhadap isu keselamatan dan Kesihatan pekerjaan dalam membantu kesatuan.

Jadual 6. Keputusan skor min bagi setiap item konstruk sokongan

	Keahlian	N	Min	Sisihan Piawai
SOKONGAN	Ahli	86	3.393	.625
	Bukan Ahli	56	3.296	.657
F = 0.084	Sig .772			

Berdasarkan Jadual 6, min bagi ahli adalah 3.393 manakala bukan ahli adalah 3.296. Keputusan yang diperoleh daripada soal selidik tersebut menunjukkan tiada perbezaan yang ketara di antara respon ahli dan bukan ahli bagi konstruk sokongan yang diberikan oleh pihak pengurusan terhadap kesatuan DH. Secara kesimpulannya, sokongan kepada kesatuan dalam kalangan ahli dan bukan ahli adalah dalam julat yang sama. Hal ini adalah berdasarkan nilai yang tertera di dalam Jadual 6, iaitu nilai F=0.084 iaitu lebih besar >0.05.

Dapatan Objektif Kajian 3: Mengenal pasti risiko dan isu kebajikan yang melibatkan masalah keselamatan dan kesihatan pekerjaan. Berdasarkan analisis data, berikut adalah dapatan mengenai risiko dan isu kebajikan yang melibatkan masalah keselamatan dan kesihatan pekerjaan.

Jadual 7. Keputusan skor min bagi setiap item bagi konstuk risiko dan isu

	Keahlian	N	Min	Sisihan Piawai
RISIKO_ISU	Ahli	86	3.386	.618
	Bukan Ahli	56	3.404	.602
F =0.625	Sig .430			

Berdasarkan Jadual 7, min bagi ahli adalah 3.386 manakala bukan ahli adalah 3.404. Keputusan yang diperoleh daripada soal selidik tersebut menunjukkan tiada perbezaan yang ketara di antara respon ahli dan bukan ahli bagi konstruk risiko dan isu kebajikan yang melibatkan masalah keselamatan dan kesihatan pekerjaan. Secara kesimpulannya, risiko dan isu kebajikan yang melibatkan masalah keselamatan dan kesihatan pekerjaan dalam kalangan ahli dan bukan ahli adalah dalam julat yang sama. Hal ini adalah berdasarkan nilai yang tertera di dalam Jadual 7, iaitu nilai F=0.625 iaitu lebih besar >0.05.

Responden telah memberikan maklum balas berkaitan risiko dan isu di tempat kerja melalui soalan pendek dalam soal selidik. Maklum balas ini telah dikategorikan kepada tiga aspek utama, iaitu Keselamatan dan Kesihatan Fizikal**,** Keselamatan dan Kesihatan Mental**,** serta Persekitaran Sosial Tempat Kerja**.**

Dari segi Keselamatan dan Kesihatan Fizikal, antara isu utama yang dikenal pasti termasuklah peralatan pengajaran dan pembelajaran (PdP) yang rosak atau usang, kerosakan siling, kebocoran bumbung, serta kekurangan alat pemadam api di tempat kerja. Selain itu, masalah sistem penghawa dingin yang tidak berfungsi dengan baik merupakan aduan yang paling kerap dikemukakan oleh responden. Turut dilaporkan ialah risiko kemalangan seperti kerusi yang patah semasa digunakan dan kerosakan peralatan ICT terutama ketika hujan.

Bagi aspek Keselamatan dan Kesihatan Mental**,** responden menyuarakan isu beban tugas sampingan yang tidak seimbang, perpindahan tempat kerja yang tidak adil, serta motivasi kerja yang rendah akibat ketidakadilan dalam urusan kenaikan pangkat dan pengiktirafan. Kesan daripada situasi ini termasuklah penurunan semangat dan produktiviti dalam kalangan pekerja, terutamanya mereka yang hampir bersara atau yang menghadapi masalah kesihatan.

Dalam aspek Persekitaran Sosial Tempat Kerja**,** isu yang dikenal pasti termasuk ruang kerja yang sempit dan tidak kondusif, ancaman haiwan berbisa seperti ular dan biawak, bau busuk serta longgokan sampah yang berlaku ketika hujan. Menariknya, dapatan menunjukkan bahawa ahli kesatuan lebih peka terhadap keadaan persekitaran kerja dan lebih aktif memberikan maklum balas berbanding bukan ahli. Ini menunjukkan peranan kesatuan dalam menyuarakan isu tempat kerja adalah signifikan dan berpengaruh.

Temu bual yang dijalankan bersama pihak pengurusan (P1 hingga P5) telah mengenal pasti enam tema utama berkaitan dengan keselamatan dan kesihatan pekerjaan (KKP) di institusi.

Tema pertama adalah Langkah Keselamatan**,** di mana kesemua informan menyatakan bahawa organisasi masing-masing telah mengambil langkah proaktif seperti pemasangan papan tanda keselamatan, penubuhan Jawatankuasa KKP serta usaha mendapatkan atau mematuhi pensijilan ISO 45001. Selain itu, setiap institusi mempunyai carta alir kecemasan dan Unit Keselamatan dan Kesihatan Pekerjaan (UKKP) yang berfungsi sebagai rujukan semasa berlakunya insiden atau kecemasan.

Tema kedua adalah Garis Panduan KKP**,** yang mana kesemua institusi dilaporkan mempunyai garis panduan yang diselaraskan mengikut akta berkaitan. Audit dalaman dan luaran dilaksanakan secara berkala, manakala Standard Operating Procedure (SOP) turut dijadikan rujukan penting, dengan pemantauan dan kerjasama erat bersama Kesatuan DH untuk memastikan pematuhan serta perlindungan pekerja.

Tema ketiga berkaitan Latihan KKP, di mana latihan keselamatan seperti penggunaan peralatan perlindungan diri (PPE), simulasi kebakaran dan pertolongan cemas digalakkan dijalankan secara berkala. Kesatuan turut disaran untuk menganjurkan bengkel dan kempen kesedaran bagi meningkatkan kefahaman pekerja terhadap tanggungjawab mereka dalam aspek keselamatan.

Tema keempat ialah Tekanan Kerja dan Keseimbangan Hidup**,** yang menyentuh isu beban kerja berlebihan yang memberi tekanan kepada staf. Kesatuan DH dikenal pasti berperanan penting sebagai saluran advokasi dan tempat aduan, manakala pihak institusi pula disaran mengambil pendekatan lebih serius untuk mewujudkan keseimbangan kerja dan kehidupan melalui program sokongan kesihatan mental.

Seterusnya, tema kelima adalah Prosedur Kecemasan, yang menekankan keperluan kewujudan prosedur lengkap ketika berlakunya kecemasan. Pihak institusi dilaporkan telah menyediakan kit pertolongan cemas, Pasukan Respon Kecemasan (ERT), dan mekanisme laporan insiden. Kesatuan turut memainkan peranan dalam menuntut pampasan atau mengadakan rundingan apabila berlaku kecederaan atau isu yang tidak ditangani dengan baik.

Akhir sekali, tema keenam adalah Kesedaran tentang Kepentingan KKP. Kesatuan DH dan pihak institusi digalakkan menjalankan kempen keselamatan, latihan serta sesi dialog untuk memupuk budaya keselamatan di tempat kerja. Penglibatan aktif staf dalam program dan perancangan keselamatan telah dikenal pasti sebagai pendekatan berkesan dalam membina rasa tanggungjawab dan kesedaran terhadap KKP dalam kalangan warga kerja.

4. Kesimpulan

Berdasarkan analisis kajian, dapat dirumuskan bahawa persepsi staf terhadap peranan kesatuan adalah positif dan hampir seimbang antara ahli dan bukan ahli. Min persepsi ahli ialah 3.409 manakala bukan ahli ialah 3.207, menunjukkan bahawa kedua-dua kumpulan mengiktiraf peranan kesatuan dalam memperjuangkan hak serta kebajikan pekerja.

Dari segi sokongan pengurusan terhadap isu keselamatan dan kesihatan pekerjaan (KKP), dapatan menunjukkan konsistensi persepsi antara ahli (min = 3.393) dan bukan ahli (min = 3.296). Ini menggambarkan bahawa pihak pengurusan memberikan tahap sokongan yang hampir sama kepada semua staf tanpa mengira status keahlian mereka dalam kesatuan.

Seterusnya, bagi persepsi terhadap risiko dan isu berkaitan keselamatan serta kebajikan di tempat kerja, min yang dicatatkan ialah 3.386 bagi ahli dan 3.404 bagi bukan ahli. Perbezaan yang kecil ini menunjukkan bahawa kedua-dua kumpulan merasakan aspek keselamatan dan kesihatan di tempat kerja adalah penting dan diberi perhatian oleh pihak pengurusan.

Secara keseluruhan, kajian ini membuktikan bahawa kesatuan memainkan peranan penting dalam menjaga kebajikan staf, termasuk dalam aspek keselamatan fizikal, kesihatan mental, dan persekitaran kerja. Walaupun persepsi adalah positif dan seimbang antara ahli dan bukan ahli, masih terdapat ruang untuk penambahbaikan khususnya dalam aspek infrastruktur, penghargaan pekerja, dan kesejahteraan mental. Justeru, kerjasama berterusan antara kesatuan dan pengurusan amat diperlukan untuk memperkukuh budaya kerja yang selamat, sihat, dan produktif di institusi pendidikan.

Untuk analisa temu bual, kajian ini mendapati bahawa pihak pengurusan atasan menerima baik kewujudan kesatuan sekerja dan mengiktiraf kepentingan perundingan kolektif dalam menyelesaikan isu pekerja. Walaupun terdapat cabaran seperti komunikasi tidak formal, kerjasama antara pengurusan dan kesatuan masih terjalin dengan baik. Pihak pengurusan melihat kesatuan sebagai penghubung antara institusi dan pihak berkepentingan.

Dalam aspek keselamatan dan kesihatan pekerjaan (KKP), pihak institusi di politeknik dan kolej komuniti menunjukkan komitmen tinggi terhadap perlindungan fizikal dan kesejahteraan psikologi pekerja. KKP memberi impak positif terhadap produktiviti, moral, dan imej institusi. Persekitaran kerja yang selamat meningkatkan fokus dan prestasi pensyarah, manakala pelajar pula mendapat latihan amali yang selamat dan pembentukan budaya keselamatan yang baik. Secara keseluruhan, KKP dilihat sebagai elemen penting yang menyumbang kepada persekitaran pembelajaran dan pekerjaan yang selamat, sihat, dan kondusif untuk semua warga institusi.

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PEMBANGUNAN E-KIT DIGITAL INTERAKTIF BERASASKAN 3D DAN AUGMENTED REALITY BAGI PENDIGITALAN DAN PEMERKASAAN WARISAN KULINER SATE MALAYSIA UNTUK TUJUAN PEMBELAJARAN DAN KOMERSIALISASI

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Abstrak

Projek ini bertujuan membangunkan e-Kit digital interaktif berasaskan aset 3D dan teknologi Augmented Reality (AR) bagi mendokumentasikan teknik penyediaan sate secara sistematik. Sate ialah makanan tradisional popular di Malaysia, namun proses penyediaannya yang rumit serta isu bahan mentah dan kebersihan menyebabkan ia kurang diminati oleh generasi muda. Projek ini memberi tumpuan kepada tiga objektif utama: mengenal pasti kaedah penyediaan sate yang efektif, membangunkan aset 3D berkualiti tinggi, dan menghasilkan e-Kit digital lengkap dengan panduan serta maklumat pembekal. Kaedah simulasi dan penilaian pengguna digunakan bagi menilai keberkesanan produk. Hasil soal selidik menunjukkan responden memberikan maklum balas positif terhadap penggunaan e-Kit, terutamanya dari segi kefahaman terhadap proses penyediaan, bahan, dan kebersihan. Pendekatan visual 3D dan interaktif AR terbukti mampu meningkatkan minat dan pemahaman pengguna terhadap warisan makanan. Bagi penambahbaikan, dicadangkan penambahan elemen seperti kuiz atau permainan mini serta penyusunan kandungan mengikut kategori agar lebih mudah dinavigasi. Kajian lanjut boleh dijalankan untuk melihat keberkesanan penggunaan e-Kit dalam bilik darjah dan perluasan kepada makanan tradisional lain.
Kata kunci: e-Kit Digital; Model 3D; Augmented Reality.

1. Pengenalan

Industri makanan jalanan di Malaysia semakin pesat berkembang dan menjadi tarikan pelancong serta masyarakat tempatan. Namun, pengusaha kecil seperti penjual sate berdepan cabaran dari segi penjenamaan digital dan penyampaian maklumat yang kurang interaktif. Menurut Sulaiman dan Ibrahim (2021) dalam Journal of Tourism and Culinary Heritage, kebanyakan peniaga masih menggunakan kaedah promosi tradisional seperti banner yang kurang menarik perhatian generasi muda, sedangkan golongan ini lebih cenderung kepada kandungan digital seperti Realiti Terimbuh (Augmented Reality, AR) dan visual 3D.

Kajian-kajian terdahulu turut mengenal pasti pelbagai isu utama berkaitan penghasilan dan penyediaan sate. Antaranya, proses pembuatan sate dianggap rumit (Projek Pengurusan Operasi, 2021) serta memakan masa yang lama, khususnya dalam proses pembakaran (Eprints UMPO, 2022). Kurangnya penerimaan generasi muda terhadap sate juga menjejaskan kelangsungan makanan warisan ini (Discol, 2024). Dari sudut kualiti, beberapa aduan dilaporkan seperti sate tidak dimasak sempurna (Tempo, 2015), rasa dan jenis yang mengelirukan (Arif, 2021), serta tekstur yang kering selepas dimasak (IDNTimes, 2023).
Selain itu, aspek bahan mentah turut menjadi cabaran apabila pengusaha sukar mendapatkan bahan berkualiti (Malaysia Gazette, 2022) dan berdepan dengan peningkatan harga bahan secara mendadak (Utusan Malaysia, 2021). Dari sudut kebersihan pula, isu sering dibangkitkan termasuk tahap kebersihan restoran yang tidak memuaskan (Astro Awani, 2025), pengendalian peralatan yang tidak bersih (Bunga Rampai Penyelenggaraan, 2021),

dan keadaan persekitaran gerai yang tidak terurus (Mahmood, 2021).

Kesemua cabaran ini membuktikan keperluan kepada satu pendekatan baharu yang moden dan sistematik dalam mengekalkan serta mempromosikan sate sebagai makanan warisan negara. Justeru, kajian ini meneliti bagaimana proses pembuatan sate boleh dipermudahkan tanpa menjejaskan keaslian, selain meneroka penggunaan teknologi digital seperti model 3D dan e-Kit berasaskan AR untuk meningkatkan pemahaman pengguna tentang penyediaan sate, bahan mentah, dan aspek kebersihan.

Projek e-Kit Satay Sedap Street dibangunkan sebagai medium pembelajaran interaktif untuk mendokumentasikan proses penyediaan sate secara lebih sistematik dan moden. Melalui penggunaan model 3D dan teknologi Realiti Terimbuh (AR), pengguna hanya perlu mengimbas kod QR untuk melihat paparan visual bersaiz sebenar mengenai bahan dan proses sate. Kaedah ini diharapkan dapat meningkatkan kefahaman serta minat generasi muda terhadap warisan makanan tradisional, tanpa perlu memasang aplikasi tambahan.

2. Metodologi

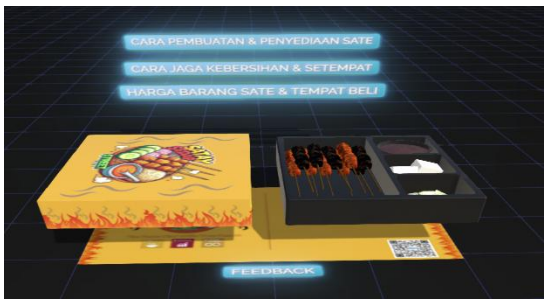
E-Kit Satay Sedap Street dibangunkan sebagai platform interaktif untuk menyampaikan maklumat berkaitan penyediaan sate dalam bentuk visual 3D dan teknologi Augmented Reality (AR). Proses pembangunan dimulakan dengan lakaran awal dan pengukuran bahan sebenar seperti sate, nasi impit, timun, bawang, dan kuah kacang. Aset 3D dibina berdasarkan ukuran sebenar dan dimuat naik ke platform AR WorldCast, membolehkan pengguna mengimbas kod QR untuk melihat kandungan secara terus tanpa memerlukan aplikasi tambahan. Pendekatan ini memudahkan pemahaman, terutamanya dalam kalangan golongan muda, terhadap proses penyediaan serta nilai warisan makanan tradisional.

Fasa pra-pembangunan melibatkan pengenalpastian masalah berkaitan penyediaan sate seperti proses rumit, isu kebersihan, dan kesukaran mendapatkan bahan berkualiti. Soal selidik diedarkan kepada kumpulan sasaran seperti remaja dan pengusaha sate untuk mendapatkan maklum balas awal. Hasil maklumat digunakan bagi mengenal pasti keperluan sebenar pengguna. Seterusnya, rujukan visual dan teknikal tentang bahan mentah, peralatan, serta pembungkusan dikaji sebelum perancangan awal dilakukan untuk struktur kandungan, lakaran kotak, dan interaksi AR.

Fasa pembangunan dimulakan dengan penyelidikan reka bentuk pembungkusan produk sate, diikuti lakaran awal dan binaan model 3D kotak e-Kit beserta elemen visual seperti logo, warna dan teks. Aset yang siap kemudian dimuat naik ke platform AR dan diuji bersama responden bagi tujuan penambahbaikan. Penggunaan e-Kit dimulakan dengan pengguna mengimbas kod QR, yang memaparkan model 3D bersama butang interaktif seperti “Cara Pembuatan & Penyediaan”, “Cara Jaga Kebersihan & Setempat”, dan “Harga Barang & Tempat Beli”. Setiap butang akan membuka kandungan seperti video, teks, atau grafik visual, manakala butang “Feedback” membawa pengguna kepada borang soal selidik digital. Proses ini memberi pengalaman pembelajaran yang bebas, mudah diakses, dan interaktif.

Rajah 1. Model 3D e-Kit satay sedap street

Rajah 1 menunjukkan paparan model 3D e-Kit *Satay Sedap Street* yang dipaparkan dalam persekitaran AR selepas pengguna mengimbas kod QR menggunakan peranti pintar. Paparan ini membolehkan pengguna melihat objek dalam saiz sebenar dan dari pelbagai sudut.



Rajah 2. Model 3D e-Kit satay sedap street

Rajah 2 pula memaparkan antara muka realiti terimbuh yang dilengkapi dengan butang interaktif seperti Cara Pembuatan & Penyediaan, Cara Jaga Kebersihan & Setempat, serta Harga Barang & Tempat Beli. Fungsi ini memberi kemudahan kepada pengguna untuk mengakses maklumat tambahan dengan lebih mudah dan sistematik.

3. Dapatan dan Perbincangan

Hasil soal selidik awal yang melibatkan 30 responden menunjukkan bahawa 61.3% bersetuju pembuatan sate adalah sukar dan rumit (Hj. Samuri, 2021), manakala 54.8% menyatakan proses penyediaannya mengambil masa yang lama (Universitas Muhammadiyah Ponorogo, 2022). Sebanyak 67.7% responden juga menyatakan kurangnya minat generasi muda terhadap pembuatan sate (Hamzah, 2024). Selain itu, antara masalah lain yang dikenal pasti ialah sate tidak dimasak sempurna (41.9%) dan rasa sate yang kering (22.6%) (Tempo, 2024; IDN Times, 2023). Dari aspek bahan mentah, 64.5% responden menyatakan kesukaran mendapatkan bahan berkualiti (Hamid & Malaysia Gazette, 2022), manakala 67.7% menekankan isu kenaikan harga bahan mentah (Roslan, 2021). Dari segi kebersihan pula, 74.2% responden menyatakan premis tidak bersih (Astro Awani, 2025) dan 67.7% menyatakan pengendalian gerai tidak memuaskan (Jabatan Pembangunan Perniagaan & Mahmood, 2021). Keseluruhan dapatan ini mengukuhkan keperluan pembangunan e-Kit Satay Sedap Street sebagai medium pembelajaran moden yang mampu menyampaikan panduan pembuatan sate secara sistematik.

Kajian kedua dijalankan melalui sesi playtest bersama 30 responden berumur antara 13 hingga 25 tahun. Hasilnya menunjukkan bahawa 93.3% memahami cara menggunakan e-Kit dan 90% menyatakan objektifnya mudah dipahami. Sebanyak 96.7% responden menyatakan e-Kit membantu mereka memahami isu penyediaan sate termasuk bahan, proses, kebersihan, dan cabaran generasi muda. Tambahan pula, 93.3% berasa lebih bermotivasi, 90% menganggap kandungan sesuai dengan umur dan tahap kemahiran, manakala 79.3% pernah menggunakan teknologi AR sebelum ini. Empat aspek utama iaitu kepuasan pengguna, relevansi kandungan, keberkesanan pembelajaran, dan kebolehgunaan aplikasi turut mencatatkan maklum balas positif yang tinggi. Dapatan ini membuktikan bahawa penggunaan elemen visual 3D dan teknologi AR dalam e-Kit Satay Sedap Street berjaya meningkatkan kefahaman, minat, serta keyakinan pengguna terhadap proses pembuatan sate.

4. Rumusan

Kajian ini menunjukkan bahawa e-Kit *Satay Sedap Street* berkesan membantu pengguna, khususnya golongan muda, memahami proses penyediaan sate secara lebih jelas dan interaktif. Majoriti responden memberikan maklum balas positif terhadap kandungan, visual 3D, dan penggunaan teknologi AR yang berjaya meningkatkan kefahaman dan minat terhadap makanan warisan. Keberkesanan e-Kit ini diperkukuh melalui pendekatan visual berasaskan saiz sebenar serta paparan maklumat yang mudah diakses tanpa aplikasi tambahan. Cadangan penambahbaikan seperti penambahan elemen kuiz atau interaksi mini dapat meningkatkan keterlibatan pengguna, manakala pengoptimuman prestasi untuk pelbagai peranti mampu memperluas capaian kepada lebih ramai pengguna dari pelbagai latar belakang. Walaupun masih ada kekangan seperti kebergantungan kepada sambungan internet dan peranti tertentu, e-Kit ini menunjukkan potensi besar dalam menyampaikan pembelajaran berasaskan budaya tempatan secara moden dan menarik.

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THE IMPACT OF FINANCIAL TECHNOLOGY AND FINANCIAL LITERACY ON FINANCIAL MANAGEMENT OF THE CULINARY INDUSTRY IN MSMES IN MEDAN

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Abstract

MSMEs have a strategic role in the Indonesian economy but still face challenges in financial management. This study analyses the influence of financial technology and financial literacy on the financial management of culinary MSMEs in Medan City. A quantitative method with an associative approach was used through a survey of 75 randomly selected respondents. Data was collected using a questionnaire and analysed by multiple linear regression. The results showed that financial technology has a positive effect (β=0.769) and financial literacy has a stronger impact (β=1.162) on financial management. Together, the two variables explained 59.4% of the variation in financial management (R^2=0.594). The findings confirm that financial literacy plays a dominant role, while financial technology serves as a support. The study's implications emphasise the importance of an integrated training program that integrates financial literacy improvement with technology assistance for MSMEs. Government and stakeholders are advised to develop simpler and more accessible financial applications. This research contributes to understanding the determinants of financial management of MSMEs in the culinary sector, particularly in urban areas such as Medan.
Keywords: Financial Technology; Financial Management; MSMEs.

1. Introduction

In Indonesia, Micro, Small, and Medium Enterprises (MSMEs) are vital to the economy. MSMEs not only provide employment but also drive inclusive economic growth. Before independence, MSMEs existed in economic transactions. After independence, government and private sector attention to MSMEs increased through policies and support. According to the Ministry of Finance, the contribution of MSMEs to Indonesia's Gross Domestic Product (GDP) reached 61%, equivalent to IDR 9,580 trillion that year. MSMEs also absorb around 117 million workers, or around 97% of the workforce. At the same time, MSME development is a priority in government economic policy.

Indonesia's economic stagnation in 1997 was a turning point for the MSME sector. Despite these challenges, MSMEs showed resilience by adapting and innovating. Many modernised their products and expanded their markets, including into online markets. MSMEs support national economic recovery and local economic stability. The government continues to prioritise the growth of MSMEs through policies such as Law No. 20/2008, which offers regulations to support them. It is expected that MSMEs will be more successful in the future, with some special category criteria as follows:

Table 1.1. Criteria for MSMEs

Category	Assets (excluding land and buildings)	Annual revenue
Micro enterprises	Rp50 Milion	Rp300 Milion
Small enterprises	Rp50-500 Milion	Rp300-2,5 Bilion
Medium enterprises	Rp.500 – 10 Bilion	Rp2,5-50 Billion

Due to the growth of information and communication technology, MSMEs are adopting digital technology in their operations. The Industrial Revolution 4.0 offers new opportunities for MSMEs to use online and e-commerce platforms, increasing their competitiveness and enabling faster access to larger markets. Technology helps improve operational efficiency and market share and assists employees in pricing products and exchanging information. However, many MSMEs face challenges in understanding and using these technologies, as they have yet to grasp their potential and applications.

MSMEs in Indonesia are thriving but also face significant challenges. They lack understanding of financial management and have low financial literacy, which hinders business management. Growth Data of MSMEs in Medan City based on Sales:

Table 1.2. Growth of MSMEs

Category	Jumlah UMKM	Penghasilan
Micro enterprises	90.041	Rp2 Miliar
Small enterprises	145	Rp2-15 Miliar
Medium enterprises	60	Rp15-50 Miliar

From an interview with the Department of Cooperatives, Small and Medium Enterprises and Trade (DISKOPDANG) of Medan City (2025), Laura Rosella stated that in 2023, Diskopdang noted that there were 90,041 micro businesses, 145 small businesses, and 60 medium businesses in Medan City. The utilisation of financial technology by MSME players is a concern, as 8,845 MSME players have utilised financial technology. However, many do not fully understand how and what the potential of its use is. Financial technology helps provide access to banking and financial services. Implementing digital banking and accounting information systems is important to improve the financial performance of MSEs. The researchers wanted to show that financial technology can improve the financial management of MSMEs. Many MSME players still lack an understanding of financial products and services. Therefore, more research on financial technology is needed to improve literacy, so that MSMEs can make good use of financial services and improve their financial management and business growth.

According to the Financial Services Authority (OJK), financial literacy in Indonesia is experiencing significant growth, with the national level reaching 65.43% by 2024, and Medan City reaching 79.13%. However, there are still challenges in understanding financial management. The ability of MSME employees to use financial services is affected by low financial literacy. Research shows that MSE members with good financial literacy can better manage their business. Therefore, it is important to improve the financial literacy of MSMEs through training. With better financial understanding, MSME members can make better decisions for their business and plan for their company's future. Financial literacy development is key to improving MSEs in Indonesia.

Research by Gunawan (2024) shows that MSME players can increase financial inclusion by utilising financial technology and good financial literacy. Preparation in finance is important in this study. Dwyanti (2024) also emphasized the importance of financial literacy in the financial management of MSMEs and identified that targeted financial education is crucial for improving understanding of fund management and financial planning. This supports our research focus on financial management in the culinary industry.

Financial access and literacy have a significant impact on the development of micro, small, and medium enterprises (MSMEs). Successful MSMEs tend to exhibit higher levels of financial literacy. This study examines the impact of financial technology and financial literacy on lending practices, particularly within culinary MSMEs in Medan. The aim is to support the growth of the MSME sector by focusing on effective financial management. The research findings are expected to inform policy recommendations and future training strategies. This

research focuses on theoretical and practical aspects, which are equally important. The results of this study are expected to assist the government and related organisations in understanding policies that support the growth of MSEs in Indonesia.

The hypotheses of this study are:

H1: Financial Technology Has a Positive Effect on the Financial Management of Culinary MSMEs in Medan
H2: Financial Literacy Has a Positive Effect on the Financial Management of Culinary MSMEs in Medan
H3: Financial Technology and Financial Literacy Simultaneously Affect the Financial Management of Culinary MSMEs in Medan

Scope of Research

1. This study will be conducted in Medan.
2. It will focus on MSME actors in the culinary sector; particularly micro and small businesses registered with the MSME Office and local cooperatives.
3. This study will not discuss other external variables that may influence MSME financial management, such as government policies, macroeconomic conditions, or broader sociocultural factors.
4. This study will focus on financial technology and literacy to understand SME financial management in the city's culinary sector.

2. Methodology

This research uses quantitative methods with an associative approach to examine the relationship between variables. The associative approach is used in the study of "The Impact of Financial Technology and Financial Literacy on Financial Management of Culinary Industry MSEs in Medan City" to assess the relationship between two or more variables (Financial Technology and Financial Literacy) and the dependent variable (financial management).

Through this study, researchers were able to understand some of the significant impacts that financial technology and financial literacy have on the financial transactions of Micro and Small Enterprises (MSEs). Multiple regression analysis was used in this context to evaluate the level of correlation between the variables concerned. Research by Putri et al. explored how financial literacy and several other characteristics affect the financial performance of MSEs using quantitative methods and associations (Putri, 2024). This was followed by other studies that showed the importance of financial literacy in improving the performance of MSEs. For example, Rosliyati and Iskandar show how financial literacy affects the performance of MSEs in Tasikmalaya through an associative quantitative approach (Rosliyati, A., 2024).

According to Iko Putri Yanti's research, associative quantitative methods are suitable for investigating the relationship between financial management, financial literacy and financial inclusion among MSMEs in North Moyo District (Dwyanti, D., 2024). This illustrates that the relationship between several types of literacy and the use of various financial tools significantly impacts business performance.

Therefore, an associative quantitative research approach can be appropriate for answering the researcher's questions. This will help academics better understand the relationship between financial literacy and financial technology and their impact on MSME financial management. Thus, they can provide valuable advice to culinary industry stakeholders in Medan.

Medan has significant potential for Micro, Small and Medium Enterprises (MSEs), especially in the food sector. The research lasted six months, starting in March and ending in July 2025. The location of this research will include several culinary centres in Medan to obtain a representative sample. The research begins when the author submits the proposal and runs from March to June 2025. Here is the timeline of the thesis process:

Table 2.1. Research schedule

No	Activities	Month																			
		March				April				Mey				June				July			
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
1	Title submission																				
2	Research proposal writing																				
3	Proposal seminar																				
4	Application for research permit																				
5	Research implementation																				
6	Thesis writing																				
7	Thesis Guidance																				
8	Publishing articles																				

1. Data Type

The types of data used in this study are divided into several parts, namely as follows:

a. Primary Data
Primary data is data obtained directly from observations, interviews, and the results of questionnaires sent to several sample respondents who meet the objectives (Sugiyono, 2024). The main data in this study are questionnaires given to respondents, namely, MSE members in Medan.

b. Secondary Data
Secondary data is information obtained from other parties on a non-long-term basis relevant to the research being conducted. The data used in this study include the number of MSEs in Medan, their growth rate, and book and journal references (Sugiyono, 2024).

2. Data Source

In completing this thesis, researchers used data sources obtained from various parties, namely:

a. Internal data
Internal data is data obtained by researchers from within the company. When researchers conducted research, they distributed questionnaires to all Micro, Small, and Medium Enterprises (MSMEs) in Medan City.

b. External data
External data or data obtained from outside sources, such as journals, books, the internet, and several other sources, provides the information researchers need to conduct research.

The data collection methods used in this study were as follows:

1. Questionnaire

The purpose of the questionnaire was to collect data from Micro and Small Enterprise (MSE) owners in Medan City. The main focus of the questionnaire was on financial technology utilisation and financial literacy. The questions addressed basic financial knowledge, use of transaction applications, budget management, and financial resources. Financial literacy is defined as the ability to understand and apply financial information. The questionnaire will be distributed online or physically. A Likert scale will be used for evaluation. According to Sugiyono (2024), individuals' or groups' awareness, understanding, and perception regarding social phenomena are assessed using a Likert scale. The Likert scale can capture respondents' attitudes in responding to questions relating to indicators of certain concepts or variables under investigation.

Table 2.2 Scoring for questionnaire answers

The Mind	Score
Strongly agree (SS)	5
agree (S)	4
less agree (KS)	3
disagree (TS)	2
strongly disagree (STS)	1

2. Interview

An interview is a way of collecting data through dialogue between the researcher and the respondent. Questions are asked to get information about a specific topic. There are three types of interviews: structured, semi-structured and unstructured. Interviews are effective for obtaining rich data and context, such as in ethnomathematics studies.

3. Documentation

The documentation method involves reviewing and analysing documents related to the research topic. Sources may include books, articles, reports, images, or other written materials. Documentation supports research by providing additional context for data from interviews and observations (Sugiyono, 2024). It is also used to record processes and outcomes and gain a deeper understanding of social phenomena in the community.

2.4 Population and Sample

1. Population

The population in this study is Micro, Small, and Medium Enterprises (MSMEs) in Medan, especially those in the culinary field. This includes restaurants, cafes, and small food vendors. There are 300 culinary MSMEs in Medan.

2. Sample

According to Sugiyono (2024), the sample is part of the population consisting of selected people. Without a sample, there is no population. The determination of the sample depends on the research results, hypothesis, objectives, and research instruments. In this study, the sample size uses the Slovin method to measure the population of Micro, Small, and Medium Enterprises (MSMEs) in Medan. This method helps determine the number of respondents as needed:

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$$n = \frac{N}{1+N.e^2} \quad (1)$$

Description:

- n = Sample
- N = Population (number of MSMEs in Medan City)
- e^2 = An error rate is allowed for author inaccuracies, so in this study, *e* was set at 10%.

Based on the Slovin formula mentioned above, the sample size is as follows:

$$n = \frac{300}{1+ 300(0,1)^2} = 75 \quad (2)$$

So that the results of the data above can be rounded up to 75 samples for this study.

2.5 Data Analysis Method

The data collected will be analysed using descriptive and inferential statistical techniques. While inferential research methods, such as multiple regression, are used to ascertain the relationship between factors (financial technology, financial literacy) and the financial management of micro and small enterprises (MSEs), descriptive analysis characterises the attributes of respondents.

Multiple linear regression:

$$Y = a + b_1x_1 + b_2x_2 + e \quad (3)$$

Y = Financial Management
a = Constant
b_1, b_2 = Regression Coefficient
x_1 = Financial Technology
x_2 = Financial Literacy
e = Error Term

2.6 Validity and Reliability Tests

1. Validity Test

A valid instrument measures data accurately. A valid questionnaire can show what needs to be checked. High and low validity indicate the level of validity of the instrument. Sugiyono (2024) states that the validity of questionnaire items can be determined using the correlation coefficient. Comparison of tcount and ttable is done using a significance test. The indication is considered valid if the tcount exceeds the ttable. Where, if the two-way significance value is less than 0.05, it is considered valid; Conversely, if it exceeds 0.05, it is considered invalid.

Instrument validity tests (such as correlation and t-test) are important in this study to ensure the questionnaire accurately measures the variables of Financial Technology, Financial Literacy, and Financial Management. The researcher can ensure each question is relevant and unbiased by comparing the t-count, t-table, and significance ($p < 0.05$). This is crucial so that the research findings on the impact of FinTech and financial literacy on the financial management of culinary MSEs in Medan are valid, reliable, and free from measurement error. Without a validity test, the research conclusions could be misleading because the data collected does not reflect the studied variables.

2. Reliability Test

Reliability testing is important to ensure that the tools used provide consistent data. Determining reliability uses traditional techniques and new, broader methods such as Cronbach's alpha. Cronbach's Alpha value ≥ 0.5 is acceptable, and ≥ 0.7 is considered good for reliability measurement tools (Lie, 2023). Reliability testing using the Cronbach's Alpha technique with the following formula:

$$r = \frac{k}{k-1} x \left\{1 - \frac{\sum S_i}{S_t}\right\} \quad (4)$$

Description:
r = Instrument reliability (Cronbach's alpha)
k = Number of question items
$\sum S_i$ = sum of item variances
S_t = total variance

With criteria:
a. If the Cronbach's alpha value ≥ 0.6, the variable instrument is reliable.
b. If the Cronbach's alpha value ≤ 0.6, then the variable instrument is not reliable.

2.7 Hypothesis Testing

This hypothesis will be tested through multiple regression analysis. The results will be used to evaluate the validity of the hypotheses that have been developed. The significance level of the results will be set at α = 0.05. The results will show a strong correlation between the independent variables (economic technology and literacy) and the dependent variable (financial literacy of MSEs) (Lie, 2023).

1. Coefficient of Determination

Regression analysis relies heavily on the Coefficient of determination (R^2). R^2 shows how much the independent variables (Financial Technology and Financial Literacy) can explain the dependent variable (Financial Management of MSMEs). A high R^2 value indicates that the regression model has good predictive ability, meaning that both factors significantly influence financial management. Conversely, if the R^2 is low, it means other factors outside the model are still more dominant. Research by Rasjid (2023) reinforces the relevance of R^2 in the context of financial literacy and financial management of MSEs, so its use in this study empirically helps validate the strength of the relationship between variables. The following is the coefficient of determination formula:

$$R = \frac{\sum_{i=1}^{n}(x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_{i=1}^{n}(x_i - \bar{x})^2}\sqrt{\sum_{i=1}^{n}(y_i - \bar{y})^2}} \quad (5)$$

Descriptions:
r = Correlation
r2 = Coefficient of determination of the regression equation
n = Number of observations in the regression equation
xi = Independent variable of the regression equation
x = Average of independent variables from the regression equation
yi = Dependent variable of the regression equation
y = The mean of the dependent variable from the regression equation
σx = Standard deviation of independent variables
σy = Standard deviation of the dependent variable

2. Simultaneous Test (F Test)

An F test is used to ascertain whether all independent factors significantly influence the dependent variable. A significant result indicates that at least one independent variable is significant in the regression model. Rosliyati 's research examined the simultaneous effects of several independent factors on the dependent variable by applying multiple regression

analysis and the F test (Rahmawati, 2023). This suggests the application test is relevant in research involving multiple independent variables. Here is the formula for the Simultaneous Test:

$$F = \frac{R^2/(n-1)}{\frac{(1-R^2)}{(n-k)}} \quad (6)$$

Descriptions:
R2 = Coefficient of Determination
n = Total Data
k = Number of Independent Variables

3. Partial Test (T Test)

The T-test (Partial Test) in this study strengthens the Regression Analysis to test the significance of the influence of each independent variable. As stated by Hidayat, (2023), this statistical test allows researchers to evaluate the individual contribution of Financial Technology (FinTech) and Financial Literacy to Financial Management in culinary MSMEs in Medan.

The t-test is applied by comparing the t-count value against the t-table at a significance level 0.05. If the probability value (p-value) is obtained below 0.05, it can be concluded that the independent variable significantly affects the dependent variable. Conversely, a p-value above 0.05 indicates no significant effect.

The findings of this statistical test will provide a clear picture of the extent to which the development of FinTech and the level of financial literacy affect the financial management skills of culinary MSME players in Medan City. The results of this analysis can also be a reference for stakeholders when formulating MSME development policies. The following is the formula for the Partial Test:

$$Df = n - k - 1 \quad (7)$$

Description:
k = Number of independent variables
n = Number of samples

3. Results and Discussion

A. Research results

1. Validity and Reliability Test Results
a. Validity Test

Table 3.1. Validity of the variable financial technology instrument

Variables	Validity Value		Description
	r_{count}	r_{tabel}	
Q1	0.685464	0.3673	Valid
Q2	0.728440	0.3673	Valid
Q3	0.745027	0.3673	Valid
Q4	0.643908	0.3673	Valid
Q5	0.413259	0.3673	Valid
Q6	0.611051	0.3673	Valid
Q7	0.776783	0.3673	Valid

The table shows that the R-count value for the Financial Literacy variable is greater than the R-table (0.367). This means that all questions in the instrument for the Financial Literacy variable are valid. Thus, this research instrument is valid and feasible, ensuring the accuracy of the data obtained about respondents' perceptions and responses to Financial Literacy.

Table 3.2. The validity of the financial literacy variable instrument

Variables	Validity Value		Description
	r_{count}	r_{tabel}	
Q1	0.446613	0.3673	Valid
Q2	0.817465	0.3673	Valid
Q3	0.649484	0.3673	Valid
Q4	0.723771	0.3673	Valid
Q5	0.783265	0.3673	Valid
Q6	0.743446	0.3673	Valid
Q7	0.716984	0.3673	Valid
Q8	0.740741	0.3673	Valid

The table shows that the R-count value for the Financial Literacy variable is greater than the R-table (0.367). This means that all questions in the instrument for the Financial Literacy variable are valid. Thus, this research instrument is valid and feasible, ensuring the accuracy of the data obtained about respondents' perceptions and responses to Financial Literacy.

Table 3.3. The validity of the financial management variable instrument

Variables	Validity Value		Description
	r_{count}	r_{tabel}	
Q1	0.857127	0.3673	Valid
Q2	0.748946	0.3673	Valid
Q3	0.734424	0.3673	Valid
Q4	0.715983	0.3673	Valid
Q5	0.483913	0.3673	Valid
Q6	0.693481	0.3673	Valid
Q7	0.858410	0.3673	Valid
Q8	0.848018	0.3673	Valid
Q9	0.889364	0.3673	Valid
Q10	0.799793	0.3673	Valid
Q11	0.879298	0.3673	Valid
Q12	0.760564	0.3673	Valid
Q13	0.722814	0.3673	Valid
Q14	0.739446	0.3673	Valid

The table above shows that the results of the Financial Management variable show the value of R-count greater than Rtabel (0.367). This means that the questions in the instrument for that variable are valid. Thus, the research instruments related to financial management are valid and appropriate for use, ensuring that the data obtained is accurate regarding respondents' perceptions and responses.

2. Reliability Test

Reliability testing was conducted to ensure the tool is stable, reliable and consistent when used routinely over time. The instrument is considered reliable if the calculated Cronbach's alpha value exceeds the alpha tolerance value of 0.60. The findings of the reliability test are displayed below:

Table 3.4. Reliability test results

NO	Variable	Cronbach's alpha value	Description
1	Finance Technology	0.870838	Reliable
2	Finance Literacy	0.906457	Reliable
3	Finance Management	0.954617	Reliable

The reliability test results show that this research questionnaire can be trusted if Cronbach's alpha for all variables exceeds 0.60.

3. Recapitulation of Respondents' Answers to Financial Technology Variables

Table 3.5. Recapitulation of respondents' answers to the financial technology variable

No	Statement	STS		TS		KS		S		SS	
		F	%	F	%	F	%	F	%	F	%
1	Q1	-	0,00%	2	2,67%	6	8,00%	46	61,33%	21	28,00%
2	Q2	-	0,00%	1	1,33%	8	8,00%	36	40,00%	29	50,67%
3	Q3	-	0,00%	2	2,67%	12	16,00%	30	40,00%	31	41,33%
4	Q4	1	1,33%	1	1,33%	8	10,67%	36	48,00%	29	38,67%
5	Q5	-	0,00%	2	2,67%	6	8,00%	40	53,33%	27	36,00%
6	Q6	-	0,00%	1	1,33%	7	9,33%	34	45,33%	33	44,00%
7	Q7	-	0,00%	2	2,67%	6	8,00%	33	44,00%	34	45,33%

4. Recapitulation of Respondents' Answers to Financial Literacy Variables

Table 3.6. Recapitulation of respondents' answers to financial literacy variables

No	Statement	STS		TS		KS		S		SS	
		F	%	F	%	F	%	F	%	F	%
1	Q1	1	1,33%	1	1,33%	3	4,00%	33	44,00%	37	49,33%
2	Q2	2	2,67%	-	0,00%	5	6,67%	30	40,00%	38	50,67%
3	Q3	-	0,00%	3	4,00%	9	12,00%	39	52,00%	24	32,00%
4	Q4	1	1,33%	1	1,33%	8	10,67%	34	45,33%	31	41,33%
5	Q5	1	1,33%	4	5,33%	15	20,00%	37	49,33%	18	24,00%
6	Q6	-	0,00%	2	2,67%	11	14,67%	31	41,33%	31	41,33%
7	Q7	-	0,00%	2	2,67%	9	12,00%	31	41,33%	33	44,00%
8	Q8	1	1,33%	1	1,33%	5	6,67%	35	46,67%	33	44,00%

5. Recapitulation of Respondents' Answers to Financial Management Variables

Table 3.7. Recapitulation of respondents' answers to financial management Variables

No	Statement	STS		TS		KS		S		SS	
		F	%	F	%	F	%	F	%	F	%
1	Q1	-	0,00%	1	1,33%	4	5,33%	37	49,33%	33	44,00%
2	Q2	-	0,00%	1	1,33%	2	2,67%	35	46,67%	37	49,33%
3	Q3	1	1,33%	3	4,00%	6	8,00%	40	53,33%	25	33,33%
4	Q4	1	1,33%	-	0,00%	6	8,00%	31	41,33%	37	49,33%
5	Q5	2	2,67%	3	4,00%	5	6,67%	29	38,67%	36	48,00%
6	Q6	1	1,33%	2	2,67%	5	6,67%	30	40,00%	37	49,33%
7	Q7	2	2,67%	2	2,67%	5	6,67%	31	41,33%	35	46,67%
8	Q8	2	2,67%	1	1,33%	8	10,67%	38	50,67%	26	34,67%
9	Q9	-	0,00%	6	8,00%	2	2,67%	35	46,67%	32	42,67%
10	Q10	-	0,00%	2	2,67%	6	8,00%	40	53,33%	27	36,00%
11	Q11	-	0,00%	2	2,67%	7	9,33%	42	56,00%	24	32,00%
12	Q12	1	1,33%	2	2,67%	8	10,67%	35	46,67%	29	38,67%
13	Q13	1	1,33%	1	1,33%	5	6,67%	32	42,67%	36	48,00%
14	Q14	1	1,33%	2	2,67%	5	6,67%	32	42,67%	35	46,67%

6. Linear Regression Results

This study aims to understand the impact of Financial Technology and Financial Literacy on the Financial Management of Industrial MSEs in Medan City. This table shows the multiple linear regression results for each variable, namely:

Table 3.8. Multiple linear regression analysis results

Coefficients				
		Nonstandard Coefficient		Standardized Coefficient
Pattern		B	Std. Error	Beta
1	(Constant)	-2.417	7.558	
	Financial Technology	.769	.288	.231
	Financial Literacy	1.162	.160	.629
a. Dependent Variable: Financial Management				

Based on the test results mentioned above, the multiline cooperation is as follows:

$$Y = -2.417 + 0.769x_1 + 1.162x_2 \quad (8)$$

Interpretation:

1. Constant Analysis (α = -2.417)

The constant in this regression model is negative, namely -2.417. Technically, this number indicates the predicted value of Financial Management when both independent variables (Financial Technology and Financial Literacy) are zero. However, this interpretation is unrealistic in practice as it is impossible to find a situation where financial technology and literacy are exactly zero. This negative value provides an interesting picture: without these two supporting factors, the condition of financial management is bad, even in the negative zone. This implies that basic financial management without literacy and technology will result in undesirable outcomes.

2. Influence of Financial Technology (β_1 = 0,769; p < 0,05)

The Financial Technology variable shows a positive coefficient of 0.769, which means that every one unit increase in the use of financial technology will improve the quality of Financial Management by 0.769 units, provided that the Financial Literacy factor is held constant. The relatively small standard error (0.288) indicates a fairly precise estimate. However, the effect is moderate when viewed from the standardised coefficient (Beta=0.231). This indicates that although financial technology makes a positive contribution, its impact is not as strong as that of Financial Literacy. This finding aligns with the reality that technology is just a tool, whose effectiveness is highly dependent on the user's ability to utilise it.

3. Influence of Literacy Technology (β_2 = 1,162; p < 0,05)

Financial Literacy recorded the highest Coefficient (1.162) with the smallest standard error (0.160), indicating that this variable has a strong effect and a very stable estimation. Every one unit increase in Financial Literacy will boost Financial Management by 1.162 units, assuming Financial Technology remains constant. The standardised Coefficient (Beta=0.629), almost three times that of the technology variable, emphasises its position as the dominant factor. This result is consistent with basic financial theory, emphasising that conceptual understanding of money management is a more crucial foundation than mere technological access. Technology may make the process easier, but literacy determines the quality of the end result.

7. Hypothesis Testing

a. Coefficient of Determination

Table 3.9. Results of the coefficient of determination R2

Model Summary				
Pattern	R	R Square	Adjusted R Square	Std. Estimation Error
1	.770a	.594	.582	4.067

a. Predictors: (Constant), Financial Literacy, Financial Technology

The R Square (R2) value, as shown in the Model Summary table, is 0.594, or 59.4%. This indicates that the dependent variable, financial management (Y), is influenced by the independent variables, financial technology (X_1) and financial literacy (X_2), by 59.4%. Consequently, factors other than this regression model account for 40.6% of the variation in financial management.

b. Simultaneous Test (F Test)

The F distribution is a suitable probability model for variance ratios with two samples drawn independently from a normally distributed population.

Table 3.10. Simultaneous test results (F Test)

ANOVA						
Pattern		Sum of Squares	Df	Square Average	F	Sig.
1	Regression	1740.021	2	870.011	52.590	000b
	Remainder	1191.126	72	16.543		
	Whole	2931.147	74			

a. Dependent Variable: Financial Management

b. Predictors: (Constant), Financial Literacy, Financial Technology

According to the previous F-test findings, the significance level of 0.000 is less than alpha 0.05, and the fcount value of 52.590 is higher than the ftable value of 2.73. This indicates that financial technology and financial literacy, whether used separately or together, positively impact the financial management of culinary MSEs in Medan. Therefore, the authors recommend that MSEs increase the use of technology and financial literacy to make their financial management more effective and efficient.

c. Partial Test (T Test)

Table 3. 11. Partial test results (t-test)

Coefficient						
		Nonstandard Coefficient		Standardized Coefficient		
Pola		B	Std. eror	Beta	t	Sig.
1	(Constant)	-2.417	7.558		-.320	.750
	Financial Technology	.769	.288	.231	2.674	.009
	Financial Literacy	1.162	.160	.629	7.280	.000

a. Dependent Variable: Financial Management

The decision criteria taken in this test are as follows:

- If the significance value> 0.05 or the tcount> ttable value, the hypothesis is rejected,
- If the significance value < 0.05 or tcount ≤ is acceptable, the hypothesis is accepted

From the Financial Technology variable, the tcount value is 2.674, which is positive. The tube value of 5% (75-2-1 = 73) obtains a table value of 1.666. It is known that the value of financial literacy is 0.009 <0.05; it can be concluded that the first hypothesis is rejected, and t count 2.674> t table 1.666, then Financial Technology has a positive and significant influence on the financial management of MSEs in the Culinary Industry in Medan City.

From Financial Literacy, a positive count value of 7,280 was obtained, and the table value of 5% (75-2-1 = 73) was obtained, with a table value of 1,666. It is known that the significant value of financial behaviour is 0.000 <0.05; it can be concluded that the first hypothesis is rejected, and the t-count is 7,280> table 1,666, so it has a positive and significant influence on the financial management of MSEs in the Culinary Industry in Medan City.

This research shows that financial technology positively impacts the financial management of MSEs in the culinary industry in Medan City. Easy access to financial services helps in financial management. However, obstacles in understanding and applying financial technology still require further training. Financial literacy is also important; respondents who understand financial concepts can better manage their businesses effectively. However, applying financial literacy in daily practice is not optimal, and many businesses do not regularly record transactions or have a clear budget plan.

This research confirms the relationship between financial technology and financial literacy, where MSEs with good literacy adopt technology faster. Therefore, training programs for MSEs should integrate these two aspects to maximise benefits. The findings show that financial literacy contributes positively (β = 1.162) to financial management. Financial literacy and technology contributed 59.4% to financial management, suggesting complementarity. Some MSEs have difficulty adopting technology due to a lack of technical understanding.

The results of this study strengthen the findings of Gunawan (2024), which state that strong financial literacy empowers MSMEs to make appropriate financial decisions and use them. In this study, the positive effect of financial literacy (B 1.162) on the financial management of culinary MSEs in Medan shows consistency with previous studies, where a good understanding of financial concepts is proven to improve the ability of business actors to manage cash flow, prepare budgets, and make investment decisions.

Furthermore, this study's findings align with the results of a study [13], which confirmed the significance of financial literacy and financial access in supporting the sustainability of micro and small enterprises (MSEs). In the context of this study, the synergy between financial literacy and financial techn0ology utilisation contributed 59.4% to the variation in financial management, indicating a complementary relationship between the two variables. However, in contrast to previous studies that generalise to MSEs in general, this study makes a specific contribution through unique findings on the culinary sector in Medan, namely: (1) there are barriers to financial technology adoption caused by limited technical understanding (found in 8% of respondents), and (2) there is a positive correlation between the habit of recording transactions routinely (done by 88% of respondents) with improved business financial performance. These findings enrich the empirical evidence in the MSE financial management literature and provide practical implications for developing more focused and contextualised business capacity building programs.

Implications for the culinary industry in Medan include collaboration between the government and technology providers to simplify applications and organise workshops. The authors suggest that MSEs improve their understanding of financial literacy through training and

optimise the use of financial technology. A clear financial plan and regular recording of transactions are key to good financial management. This study was limited to the culinary sector in Medan, and future research is recommended to broaden the scope. The results of this study recommend government support in financial literacy and technology training for MSEs, as well as better access to technology and digital infrastructure.

4. Conclusion

This study aims to determine how financial technology and financial literacy affect the financial management of culinary industry MSEs in Medan, based on the data analysis, testing, and the previously described discussion. The following are some of the findings that researchers can obtain:

1. Research shows that financial technology has a significant positive impact on the financial management of MSMEs in the culinary sector of Medan City. Using digital platforms such as e-payments, mobile banking, and accounting software helps improve operational efficiency, reduce transaction costs, and expand access to financial services. However, there are some constraints, such as a lack of technical understanding by older businesses, uneven digital infrastructure, and concerns about the security of digital transactions.

2. Aspects of financial literacy greatly influence the financial management of MSMEs. Research shows that a good understanding of finance positively correlates with compiling basic accounting, planning budgets and making better financial decisions. MSMEs with sufficient financial literacy can separate personal assets from business, record transactions systematically and prepare cash flow projections more precisely. However, there are still gaps in implementing financial management, especially in micro enterprises, due to a lack of further training, perceived complexity of record-keeping and reliance on traditional practices.

3. Regression analysis shows that the combination of financial technology and financial literacy explains 59.4% of the variation in financial management. These two factors support each other. Good financial literacy enhances the use of financial technology, while financial technology helps the application of sound financial principles. Together, they create more transparent and accountable financial management. However, 40.6% of other factors, such as the business environment and government policies, still affect the quality of financial management.

4. For future research development, it is suggested that the scope of the study is not only limited to the culinary industry, but also includes other MSME sectors, such as trade, services, or manufacturing, to see whether the pattern of the relationship between financial literacy, financial technology, and financial management remains consistent or different between sectors. In addition, future research can expand the study area not only in Medan, but also in other regions in North Sumatra or even nationally, so that the resulting findings have a higher level of generalisation. The latest research methods, such as big data analytics or machine learning, can analyse data more deeply and accurately, especially in exploring trends in financial technology adoption among MSMEs.

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THE EFFECT OF PRICE AND PROMOTION ON THE PURCHASE DECISION OF PESTICIDE PRODUCTS AT PT. UPL INDONESIA

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Abstract

The progress of the agricultural sector in Indonesia is highly dependent on the use of pesticides that can increase productivity and crop quality. In increasingly fierce market competition, pricing and promotion strategies influence consumer purchasing decisions. Based on a study by Putranto and Eliyani (2025), it was found that the variables of price and promotion have a significant influence on purchasing decisions. This study aims to analyse the influence of price and promotion on purchasing decisions for PT UPL Indonesia's pesticide products. The research was conducted using a quantitative approach through a survey questionnaire administered to 64 respondents who are consumers of PT UPL Indonesia. Data analysis techniques used multiple linear regression, determination tests, t-tests, and F-tests. The study results indicate that price and promotion simultaneously and partially positively and significantly influence purchasing decisions, with an R Square value of 0.811, meaning that the price and promotion variables can explain 81.1% of purchasing decisions. The regression coefficients for price and promotion were 0.582 and 0.458, respectively, indicating a positive contribution to increased purchase decisions. These findings reinforce the importance of effective pricing and promotion strategies in enhancing product competitiveness in the market. Prices must be commensurate with product quality, and promotions must provide understanding about the product and influence purchasing decisions. Therefore, companies must continue developing relevant marketing approaches to support the growth of pesticide product sales.

Keywords: Price; Promotion; Purchasing Decision.

1. Introduction

The progress of the agricultural sector in Indonesia cannot be separated from the use of pesticides as an important component in increasing agricultural productivity. Pesticides serve to protect plants from pests and diseases so that they can maximise crop yields and produce high-quality crops. Abundant harvests and healthy crops are every farmer's hope. Therefore, the planting process must be accompanied by the use of pesticides that offer advantages and benefits tailored to farmers' needs and crop criteria to ensure the desired results. As a result, many companies are developing pesticide products that can serve as solutions for farmers to help them address crop-related issues. However, amid the increasingly intense competition in the pesticide industry, farmers or distributors have numerous product options from various brands. Therefore, every company must study marketing strategies as competition in the industry becomes increasingly fierce, evidenced by continuous price competition and promotions aimed at introducing products

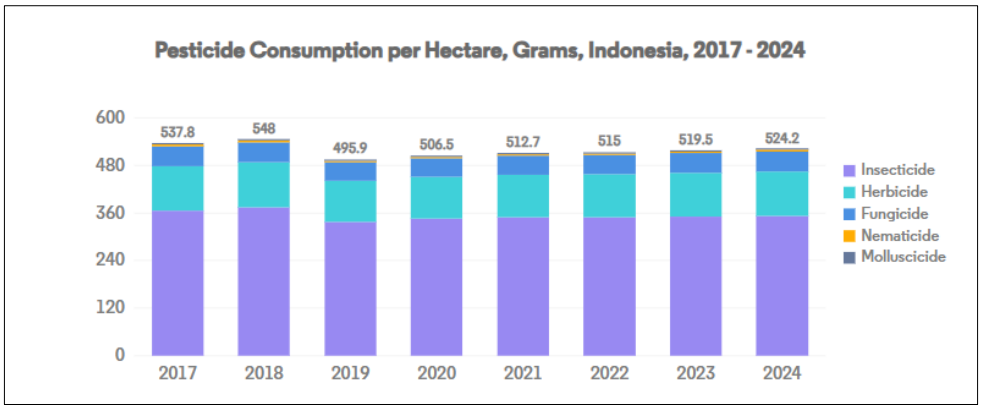

Fig. 1. Pesticide consumption

Pricing and promotion are crucial because they directly relate to consumers' costs. Competitive pricing that aligns with product quality can increase purchasing interest. At the same time, promotion increases brand awareness and encourages consumers to choose certain products through discounts, advertisements, or other marketing programs. Therefore, companies must set the right prices and promotions, as there is significant competition from similar businesses. When promotions are executed effectively, consumers naturally consider the prices of similar products before purchasing.

In short, price can be defined as the amount of money paid for a product or service purchased by consumers to own or use it. Meanwhile, businesspeople or entrepreneurs use promotion to provide incentives and various benefits to customers, aiming to increase product usage and transactions (Yasmin & Pratomo, 2023). After the consumer determines price and promotion, a purchase decision is made, which is the final stage of the decision-making process, where the buyer finally agrees to make a purchase related to the product being offered. The individual actions that are silently present during the purchase and use of a product are known as decision-making (Septyadi et al., 2022)

Research entitled "The Effect of Price and Promotion on the Decision to Purchase Used Motorcycles at the Kurnia Indah Maumere Showroom" by Erliana et al. (2024) states that the results of the t-test show that the price variable has a positive and significant effect on the purchase decision variable. Meanwhile, promotion has a significant effect on the purchase decision. The results of the F test indicate that, collectively (simultaneously), all independent variables consisting of the Price variable (X1) and the Promotion variable (X2) have a significant effect on the Purchase Decision variable.

Negara et al. (2023) in their study titled "The Influence of Price and Promotion on Consumer Purchasing Decisions" conclude that price and promotion simultaneously positively and significantly influence consumer purchasing decisions with a significance level of 0.000. Price partially has a positive and significant influence on consumer purchasing decisions at a significance level of 0.036. Promotion partially has a positive and significant influence on consumer purchasing decisions at a significance level of 0.003.

A research entitled "The Influence of Price and Promotion on Fast Food Purchasing Decisions at Lawson Teluknaga Tangerang" by Fauzan and Hanny (2024) states that price and promotion have a significant influence on purchasing decisions with the regression equation Y = 12.616 + 0.282 X1 + 0.376 X2. The coefficient of determination is 0.418 or 41.8%, while the remaining 58.2% is influenced by other factors. The hypothesis test yields an F-value > F-table value or (34.842 > 3.09). Therefore, H0 is rejected and H3 is accepted, meaning there is a significant simultaneous effect between Price and Promotion on the Purchase Decision of fast food at Lawson Teluknaga Tangerang.

This research was conducted at PT UPL Indonesia, part of UPL Ltd, a global company specialising in agriscience and modern agricultural solutions. The company provides agrochemical products and agricultural technology to enhance productivity and sustainability in the agricultural sector. As a subsidiary of UPL Ltd., headquartered in Mumbai, India, PT UPL Indonesia is part of an international business network spanning over 130 countries, offering a diverse product portfolio and innovative solutions for farmers and agribusinesses. In Indonesia, PT UPL Indonesia actively supports the agricultural sector by providing crop protection products, including pesticides, herbicides, and fungicides.

PT UPL Indonesia continues to expand its market reach across Indonesia, collaborating with farmers, distributors, and various stakeholders in the agricultural sector. The company's headquarters are located in Jakarta, and it has a strong distribution network in various regions of Indonesia, such as North Sumatra, covering areas from Karo Berastagi to Dairi Sidikalang. The company serves the needs of small—to large-scale farmers and collaborates with the government and research institutions to develop better agricultural solutions.

From the author's observations, a phenomenon occurs at PT UPL Indonesia: the company has consistently failed to achieve its sales targets in recent years. Sales performance that falls far short of expectations or targets indicates a gap between planning and execution. This also results in sales that do not always increase but fluctuate. This can be seen in the data analysed from PT UPL Indonesia's sales reports for the Karo Berastagi to Dairi Sidikalang region in North Sumatra, as presented in the table below.

Table 1. Sales report of PT.UPL Indonesia.

Period	Total Budget (IDR)	Total Actual (IDR)	% Achievement
2022-2023	14,107,457,857	10,713,669,500	76%
2023-2024	15,115,525,959	11,204,516,027	74%
2024-2025	10,575,745,000	8,664,337,000	82%

This problem occurs due to several factors. The first is land area, where farmers have limited capital for farming. The second is commodity prices, where the market's selling price of crops is unstable. The third is weather conditions, where the weather significantly affects the growth process of plants. However, to maintain stability and increase sales, PT UPL Indonesia continues to promote its products and offer more competitive prices in the market to ensure its products remain sellable and achieve its targets. Based on the above, the researcher intends to conduct a study titled "The Influence of Price and Promotion on the Purchase Decision of Pesticide Products at PT UPL Indonesia."

2. Methodology

The data collection methods used in this study are as follows:

Documentation study: The study was based on documents from PT UPL Indonesia. A documentation study was conducted to ensure the availability of secondary data to support this study.

Questionnaire: A list of questions in the form of a questionnaire was created and distributed to respondents for their use as samples. The questionnaire was given to respondents, namely, farmers who use products from PT. UPL. The data collected from the questionnaire distribution constitutes primary data, which is subsequently processed statistically.

Observation: Direct observation of the research object to identify issues or phenomena occurring within the research object.

Literature review: Collecting data through various sources such as journals, theses, books on marketing mix and decision making, and the internet for obtaining journals, theses, and articles related to the research title.

The researcher uses a combination of documentation study, questionnaire, observation, and literature review methods to obtain complete, accurate, and in-depth data to answer the research questions. Each method was chosen because they complement each other: documentation studies provide factual data from the company; questionnaires allow for the systematic collection of consumer perception data; observations provide a real-world picture; and literature review provides the theoretical foundation and comparisons from previous research. Using this approach, the researcher can conduct a comprehensive analysis and draw more objective and scientifically accountable conclusions.

2.1 Population and Sample

Before distributing questionnaires directly or indirectly to respondents, the author first determined the population that would become the sample.

1.2 Population

The population is the area of generalisation consisting of objects/subjects with certain qualities and characteristics determined by the researcher to be studied, and then conclusions drawn (Sugiyono, 2016). The population size in this study is all farmers who purchased PT UPL Indonesia products in April 2025, totalling 175 consumers in the Berastagi Karo to Sidikalang Dairi region.

This figure was obtained from the average number of buyers over the past three months (January to March 2025), with an average of 44 buyers of PT UPL Indonesia products per week multiplied by four weeks in one month, totalling 175 buyers. Therefore, it is assumed that the number of buyers in April is the same as in the previous three months.

1.3 Sample

This study's sample consists of buyers of PT UPL Indonesia's pesticide products, a subset of the total population (Sugiyono, 2016). The sampling technique used in this study is non-probability sampling with accidental sampling, where the sample is selected based on chance encounters.

The method for determining the sample size in this study used the Slovin formula:

$$n = \frac{N}{1 + N.e^2} \quad (1)$$

Explanation:
n = sample size
N = population size (number of buyers of PT. UPL Indonesia pesticide products in April 2025)
e^2 = acceptable error rate due to the author's inaccuracy, so in this study e is set at 10%.

Based on the Slovin formula, the sample size is as follows:
n = N / (1 + Ne2)
n = 175/(1 + 175(0.01))
n = 175/(1 + 1.75(0.01))
n = 175/(2.75)
n = 175/2.75
n = 63.63

n = 64

1.4 Data Analysis Method

The data analysis method used in this study is quantitative descriptive, while the analysis model used in this study is regression analysis of independent variables (X) on dependent variables (Y), both simultaneously and partially, using SPSS26 (Statistical Program for Social Science) software and a multiple linear model with the following results:

$$Y = a + b1X1 + b2X2 + e \quad (2)$$

Notes:
Y = Purchase decision
A = Constant
b1, b2 = Regression coefficients
X1 = Price
X2 = Promotion
e = Error term

Hypothesis Testing:

Determination (R Square)
The coefficient of determination (R Square) is a quantitative analysis of how independent variables affect dependent variables. Its relevance to this study is to determine the extent to which price and promotion as independent variables affect purchasing decisions as dependent variables.

Simultaneous Test (F-test)

Simultaneous test criteria:
If Fcount ≤ Ftab, then H0 is accepted, 1) H1 is rejected, meaning that this study has no simultaneous effect;
If Fcount > Ftab, then H0 is rejected, H1 is accepted, meaning that this study has a simultaneous effect.

Partial Test (t-test)

Partial test criteria:
If t_(calculated) ≤ t_(table), then H_0 is accepted, H_1 is rejected, meaning that this study has no effect;
If t_(calculated) > t_(table), then H_0 is rejected, H_1 is accepted, meaning that this study has an effect.

3. Results and Discussion

3.1 Results

Validity Test Results

A valid instrument means that the measuring tool used to obtain data (measure) is valid. Valid means that the instrument (questionnaire) can be used to measure what it is supposed to measure. The level of validity of the instrument indicates the extent to which the instrument has high validity (Sugiyono, 2017). The validity test in this study was conducted to determine the validity of the statements in the questionnaire given to the respondents.

Table 2. Instrument validity of the price variable (X1)

Variable	Validity Value		Description
	Calculated R	Rtable	
Price 1	0,835	0.3673	Valid
Price 2	0,900	0.3673	Valid
Price 3	0,883	0.3673	Valid
Price 4	0,884	0.3673	Valid
Price 5	0,797	0.3673	Valid
Price 6	0,782	0.3673	Valid
Price 7	0,744	0.3673	Valid
Price 8	0,921	0.3673	Valid

From the table above, it is clear that each test result for the price variable instrument has a rhitung > rtabel, which indicates that the price variable statement instrument is generally valid.

Table 3. Validity of the promotion variable instrument (X2)

Variable	Validity Value		Description
	Calculated R	Rtable	
Promotion 1	0,709	0.3673	Valid
Promotion 2	0,913	0.3673	Valid
Promotion 3	0,855	0.3673	Valid
Promotion 4	0,891	0.3673	Valid
Promotion 5	0,833	0.3673	Valid
Promotion 6	0,858	0.3673	Valid
Promotion 7	0,851	0.3673	Valid
Promotion 8	0,910	0.3673	Valid
Promotion 9	0,907	0.3673	Valid
Promotion 10	0,875	0.3673	Valid

From the table above, it can be seen that each instrument of the Promotion variable tested has an r-count> r-table; thus, it can be concluded that the statement instruments used are valid overall.

Table 4. Validity of the Purchase Decision (Y) variable instrument

Variable	Validity Value		Description
	Calculated R	Rtable	
Purchase Decision 1	0,895	0.3673	Valid
Purchase Decision 2	0,672	0.3673	Valid
Purchase Decision 3	0,809	0.3673	Valid
Purchase Decision 4	0,884	0.3673	Valid
Purchase Decision 5	0,812	0.3673	Valid
Purchase Decision 6	0,910	0.3673	Valid
Purchase Decision 7	0,895	0.3673	Valid
Purchase Decision 8	0,930	0.3673	Valid
Purchase Decision 9	0,948	0.3673	Valid
Purchase Decision 10	0,922	0.3673	Valid
Purchase Decision 11	0,904	0.3673	Valid
Purchase Decision 12	0,854	0.3673	Valid

From the table above, it is clear that each test result for the Purchase Decision variable instrument has an r-count > r-table, which indicates that the price variable statement instrument is generally valid.

Reliability Test Results:

Reliability measures the accuracy of an instrument used to measure constructs or variables. A variable instrument is one that, when used several times to measure the same object, will

produce the same data (Sugiyono, 2017). Its relationship to this study is to determine whether the questionnaire instrument is consistent and reliable in measuring independent and dependent variables.

Table 5. Reliability test results for research instruments

No	Variable	value Cronbach's alpha	Conclusion
1	Price (X1)	0.958	Reliable
2	Promotion (X2)	0.969	Reliable
3	Purchase decision (Y)	0.975	Reliable

The reliability test results, which show that the Cronbach's alpha value for each variable is greater than 0.60, confirm the reliability of the questionnaire used in this study.

Results of the Multiple Linear Regression Test:

This test was conducted to determine the effect of price and promotion on the decision to purchase pesticide products at PT UPL Indonesia and to identify the variables that truly have an impact, providing a basis for data-driven decision-making and serving as the primary tool for testing the hypotheses proposed in this study. The following table shows the multiple linear regression test results for each variable:

Table 6. Multiple linear regression analysis results

Coefficients[a]						
		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	12.293	2.465		4.988	.000
	price	.582	.168	.438	3.460	.001
	Promotion	.458	.119	.486	3.838	.000
a. Dependent Variable: Purchase Decision						

The following multiple linear equation is derived from the test data mentioned above:

$$Y= 12.293+0.582x1+0.458x2 \quad (3)$$

The constant value for the purchase decision in the multiple linear regression model is 12.293, which indicates that if the independent variables, namely price and promotion, are equal to 0, the purchase decision value (dependent variable) remains at 12.293. The regression coefficients for the price variable are 0.582 and for the promotion variable are 0.458, meaning that every one-unit increase in the price or promotion variable will cause an increase in the purchase decision value, assuming all other variables remain constant.

Hypothesis Testing:

1. Determination Test (R^2)

The coefficient of determination (R Square) is a test conducted to measure the extent to which the independent variables influence the dependent variable, or in other words, the proportion of influence of all independent variables on the dependent variable. The following table shows the results of the coefficient of determination calculations for this study.

Table 7. Test results determination (r2)

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.901[a]	.811	.805	2.245
a. Predictors: (Constant), Promotion, price				

The R Square value of 0.811, or 81.1%, can be interpreted from the table above. This means that the factors studied can explain the purchase decision variable (Y), while the remaining 18.9% is influenced by variables not studied in this research, such as product quality.

2. Simultaneous Test

A simultaneous test (F-test) was used to test this research hypothesis. This test was conducted to see the combined effect of price and promotion on purchasing decisions. The test was conducted at a confidence level of 95% or an error rate of e = 0.05 (5%), with the following criteria:

Table 8. Simultaneous test tesults (F Test)

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1320.546	2	660.273	130.954	.000[b]
	Residual	307.564	61	5.042		
	Total	1628.109	63			
a. Dependent Variable: purchase decision						
b. Predictors: (Constant), Promotion, price						

Based on the results of the F test above, the significance value of 0.000 is smaller than the alpha value of 0.05, and the calculated F value of 130.954 is higher than the table F value of 2.76. Thus, H1 is accepted, and H0 is rejected. This indicates that, in the case of PT UPL Indonesia's pesticide products, price and promotion significantly influence consumers' purchasing decisions.

Partial test

Partial testing aims to examine the partial influence of price and promotion on purchasing decisions, with the following criteria:

Table 9. Partial test results

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	12.293	2.465		4.988	.000
	price	.582	.168	.438	3.460	.001
	Promotion	.458	.119	.486	3.838	.000
a. Dependent Variable: purchase decision						

From the table above, it can be seen that:

H0 is rejected and H1 is accepted when the t-value of the Price variable is 3.460 > t-table 1.999 and the significance value is 0.001 < alpha 0.05. Therefore, price influences the decision to purchase PT UPL Indonesia pesticide products to a certain extent.

The significance level of 0.000 is smaller than the alpha level of 0.05, and the t-value for the Promotion variable is 3.838 > the t-table value of 1.999. Thus, H0 is rejected, and H1 is

accepted, indicating that promotion influences consumers' decisions to purchase PT UPL Indonesia's pesticide products.

The results of the first hypothesis test show that price and promotion can explain the variation in decisions to purchase PT UPL Indonesia pesticide products, with a coefficient of determination of 0.811 or 81.1%, while other factors not included in this study, such as product quality, influence the remaining 18.9%. Therefore, businesses should consider ways to maximise the impact of price and promotion, which have already changed by 81%. Improving product quality will help PT UPL Indonesia's pesticide products remain competitive with other brands and maintain a good reputation among farmers and pesticide product retailers. This approach aims to increase demand and purchasing decisions for PT UPL Indonesia's pesticide products by 100% through strategies beyond pricing and promotions. This aligns with the research (Pertiwi & Sudarsono, 2025) titled "The Influence of Prices and Promotions on Purchasing Decisions at Kedaibystarla Kalisuren, Tajur Halang," which found that prices and promotions influence purchasing decisions.

The findings of the second hypothesis test indicate that price and promotion significantly affect the decision to purchase PT UPL Indonesia pesticide products. This is because the Fcount value for the Price and Promotion variables is greater than the Ftable value. This is consistent with the study (Putranto & Eliyani, 2025) titled "The Influence of Price and Promotion on Purchase Decisions at Japricoffee Ciputat, South Tangerang City," which found that price and promotion significantly influence purchase decisions.

The results of this study are consistent with the results of a study conducted by Erliana et al. (2024) entitled "The Effect of Price and Promotion on the Decision to Purchase Used Motorcycles at the Kurnia Indah Maumere Showroom". The results indicate that the F-test shows that all independent variables, consisting of the Price variable (X1) and the Promotion variable (X2), simultaneously and significantly influence the Purchase Decision variable. From the above research findings, the Price and Promotion variables can influence the purchase decision for PT UPL Indonesia's pesticide products. This strategy is an important element for companies, especially for the sale of goods or products, as it can be an effective way to increase sales, build customer loyalty, enhance brand image, and manage competition in the market. This can serve as input for companies to maintain their existing price and promotion strategies, but it is also important to continue improving them to a higher level. For a trading company, the above strategy is very important and highly relied upon, as it directly relates to customers as product users.

The findings of the third hypothesis test indicate that pricing and promotion significantly and partially influence consumers' decisions to purchase PT UPL Indonesia's pesticide products. The t-calculated values demonstrate this for the price and promotion variables, which are higher than the t-table values. PT UPL Indonesia can use these findings to develop more successful marketing plans. Given that price and promotion have a significant impact on purchasing decisions, the business should focus more on creating attractive and competitive prices and targeted promotional campaigns, enhancing product appeal to consumers, strengthening market position, and ultimately driving sales growth. Additionally, these results can serve as a basis for managerial decision-making and long-term marketing strategy planning. This aligns with the research by Pratama and Megawati (2025) titled "The Influence of Price and Promotion on Purchase Decisions at HokBen Branch in Palembang City," which shows that price and promotion partially influence purchase decisions.

4. Conclusion

Based on the results of research and discussions conducted at PT UPL Indonesia, the following conclusions can be drawn:

1. The R-Square value of 0.811 or 81.1%, as indicated by the determination test results, shows that the research factors can explain the purchase decision variable (Y). The remaining 18.9% is influenced by other variables not included in this study, such as product quality and others.

2. The significance value of 0.000 is less than the alpha value of 0.05, and the calculated F value of 130.954 is higher than the table F value of 2.76, consistent with the findings of the F test above. Therefore, it can be concluded that H1 is accepted and H0 is rejected. This indicates that, when combined, price and advertising have a significant influence on consumers' decisions to purchase PT UPL Indonesia's pesticide products.

3. The partial t-test results show that price and promotion influence the decision to purchase PT UPL Indonesia's pesticide products.

Future researchers are advised to expand this study by incorporating additional variables, such as product quality, brand image, or product availability, which may also influence purchasing decisions. Additionally, intervening or moderating variables could be added using data analysis models such as SEM. Furthermore, the research scope could be expanded beyond consumer users to include distributors or retailers, making the research results more comprehensive and applicable in supporting the company's marketing strategies.

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INFLUENCE OF LEADERSHIP STYLE AND WORK MOTIVATION TOWARD EMPLOYEE PERFORMANCE ON DINAS PEMUDA, OLAHRAGA, KEBUDAYAAN DAN PARIWISATA KABUPATEN BATU BARA

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Abstract

An organisation's progress is often determined by the good or bad of its human resources management. In an organisation, humans are the central part in processing input into output produced by the organisation. Human resource management is the process of obtaining, training, assessing, and providing compensation to employees, paying attention to their work relationships, health and safety, and justice issues. This study aims to determine whether the leadership style influences performance, whether work motivation influences performance, and to analyse the effect of leadership style and work motivation simultaneously on performance in Dinas Pemuda, Olahraga, Kebudayaan dan Pariwisata Kabupaten Batu Bara. The results of hypothesis testing indicate that leadership style has an effect on performance, and work motivation has an impact on performance. Simultaneously, leadership style and work motivation significantly influence performance.
Keywords: Leadership Style; Work Motivation; Employee Performance.

1. Introduction

Achieving organisational goals is the main focus of the formation of organisations, both public and business. An organisation will succeed in achieving its goals and programs if the people working in it can do their jobs well according to their respective fields and responsibilities. A leader who can influence and direct all available resources towards achieving goals is needed for people working in the organisation to do their jobs well.

A leader largely determines an organisation's success or even failure. A noble expression says that the leader is responsible for the failure of the implementation of a job, which places the leader's position in an organisation in the most important position. Leadership is needed because there are certain limitations and advantages in humans. People's abilities vary; some have advantages, and some have limited leadership abilities. Here the need for leaders and leadership arises. Ack off stated that in addition to leaders, employees also determine a company's success (Lai, 1995). Employees with active characteristics and attitudes, such as high responsiveness, initiative, creativity, and sensitivity, are needed to adapt to the environment. All of this will be able to improve the performance of the employees themselves. Without support between leaders, the influence of leaders is marked by a change in the behaviour of their employees, in someone who feels capable and highly motivated. Leaders change their subordinates so that organisational goals can be achieved together. Siagian also strengthens this opinion by stating that the success or failure experienced by most organisations is determined by the quality of leadership possessed by the people entrusted with the task of leading the organisation (Bulayak, 2019).

From the opinions above, leaders have a fairly important role in achieving organisational goals. Furthermore, this is inseparable from the employees they lead, including their nature, attitude, and ability. A leader's responsibility is to encourage the group towards functional goals. Group members need to feel that something useful can be done with the available resources to increase their work performance (Benny, 1995).

Motivation can spur employees to work hard so they can achieve their goals. This will increase employee work productivity, which will impact on achieving company goals. There are three sources of motivation: (1) the possibility of developing, (2) the type of work, and (3) whether they feel proud to be part of the company where they work (Guanawan, 1995). In addition, several aspects influence employee motivation: a sense of security in working, a fair and competitive salary, a pleasant work environment, appreciation for work performance and fair treatment from management. Motivation has a positive and significant effect and dominant contribution in influencing employee performance (Prasetio, 2014).

Civil servants, as a bureaucratic machine, are required to work effectively and efficiently to maximise the function of government organisations. In addition to the demands above, other responsibilities include maintaining and improving the image of employees in the eyes of the public. They are often considered employees who lack work innovation, so organisational performance is considered less than optimal.

Dinas Pemuda, Olahraga, Kebudayaan dan Pariwisata Kabupaten Batu Bara is one of the government organisations that must have a good image in the eyes of the public. The existing conditions in Dinas Pemuda, Olahraga, Kebudayaan dan Pariwisata Kabupaten Batu Bara must strive to improve the performance of its employees so that organisational goals can be achieved effectively and efficiently. However, based on temporary observations in the field, there are employees whose performance is still low, and there are still many employees who are lazy and have not been optimal in meeting their performance standards. This can be seen from several indications, such as below:

Piled up work, slow job completion and lack of communication between employees or superiors. For example, when there is a letter disposition from the Regent to Dinas Pemuda, Olahraga, Kebudayaan, dan Pariwisata Kabupaten Batu Bara, the head of the office again disposes it to the head of the sub-section. Usually, in the sub-section head, if the letter is not considered important, most of it will be piled on his desk first and not worked on immediately because he prioritises other letters or work.

Some employees are less responsible for their work and prioritise their own interests. For example, suppose there is a personal interest that is not so important. In that case, the employee prefers to pursue his interests rather than his work and hands it over to another employee to temporarily take over his work, even though it is not the employee's responsibility.

There are still employees who are absent during working hours or go home early. For example, some employees leave without explanation during working hours and go home earlier than the normal time to go home from work.

The low performance of employees of Dinas Pemuda, Olahraga, Kebudayaan, and Pariwisata Kabupaten Batu Bara can be studied by looking at the factors that influence employee performance, and can even be said to be very decisive in efforts to achieve previously set organisational goals. This is in accordance with the opinion of Sondang P. Siagian who stated: "The Relationship between Leadership and Performance The success of an organisation both as a whole and various groups within an organisation concerned (Mujiati, 2014). It can even be accepted as a "trueism" if it is said that the quality of leadership in an organisation plays a very dominant role in the success of the organisation in carrying out its various activities, especially seen in the performance of its employees".

2. Methodology

This quantitative research gathers data numerically and statistically to meet scientific standards such as concrete or empirical, objective, quantifiable, rational, and methodical

Mujiati (Ausat, 2022). This study consists of two variables: Leadership Style and Work Motivation as independent variables and Employee Performance as the dependent variable.

The population in this study were the employees of Dinas Pemuda, Olahraga, Kebudayaan, and Pariwisata Kabupaten Batu Bara, namely 60 employees. The sample in this study was 31 employees. The research instrument used in this study was a questionnaire, a list of questions asked of respondents to be answered. Instrument testing in this study used validity and reliability tests. Before conducting data analysis, classical assumption testing was carried out, including normality tests, multicollinearity tests and heteroscedasticity tests. The data analysis used was descriptive and inferential analysis, which included multiple linear regression analysis and hypothesis testing, which included simultaneous tests (F tests) and partial tests (t tests).

3. Results and Discussion

a. Validity Test

Table 1. Validity test

Question Item	r-count	r-table	Description
	Leadership style (X1)		
X1.1	0,364	0,355	Valid
X1.2	0,451	0,355	Valid
X1.3	0,285	0,355	Invalid
X1.4	0,431	0,355	Valid
X1.5	0,408	0,355	Valid
X1.6	0,403	0,355	Valid
X1.7	0,526	0,355	Valid
X1.8	0,266	0,355	Invalid
	Work Motivation (X2)		
X2.1	0,637	0,355	Valid
X2.2	0,243	0,355	Invalid
X2.3	0,652	0,355	Valid
X2.4	0,666	0,355	Valid
X2.5	0,502	0,355	Valid
X2.6	0,146	0,355	Invalid
X2.7	0,602	0,355	Valid
X2.8	0,624	0,355	Valid
	Employee Performance (Y)		
Y.1	0,777	0,355	Valid
Y.2	0,549	0,355	Valid
Y.3	0,555	0,355	Valid
Y.4	0,822	0,355	Valid
Y.5	0,348	0,355	Invalid
Y.6	0,656	0,355	Valid
Y.7	0,562	0,355	Valid
Y.8	0,560	0,355	Valid

Most questionnaires on the Leadership Style variable (X1) show a calculated r value greater than the r-table (0.355), so they are declared valid. Question items X1.1, X1.2, X1.4, X1.5, X1.6, and X1.7 meet the validity criteria. However, there are two invalid question items, namely X1.3 and X1.8, because their calculated r values are 0.285 and 0.266, respectively, below the r table.

The Work Motivation variable (X2) contains six valid question items, X2.1, X2.3, X2.4, X2.5, X2.7, and X2.8, with r-count values above the r-table. These items can be relied on to measure respondents' work motivation. Meanwhile, two items, X2.2 and X2.6, are declared invalid because their r-count values are only 0.243 and 0.146, respectively.

For the Employee Performance variable (Y), almost all question items were declared valid, with r count values ranging from 0.549 to 0.822, except for item Y.5, which had an r count value of 0.348, slightly below the r table threshold, so it was considered invalid. In general, the results of this test indicate that most of the research instruments have met the validity requirements.

b. Reliability Test

Table 2. Reliability test

Variable	Cronbach Alpha	Description
Leadership style (X1)	0,692	Unreliable
Work Motivation (X2)	0,757	Reliable
Employee Performance (Y)	0,851	Reliable

Three variables were tested, and two were declared reliable: the Work Motivation variable (X2) with a Cronbach's Alpha value of 0.757 and the Employee Performance variable (Y) with a value of 0.851. This shows that the instrument used to measure the two variables has good internal consistency and can be relied on in the data collection process. Meanwhile, the Leadership Style variable (X1) shows a Cronbach's Alpha value of 0.692, slightly below the minimum reliability limit generally set at 0.70. Thus, the X1 variable is categorised as unreliable, which means that the measurement instrument for this variable has inadequate internal consistency.

c. Classical Assumption Test

1. Normality Test

Table 3. Reliability test

One-Sample Kolmogorov-Smirnov Test

		Unstandardized Residual
N		31
Normal Parameters[a,b]	Mean	.0000000
	Std. Deviation	3.00493675
Most Extreme Differences	Absolute	.087
	Positive	.083
	Negative	-.087
Test Statistic		.087
Asymp. Sig. (2-tailed)		.200[c,d]

a. Test distribution is Normal.

b. Calculated from data.

c. Lilliefors Significance Correction.

d. This is a lower bound of the true significance.

The results of the normality test show that the Asymp. Sig. (2-tailed) value is 0.200, a value of 0.200 > 0.05 was obtained, and it can be concluded that the data is normally distributed. Thus, the normality assumption is met so that parametric statistical analysis can be used for hypothesis testing in this study. This normality is important to ensure the validity of the results of further statistical tests, such as linear regression or Pearson correlation.

2. Linearity Test

Table 4. Linearity test

ANOVA Table

			Sum of Squares	df	Mean Square	F	Sig.
Employee Performance (Y) * Leadership style (X1)	Between Groups	(Combined)	494.173	13	38.013	2.280	.056
		Linearity	229.739	1	229.739	13.782	.002
		Deviation from Linearity	264.435	12	22.036	1.322	.292
	Within Groups		283.375	17	16.669		
	Total		777.548	30			

Based on the results of the linearity test, the Deviation from Linearity value is 0.292, which is greater than the significance level of 0.05. This indicates that there is no significant deviation from the linear relationship pattern between the independent and dependent variables. Thus, it can be concluded that the relationship between the two variables is linear and meets one of the important assumptions in linear regression analysis.

3. Heteroscedasticity Test

Table 5. Heteroscedasticity test

Correlations

			Leadership style (X1)	Work Motivation (X2)	Unstandardized Residual
Spearman's rho	Leadership style (X1)	Correlation Coefficient	1.000	.452*	.003
		Sig. (2-tailed)	.	.011	.985
		N	31	31	31
	Work Motivation (X2)	Correlation Coefficient	.452*	1.000	-.044
		Sig. (2-tailed)	.011	.	.813
		N	31	31	31
	Unstandardized Residual	Correlation Coefficient	.003	-.044	1.000
		Sig. (2-tailed)	.985	.813	.
		N	31	31	31

*. Correlation is significant at the 0.05 level (2-tailed).

Based on the results of the heteroscedasticity test using the Spearman Rank method, the significance value (Sig. 2-tailed) for the Leadership Style variable (X1) was 0.985, and for the Work Motivation variable (X2) was 0.813. Both values are above the significance threshold of 0.05, so it can be concluded that there is no significant relationship between the independent and residual variables. Thus, the regression model in this study does not experience heteroscedasticity problems, which means that the error variance (residual) is constant at each predictor value. This shows that the classical assumption of homoscedasticity is met, so the linear regression model used can be interpreted as statistically valid and reliable.

4. Multiple Linear Regression Analysis Results

Table 6. Multiple linear regression analysis test

Coefficients[a]						
		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	2.122	4.128		.514	.611
	Leadership style (X1)	.224	.133	.214	1.682	.104
	Work Motivation (X2)	.761	.142	.682	5.350	.000
a. Dependent Variable: Employee Performance (Y)						

Based on the regression equation above, it is interpreted as follows:

a. Constant (2.122): This means that if Leadership Style (X_1) and Work Motivation (X_2) are zero, then the Employee Performance (Y) value is predicted to be 2.122. This value reflects the basic performance of employees without the influence of the two independent variables.

b. Leadership Style Coefficient X_1 (0.224): Every one-unit increase in the Leadership Style variable (X_1) will increase Employee Performance (Y) by 0.224, assuming that the Work Motivation variable remains the same. This shows that leadership style has a positive influence on employee performance.

c. Work Motivation Coefficient X_2 (0.761): Every one-unit increase in the Work Motivation variable (X_2) will increase Employee Performance (Y) by 0.761, assuming that the leadership style remains the same. This shows that work motivation also positively influences employee performance, even stronger than leadership style.

d. Hypothesis Testing Results

1. Partial Test (t-Test)

Table 7. Partial test

Coefficients[a]						
		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	2.122	4.128		.514	.611

Leadership style (X1)	.224	.133	.214	1.682	.104
Work Motivation (X2)	.761	.142	.682	5.350	.000

a. Dependent Variable: Employee Performance (Y)

Based on the results of the partial test (t-test) on the Leadership Style variable (X_1) on Employee Performance (Y), the calculated t value was 1.682, while the t-table value was 2.048 at a significance level of 5% with degrees of freedom (df) = 28. In addition, the significance value (Sig.) produced was 0.104, which is greater than 0.05. Thus, it can be concluded that the Leadership Style variable does not have a significant influence on Employee Performance.

Based on the results of the partial test (t-test) on the variable Work Motivation (X_2) on Employee Performance (Y), the calculated t value is 5.350, while the t table is 2.048 at a significance level of 5% with degrees of freedom (df) = 28. The resulting significance value (Sig.) is 0.000, which is smaller than 0.05. Thus, it can be concluded that Work Motivation has a significant effect on Employee Performance.

2. Simultaneous Test (F Test)

Table 7. Simultaneous test

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	506.659	2	253.330	26.185	.000[b]
	Residual	270.889	28	9.675		
	Total	777.548	30			

a. Dependent Variable: Employee Performance (Y)

b. Predictors: (Constant), Work Motivation (X2), Leadership style (X1)

Based on the results of the simultaneous test (F test), the calculated F value is 26.185, while the F table value is 3.34 at a significance level of 5% with degrees of freedom numerator (df_1) = 2 and denominator (df_2) = 28. The resulting significance value (Sig.) is 0.000, which is much smaller than 0.05. Thus, it can be concluded that Leadership Style and Work Motivation simultaneously have a significant effect on Employee Performance.

3. Test of Determination Coefficient (R2)

Table 8. Coefficient Determination t-test

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.807[a]	.652	.627	3.110

a. Predictors: (Constant), Work Motivation (X2), Leadership style (X1)

b. Dependent Variable: Employee Performance (Y)

Based on the coefficient of determination (R^2) value of 0.652, it shows that 65.2% of the variation in Employee Performance (Y) can be explained by two independent variables, namely Leadership Style (X_1) and Work Motivation (X_2) simultaneously. Meanwhile, the remaining 34.8% is explained by other factors outside this research model. In other words, this regression model has a fairly strong ability to explain changes in employee performance,

so that both leadership style and work motivation play an important role in improving employee performance in Dinas Pemuda, Olahraga, Kebudayaan dan Pariwisata Kabupaten Batu Bara.

4. Conclusion

Statistically, the variables of Leadership Style and Work Motivation in Dinas Pemuda, Olahraga, Kebudayaan, and Pariwisata Kabupaten Batu Bara simultaneously have a significant effect on Employee Performance. In other words, both variables simultaneously make a real contribution to influencing the level of employee performance. Combining an appropriate leadership style and high work motivation has been empirically proven to improve employee performance.

Based on the results of the research conducted, several weaknesses and deficiencies were found in this study. The weaknesses and deficiencies in this study are:

1. The variables used to analyse the factors that influence employee performance consist of only two factors. So, this variable does not represent all the factors affecting employee performance.

2. This research only uses a sample of 31 people from a population of 60. The results obtained may cause differences if carried out on all employees.

To improve employee performance, the synergy between an effective leadership style and strong work motivation can significantly boost employee performance. The most dominant variable in influencing employee performance is work motivation, which can be an input to motivate employees further, so that employee performance can be even better. Dinas Pemuda, Olahraga, Kebudayaan dan Pariwisata Kabupaten Batu Bara must pay great attention to developing leadership competencies and strategies for increasing motivation to achieve optimal service goals.

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THE EFFECT OF PRICE, PRODUCT QUALITY, AND SERVICE QUALITY ON CUSTOMER SATISFACTION AT MORIA'S CAFÉ

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Abstract

This study aims to determine the effect of price, product, and service quality on customer satisfaction with Moria's cafécafé. The sample of this study was all Moria's Café customers, using non-probability sampling with an accidental sampling technique. The data analysis method used multiple linear regression tests and hypothesis testing using the coefficient of determination (R2) test. R2 determination test price variables, product quality, and service quality can explain the variations that occur in variable Y. Besides that, simultaneous hypothesis testing shows that price variables, product quality and service quality significantly affect customer satisfaction at Moria's Café. While partially price, product quality does not affect customer satisfaction at Moria's Café.
Keywords: Price; Product quality; Service quality.

1. Introduction

Exciting destinations such as Lake Toba in North Sumatra are examples of the rapid growth of Indonesian tourism. The government has designated Lake Toba as one of the Super Priority Tourism Destinations (DPSP) to attract more local and international tourists. Simarjarunjung, Simalungun Regency, is famous for its stunning natural scenery and direct view of Lake Toba. Because of this natural beauty, many businesses see great opportunities, especially those working in the culinary field, who seek to provide travellers with unique experiences.
In the tourism and hospitality industry, customer satisfaction is the main factor determining a business's success. Customers who feel satisfaction and joy after using a good or service can be defined as customer satisfaction. In the culinary industry, good price, product quality, and service quality are needed because these can increase customer satisfaction and are expected to increase the company's profitability (Riyanto, 2003).

A product can be considered quality if it is fit for its intended use and the subjective quality of the product meets one's taste. Quality can be defined as the physical compliance with the manufacturer's specifications and conformity with requirements, according to the manufacturer's understanding. Satisfactory quality in this case is based on consumer satisfaction. In a broad sense, quality includes products, services, people, processes, and the environment. This fulfils customer desires so that customers will feel satisfied and like the product.

In addition to product quality, every competing company, especially in the culinary field, must pay attention to pricing policies. Price is the product's value because it affects producers' profits and is a consumer consideration when buying goods. Therefore, the price must be calculated carefully (Ardiansah, 2022). However, in other cases, the price is the amount the buyer pays. In this case, sellers use price to differentiate themselves from their competitors. Pricing is part of the differentiation function of goods in marketing.

In addition to improving product quality, companies must also enhance the quality of service to ensure customer satisfaction. This is important because it will affect the company's

reputation, and the company will benefit from good service. According to (Park Aditia, 2023), one way to assess the quality of "service" is to see how well the service is provided; good service will definitely satisfy customers.

Customer satisfaction is influenced by service quality and price. Customer satisfaction will increase if service variables can be improved and pricing policies can be adjusted to customer expectations and demands.

This research was conducted at Moria's Café, which is located at Jalan Besar Simarjarunjung, Simalungun Regency. Moria's Café in Simarjarunjung has a culinary tourism concept with the beauty of Lake Toba as the main attraction. This café is a favourite place for foreign and local tourists who want to enjoy food and drinks against the backdrop of exotic natural scenery and coffee produced by Moria's Café. Therefore, to maintain and improve business competitiveness, the manager of Moria's Café must know what affects customer satisfaction. From the observations made by the researcher, there are still many customer complaints regarding prices, slow service, unfriendly employees, and product quality, including unappetising fried rice and snacks that do not match expectations.

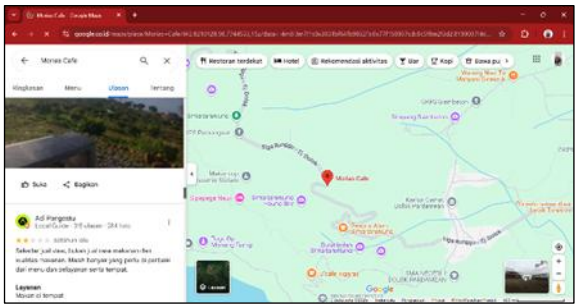

Fig. 1. Customer reviews of Moria's cafe

Based on the above background, the researchers are interested in researching the "Effect of Price, Product Quality, and Service Quality on Customer Satisfaction at Moria's Café".

Research conducted by Riyanto (2023), titled "The Effect of Pricing, Product Quality, and Service Quality on Customer Satisfaction," shows that the price variable has a positive effect on customer satisfaction, the product quality variable has a positive impact on customer satisfaction, and the service quality variable has a positive and significant effect on customer satisfaction.

Research conducted by Aisyah (1995), titled "Effect of Product Quality, Service Quality and Price on Consumer Satisfaction on VGY Wallpaper Pekanbaru Consumers", shows that product quality has a positive and significant effect on customer satisfaction, service quality has a positive and significant impact on customer satisfaction, and price has a positive and significant effect on customer satisfaction. Product quality, service quality and price jointly affect customer satisfaction with VGY wallpaper.

Research by Laksana (2022) has shown that price, product quality, and service quality significantly influence customer loyalty. Product and service quality have a positive and significant influence on customer loyalty, but price has a positive and insignificant influence on customer loyalty. The results of the determination test state that the percentage effect of price, product quality, and service on customer loyalty is 72.4%, and the influence of other variables on customer satisfaction outside this study is 27.6%.

2. Methodology

The data collection methods used in this study are as follows:

1. Documentation: The study is based on documents from Moria's Café
2. Questionnaire: making a list of questions to be addressed to respondents
3. Observation: Data will be directly observed at Moria's Café Simarjarunjung.
4. Literature research: Collecting data through various journal acquisitions, theses, marketing mix books and voting decisions, the internet for acquiring thesis journals and theses and articles related to the research title.

2.1 Population and Sample

Before distributing questionnaires to respondents, the researchers first determined the population that would be sampled. A population is a generalisation area consisting of objects/subjects with certain qualities and characteristics that researchers choose to study and then draw conclusions Sugiyono (2016). The population in this study was all visitors to Morias Café in April 2025, totalling 2,400 consumers.

This figure is obtained from the average number of visitors in the last three months (January-March 2025). The average number of visitors to Moria's Café weekly was 600, multiplied by four weeks a month, totalling 2400 visitors. So, it is assumed that the number of April visitors will be the same as in the previous 3 months.

The sample is part of the population (Sugiyono, 2016). This study used non-probability sampling with an accidental sampling technique. An accidental sampling is a withdrawal based on the truth of the meeting.

Based on the Slovin formula, the sample size is obtained as follows:

$n= N/ 1+Ne^2$
$n= 1.200/(1+1.200(0.01^2))$
$n= 1.200/(1+1.200(0.01)$
$n= 1.200/ (1+12)$
$n= 1200/13$
$n= 92,307$
$n= 92$

The data analysis method applied in this study uses quantitative descriptive methods while the analysis model used in this study is multiple linear regression analysis to find the effect of the independent variable (X) on the dependent variable (Y), both simultaneously and partially using the SPSS27 (Statistical Program for Social Science) programme with the Multiple Linear Regression model with the following formulas:

$$Y=a+b_1X_1+b_2X_2+e \quad (1)$$

Description:
Y = Purchase decision
a = Constant a
b_1,b_2 = Regression Coeffeicient
X_1 = Price
X_2 = Promotion
e = Error term

2.2 Hypothesis Testing:

a. Coefficient of Determination (R Square)

The coefficient of determination (R Square) is a test to measure how much the independent variable influences the dependent variable. It can also be said to be the proportion of the influence of all independent variables on the dependent variable.

b. Simultaneous Test (F-Test)

This study's hypothesis was tested using a simultaneous test (F test). The test is conducted to see the effect of the marketing mix, which includes price, product quality, and service quality, simultaneously on customer satisfaction. Testing is carried out at a confidence level of 95.

c. Partial Test (T-Test)

Partial test aims to see the effect of the marketing mix, which includes Price, Product Quality, Service Quality, partially on Consumer Satisfaction, with criteria:

1) If $t_{count} \leq t_{table}$ then H_0 is accepted, H_1, H_2, H_3, are rejected, meaning that partially this research has no effect.
   If $t_{count} > t_{table}$ then H_0 is rejected, H_1 is accepted, meaning that partially this research has an effect.

3. Results and Discussion

3.1 Test validity

The validity test is used to see the accuracy of the instrument used in the study. The instrument is said to be valid if r-count> r-table. The validity results of each research variable instrument are as follows:

Table 1. Validity instrument variable (Price) (X1)

Variable	Value		Description
	Rcount	Rtable	
Price 1	0,520	0.373	Valid
Price 2	0,487	0.373	Valid
Price 3	0,659	0.373	Valid
Price 4	*0,772*	0.373	*Valid*
Price 5	0,625	0.373	Valid
Price 6	0,538	0.373	Valid
Price 7	0,844	0.373	Valid
Price 8	0,664	0.373	Valid

Table 1 shows that testing each instrument of the Price variable has r-count> r-table; thus, it can be concluded that the overall statement instrument of the Price variable used is valid.

Table 2. Validity of product quality variable instruments (X2)

VariabelVariable	Validity Value		Description
	Rcount	Rtable	
Product quality 1	0,749	0.373	Valid
Product quality 2	0,721	0.373	Valid
Product quality 3	0,580	0.373	Valid
Product quality 4	0,711	0.373	Valid
Product quality 5	0,580	0.373	Valid
Product quality 6	0,778	0.373	Valid

Product quality 7	0,576	0.373	Valid
Product quality 8	0,562	0.373	Valid
Product quality 9	0,561	0.373	Valid
Product quality10	0,685	0.373	Valid
Product quality11	0,827	0.373	Valid
Product quality12	0,701	0.373	Valid

Table 2 shows that testing each instrument of the product quality variable has r-count> r-table; thus, it can be concluded that the overall statement instrument of the product quality variable used is valid.

Table 3. Validity of service quality variable instruments (X3)

Variable	Validity Value		Description
	Rcount	Rtable	
Service quality 1	0,595	0.373	Valid
Service quality 2	0,647	0.373	Valid
Service quality 3	0,815	0.373	Valid
Service quality 4	0,786	0.373	Valid
Service quality 5	0,786	0.373	Valid
Service quality 6	0,831	0.373	Valid
Service quality 7	0,864	0.373	Valid
Service quality 8	0,663	0.373	Valid
Service quality 9	0,738	0.373	Valid
Service quality 10	0,717	0.373	Valid

Table 3 shows that the test of each service quality variable instrument has r-count> r-table; thus, it can be concluded that the overall statement instrument of the service quality variable used is valid.

Table 4. Validityl ofl iinstrumentl variablel consumerl satisfactionon (Y)

VariabelVariable	Validity Value		Description
	Rcount	Rtable	
Customer satisfaction 1	0,688	0.373	Valid
Customer satisfaction 2	0,688	0.373	Valid
Customer satisfaction 3	0,691	0.373	Valid
Customer satisfaction 4	0,818	0.373	Valid
Customer satisfaction 5	0,769	0.373	Valid
Customer satisfaction 6	0,791	0.373	Valid

Table 4 shows that testing each instrument of the Consumer Satisfaction variable has a rcount>l rtable; thus, it can be concluded that the overall statement instrument of the Consumer Satisfaction variable used is valid.

3.2 Reliability Test

The reliability test is carried out to ensure that the instrument used is reliable, consistent, and stable if used repeatedly at different times. The instrument is reliable if the calculated Cronbach's alpha value> Cronbach's alpha tolerance (0.60). The results of the reliability test look like the following:

Table 5.Reliabilityltest results

No	Variabel		Conclusion
1	Pricel (X1)	0,866	Reliable
2	Productl qualityl (X2)	0.916	Reliable
3	Servicel qualityl l (X3)	0.932	Reliable

4	Customer satisfaction (Y)	0.904	Reliable

The reliability test results show that the Cronbach's alpha value of all variables is greater than 0.60, so it can be concluded that this research questionnaire is declared reliable.

3.3 Multiple linear regression test results

This test was conducted to determine the effect of price, product and service product quality, and service quality on customer satisfaction at Moria Café. The following is a table of multiple linear regression test results on each variable, namely:

Table 6. Multiple linear regression analysis results

Coefficients[a]						
		Unstandardised Coefficients		Standardised Coefficients		
Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	6.934	2.829		2.451	.016
	Price	.115	.083	.144	1.396	.166
	Product_Quality	-.041	.042	-.075	-.986	.327
	Quality_Service	.398	.067	.621	5.975	.000
a. Dependent Variable: Satisfaction_consumer						

Based on the test results above, the multiple linear equation is obtained as follows:

$$Y = 6.934 + 1.396 + (-0.986) + 5.975 \quad (2)$$

In the multiple linear regression model, the constant value of the purchasing decision is 6,934, meaning that if the value of the independent variables is price, product quality, service quality, and physical evidence is 0, then the dependent variable of consumer satisfaction has a value of 6,934. The regression coefficient of the independent variable is positive, meaning that customer satisfaction at Moria's café can be influenced by service quality. Conversely, the regression coefficient of the independent variable is negative, meaning that consumer satisfaction at Moria's Café affects price and product quality.

3.3 Hypothesis Testing

1. Coefficient of determination (r2)

The results of the calculation of the Coefficient of Determination of this study can be seen in the following table:

Table 7. Determination test results (r2)

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.718[a]	.516	.500	1.247

Table 7 shows that the magnitude of the R Square value of 0.516, or 51.6%, explains this study's significant Customer Satisfaction (Y). The remaining 48.4% is influenced by other variables not examined in this study, such as facilities.

2. Simultaneous test (F-test)

The F distribution can be an appropriate probabilistic model for the covariance ratio of two samples taken independently from a normally distributed population.

Table 8. Simultaneous test results (F-Test)

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	146.026	3	48.675	31.294	.000[b]
	Residual	136.876	88	1.555		
	Total	282.902	91			

a. Dependent Variable: Satisfaction_consumer

b. Predictors: (Constant), Service Quality, Product Quality, Price

Based on the results of the F test above, the results obtained from the count value of 31.294 are greater than the table value of 2.48, and the significance value of 0.000 is smaller than the alpha of 0.05. It can be concluded that H0 is rejected and H1 is accepted. This means that simultaneously the price, product quality, and service quality variables significantly affect customer satisfaction at Moria's café.

3. Partial Test (T-Test)

Table 9. Partial test results (T-Test)

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	6.934	2.829		2.451	.016
	price	.115	.083	.144	1.396	.166
	Product_Quality	-.041	.042	-.075	-.986	.327
	Quality_Service	.398	.067	.621	5.975	.000

a. Dependent Variable: Satisfaction_consumer

Based on the table above:

1. The calculated value of the Price variable is 1.396 < t -table 1.987 and a significant value of 0.166> from alpha 0.05, so H0 is accepted and H1 is rejected, thus, the price has no effect on customer satisfaction at Moria's Café.
2. The t-value of the product quality variable is -0.986< t-table 1.987, with an insignificant value of 0.327> from alpha 0.05, so H0 is accepted, and H1 is rejected. Thus, partially, product quality has no effect on customer satisfaction at Moria's Café.
3. The t-value of the service quality variable is 5.975> t-table 1.987 and a significant value of 0.000 < alpha 0.05, so H0 is rejected and H1 is accepted. Thus, the quality of service partially affects customer satisfaction at Moria's Café.

The results of testing the first hypothesis show that the coefficient of determination obtained is 0.516, or 51.6%, indicating that service quality can explain the variations that occur in Moria's Café customer satisfaction. The remaining 60.3% is explained by other variables not examined in this study, such as facilities, etc.

The results of testing the second hypothesis show that simultaneously the price, product quality, and service quality variables have a significant effect on customer satisfaction at Moria's Café. This is evidenced by the F-count value for the price variable, product quality, and service quality, which is greater than the F-table.

The results of this study are in accordance with research conducted [7]. By analysing the results of this study, it is indicated that product quality, price, and service quality have a positive

and significant effect on customer satisfaction at Cafe Madanil Bumdesl Rambipuji. This study suggests that companies implement strategies to ensure customer satisfaction by examining product quality, price, and service quality factors.

However, when tested partially using the t-test, only the service quality variable is proven to affect customer satisfaction significantly. The service quality t-value is 5.975 with a significance of 0.000, indicating that service quality is the dominant factor in determining customer satisfaction at Moria's Café. This is in line with research conducted by [8], which also proves the positive effect of service quality on customer satisfaction in Sukoharjo Coffee shops. Good service quality, such as staff friendliness, service speed, and the ability to meet customer needs, is the main key to creating a positive experience that leads to customer satisfaction and loyalty.

In contrast, the price and product quality variables do not significantly affect customer satisfaction. Pricel has a t-value of 1.396 with a significance of 0.166. In contrast, product quality has a t-value of -0.986 with a significance of 0.327, both of which are above the 0.05 significance limit, so the hypothesis of the partial influence of the two variables is rejected. This is similar to research conducted by [8], which found that price perception has no significant effect on customer satisfaction in Sukoharjo coffee shops. This indicates that Moria's Café consumers may have considered the price offered to be in accordance with the value received, so that price is not the main determining factor for satisfaction. Meanwhile, insignificant product quality can be caused by consumer perception that the product served lacks differentiation or innovation compared to competitors, so it is not a major factor in assessing satisfaction.

Overall, the findings of this study indicate that increasing customer satisfaction at Moria's Cafe can be achieved by prioritising improving service quality. Responsive, friendly, and professional service has created positive customer experience and strengthened loyalty. This finding aligns with previous research that emphasises the importance of service quality as a major factor in determining customer satisfaction in the café and restaurant sector. Although price and product quality did not have a significant effect, both aspects still need to be maintained so as not to cause dissatisfaction.

The results of this study indicate that in the context of culinary tourism, such as Moria's Café, which relies on the natural charm of Lake Toba as the main attraction, customer service experience is a more prominent factor than price and product quality. This is likely due to consumer expectations, especially those of tourists, who prioritise comfort, hospitality, and atmosphere when visiting. Therefore, service quality is the element that customers most directly feel.

Although the price and product quality variables do not significantly affect customer satisfaction, this does not mean that these two factors can be ignored. The analysis results show that consumers consider the price variable reasonable and tend to accept it according to the value of the benefits obtained. This indicates that price is not a major concern for consumers because it is in accordance with the location and atmosphere offered by Moria's Café.

Meanwhile, the partial insignificance of product quality's effect may indicate problems such as a lack of consistency in taste, appearance, or product innovation. Consumer complaints, such as food that does not meet expectations, can be the basis for evaluating product quality aspects to meet consumer expectations better.
On the other hand, the service quality variable is proven to affect customer satisfaction significantly. This shows that staff friendliness, service speed, and the ability to respond to customer needs are dominant indicators of satisfaction at Moria's Café. This finding aligns

with previous research, which states that service quality is closely related to customer loyalty and positive experiences.

The findings also reinforce the importance of human resource management in the service sector, particularly by providing ongoing training to employees, improving service systems, and raising the standard of customer interaction. Thus, customer satisfaction can be maintained and even increased over time.

In addition to the variables studied, 48.4% of other variables have not been explained in this study, but they also influence customer satisfaction. These variables may include aspects of the café atmosphere, complete facilities such as seating, environmental cleanliness, parking access, internet network, interior aesthetic elements and background music that contribute to the overall consumer experience. For this reason, it is recommended that future researchers expand the scope of the study by adding these factors to obtain a more comprehensive picture of the determinants of customer satisfaction in the tourism-based culinary industry.

4. Conclusion

Based on the results of research and discussion conducted at Moria's cafécafé, the following conclusions can be drawn:

1. Based on the results of the determination test, the R-squared value of 0.516, or 51.6%, explains that the variables of this study can explain the Consumer Satisfaction variable (Y), while the remaining 48.4% is influenced by other variables not examined in this study, such as facilities, etc.

2. Based on the results of the F-test, the F-count value of 31.294 is greater than the F-table value of 2.48, and the value of 0.000l is significantly smaller than the alpha of 0.05; it can be concluded that H0 is rejected and H1 is accepted. This means that simultaneously, the variables of price, product quality, and service quality have a significant effect on customer satisfaction at Moria's café.

3. Based on the results of the t-test, service quality affects customer satisfaction. Moria's café. Meanwhile, price and product quality do not affect customer satisfaction at Moria's Café.

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EVALUATION OF SUSTAINABILITY OF MSME BUSINESS BASED ON FINANCIAL HEALTH THROUGH ALTMAN Z-SCORE ANALYSIS

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Abstract

This study aims to evaluate the sustainability of PT Keloria Moringa Jaya's MSME business based on financial health through Altman Z-Score analysis. MSMEs play a vital role in the Indonesian economy; however, many face challenges in maintaining their financial health. The Altman Z-Score method measures the likelihood of bankruptcy by analysing five key financial ratios. This study employs a qualitative descriptive approach, utilizing secondary data from PT Keloria Moringa Jaya's financial statements for the years 2022 to 2024. Data were collected through documentation of income statements and balance sheets, and limited interviews with the company's accounting staff were conducted as supporting data. The analysis technique uses the Altman Z-Score modified model for non-public companies, with the formula Z = 0.717X1 + 0.847X2 + 3.107X3 + 0.420X4 + 0.998X5. The analysis results indicate that the company is in a safe zone with a Z score far exceeding the threshold in each observation year, indicating excellent financial stability and a low risk of bankruptcy. This research provides strategic recommendations for improving financial management, employee training, and developing marketing strategies to support business sustainability. Therefore, this study is expected to contribute to developing healthier and more sustainable MSMEs.
Keywords: Sustainability; Financial Health; Altman Z-Score.

1. Introduction

Micro, Small, and Medium Enterprises (MSMEs) are vital to the Indonesian economy. According to the Ministry of Cooperatives and SMEs data, the MSME sector contributes around 60% of the national GDP and absorbs more than 100 million workers. However, many MSMEs face various challenges that hinder the sustainability of their businesses, especially in terms of financial health. Financial health is key in determining the competitiveness and sustainability of a business. Therefore, it is important to evaluate the sustainability of MSME businesses based on their financial health. According to (Wibowo & Hidayah, 2023), the low understanding of MSME actors regarding internal financial conditions is a factor causing weak, irrational and measurable business decision-making. Research on the financial health of MSMEs is often conducted using various analysis methods. One of the most famous is the Altman Z-Score, a statistical model designed to measure the likelihood of a company going bankrupt. This model measures several financial ratios to provide an overview of a company's financial stability. In the context of MSMEs, applying the Altman Z-Score can help business owners understand their financial position and take appropriate steps to improve business sustainability. Kurniawansyah & Agustia (2021) explained that the Altman Z-Score is very relevant in identifying the financial distress conditions of companies early on, including on the scale of MSMEs that have not yet been listed on the stock exchange. The Altman Z-Score is a bankruptcy prediction model developed by Edward Altman in 1968. This model uses discriminant analysis to combine several financial ratios into one score that can be used to assess the likelihood of a company going bankrupt. Initially, this model was designed for public manufacturing companies in the United States but has undergone various modifications to be applied to various types of companies, including MSMEs.

Financial health analysis is crucial at PT Keloria Moringa Jaya, which is engaged in producing and selling moringa leaves. Although moringa products have broad market potential, challenges in financial management often hinder business development. Therefore, evaluating the financial health of PT Keloria Moringa Jaya using the Altman Z-Score is the right step to identify potential risks and formulate improvement strategies. This is reinforced by the findings by Romaniyah & Alfian (2024), which state that most MSMEs in the agribusiness sector have difficulty maintaining stable cash flow and require an applicable financial risk detection method. To identify potential problems or threats in a company's finances, such as the risk of bankruptcy, cash shortages, or capital structure imbalances.

The desire to research the financial health of MSMEs, especially in the context of PT Keloria Moringa Jaya, is based on several important factors. First, the MSME sector has a strategic role in the Indonesian economy, significantly contributing to GDP (Gross Domestic Product) and job creation. However, many MSMEs have difficulty maintaining their financial health, which can threaten business continuity if not appropriately handled. Second, this research is important to provide a deeper understanding of applying relevant financial analysis methods, such as the Altman Z-Score, which many MSME still rarely use in practice. By conducting this research, it is hoped to provide a clear picture of the challenges faced by PT Keloria Moringa Jaya and provide strategic recommendations that can help them improve financial performance and business sustainability. Third, this research has the potential to contribute to academic and practical literature in MSME financial management, as well as open new horizons for developing more effective strategies in utilising the potential of the growing herbal product market. Therefore, the desire to conduct this research is important in supporting the development of healthier and more sustainable MSMEs in Indonesia.

Initial observations were conducted at PT Keloria Moringa Jaya, which provided valuable insights into the company's financial and operational health. During the visit, it was seen that PT Keloria Moringa Jaya has excellent potential in producing and marketing moringa leaf products, which are known as a superfood with high health benefits. Although the product is in good demand in the market, there are some striking challenges related to financial management. One of the first things that caught our attention was the lack of systematic financial reporting and management. The management team did not have easy access to regular income statements and balance sheets, making it difficult to understand the company's revenue, costs, and profitability. In addition, it was seen that most financial decisions were made based on intuition and experience, without strong data support. Furthermore, observations regarding production operations revealed fluctuations in raw material inventory, possibly due to a lack of planning in purchasing and storage. Fluctuations in raw material prices were also a concern, with management having difficulty anticipating sudden price increases, directly impacting profit margins.

2. Methodology

The data analysis method used in this study is a qualitative descriptive method, which aims to provide a comprehensive overview of the company's financial condition. The analysed data consists of primary and secondary data. Primary data was obtained through direct interviews with accounting and finance staff at PT Keloria Moringa Jaya. Meanwhile, secondary data consists of the company's audited financial statements for 2022 to 2024, including the balance sheet and income statement. Internal data originates from within the company and is used as a basis for managerial decision-making. This aligns with research by Sularsih & Wibisono (2021), which emphasises that financial literacy and good accounting information systems improve the quality of financial reports and internal control of MSMEs. In addition, (Kaukab et al., 2020) found that accounting knowledge, business experience, and work motivation significantly influence how intensively MSME actors use accounting information in their operational activities. This finding is also reflected in a study (Wijaya et al., 2023), which shows that using accounting information contributes 83.6% to the success of MSME businesses. The

data collection technique was done through the documentation method, which collected the company's financial documents during the research period. All financial data was then used to calculate the ratios required in the Altman Z-Score analysis to assess the potential risk of bankruptcy and the company's financial health.

The library research method involves collecting data and information from various reference sources relevant to the research topic. These sources include textbooks, scientific journals, articles, government publications, and trusted online sources. The documentation method involves collecting data from company documents, especially PT Keloria Moringa Jaya's financial statements for 2022-2024. The financial statements collected include profit and loss statements and balance sheets.

The population in this study comprises all three financial reports of PT Keloria Moringa Jaya from 2022 to 2024. Given the small population available and only three financial reports, this study uses the entire population as a sample. In other words, all three (three) annual financial reports of PT Keloria Moringa Jaya from 2022 to 2024 will be analysed. The sampling technique used in this study is census or total sampling.

3. Results and Discussion

Table 1. Summary of financial report components of PT Keloria Moringa Jaya for the Period 2022-2024

Year	2022	2023	2024
Total Assets	125.000.000	657.777.975	1.091.262.651
Capital/equity	75.000.000	626.337.975	929.608.975
Long Term Debt/Liabilities	50.000.000	31.400.000	12.800.000
Sale	369.486.461	1.156.359.013	1.749.290.835
Earnings Before Interest and Tax (EBIT)	159.704.552	507.777.975	976.591.820
Retained earning	159.260.108	507.777.975	976.591.820
Tax	444.444	5.781.795	8.746.454

The Altman Z-Score model used in this study is a modified model for non-public companies, which is suitable for the context of MSMEs. The formula is as follows:

$$Z = 0{,}717X_1 + 0{,}847X_2 + 3{,}107X_3 + 0{,}420X_4 + 0{,}998X_5 \quad (1)$$

Information:
Z = Overall Index
X_1 = Working Capital / Total Assets
X_2 = Retained Earnings / Total Assets
X_3 = Earnings Before Interest and Tax / Total Assets
X_4 = Book Value of Equity / Total Liabilities
X_5 = Sales / Total Asset

Table 2. Interpretation of Z Value

Z Value Range	Information
Z > 2.9	Safe Zone (Healthy)
1.23 < Z < 2.9	Grey Zone (Doubt)
Z < 1.23	Distress Zone

The calculation of the Altman z-score analysis in numbers and percentages for the last three years (2022-2024 period) at PT Keloria Moringa Jaya is as follows:

a. Year 2022

$$X_1 = \frac{\text{working capital}}{\text{total assets}} = \frac{57.087.500}{125.000.000} = 0{,}4567$$

$$X_2 = \frac{\text{retained earning}}{\text{total assets}} = \frac{159.087.500}{125.000.000} = 1{,}2741$$

$X_3 = \frac{\text{EBIT}}{\text{total assets}} = \frac{159.704.552}{125.000.000} = 1{,}2776$
$X_4 = \frac{\text{book value of equity}}{\text{total liabilities}} = \frac{75.000.000}{50.000.000} = 1{,}5$
$X_5 = \frac{\text{sales}}{\text{total assets}} = \frac{369.486.461}{125.000.000} = 2{,}9559$

Z = 0,717(0,4567) + 0,847(1,2741) + 3,107(1,2776) + 0,420(1,5) + 0,998(2,9559) (2)
= 0,3274 + 1,0791 + 3,9716 + 0,63 + 2,9499
= 8,958

b. Year 2023

$X_1 = \frac{\text{working capital}}{\text{total assets}} = \frac{626.337.975}{657.777.975} = 0{,}9522$
$X_2 = \frac{\text{retained earning}}{\text{total assets}} = \frac{159.087.500}{657.777.975} = 0{,}2418$
$X_3 = \frac{\text{EBIT}}{\text{total assets}} = \frac{507.777.975}{657.777.975} = 0{,}7719$
$X_4 = \frac{\text{book value of equity}}{\text{total liabilities}} = \frac{626.337.975}{31.400.000} = 19{,}94$
$X_5 = \frac{\text{sales}}{\text{total assets}} = \frac{1.156.359.013}{657.777.975} = 1{,}7579$

Z = 0,717(0,9522) + 0,847(0,2418) + 3,107(0,7719) + 0,420(19,94) + 0,998(1,7579) (3)
= 0,6827 + 0,2048 + 2,3982 + 8,3748 + 1,7543
= 13,3591

c. Year 2024

$X_1 = \frac{\text{working capital}}{\text{total assets}} = \frac{929.608.975}{1.091.262.651} = 0{,}8518$
$X_2 = \frac{\text{retained earning}}{\text{total assets}} = \frac{976.591.820}{1.091.262.651} = 0{,}8949$
$X_3 = \frac{\text{EBIT}}{\text{total assets}} = \frac{976.591.820}{1.091.262.651} = 0{,}8949$
$X_4 = \frac{\text{book value of equity}}{\text{total kliabilities}} = \frac{929.608.975}{12.800.000} = 72{,}39$
$X_5 = \frac{\text{sales}}{\text{total assets}} = \frac{1.749.290.835}{1.091.262.651} = 1{,}6030$

Z = 0,717(0,8518) + 0,847(0,8949) + 3,107(0,8949) + 0,420(72,39) + 0,998(1,6030)
= 0,6107 + 0,7580 + 2,7804 + 30,4038 + 1,6000
= 36,1529

The Z-score calculation result for 2022, 8.96, places PT Keloria Moringa Jaya in the safe (healthy) zone, which means the company is in excellent financial condition. This value far exceeds the minimum threshold (2.9), which indicates that the company has robust financial health and is not in a condition that will lead to bankruptcy in the near future.

High value on X ratio$_2$and X_3shows that the company has significant retained earnings and EBIT to total assets. This indicates high efficiency in generating profits from the assets owned. The X ratio$_5$which is close to 3, indicates that assets are used productively in supporting sales activities. In addition, the X ratio$_4$which reaches 1.5, indicates a balanced and relatively healthy capital structure, although the proportion of debt is still quite significant. This finding is supported by Harahap et al.(2020), who stated that a high Z-score reflects efficient asset utilisation and a stable capital structure.

The liquidity ratio (X_1) is also moderate at 0.4567, which indicates that the company has sufficient working capital to support short-term operations.

Based on the Altman Z-Score method analysis, the Z value obtained by PT Keloria Moringa Jaya in 2023 was 13.35, far above the safe threshold (2.9). This shows that the company's financial condition is very healthy. Financial ratios such as working capital, profitability (EBIT and retained earnings), capital structure, and asset utilisation efficiency show positive results. This aligns with the findings of Tania et al. (2021), who stated that the modified Z-score is effective in detecting early financial risks in developing MSMEs.

The company has demonstrated an extraordinary ability to manage finances, maintain liquidity, generate profits, and utilise assets for sales efficiently. With a high ratio of equity to liabilities (X ratio)$_4$of 19.94, the company has a robust capital structure and is not dependent on debt.

The results of the Altman Z-Score calculation show that PT Keloria Moringa Jaya is in the safe zone with a very high score, namely 36.15, far above the threshold of 2.9. This shows that the company has a robust financial structure, with:

1. High liquidity (X_1= 0.85)
2. High profitability ($X_2$and X_3= 0.89)
3. The equity to liability ratio is very high (X_4= 72.39), indicating minimal dependence on debt.
4. Good efficiency of asset utilisation to generate sales (X_5= 1.60)

4. Conclusion

Based on the analysis conducted using the Altman Z-Score method on PT Keloria Moringa Jaya from 2022 to 2024, it can be concluded that this company shows excellent financial health. The Z-score value obtained is far above the safe threshold, indicating that PT Keloria Moringa Jaya is not at risk of bankruptcy. This shows that the company has good financial stability, which is crucial in supporting business sustainability.

Further analysis shows that the company's financial management efficiency is also high. Ratios such as working capital, retained earnings, and EBIT show the company can utilise existing resources to generate significant profits. With good performance in utilising assets, PT Keloria Moringa Jaya can maintain competitiveness in an increasingly competitive market, especially in the herbal product sector. The company's capital structure also shows positive results. The high equity-to-liability ratio shows that PT Keloria Moringa Jaya has a low dependence on debt. This is important because it reduces financial risk and provides more flexibility in making investment decisions. This strong financial health allows the company to invest in product development and market expansion.

Although the analysis results show good financial conditions, PT Keloria Moringa Jaya must remain vigilant and not be complacent. The company is expected to manage financial reports more systematically and regularly. This will make it easier for management to make data-based decisions and minimise the possibility of errors in financial management. As a real step in improving performance, the company is advised to train employees on financial management and using accounting software. PT Keloria Moringa Jaya can ensure financial management is carried out more professionally by improving employee skills. In addition, a more effective marketing strategy needs to be developed to face competition in the market, so that moringa leaf products can reach more consumers and increase company revenue.

Several previous studies support this finding. Ginting & Wardayani (2022) found that the Altman Z-Score method is reliable for detecting early signs of financial distress, including in companies operating in developing regions. Romaniyah & Alfian (2024) showed that many MSMEs in the agribusiness sector struggle to maintain stable cash flow, and implementing methods such as the Altman Z-Score can help them identify risky financial conditions early on. In another study, Triani (2023) applied a modified Altman Z-Score to MSMEs in Southeast

Sulawesi and demonstrated that the model effectively maps the potential risks and sustainability of small and medium enterprises. The findings of this study also align with research by Wibowo & Hidayah (2023), which stated that companies with high equity-to-debt ratios, stable retained earnings, and year-over-year sales increases tend to have Z-Scores in the safe zone, indicating a strong and sustainable financial structure.

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THE INFLUENCE OF BRAND AMBASSADORS AND PRODUCT QUALITY ON PURCHASING DECISIONS AT GLAD2GLOW

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Abstract

This study aims to understand how brand ambassadors and product quality influence purchasing decisions for Glad2Glow products. The research sample, selected using a census technique, includes all young men and women from GKPI Perdagangan in Simalungun, North Sumatra. Using multiple linear regression analysis, coefficient of determination (R^2), F-test, and t-test, the results indicate that brand ambassadors and product quality play a significant role in explaining the variation in purchasing decisions. Additionally, simultaneous and partial hypothesis testing confirmed that both variables, Brand Ambassador and product quality, significantly influence purchasing decisions for Glad2Glow products.
Keywords: Brand Ambassador; Product Quality; Purchase Decision.

1. Introduction

The demand for beauty continues to grow as a priority and has become a lifestyle, especially for women, to enhance their appearance. Women always strive to beautify themselves by using cosmetics. Excessive desire for beauty and misunderstandings when using cosmetics often lead women to make mistakes when choosing and applying cosmetics, without considering their impact on the skin and the environment. The results do not lead to healthy and beautiful skin, but excessive use of cosmetics can cause various skin conditions. Beauty care has become a necessity for everyone who desires clean and beautiful skin. The current lifestyle demands greater attention to appearance. Moreover, Indonesia is a tropical country, where people living in tropical climates face unique skin issues.

Currently, the beauty product, known as skin care products that is popular and loved among teenagers and adults is Glad2glow. Glad2glow is an Indonesian brand that sells various beauty care products. Glad2glow was founded in 2022 by young entrepreneur Aliyyah Kohl. Glad2glow focuses on beauty products such as facial cleansers, masks, serums, and cushions. Glad2glow beauty products are very popular at the moment, due to their quality and the fact that they are registered with the Indonesian Food and Drug Administration (BPOM). Glad2glow does not use harmful substances for the skin, such as mercury and hydroquinone. According to the official Glad2glow website via the Shopee platform, Glad2glow products are priced at Rp47, 000 per item. Glad2glow also offers product bundles and reseller packages.

Technological developments are advancing and evolving, particularly in the field of marketing. Increasingly fierce competition has led many companies to consider ways to make their businesses more competitive. Companies use the web as a means of marketing their products. Companies utilise web technology in marketing by designing and establishing commercial centres. A Commercial Centre is a website or online application that facilitates the buying and selling process across various stores. Companies employ various strategies to strengthen their business in their competitive landscape. One strategy is to identify icons that attract consumers' attention to their products. In marketing, the term 'icon' refers to an individual who can influence consumers to purchase their products, and such individuals are often referred to as brand ambassadors.

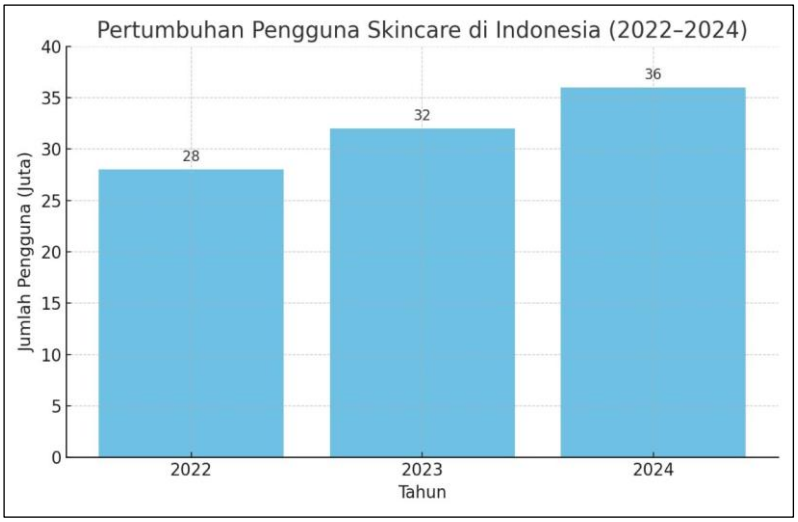

Fig. 3. Growth of skincare users in Indonesia
Source: Statista Market Forecast Data, 2024

The development of the skincare industry in Indonesia also shows an interesting trend, where skincare products are no longer only sought after by adults, but have spread to various age groups, from school children to the elderly. This phenomenon is triggered by increasing awareness of the importance of early skincare and societal changes in consumption patterns. Among schoolchildren and teenagers, skincare has become an integral part of their daily lifestyle. Social media and influencers play a significant role in introducing basic skincare routines such as facial cleansers, moisturisers, and sunscreen. Meanwhile, the productive age group (20-40 years old) tends to be more selective in choosing products, considering ingredient content and long-term benefits.

However, older people are also beginning to show interest in anti-aging products that help maintain skin health as they age. Glad2glow, as a local skincare brand, faces the challenge of meeting the needs of this diverse age group. The brand's success in positioning its products in the market is greatly influenced by two main factors: the selection of the right brand ambassador and consistent product quality. A brand ambassador relatable to various generations can create an emotional connection, while proven product quality will build long-term trust.

Table 1. Major Skincare brands in Indonesia and their number of users

Brand Skincare	Users	Age segmentation
Wardah	20 million	20-40 years
Scarlett whitening	15 million	18-35 years
Somethinc	10 million	18-30 years
Emina	7 million	13-22 years
Glad2glow	2,5 million	16-25 years

Glad2Glow is very popular because it successfully meets the needs of young people looking for practical and affordable skincare products. With proven quality that delivers real results, such as brighter and smoother skin, and pocket-friendly prices, this product is perfect for young people on a limited budget. By 2025, more than 2.5 million users in Indonesia will have used Glad2glow, with the majority coming from the student community. Glad2Glow offers skincare and an experience that boosts users' confidence.

1. Maulana and Komala (2024), in their research on "The Influence of Brand Ambassadors and Product Quality on Purchasing Decisions," state that brand ambassadors influence purchasing decisions, and product quality influences buying decisions.

2. Sivalia's (2023) research on "The Influence of brand ambassadors and product quality on Online Purchasing Decisions on Shopee E-Commerce with Trust as a Moderating Variable Reviewed from a Sharia Business Perspective" states that brand ambassadors and product quality significantly influence online purchasing decisions.

3. Pakpahan's (2023) research on "The Influence of brand ambassadors and product quality on Purchase Decisions for Scarlett Whitening Skincare by Students of the Faculty of Economics, University of Medan Area" states that brand ambassadors and product quality can influence purchase decisions for Scarlett Whitening skincare by students of the Faculty of Economics, University of Medan Area, by 35.5% after adjusting for the sample and independent variables. The remaining 64.5% is explained by other variables not investigated in this study.

4. Lestari and Murtiyanto (2024), in their research on "The Influence of Product Quality and Brand Ambassador on the Purchase Decision of Somethinc Skincare Products," state that product quality and the contribution of the brand ambassador have a significant and beneficial influence on the purchase decision of Somethinc skincare products.

5. Chintya and Rismawati (2022), in their research on "The Influence of brand ambassadors, product quality, and Brand Image on the Purchase Decision of Scarlett Whitening Products", state that the results of the study show that brand ambassadors have a positive and significant influence on purchase decisions, and product quality has a positive and significant influence on purchase decisions. Brand image has a positive and significant influence on purchase decisions.

When using brand ambassadors, companies typically focus on the achievements and images of the brand ambassadors. Companies will choose ambassadors who are well-liked and idolised by the public, whether because of their accomplishments, work, or behaviour. Brand ambassadors are intended to promote the company's products, foster the company's identity, and shape consumer opinion about a product. Brand ambassadors and advertising are crucial for a company, as they determine whether the products offered can compete with those of competitors, especially since many consumers today are selective when purchasing products offered by companies.

2. Methodology

The data collection methods used in this study are as follows:

1. Field research

This research was conducted at Gkpi Trade Church Street 1. It uses in-depth interviews to explore further the experiences and perspectives of Gkpi youth regarding the factors influencing their purchasing decisions.

2. Questionnaire

The questionnaire is a data collection method used in this study. It involves a series of written questions and responses from respondents. In this research, a Likert scale is employed in the questionnaire. The Likert scale measures individuals' or groups' awareness, understanding, and perceptions regarding social issues. The Likert scale is utilised to assess responses that range from positive to negative.

3. Library Research

A technique for collecting secondary data based on books and literature related to research variables is library research. The aim is to find theories related to the study problem. There are various methods for obtaining secondary data, including:

a. Library studies - involve collecting data or information through reading and studying literature or other materials related to the issues being researched. The study of libraries is based on secondary sources, such as literature and books that relate to the object of research and aim to understand existing theories related to the problems being investigated.
b. Journals supporting data related to research discussing various fields of education and research are considered relevant to the topic of education.
c. Internet - By searching for data related to the research topic, published on the internet in journals, papers or written works.

2.1 Population and Sample

Population: A population is a set of individuals or objects that share certain similarities and serve as the primary focus of a research study. The population utilised in this research consists of 65 youth members of GKPI Commerce.

Sample: A sample is a subset of a population with specified numbers and characteristics. The saturation sampling (census) analysis approach is used in this research. Census techniques are employed in this study's sampling process. Information was collected using census techniques, utilising every population member as a source or respondent. In other words, no one is excluded from the population. Each member of the population is examined individually. All 65 members of the population will be sampled, given questionnaires, or interviewed if there are 65 members. This method is typically employed when the population is small enough to allow for a study of the entire population. Consequently, the total population of 65 individuals becomes the sample in this research.

2.2 Data Analysis Method

This study employs a quantitative method as the data analysis approach. This method has been utilised for many years and encompasses a long-standing tradition as a research method. Quantitative data analysis involves using computational and statistical techniques that focus on data sets' numerical, mathematical, or statistical evaluation. Therefore, measurement or numerical representation is inevitable when researchers employ this method. In this method, research begins with descriptive statistical phases, followed by more specific analyses to obtain additional data. Through quantitative research, it is possible to collect and analyse large volumes of data (Sofwatillah et al., 2024).

2.3 Hypothesis Testing

Determinasi (R Square)
The coefficient of determination, commonly known as a measure of the impact of all independent variables on the dependent variable, is used to evaluate various factors that indicate how independent variables affect the dependent variable.

Simultaneous Test (F Test)

Test criteria:
a) If the significance value (sig) > 0.05, then H0 is accepted and H1 is rejected.
b) If the significance value (sig) < 0.05, then H0 is rejected and H1 is accepted.

Partial Test (t-test)

Partial Test (T-test) With a confidence level of 95% (α = 0.05), the t-test assesses the partial impact of independent variables on the dependent variable while keeping all other factors constant.

Test criteria:
a) If the significance value (sig) < 0.05, the hypothesis is accepted.
b) If the significance value (sig) > 0.05, the hypothesis is rejected.

3. Results and Discussion

Validity Test Results:

The validity test determines the accuracy of the instruments used in the study. An instrument is considered valid if r-count > r-table. The validity results for each research variable instrument are as follows:

Table 2. Validity of Brand Ambassador (X1) variable instruments

Variable	Validity Value		Description
	RCalculate	Rtable	
Brand Ambassador 1	0,650	0.3673	Valid
Brand Ambassador 2	0,741	0.3673	Valid
Brand Ambassador 3	0,775	0.3673	Valid
Brand Ambassador 4	0,752	0.3673	Valid
Brand Ambassador 5	0,732	0.3673	Valid
Brand Ambassador 6	0,785	0.3673	Valid

According to the table displayed above, it is clear that each instrument used for the brand ambassador variable has an r-value that exceeds the r-value in the table, indicating that all instruments related to statements regarding the brand ambassador variable are valid.

Table 3. Validity of product quality Variable Instruments (X2)

Variable	Validity Value		Description
	Rcalculate	Rtable	
product quality 1	0,785	0.3673	Valid
product quality 2	0,739	0.3673	Valid
product quality 3	0,675	0.3673	Valid
product quality 4	0,836	0.3673	Valid
product quality 5	0,660	0.3673	Valid
product quality 6	0,731	0.3673	Valid
product quality 7	0,588	0.3673	Valid
product quality 8	0,534	0.3673	Valid

The table above shows that all instruments used to measure the product quality variable have produced correlation coefficients that exceed the tabulated values, demonstrating their validity.

Table 4. Validity of the Purchase Decision (Y) variable instrument

Variable	Validity Value		Description
	Rcalculate	Rtable	
Purchase Decision 1	0,820	0.3673	Valid
Purchase Decision 2	0,771	0.3673	Valid
Purchase Decision 3	0,799	0.3673	Valid
Purchase Decision 4	0,775	0.3673	Valid
Purchase Decision 5	0,843	0.3673	Valid

Purchase Decision 6	0,739	0.3673	Valid
Purchase Decision 7	0,835	0.3673	Valid
Purchase Decision 8	0,895	0.3673	Valid
Purchase Decision 9	0,771	0.3673	Valid
Purchase Decision 10	0,458	0.3673	Valid
Purchase Decision 11	0,828	0.3673	Valid
Purchase Decision 12	0,836	0.3673	Valid

As seen from the table above, where each instrument of the purchasing decision variable Y has r-count > r-tabel, the instruments for the statements of the purchasing decision variable used are generally valid.

Reliability Test Results:

Reliability testing ensures that the device is stable, reliable, and consistent when used repeatedly at different times. The instrument is considered reliable if the calculated Cronbach's alpha value exceeds the permissible Cronbach's alpha (0.60). The results of the reliability testing are as follows:

Table 5. Results of the reliability test of the research instrument

No	Variable	Nilai Cronbach's alfa	Conclusion
1	Brand Ambassador (X1)	0.900	Reliable
2	product quality (X2)	0.895	Reliable
3	Purchase Decision (Y)	0.954	Reliable

The reliability of the questionnaire used in this study can be derived from the reliability test results, which indicate that the Cronbach's alpha value for each variable is greater than 0.60.

Multiple Linear Regression Test Results:

This research aims to determine how purchasing decisions regarding Glad2Glow are influenced by product quality and brand support. The table below displays the results of the multiple linear regression test for each variable:

Table 6 Results of multiple linear regression analysis

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	-4.567	4.596		-.994	.324
	BrandAmbassadorx1	1.035	.287	.432	3.604	.001
	product qualityx2	.840	.227	.442	3.693	.000

a. Dependent Variable: Purchase Decision

Based on the above test results, the following multiple linear equations were obtained:

$$Y= -4.567+(0.432)X1+(0.442)X2 \quad (1)$$

The value of the purchase decision constant from the multiple linear regression analysis is -4.567. This indicates that when both independent factors, namely product quality and brand ambassador, are set to zero, the dependent variable of purchase decision will equal -4.567. The regression coefficients for the independent factors are greater than zero.

Hypothesis Testing

1. Determination Test (R2)
The results of the Determination Coefficient calculations for this study can be seen in the following table:

Table 7. Test Results Determination (r2)
Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.831[a]	.690	.680	4.40520

a. Predictors: (Constant), product qualityx2, BrandAmbassadorx1

According to Table 7, the R Square value of 0.690, or 69.0%, clearly indicates that the research variables can explain the purchasing choice variable (Y), with the remaining 31.10% influenced by factors not included in this study, such as product price.

2. Simultaneous Test:
The F distribution can be an appropriate probability model for the ratio variance of two samples taken independently from the same normally distributed population.

Table 8. Simultaneous Test Results (F Test)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2679.242	2	1339.621	69.032	.000[b]
	Residual	1203.158	62	19.406		
	Total	3882.400	64			

a. Dependent Variable: Purchase Decision
b. Predictors: (Constant), product qualityx2, BrandAmbassadorx1

The results of the previously discussed F test indicate that the calculated F value of 69.032 exceeds the tabulated F value of 2.75, and the significance level of 0.000 is lower than the alpha threshold of 0.05. Therefore, H0 is rejected while H1 is accepted. This indicates that the quality of Glad2Glow products and brand representatives significantly affects the overall purchase decision for Glad2Glow products.

3. Partial Test:

Table 9. Partial Test Results
Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	-4.567	4.596		-.994	.324
	BrandAmbassadorx1	1.035	.287	.432	3.604	.001
	product qualityx2	.840	.227	.442	3.693	.000

a. Dependent Variable: Purchase Decision

Based on the table above, it can be seen that:

The brand ambassador variable has a t-value of 3.604, higher than the table t-value of 1.998. Additionally, the significance value of 0.001 is less than the required significance level of alpha, which is 0.05. These results provide credibility to reject the null hypothesis H0 and accept the

alternative hypothesis H1. This indicates that the brand ambassador significantly impacts consumers' purchasing decisions for Glad2Glow products, at least in part.

The calculated t value for product quality is 3.693 > the table t value of 1.998, indicating that H0 is rejected and H1 is partially accepted. The significance threshold is 0.000 < alpha 0.05. Customer intention to purchase the Glad2Glow product is influenced by its quality.

Based on the first hypothesis test results, brand ambassadors and product quality can explain the variation in Glad2Glow product purchases, as evidenced by a coefficient of determination of 0.690 or 69.0%. Meanwhile, factors such as product price and other elements not analysed in this study account for the remaining 31.10%. Therefore, the company should consider optimising the results of brand ambassador and product quality, which have influenced 69.0% of purchases. To ensure that Glad2Glow products can continue to compete with other companies and maintain a positive reputation among users, this can be achieved by setting competitive and reasonable prices. This aligns with the research conducted by Yusuf et al. (2022) titled "The Influence of product quality and K-Pop Brand Ambassador NCT Dream on Purchase Decisions for Lemonilo Noodles in Manado," which states that the variables of brand ambassador and product quality can only influence purchase decisions by 69.8%, with the remaining percentage influenced by variables not examined in this study.

The results of the second hypothesis test indicate that the brand ambassador variable and the product quality variable significantly impact the purchase of Glad2Glow products simultaneously. This is evidenced by the fact that the F value for the Brand Ambassador variable is greater than the F value. The findings of this study are in line with the research conducted by Maulana and Komala (2024), which shows that based on the F test, all independent variables, namely brand ambassador X1 and product quality X2, have a significant influence on the overall Purchase Decision variable. This study shows that the brand ambassador and product quality influence the decision to purchase Glad2Glow products.

This strategy is essential for companies, especially when selling goods or products, as it can effectively increase sales. The techniques mentioned above are very important and reliable for trading companies, given their direct relationship with customers as product users. This aligns with the research conducted by Apriliana et al. (2025) titled "The Influence of product quality, Price, and Brand Ambassador on Purchase Decisions and Consumer Satisfaction with Azarine Brand Sunscreen Skin Care Products in Pekanbaru City," which states that the variables of brand ambassador and product quality significantly influence purchase decisions.

The results of the third hypothesis test show that purchasing decisions for Glad2Glow are significantly influenced, in part, by brand ambassadors and product quality. The t-values calculated for both variables, which exceed the t-values listed in the table, clarify this point. Glad2Glow will significantly benefit from this data when developing a stronger marketing plan. Given that brand ambassadors significantly impact purchasing decisions, it is important for businesses to choose competitive and attractive brand ambassadors. Similarly, maintaining and improving product quality will increase the product's appeal to consumers. This aligns with the research conducted by Chasanah and Budiarti (2025) titled "Brand Ambassador, Product Quality, and E-WOM to Enhance Purchase Decisions for Y.O.U Beauty Cosmetics Among Students at the University of 17 August 1945 Surabaya, which states that the variables of brand ambassador and product quality have a significant influence on purchase decisions.

4. Conclusion

Based on the research results and discussion, the following conclusions can be drawn:

1. The results of the determination test show that the R Square value is 69.0%, equivalent to 0.690. From this statistic, it is clear that 69.0% of the fluctuations in the Purchase Decision variable (Y) can be explained by the variables analysed in this study. The remaining 31.0% of the changes in purchase decision are attributable to price and additional factors not discussed in this study.

2. Based on the findings from the F test, the calculated F value of 69.032 exceeds the registered F value of 2.75. Additionally, the alpha level of 0.05 exceeds the significance level of 0.000. This indicates that the null hypothesis, H0, is rejected, and the alternative hypothesis, H1, is accepted. In simpler terms, both brand ambassadors and product quality significantly influence consumer purchasing choices for Glad2Glow products.

3. According to the partial t-test results, the factors of brand ambassador and product quality impact the decision to purchase Glad2Glow products.

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ADAPTATION STRATEGY OF TOURISM CULINARY TO CHANGES IN CONSUMER BEHAVIOR DUE TO TOLL ROAD DEVELOPMENT IN TANJUNG PURA IN THE ERA OF SOCIETY 5.0 (CASE: DODOL KARUNIA PAK RAHMAT)

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Abstract

This study aims to identify changes in tourists' patterns towards Karunia Dodol Pak Rahmat due to the construction of toll roads, analyse adaptation strategies implemented by the dodol business sector, and determine the factors that influence the success of these strategies. The research approach used is a qualitative method with a case study type, data collection techniques through interviews and in-depth observations of business actors. The sample was selected using purposive sampling based on direct involvement in the studied phenomenon. The sample consists of business actors who have run their businesses before and after the construction of toll roads to provide a perspective on changes in consumer patterns. The results of this study indicate that the construction of toll roads has a negative impact as it decreases the dodol sales. Therefore, an appropriate adaptation strategy is needed to utilise social media to increase dodol businesses in the era of society 5.0.

Keywords: Consumer Pattern; Adaptation Strategy; Society 5.0

1. Introduction

Tourism is one of the fastest-growing economic sectors and contributes significantly to regional growth. In its development, culinary tourism has become an integral part, as it serves as a tourist attraction and reflects a region's cultural richness (Suprihatin, 2020). Traditional food products managed by Micro, Small, and Medium Enterprises (MSMEs), such as dodol, have become distinctive identities with economic value and cultural significance.

Dodol is one of the most popular traditional foods, made from glutinous rice flour, coconut milk, and sugar, and undergoes a special processing method. One of the well-known regions for dodol production is Tanjung Pura in Langkat District, North Sumatra. This sub-district, particularly the village of Paya Perupuk, has developed into a dodol industry hub, with a row of dodol shops along the North Sumatra–Aceh highway serving as a natural marketing magnet for travellers (Netti Herlina et al., 2021). The distinctive soft, sweet, and savoury taste of Tanjung Pura dodol is a unique attraction and has been passed down through generations by the local community. Along the Medan–Aceh route, SMEs from various villages such as Pematang Tengah and Serapuh Asli have also developed similar businesses, creating a strong local economic ecosystem based on traditional cuisine (Tambunan et al., 2022).

However, the construction of significant infrastructure, such as the Binjai–Langsa toll road, has had an impact that was not fully anticipated by local businesses. The toll road connecting major cities in North Sumatra has shortened travel times and changed the community's mobility patterns and tourists' behaviour (Alham et al., 2024). This more efficient access has redirected tourist traffic from the old route to the toll road, thereby reducing the number of visits to local culinary centres not located along the main toll road corridor (Hamsana & Hidir, 2025).

This situation poses a significant challenge for SMEs that previously relied heavily on direct tourist visits. Before the construction of the Binjai-Langsa toll road, this area was known as a centre for dodol production and was popular with tourists. However, after the toll road was built, the main transportation route became more accessible, resulting in a drastic decline in the number of tourists visiting Tanjung Pura. This phenomenon has become a serious problem for businesses that rely on direct tourist visits.

These changes do not occur in isolation, but rather alongside broader social transformations marked by the advent of the Soc era. Artificial intelligence (AI), the Internet of Things (IoT), and big data are technologies used during the Society 5.0 era to address social issues and improve the quality of life for communities. In the Society 5.0 era, e-commerce is shaped by leveraging technology to adapt to changes in consumer behaviour and enhance market dynamics (Bernovskis et al., 2024). Consumers are now more active, selective, and reliant on digital platforms to determine preferences, make purchases, and provide reviews. Therefore, adaptation strategies that align with the needs of MSMEs in the Society 5.0 era are quite significant (Alamin et al., 2022).

In this context, adaptation strategies are key to maintaining the sustainability of traditional dodol businesses amid changes in the business landscape. These strategies include using digital technology, product innovation, and developing broader distribution and marketing networks. This study will examine how the adaptation strategies implemented by Dodol Karunia Pak Rahmat in Tanjung Pura have responded to changes in consumer patterns resulting from the construction of a toll road and how business operators have undergone transformation in response to the challenges of the Society 5.0 era.

2. Methodology

This study was conducted on Jalan Lintas Tanjung Pura-Aceh, Langkat Regency, North Sumatra, which is known as one of the centres of traditional dodol production. This location was chosen because it has been significantly impacted by the construction of a toll road, which has altered consumer visit patterns and local market dynamics. The subject of this study is Usaha Dodol Karunia Pak Rahmat, a local culinary business. The research was conducted over five months, from February to June 2025.

Table 1 Research Schedule

No	Activities	Month				
		Feb	Mar	Apr	May	June
1	Title submission					
2	Research proposal writing					
3	Research permit application					
4	Research implementation					
5	Thesis writing					
6	Thesis guidance					
7	Publish					

The aim is to explore and gain a deep understanding of the adaptation strategies employed by businesses in response to changes in consumer patterns in the Society 5.0 era. This study uses a descriptive qualitative approach because it allows researchers to gain a contextual and in-depth understanding of the phenomenon being studied (Grave et al., 2022).

The research procedure consists of three main stages: preparation, implementation, and analysis. During preparation, researchers develop a research proposal, obtain permits, and determine participant selection criteria. The implementation stage includes direct observation

at the business location, in-depth interviews with owners and employees, and interaction with consumers or tourists. Additionally, researchers document findings through photographs and field notes to support data validity. The final stage involves data processing and analysis.

Research data analysis consists of three main steps: exploration, interpretation, and conclusion. The exploration stage is carried out by identifying and classifying data from observations and interviews based on relevant themes. Next, the interpretation stage involves interpreting the meaning of behaviours, statements from informants, and the context of field findings, which are then linked to the concept of adaptation strategies in the Society 5.0 era. The final stage is the conclusion, which involves formulating research findings based on patterns emerging from the data, and then verifying these findings through the triangulation of information sources to ensure their validity. This approach enables researchers to produce a complete picture of the adaptive responses of business actors to external challenges, such as toll road construction and changes in consumer behaviour.

The research instruments used consisted of observation guidelines and semi-structured interview guidelines. The observation guidelines were used to record daily operational activities, interactions with consumers, the use of technology in marketing, and changes in accessibility due to toll road construction. Meanwhile, the interview guide was used to explore in-depth narratives related to the adaptation strategies implemented by business actors. This study used visual documentation as supporting data and utilised secondary literature such as scientific journals, official reports, and relevant online articles. Since this study was qualitative and non-experimental, no laboratory equipment or specific test materials were used in the information-gathering process.

3. Results and Discussion

To achieve a goal, a strategy must be developed. In Greek, the word "strategy" comes from the word "strategos," which means "soldier," and "ego," which means "leader." A strategy has a basis or plan for achieving the intended goal. Therefore, a strategy is a tool for achieving goals (Wirawan et al., 2022). A strategy is a plan created by a company leader that focuses on long-term goals to improve the quality of the business. In conducting business, every company does not release products based solely on its own decisions (Rahmatunnisa, Ayu; Kamaliah, R; Yusri, 2023).

Strategies are not only aimed at reaching target markets or increasing profits, but must also be able to respond to current challenges such as changes in consumer behaviour, shifts in tourism trends, and disruptions caused by digital innovation. Thus, adaptation strategies are a concrete manifestation of a business's ability to read the situation and respond quickly and appropriately to remain relevant and competitive.

Adaptation strategies are an important response to social change, as societies must strive to remain relevant and meet new needs and demands arising from social transformation (Nur et al., 2022). In this context, it is important to discuss how businesses respond to changing consumer patterns and how adaptation strategies are key to this process. Businesses can adopt strategies such as innovation or transformation to respond to these changes.

Dodol Karunia is a traditional culinary business located in Tanjung Pura, Langkat Regency, North Sumatra. It has been in operation since 2000. Mr. Rahmat owns and manages the business directly. He is a small and medium-sized enterprise (SME) entrepreneur who is deeply committed to preserving the traditional taste of dodol amidst the rapid changes of modern times. The name "Dodol Karunia" derives from the name of his second son, Karunia.

The main product produced is sticky rice dodol in various flavours and colours, such as original pulut dodol, pandan dodol, durian dodol, and peanut dodol. These are processed manually

while maintaining traditional processing methods without preservatives. The unique taste and consistent quality make Karunia dodol one of the most famous local souvenirs among the local community and tourists, especially from Aceh and its surroundings.

Pak Rahmat's Dodol Karunia business faced significant challenges due to changes in consumer patterns influenced by the construction of toll roads and technological developments in the era of Society 5.0. Before the toll road was built, the business location on the side of Jalan Lintas Sumatera was a busy main road passed by visitors from various regions. However, after the Binjai–Langsa toll road became operational, people shifted to the faster and more efficient toll road, resulting in a drastic decline in direct visits to the business location. This phenomenon demonstrates that infrastructure development directly impacts the decline in consumer traffic for local businesses not located along the main toll road.

On the other hand, the era of Society 5.0 has also contributed to a shift in consumer behaviour from direct shopping to digital platforms. Consumers today prefer efficient and practical transactions through social media, marketplaces, or digital payment platforms. Businesses like Dodol Karunia Pak Rahmat must face the reality that reliance on offline sales is no longer sufficient. This aligns with the view (Gracio & Tanuwijaya, 2024) that explains how consumer purchasing behaviour has shifted from traditional to online due to efficiency, speed, and ease of access. Society 5.0 solves the 4.0 industrial revolution, where advanced technology will reduce human work. Meanwhile, the Society 5.0 is expected to help create new technologies to reduce social inequality by utilising advanced technology (Nur et al., 2022).

In response to these changes, businesses have begun implementing adaptation strategies, including several key indicators, to maintain their existence and reach a broader market.

First is the ability to develop new products, more commonly known as modifying existing ones, that align with ever-changing consumer preferences. Product innovation and production processes are carried out by adjusting dodol flavour variants, improving packaging appearance, and optimising product quality in accordance with consumer preferences (Alamin et al., 2022). Second, digitalisation of marketing and sales has begun to be implemented through social media for promotions, although it has not yet fully reached major e-commerce platforms. Social media, marketplaces, and digital payment systems are used to reach new consumers (Latifa et al., 2023). Third, consumer personalisation and interaction are carried out directly through online communication with customers to build personal consumer loyalty. Fourth, strengthening branding and online reputation is also a priority by leveraging positive reviews, digital promotional content, and enhancing the business's online presence. These four indicators are considered key factors supporting the success of business adaptation amid the increasingly complex market dynamics.

Consumer patterns describe how individuals and groups fulfil their needs for goods or services. Consumers tend to choose products based on personal preferences, such as taste, nutritional content, and practicality. In addition, the frequency of consumption is also an important factor. The choice of purchasing location also reflects consumption patterns, as consumers prefer places that offer products with complete stock and clear information (Thooriq et al., 2025). Consumption patterns are categorised based on the type of need: primary, secondary, and tertiary. Therefore, in the context of dodol businesses, understanding consumer needs is important for determining market segments and product offering strategies (Ayunda Febri Kinanti et al., 2024).

Changes in consumption patterns are also increasingly evident in how consumers determine their needs. Today's consumers consider practicality, frequency of consumption, clear product information, and product accessibility when choosing what to buy. In this case, dodol products, which were initially classified as traditional souvenirs, must now be repositioned to remain attractive. Mapping consumer needs, whether primary, secondary, or tertiary, is necessary to

ensure that product marketing strategies are targeted effectively. This study also indicates that digitalisation is reinforcing shifts in consumption patterns. Consumers are more comfortable conducting transactions online than visiting physical locations, meaning businesses must optimise social media and digital payment systems to remain competitive.

Toll roads can serve as gateways to larger markets and increased investment for previously difficult-to-reach areas, significantly transforming the economic and social landscape. When toll road construction is carried out without considering certain aspects, both societal and environmental, the negative impacts of toll road construction will hinder growth in some areas, which in turn will affect overall development, including the SME sector (Januardin Manullang dan Hottua Samosir, 2019).

Furthermore, toll road construction as a national project has a dual impact on local businesses. On one hand, toll roads open new access routes that can expand product distribution to other regions. On the other hand, toll roads also shift traffic flow from traditional routes to new routes, which affects the decline in direct visits to souvenir centres outside toll road access. This requires businesses to change their distribution and marketing strategies through location adjustments, digital promotions, and cooperation with shipping services.
This study found that adaptation strategies are key to maintaining the sustainability of Dodol Karunia Pak Rahmat's business amid changes in consumer patterns due to toll road construction and the dynamics of the era of Society 5.0. Based on innovation and digital technology, the right strategy can be a solution for surviving and growing amid external pressures such as infrastructure development and changes in consumer patterns. Without serious and sustained adaptation efforts, businesses risk falling behind in an increasingly dynamic and digitally integrated market competition.

In this context, adaptation strategies serve as businesses' response to social changes and market behaviour. Pak Rahmat's Dodol Karunia business has begun to make adjustments through digital marketing, although it is still in its early stages. This aligns with the view (Gracio & Tanuwijaya, 2024) that digitalisation directly impacts efficiency and consumer behaviour. The results of the study show that four indicators of adaptation strategy are important measures of business adjustment success, namely:

1. Opening a New Offline Store

To anticipate a decline in customers at the old location, the owner also opened a new store in a more logical and accessible location.

Figure 1. New Offline Store

2. Marketing Expansion Outside the City

One significant step Mr. Rahmat took to ensure the sustainability of the business was to distribute products outside the city, particularly to the city of Aceh and its surrounding areas, as far as the city of Tebing Tinggi. This is usually done once a month.

3. Online Promotion

Unfortunately, the owner of Dodol Karunia has not yet implemented this, so the author suggests and assists in leveraging digital technology to make the Dodol product more widely known to consumers. Social media platforms such as Instagram, Facebook, and WhatsApp Business will be utilised to promote Dodol Karunia.

However, the adaptation strategy faced several problems, including increased operational costs. The toll road construction resulted in huge losses, causing Dodol Karunia to experience 100% bankruptcy. The recovery process required additional marketing, production, and distribution funds outside the city. This posed a particular challenge for MSME players such as Mr. Rahmat.

The adaptation strategy implemented is fairly successful, although it has not fully restored the business conditions to what they were before the toll road was built. This success is evident in consumers' continued trust in the quality of the dodol products. According to the owner, many consumers continue to make purchases because they feel the products do not disappoint. This indicates that the brand image of Dodol Karunia remains strong in the eyes of its consumers.

In the interview, Mr. Rahmat expressed his high hopes that his business would return to its heyday, with increased customers from within and outside the city. He also hopes that orders from other cities will continue to increase, and that this local dodol product can remain part of the region's traditional culinary identity.
Overall, this discussion underscores that effective adaptation strategies can bridge the gap between consumer behaviour changes and the business environment dynamics. The Society 5.0 era promotes digitalisation as a necessity, not an option, so business actors such as Dodol Karunia Pak Rahmat must continue developing strategies based on innovation, technology, and personalisation. This study provides an overview of how understanding the indicators of adaptation strategies and appropriate consumer consumption patterns can help MSMEs survive and thrive amid globalisation and digital transformation challenges.

4. Conclusion

This study aimed to identify changes in consumer patterns resulting from the construction of the toll road and the adaptation strategies employed by local culinary business Dodol Karunia in Tanjung Pura. Using a qualitative interview method, it was found that the construction of the toll road had a significant impact on the decline in business income, the number of direct consumers, and shopping behaviour. Despite facing severe challenges, the business owner implemented adaptation strategies such as opening new stores, expanding distribution out of town, and focusing on digital promotion to respond to the era of Society 5.0. These strategies have proven to be quite successful, but have not fully restored the situation to what it was before the construction of the toll road.

The results showed that the construction of the highway had an adverse effect in the form of a decrease in sales of the dodol business; therefore, an appropriate adaptation strategy is needed in the form of utilising social media to increase dodol business again in the era of

society 5.0. This shows the high level of consumer confidence in product quality, which is an important indicator that the Dodol Karunia brand is still strong in the eyes of the community. However, significant challenges remain, especially regarding operational and marketing financing after the drastic drop in revenue. Despite experiencing total bankruptcy, the spirit and commitment of the business owner remain high. Mr. Rahmat's hope for the future is that his business can return to its glory days, with an increase in the number of customers from within and outside the city, as well as maintaining the existence of dodol as a traditional regional culinary heritage.

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IMPLEMENTATION OF ANDROID-BASED MSME BOOKKEEPING APPLICATIONS BY USING THE BUKU WARUNG APPLICATION FOR MSME BAIK KOPI

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Abstract

This study examines the implementation of an Android-based bookkeeping application, specifically the BukuWarung app, at Baik Kopi MSME in Medan. The background of this research stems from the fact that many MSME still record financial transactions manually, which poses a high risk of data loss, recording errors, and inefficiency in terms of time and effort. BukuWarung was introduced as a modern solution that helps MSMEs record income and expenses and generate financial reports digitally, automatically, and easily. This research employs a qualitative descriptive method, utilizing data collection techniques that include observation, interviews, and documentation. The results indicate that using the BukuWarung application at Baik Kopi has improved the efficiency of daily transaction recording and financial report preparation. Moreover, the application lets business owners monitor real-time cash flow and profits. However, several challenges were encountered during the initial implementation, such as limited user understanding of the app's features and restricted internet connectivity. In conclusion, implementing the BukuWarung application significantly aids MSMEs in practical, efficient, and accurate financial bookkeeping.
Keywords: MSMEs; Digital Bookkeeping; Buku Warung.

1. Introduction

Micro, Small, and Medium Enterprises (MSMEs) are crucial to Indonesia's economy. According to data from the Ministry of Cooperatives and MSMEs (2022), MSMEs contribute over 60% to the national Gross Domestic Product (GDP) and absorb more than 90% of the workforce in Indonesia. Despite this significant role, MSMEs face various challenges, particularly in financial management. Many MSME owners continue to rely on manual bookkeeping methods, such as recording transactions in notebooks, which are prone to data loss, calculation errors, and inefficiency in terms of time and effort (Afriansyah et al., 2021).

Proper bookkeeping is crucial for comprehending a business's financial health, determining profits and losses, and enabling entrepreneurs to make informed business decisions (Fitriana & Amelia, 2023). A lack of proper financial records can result in MSME owners struggling to access accurate financial data and often mixing personal and business finances, ultimately affecting business sustainability (Rahmad Kurniawan et al., 2022).

Advances in information technology have provided solutions through the emergence of digital bookkeeping applications accessible via smartphones, enabling financial transactions to be recorded more easily, quickly, and in real-time. One widely used application among MSME players in Indonesia is BukuWarung. This application offers various features, including recording income and expenses, managing receivables and payables, generating automatic financial reports, and sending payment reminders (Sholihah et al., 2022). BukuWarung has been adopted by more than 7 million MSMEs in Indonesia due to its user-friendly interface and availability for free download from the Google Play Store (Muslimah Hlta & Desitama, 2023).

Previous studies have shown that digital bookkeeping applications like BukuWarung improve financial recording efficiency, reduce recording error risks, and help MSME owners better manage their businesses (Larasati & Widyawati, 2022). However, the adoption of this technology is still uneven, particularly among micro-scale MSMEs, who may find it challenging to learn digital applications or face infrastructure barriers such as limited internet connectivity.

Baik Kopi, an MSME located in Medan, is one such micro-enterprise engaged in coffee beverage sales. Established in 2022, this business initially relied on manual bookkeeping methods. Financial records were kept simply by writing down sales and expenses in a notebook. This practice made it difficult for the owner to determine business profits and monitor daily cash flows accurately. Additionally, transactions involving credit sales (kasbon) further complicated manual financial recording.

In response to these issues, this research aims to implement the BukuWarung application as a financial recording tool in Baik Kopi. The objective is to analyse how BukuWarung is applied in daily financial transactions and to evaluate its impact on the efficiency, accuracy, and ease of preparing financial reports. The findings of this study are expected to benefit not only Baik Kopi but also serve as a reference for other MSMEs considering transitioning from manual to digital bookkeeping systems.

2. Methodology

This research employed a descriptive qualitative approach to analyse the implementation of the BukuWarung application in the daily financial recording of Baik Kopi, an MSME located in Medan, North Sumatra. The study was conducted from 01 March to 30 March 2025. The research was carried out at Baik Kopi, a micro-enterprise established in 2022, operating in the coffee beverage sector. The business initially managed its financial records manually using physical notebooks.

This study used both primary and secondary data:

i. Primary data were obtained through direct interviews and observations with the owner of Baik Kopi.

ii. Secondary data were sourced from existing financial transaction records before and after implementing the BukuWarung application.

The data collection techniques employed in this study were:

i. Structured interviews: These were conducted with the owner of Baik Kopi to gather insights into business operations and financial recording practices.

ii. Direct observation: observing daily operational activities and financial transaction processes.

iii. Documentation: collecting financial records, including reports prepared manually and those generated by the BukuWarung application.

This study's population consisted of all financial recording activities in Baik Kopi. The research sample comprised financial transaction data covering one month before and three months after implementing the BukuWarung application.

Data were analysed using a descriptive qualitative method, involving three key stages:

i. Data reduction: summarising and focusing on relevant data, particularly related to fixed assets, financial recording practices, and the implementation process of BukuWarung.

ii. Data display: presenting organised data highlighting patterns and relationships, facilitating clearer interpretation.

iii. Conclusion drawing and verification: interpreting findings to conclude the impact and effectiveness of using BukuWarung at Baik Kopi.

Triangulation techniques, including source, method, and theory triangulation, were used to ensure the credibility and validity of the data.

3. Results and Discussion

Baik Kopi is a micro-enterprise established in 2022, operating as a small coffee shop in Medan, North Sumatra. The business is managed by Ali Asman, who also serves as the cashier, supported by one employee, Ridho, who works as both a barista and a waiter.

Baik Kopi's operational hours are from 6:00 PM to midnight. Before adopting digital tools, Baik Kopi recorded financial transactions manually in notebooks, which posed challenges in maintaining accurate and efficient financial records.

Prior to implementing BukuWarung, Baik Kopi experienced several problems in financial management:

i. Manual Recording: Sales and expense data were recorded manually, increasing the risk of data loss and calculation errors.

ii. Cash Flow Uncertainty: The owner struggled to determine precise profit margins, as cash flow records were incomplete and inconsistent.

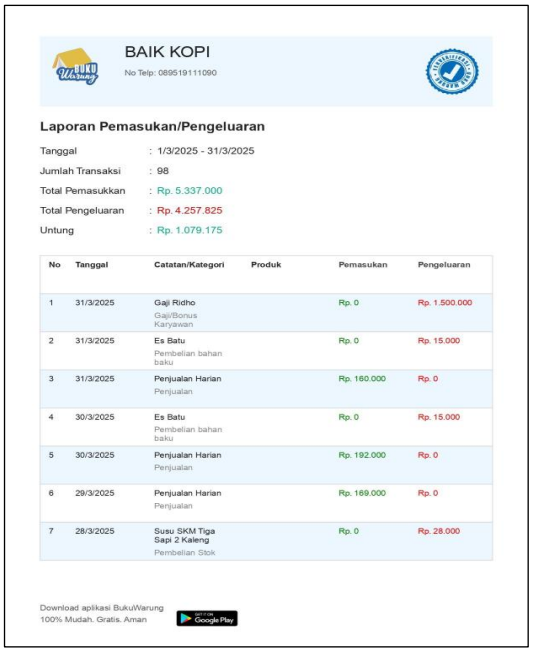
iii. Mixed Funds: Business and personal finances were often intermingled, complicating financial analysis.

To address these issues, the BukuWarung application was introduced as a digital bookkeeping tool. BukuWarung offers several features, such as:

i. Recording daily income and expenses
ii. Generating real-time financial reports
iii. Managing inventory stock
iv. Monitoring receivables and payables
v. Creating digital invoices

The application's user-friendly interface made it easier for Baik Kopi's owner to adopt the technology, despite initial challenges in learning new features.

The feature used in recording daily transactions is that, after all income and expense transactions are recorded through the BukuWarung Application, the next step is to prepare a profit and loss report. The profit and loss report of the Baik Kopi UMKM for the period March 1, 2024 - March 31, 2024, which was created using the BukuWarung application, is presented as follows:



BAIK KOPI
No Telp: 089519111090

Laporan Pemasukan/Pengeluaran

Tanggal : 1/3/2025 - 31/3/2025
Jumlah Transaksi : 98
Total Pemasukkan : Rp. 5.337.000
Total Pengeluaran : Rp. 4.257.825
Untung : Rp. 1.079.175

No	Tanggal	Catatan/Kategori	Produk	Pemasukan	Pengeluaran
1	31/3/2025	Gaji Ridho Gaji/Bonus Karyawan		Rp. 0	Rp. 1.500.000
2	31/3/2025	Es Batu Pembelian bahan baku		Rp. 0	Rp. 15.000
3	31/3/2025	Penjualan Harian Penjualan		Rp. 160.000	Rp. 0
4	30/3/2025	Es Batu Pembelian bahan baku		Rp. 0	Rp. 15.000
5	30/3/2025	Penjualan Harian Penjualan		Rp. 192.000	Rp. 0
6	29/3/2025	Penjualan Harian Penjualan		Rp. 169.000	Rp. 0
7	28/3/2025	Susu SKM Tiga Sapi 2 Kaleng Pembelian Stok		Rp. 0	Rp. 28.000

Download aplikasi BukuWarung
100% Mudah, Gratis, Aman

Fig. 1. Example of daily transactions of MSMEs Baik Kopi

The study recorded Baik Kopi's financial transactions for March 2025 using the BukuWarung application. The results showed:

i. Total Income: IDR5,337,000
ii. Total Expenses: IDR4,257,825
iii. Net Profit: IDR1,079,175

A comparison of financial management before and after using BukuWarung indicated significant improvements:

Aspect	Before Using BukuWarung	After Using BukuWarung
Transaction Recording	Manual, using notebooks	Digital via mobile application
Data Accuracy	Prone to errors and missing data	More accurate, automatic summaries
Time Efficiency	Time-consuming manual calculations	Faster, real-time reporting
Profit Analysis	Difficult to calculate accurately	Clearer Profit and loss reports
Data Security	Risk of losing physical records	Data safety is stored in the cloud

Although the application provided significant benefits, some challenges were encountered.

Learning Curve: Initially, the owner experienced difficulties navigating the application's features.

Internet Dependence: Some functions require stable internet connectivity for data synchronisation and report downloads.

Limited Features: BukuWarung does not fully support financial reporting standards such as SAK-EMKM, which might be necessary for more complex financial analysis.

The findings of this study align with previous research, indicating that digital bookkeeping applications significantly improve the efficiency and accuracy of financial management for MSMEs (Soejono et al., 2020). By transitioning from manual bookkeeping to a digital system, Baik Kopi was able to:

i. Monitor daily cash flow more effectively
ii. Prepare profit and loss statements accurately
iii. Separate business finances from personal funds

This digital transformation is crucial for micro-businesses aiming to sustain operations and make data-driven business decisions. However, successful implementation requires adequate training and continuous support to help MSME owners fully utilise digital applications. Despite its limitations, BukuWarung proved to be a practical and accessible solution for Baik Kopi, offering significant improvements in bookkeeping practices and business oversight. Future enhancements in the application's compliance with financial standards and security features are recommended for broader adoption among MSMEs.

4. Conclusion

The results of this study demonstrate that implementing the BukuWarung application significantly improves the financial management of Baik Kopi, a micro-enterprise in Medan. The transition from manual bookkeeping to digital recording using BukuWarung has provided several advantages, including increased efficiency in recording transactions, greater accuracy in financial reporting, and clearer insights into daily cash flows and business profits.

The application's user-friendly interface enabled Baik Kopi's owner to record daily income, expenses, and inventory movements with greater ease and speed than manual methods. The automatically generated financial reports have facilitated better business monitoring and decision-making.

Despite these benefits, certain challenges remain, such as initial difficulties in using the application’s features, dependence on internet connectivity for some functions, and the limited scope of financial reporting compared to official accounting standards like SAK-EMKM. Nevertheless, BukuWarung has proven to be a practical solution for micro-businesses seeking to improve their financial management practices without incurring significant costs.

Overall, the study suggests that digital bookkeeping applications like BukuWarung hold significant potential to support MSMEs in modernising their financial systems and enhancing business sustainability. Adopting such tools and adequate training and support can empower more MSME owners to maintain accurate financial records and make data-driven business decisions.

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THE INFLUENCE OF PROMOTION AND BRAND AWARENESS ON MOTORCYCLE PURCHASE DECISIONS AMONG GEN Z

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Abstract

This study aims to determine the influence of promotion and brand awareness on motorcycle purchasing decisions among Generation Z in Patumbak Village. This research uses a quantitative method. The population comprises Gen Z individuals who have purchased or used motorcycles in Patumbak. The sampling technique used is purposive sampling with a total of 100 respondents. Data were collected through questionnaires using a Likert scale. The data analysis techniques include validity and reliability tests, multiple linear regression, t-test, F-test, and the coefficient of determination (R^2). The results show that promotion and brand awareness simultaneously have a significant effect on purchasing decisions. Partially, promotion has an influence but is not significant, as indicated by a significance value of 0.562 > 0.05, while brand awareness has a more dominant effect on purchasing decisions. The coefficient of determination (R^2) value of 67.3% indicates that promotion and brand awareness jointly explain purchasing decisions. These findings highlight the importance of attractive promotional strategies and strong brand awareness in attracting the buying interest of Gen Z consumers.
Keywords: Brand Awareness; Generation Z; Motorcycle.

1. Introduction

Transportation plays a vital role in modern society, particularly for daily travel. Among the most commonly used modes of transportation is the motorcycle. A motorcycle is a gasoline-powered vehicle equipped with two wheels and handlebars for steering (Pasaribu, 2022). Due to increasing mobility demands, especially in urban areas, motorcycles have become a preferred choice for many because of their efficiency and lower cost compared to four-wheeled vehicles (Sinaga & Gultom, 2024). Their compact size also allows for greater flexibility on congested roads, supporting fast and agile movement (Nasution & Rinaldi, 2021). The growing popularity of motorcycles has established them as a primary mode of transportation, opening new business opportunities. In response, many companies now manufacture motorcycles under various brands and models. Automotive manufacturers continually strive to enhance features and specifications to attract consumers (Erliana & Kurniawan, 2024).

Amidst the tight competition in the automotive industry, motorcycle companies are competing to attract the attention of consumers of all ages, especially Generation Z or Gen Z, which is a group of individuals born between 1997 and 2012 (Kristyowati, 2021). They are known as a generation that grew up in the digital era, highly dependent on technology, and tend to prioritise efficiency and comfort in various aspects of life, including transportation. For Gen Z, motorcycles are a transportation solution that suits their dynamic lifestyle. In addition to supporting academic and work activities, motorcycles are also used as a means of transportation to support a social lifestyle, such as travelling with friends or accessing various digital-based services, such as online delivery and transportation services.

To attract Generation Z, automotive companies must create strategies that align with the needs of Generation Z as their target market. This aims to influence Gen Z to be interested in their motorcycle products. One strategy that automotive companies must use is promotion.

"Promotion is one of the main strategies in introducing products and building brand appeal" (Sinaga et al., 2024). In addition, brand awareness also plays an important role in influencing purchasing decisions (Arianty & Andira, 2021). Gen Z, who are familiar with social media and digital information, tend to be more selective in choosing products based on exposure to advertisements, consumer reviews, and the brand image built by the company. Therefore, this study analysed how promotion and brand awareness influence motorcycle purchasing decisions among Gen Z.

This study was conducted to determine the influence of promotion and brand awareness on motorcycle purchasing decisions among Generation Z, both partially and simultaneously or together. The findings can later be used as a reference for motorcycle companies to help develop the right strategy to market motorcycles in the future.

The following are some previous studies that can strengthen this research:

1. The study conducted by Edwin Sugesti Nasution and Muammar Rinaldi, titled "The Influence of Promotion and Service Quality on Motorcycle Customer Satisfaction at PT. Alfa Scorpii Medan," applied a quantitative research method. Using Slovin's formula with a 10% margin of error, they selected 83 respondents as the sample. The findings indicated that both promotion and service quality—individually and collectively—positively and significantly affect customer satisfaction at the company.

2. In another study, Hommy Dorthy Ellyany Sinaga, Gultom Party, and Suhpina (2024) explored "The Effect of Promotion and Brand Image on the Purchase Decision of Honda Motorcycles at PT. Indah Sakti Motorindo." Using descriptive and quantitative methods with both primary and secondary data, they examined consumers who had purchased Honda motorcycles. Their results revealed that neither promotion nor brand image had a significant impact either partially or simultaneously on the customers' purchasing decisions at the studied dealership.

3. Lastly, Yani Restiani Widjaja and Wildan's (2023) research "The Effect of Product Innovation, Promotion, and Service Quality on Motorcycle Purchase Decisions" employed a descriptive-verificative quantitative approach. They selected 70 respondents using purposive sampling. The study concluded that product innovation and service quality did not significantly affect purchasing decisions, whereas promotion did have a significant impact. However, when considered together, all three factors- product innovation, promotion, and service quality- collectively influence customers' purchase decisions when buying Honda Beat motorcycles at CV. Subur Jaya Motor, Ciawi Tasikmalaya branch.

2. Methodology

This study was conducted on Generation Z who owned motorcycles in Patumbak Village, sampling using Purposive Sampling from individuals in the Generation Z age category, individuals born in 1997 - 2021. The variables observed in this study consisted of two independent variables, namely the promotion variable with indicators of promotion targets and promotion tools and the brand awareness variable with indicators of top of mind, brand recognition, brand recall, dominant brand and one dependent variable, namely purchasing decisions with indicators of problem recognition, information search, alternative evaluation, purchasing decisions and post-purchase behavior. Data was collected using an electronic questionnaire (Google Form) distributed to 100 Generation Z people who own motorbikes in Patumbak Village. Data analysis using quantitative descriptive methods with multiple linear regression, hypothesis testing using the coefficient of determination test, partial test, and simultaneous test, with data processing using SPSS Statistics software.

3. Results and Discussion

1.1 Respondent Characteristics

Respondent characteristics are the identities of the people who are the research samples. In this study, the sample was 100 people who could be identified based on age, occupation and level of education.

Table 1. Respondent characteristics based on age

NO	AGE	TOTAL
1	15 - 20 years	14
2	21 - 25 years	58
3	26 - 30 years	28
Total		100

Table 1 shows that the largest number of respondents is aged 21-25 years, with a total of 58 people. This is because people in that age range have more activities that require them to travel by motorbike. This followed people aged 26-30 years who are still busy with all matters that require them to have a motorbike and travel by motorbike. Generation Z, in the age range of 15-20, is the smallest part of respondents, with as few as 14 people. This is because in that age range, most Generation Z do not have a motorbike, and they still travel by public transportation or are driven by their parents.

Table 2. Respondent characteristics based on occupation

NO	WORK	TOTAL
1	Factory	13
2	Student	20
3	Marketing	6
4	Housewife	14
5	Self-employed	4
6	Employee	9
7	Barista	1
8	Costumer service	1
9	Sales	4
10	Teacher	3
11	Admin	1
12	Indonesian National Armed Forces	1
13	civil servant	4
14	Lawyer	1
15	Driver	3
16	Courier	4
17	Olshop	1
18	School	3
19	Cashier	1
20	Businessman	1
21	Shop	2
22	Sell Fried Rice	1
23	Could	1
24	Security guard	1
	Total	100

The table above shows the professions of respondents who filled out the questionnaire in this study. Based on the data, most Generation Z respondents are students, totalling 20 people. Their busy campus activities make them frequent users of motorbikes for daily transportation.

The next largest group consists of housewives, with 14 respondents, followed by factory workers, with 13 respondents. Other professions are also represented in smaller numbers.

Table 3. Respondent characteristics based on the highest level of education

NO	LAST EDUCATION	TOTAL
1	Junior High School	2
2	High School/Vocational School	84
3	Masters	14
	Total	100

Table 3 shows that Generation Z, the study's sample, are dominated mainly by high school/vocational high school graduates. Because the age of graduating from high school/vocational high school is already eligible for driving license ownership, many Generation Z individuals at this level of education already own and ride motorbikes. The number of respondents who are bachelor's graduates is 14, and only 2 are junior high school graduates.

1.2 Recapitulation of Respondents' Answers

1. Recapitulation of respondents' answers to the promotion variables

Three indicators were used to measure motorcycle promotion among Generation Z, each formed from three statements. Based on the results of the respondents' answers, the following data were obtained:

Table 4. Recapitulation of respondents' answers to promotion variables

No	Statement	Strongly Agree F (%)	Agree F (%)	Disagree Less F (%)	Don't agree F (%)	Strongly Disagree F (%)
1	I often see motorcycle product advertisements on social media.	41 (41%)	55 (55%)	2 (2%)	0 (0%)	2 (2%)
2	I have received information about motorbike promotions through influencers, content creators or direct sales on the streets.	34 (34%)	62 (62%)	2 (2%)	0 (0%)	2 (2%)
3	I am interested in promotional offers such as discounts or cashback on motorbikes that are offered to me.	42 (42%)	54 (54%)	2 (2%)	1 (1%)	1 (1%)
4	I feel that the promotion of motorcycle products is indeed aimed at a generation like me (Gen Z).	43 (43%	49 (49%)	7 (7%)	0 (0%)	1 (1%)
5	The language and visual style in motorcycle product promotions that I found on social media suited my taste.	33 (33%)	61 (61%)	5 (5%)	1 (1%)	0 (0%)
6	Motorcycle product promotions appear on media that I frequently use (such as Instagram, TikTok, or YouTube).	42 (42%)	56 (56%)	1 (1%)	1 (1%)	0 (0%)
Total		39%	56%	3%	1%	1%

In the table above, it was found that those who answered strongly agree were 39%, and those who answered agree were 56%. This shows that motorcycle promotions do influence Gen Z to buy motorcycles. Those who answered disagree were 3% on average, those who answered disagree were 1% on average, and those who answered strongly disagree were 1%. This

indicates that for a small portion of Generation Z, which was the sample of this study, promotions had little influence.

2. Recapitulation of respondents' answers to the brand awareness variable

Four indicators were used to measure the brand awareness variable among Generation Z regarding motorcycle purchasing decisions, each interpreted in 3 statements. Based on the answers given by respondents, the following data was obtained:

Table 5. Recapitulation of respondents' answers to the variable brand awareness

NO	Statement	Strongly Agree F (%)	Agree F (%)	Disagree Less F (%)	Don't agree F (%)	Strongly Disagree F (%)
1	I immediately remember a motorcycle brand when I hear the word 'motorcycle.'	48 (48%)	51 (51%)	0 (0%)	1 (1%)	0 (0%)
2	When talking about motorbikes, the brand of motorbike that I use is the first that comes to my mind.	51 (51%)	47 (47%)	0 (0%)	1 (1%)	1 (1%)
3	The motorbike I am riding now is the best motorbike brand of all time.	47 (47%)	49 (49%)	4 (4%)	0 (0%)	0 (0%)
4	I can recognize the logos and distinctive colors of certain motorcycle brands, especially the one I ride.	43 (43%)	55 (55%)	1 (1%)	1 (1%)	0 (0%)
5	I can recognize the engine sound of the brand of motorbike I ride.	36 (36%)	59 (59%)	4 (4%)	0 (0%)	1 (1%)
6	When I pass by one on the street, I immediately recognize a certain brand of motorbike just by glancing at its shape.	37 (37%)	60 (60%)	2 (2%)	1 (1%)	0 (0%)
7	I remembered a certain brand of motorcycle while discussing vehicles with a friend.	32 (32%)	66 (66%)	1 (1%)	0 (0%)	1 (1%)
8	If given several choices of motorcycle brands, I can recall this brand.	38 (59%)	60 (60%)	1 (1%)	1 (1%)	0 (0%)
9	I can recall this brand after seeing previous advertisements or promotions.	39 (39%)	59 (59%)	1 (1%)	1 (1%)	0 (0%)
10	There is one brand of motorbike that I most often encounter in the media or on the street.	47 (47%)	52 (52%)	0 (0%)	1 (1%)	0 (0%)
11	I am confident that I know the brand of my chosen motorbike well and trust its quality because the brand is well-known.	39 (39%)	58 58%)	1 (1%)	1 (1%)	1 (1%)
12	I feel confident when using a motorbike from a brand I know.	47 (47%)	51 (51%)	0 (0%)	1 (1%)	1 (1%)
Total		42%	56%	2%	1%	0%

From the table above, data is obtained that those who answered strongly agree on average 42%, those who answered agree on average 56%, this shows that Generation Z's brand awareness of motorcycles is quite high, in other words, Generation Z knows the motorcycle brand they own well, Generation Z's brand awareness of motorcycles is quite high. While for

those who answered, the average is 2%, for those who answered, the average 1%. This means that in a small portion of Generation Z, the awareness of motorcycle brands is still low.

3. Recapitulation of respondents' answers to the purchasing decision variables

Fi indicators measure the decision variables of motorcycle purchasing among Generation Z, each interpreted in three statements. Based on the answers given by respondents, the following data was obtained:

Table 6. Recapitulation of respondents' answers to purchasing decision variables

NO	Statement	Strongly Agree F (%)	Agree F (%)	Disagree Less F (%)	Don't agree F (%)	Strongly Disagree F (%)
1	I bought a motorbike because I needed one.	56 (56%)	43 (43%)	0 (0%)	1 (1%)	0 (0%)
2	I realized that there was a need before deciding to buy a motorbike.	53 (53%)	46 (46%)	0 (0%)	1 (1%)	0 (0%)
3	I feel that buying a motorbike can solve my problems or fulfil my needs.	55 (55%)	42 (42%)	2 (2%)	0 (0%)	1 (1%)
4	I looked for information first before buying a motorbike.	59 (59%)	40 (40%)	1 (1%)	0 (0%)	0 (0%)
5	I look at motorcycle reviews before buying.	52 (52%)	48 (48%)	0 (0%)	0 (0%)	0 (0%)
6	I ask friends or other people before deciding to buy a motorcycle product.	47 (47%)	52 (52%)	1 (1%)	0 (0%)	0 (0%)
7	I compared several motorcycle brands before deciding to buy.	52 (52%)	47 (47%)	1 (1%)	0 (0%)	0 (0%)
8	I consider the advantages and disadvantages of this product compared to other similar products.	52 (52%)	47 (47%)	0 (0%)	1 (1%)	0 (0%)
9	I chose this product after considering the price, quality, and features of various options.	50 (50%)	49 (49%)	0 (0%)	1 (1%)	0 (0%)
10	I am confident with the choice of motorcycle brand that I purchased.	53 (53%)	47 (47%)	0 (0%)	0 (0%)	0 (0%)
11	I bought the motorbike consciously and without coercion from any other party.	49 (49%)	51 (51%)	0 (0%)	0 (0%)	0 (0%)
12	I feel that the decision to buy this motorbike was the right decision.	51 (51%)	49 (49%)	0 (0%)	0 (0%)	0 (0%)
13	I feel satisfied after buying the motorbike.	53 (53%)	47 (47%)	0 (0%)	0 (0%)	0 (0%)
14	I am willing to recommend the motorcycle I purchased to others.	50 (50%)	49 (49%)	1 (1%)	0 (0%)	0 (0%)
15	I will buy another motorcycle of this brand in the future.	59 (59%)	39 (39%)	2 (2%)	0 (0%)	0 (0%)
Total		53%	46%	1%	0%	0%

Based on the table above, data was obtained that the average number of respondents who strongly agreed was 53% and the average number of respondents who agreed was 49%. This shows that Generation Z chose to buy a motorbike because they needed it and were influenced by promotions and brand awareness of the motorbike itself. While those who disagreed were 1%, this indicates that for a small portion of Generation Z, purchasing a motorbike is not influenced by promotions or brand awareness.

3.3 Multiple Linear Regression Test Results

This test was conducted to determine the effect of promotion and brand awareness on purchasing decisions among Generation Z. The following table shows the results of multiple linear regression testing on each variable, namely:

Table 7. Results of multiple linear regression tests

Model	Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.
1 (Constant)	2.292	.377		6.081	.000
Promosi	.059	.101	.067	.582	.562
Brand_Awareness	.440	.106	.478	4.163	.000

a. Dependent Variable: Keputusan_Pembelian

Based on the test results above, the following multiple linear regression equation is obtained:

$$Y= 2.292 + 0.059\ X_1 + 0.440\ X_2 \quad (1)$$

In the multiple linear regression model, the constant value of the purchasing decision was 2.292, meaning that if the value of the independent variables promotion and brand awareness is 0, then the dependent variable of the purchasing decision has a value of 2,292. The coefficient of each independent variable is positive, meaning that promotions and brand awareness can influence the decision to purchase a motorbike among Generation Z.

3.4 Hypothesis Testing

1. Coefficient of determination

Table 8. Results of the determination coefficient test

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.524a	.275	.260	.44891

a. Predictors: (Constant), Brand_Awareness, Promosi

The coefficient of determination value obtained was 0.275, or 27.5%, indicating that promotion and brand awareness can explain the variations in motorcycle purchasing decisions among Generation Z, while other variables not examined in this study explain the rest.

2. Simultaneous Test (F)

Table 9. Simultaneous test results

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	7.413	2	3.706	18.392	.000[b]
	Residual	19.547	97	.072		
	Total	26.96.	99			

a. Dependent Variable: Keputusan_Pembelian
b. Predictors: (Constant), Brand_Awareness, Promosi

Based on the table above, it can be seen that the F $value_{count}$ 18,392 > from F $value_{table,}$ which is 3.09 and significant at 0.000 < alpha 0.05. So, the decision taken is H_0rejected H_1accepted; thus, promotion and brand awareness positively and significantly influence motorcycle purchasing decisions among Generation Z.

3. Partial Test (t-test)

Table 10. Partial test results

Model	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
1 (Constant)	2.292	.377		6.081	.000
Promosi	.059	.101	.067	.582	.562
Brand_Awareness	.440	.106	.478	4.163	.000

a. Dependent Variable: Keputusan_Pembelian

Based on the table above, it can be seen that:

a. t value $_{count}$ for promotion variable 0.582 > t_{table} 1.660 and a significant value of 0.562 > 0.05 (5%), then H_0 accepted and H_1 rejected, thus partially the promotion has no effect on purchasing decisions;

b. t value $_{count}$ variable brand awareness 4.163 > t_{table} 1.660 and a significance value of 0.000 < alpha 0.05 (5%), then H_0 rejected and H_1 accepted, thus partially brand awareness has a positive and significant influence on purchasing decisions.

4. Conclusion

Based on the research results on the influence of promotion and brand awareness on motorcycle purchasing decisions among Generation Z, several conclusions can be drawn that promotion has a positive but less significant effect on purchasing decisions because the p-value is 0.562 > 0.05. Promotions carried out through social media, influencers, and discounts have not been able to influence Generation Z's purchasing interest, partially but not significantly. Brand awareness has a positive and significant influence on motorcycle purchasing decisions among Generation Z and has a more dominant influence than promotion on purchasing decisions. Consumer awareness of brands, whether in the form of logos, product characteristics, or brand reputation, has been shown to increase trust and loyalty in purchasing decisions. Promotion and brand awareness simultaneously or together positively and significantly influence purchasing decisions. The combination of effective promotional strategies and reinforcement of brand awareness becomes the primary factor driving the decision to purchase a motorbike by Generation Z.

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THE IMPACT OF QUALITY AND DIGITAL MARKETING ON INGCO PRODUCT PURCHASE DECISIONS

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Abstract

This research explores how INGCO product quality and digital marketing strategies influence consumer purchasing decisions. This research adopts a quantitative approach through 100 respondents who use INGCO products. Data analysis was performed through multiple linear regression with SPSS. Based on the partial test results, digital marketing shows a strong and significant influence on purchasing decisions, with a coefficient of 0.902 and a significance value of 0.000. Meanwhile, high product quality also has a notable impact, although smaller, with a coefficient of 0.153 and a significance of 0.001. The simultaneous test produced an R2 of 0.942, which means that both independent variables simultaneously have a significant influence on consumer purchasing decisions. This study concludes that consumers' positive views of product quality and the effectiveness of digital marketing are important factors in shaping purchasing decisions. Therefore, companies are advised to develop appropriate digital marketing strategies that consistently improve product quality to support consumer purchasing decisions.
Keywords: Product Quality; Digital Marketing; Purchase Choice

1. Introduction

The advancement of technology and the internet has significantly changed consumer behaviour, especially in how products are purchased. Today, more and more consumers prefer online shopping, which has gained significant momentum, especially with the growing e-commerce sector in Indonesia. This change has reduced the reliance on traditional shopping methods, as digital marketing offers a more accessible and flexible approach for consumers.

Digital marketing encompasses various online strategies, such as web-based media (blogs, websites, emails, social media), which are integral to enhancing a company's branding efforts. Digital marketing facilitates the transition from conventional marketing methods to digital marketing to better and faster meet consumer needs (Nabillaprila et al., 2023; Masyithoh et al., n.d.). Key digital marketing indicators, such as transaction costs, incentive programs, website design, and interactivity, affect the overall company image and consumer engagement.

Product quality is a determining factor in achieving or exceeding buyer expectations, so it becomes a major component in production and marketing strategies (Nugroho et al., 2020). As Gunawan (2022) explains, purchasing decisions are a crucial stage in the purchasing process. Consumers choose which products to buy based on the available alternatives, thus forming post-purchase behaviour.

2. Methodology

a. Types of research

This study uses quantitative methodology. Primary data were collected through questionnaires from 60 respondents using INGCO products. The variables X1, X2 and Y are used in multiple

linear regression through SPSS. The questionnaire allows researchers to collect data in a relatively short time. This study was conducted at PT INGCO TEKNIKA INDONESIA, North Sumatra, in March 2025.

b. Population and Sample

People or objects with certain similarities become the main focus of the study. One hundred people who used the INGCO product served as the sample for this research. This number is the basis for determining the population in this study with a purposive sampling technique, namely by using certain criteria for the sample using the Slovin formula:

$$n = \frac{N}{1+N\,e^2} \quad (1)$$

Information:
n = Number of samples
N = Population size
e = margin of error (0.10 to 10%)

c. Data collection techniques

A quantitative method was used through a survey approach, using a closed questionnaire based on a 5-point Likert scale as the main instrument.

d. Data Quality Test

1. Validity Test

The validity test was conducted using the Pearson product-moment correlation technique.

Testing criteria:
- If r value > r table (0.05) and the significance value (p-value) < 0.05, then the statement item is declared valid.
- If r value < r table (0.05) and the significance value (p-value) > 0.05, it is declared invalid and can be considered for disposal or correction.

2. Reliability Test

This test was conducted using the Cronbach's Alpha technique.
Testing criteria:
- If the Cronbach's Alpha value ≥ 0.60, the instrument is declared reliable or consistent
- If the Cronbach's Alpha value is <0.60, the instrument is declared less reliable.

e. Data Analysis Test

Multiple linear regression test is applied to analyse the extent to which the independent variables, namely Digital Marketing and Product Quality, affect the dependent variable, namely Purchase Decision. This analysis allows the evaluation of the influence of both independent variables simultaneously or separately (partially). The general regression equation used:

$$Y = \alpha + \beta 1X1 + \beta 2X2 + e \quad (2)$$

Information:
Y = Purchase decision
α = Constant

β1, β2 = Regression coefficients
X1 = Digital marketing
X2 = Product quality
e = Error

f. Research Hypothesis Testing

1. Partial Test (t-Test)
The t-test assesses the individual influence of each variable X on the variable Y. This test uses a 95% confidence level or α = 0.05.

- If sig <0.05, the hypothesis is accepted.
- If sig > 0.05, the hypothesis is rejected.

2. Simultaneous Test (f Test)
The F-test assesses if all variables X together significantly affect the variable Y, based on a 5% significance level.Testing criteria:

- If sig <0.05, the hypothesis is accepted.
- If sig > 0.05, the hypothesis is rejected.

3. Test of Determination Coefficient (R^2)
R^2 assesses the extent of variable X's influence on variable Y, which can be expressed in percentage form (Sujarweni, 2022).

3. Results and Discussion

a. Results of Research Instrument Validity Test

Table 1. Results of the Validity Test of the Research Instrument X1

Nomor	Item	r Hitung	Tabel r (0,05)	Sig. (2-ekor)	Informasi
1	X1.1	0,509	0,254	0	Valid
2	X1.2	0,644	0,254	0	Valid
3	X1.3	0,648	0,254	0	Valid
4	X1.4	0,662	0,254	0	Valid
5	X1.5	0,656	0,254	0	Valid
6	X1.6	0,682	0,254	0	Valid
7	X1.7	0,653	0,254	0	Valid
8	X1.8	0,555	0,254	0	Valid
9	X1.9	0,312	0,254	0,015	Valid
10	X1.10	0,285	0,254	0,027	Valid

All items (X1.1 to X1.10) have a value <0.05, so it is said that all items are valid to measure the Digital Marketing construct. This means that each item in the questionnaire has a significant and strong correlation to each construct's total score, so all instruments submitted are declared valid and suitable for use in the data collection process.

Table 2. Results of the Validity Test of the Research Instrument X2

Nomor	Item	r Hitung	Tabel r (0,05)	Sig. (2-ekor)	Informasi
1	X2.1	0,324	0,254	0,011	Valid
2	X2.2	0,638	0,254	0	Valid
3	X2.3	0,271	0,254	0,036	Valid
4	X2.4	0,627	0,254	0	Valid
5	X2.5	0,390	0,254	0,002	Valid
6	X2.6	0,782	0,254	0	Valid
7	X2.7	0,619	0,254	0	Valid
8	X2.8	0,636	0,254	0	Valid
9	X2.9	0,558	0,254	0	Valid
10	X2.10	0,693	0,254	0	Valid

All indicators X2.1 to X2.10 have a calculated r value greater than the r table and a significance value below 0.05, so they are said to be valid in measuring the Product Quality variable. This means that each questionnaire item has a significant and strong correlation to the total score of each construct, so all instruments submitted are declared valid and suitable for use in the data collection process.

Table 3. Results of the Validity Test of Research Instrument Y

Nomor	Item	r Hitung	Tabel r (0,05)	Sig. (2-ekor)	Informasi
1	Y1	0,483	0,254	0	Valid
2	Y2	0,634	0,254	0	Valid
3	Y3	0,630	0,254	0	Valid
4	Y4	0,665	0,254	0	Valid
5	Y5	0,666	0,254	0	Valid
6	Y6	0,695	0,254	0	Valid
7	Y7	0,689	0,254	0	Valid
8	Y8	0,561	0,254	0	Valid
9	Y9	0,633	0,254	0,001	Valid
10	Y10	0,505	0,254	0	Valid

All indicators Y1 to Y10 have sig. < 0.05, they are declared valid to measure the Purchasing Decision variable. This means that each questionnaire item has a significant and strong correlation to each construct's total score, so all instruments submitted are declared valid and suitable for use in the data collection process.

a. Results of the Reliability Test of Research Variables

Table 4. Results of the Reliability Test of Research Variables

Variabel	N of items	Cronbach's Alpha	Keterangan
Strategi Digital Marketing (X1)	10	0,896	Reliabel
Kualitas Produk (X2)	10	0,865	Reliabel
Peningkatan Penjualan (Y)	10	0,877	Reliabel

The table shows that all statement items in Variable X1, Variable X2, and Variable Y have Cronbach's Alpha values > 0.60. Thus, each construct in Digital Marketing used in this study is reliable. In other words, the questionnaire instrument used in measuring digital marketing is consistent in measuring product quality and purchasing decisions. This high reliability strengthens the belief that the data obtained can be relied on in the subsequent analysis process.

b. Linear Regression Analysis Test Results

Table 5. Multiple Linear Regression Test

Coefficient

	Model	Unstandardized Coefficient B	Unstandardized Coefficient Standard Error	Standard Coefficient English	T	Signature .	Collinearity Statistics Tolerance	Collinearity Statistics English : VIF
1	(Constant)	-2,469 years	1.418		-1,741 years	.087		
	Digital Marketing	.902	.047	.860	19.212	.000	.508	1,969 years
	Product Quality	.153	.046	.150	3.348	.001	.508	1,969 years

With the following equation:

$$Y= 0.005 + 0.176X1 + 0.404X2 \quad (3)$$

Where:
Y = Purchase Decision
α = Constant
β1, β2 = Regression coefficients
X1 = Digital Marketing
X2 = Product Quality
e = Error

The constant -2.469 is that if X1 and X2 = 0, then the purchasing Y > 0.05.
X1 has a significant influence on Variable Y (B = 0.902, p = 0.000 < 0.05).
Product quality also has a positive and significant influence (B = 0.153, p = 0.001 < 0.05), although the influence is smaller than that of digital marketing.

c. Test Results (t-Test)

Table 6. Partial Test (t-Test)

Coefficient

Model		Unstandardized Coefficient		Standard Coefficient			Collinearity Statistics	
		B	Standard Error	English	T	Signature .	Tolerance	English : VIF
1	(Constant)	-2,469 years	1.418		-1,741 years	.087		
	DIGITAL MARKETING	.902	.047	.860	19.212	.000	.508	1,969 years
	PRODUCT QUALITY	.153	.046	.150	3.348	.001	.508	1,969 years

a. Dependent Variable: PURCHASE DECISION

The following are the regression values of the calculated results that can be seen from the calculations carried out using SPSS:

Digital marketing (X1):
The calculated t value = 19.212 and p = 0.000 < 0.05. This means: Digital marketing has a positive and significant influence on purchasing decisions.

Product Quality (X2):
The calculated t value = 3.348, and p = 0.001 < 0.05. This means that product quality also positively and significantly affects purchasing decisions.

Constants:
The t value = -1.741 and p = 0.087 > 0.05. This means that it is not significant or very important practically in the interpretation (only the initial position of the model).

d. Simultaneous Test (f-Test)

Table 7. Simultaneous Test (f Test)

	Model	Sum of Squares	df	Mean Square	F	Signature.
1	Regression	917,315	2	458.657 million	463,383	.000 billion
	Remainder	56,419 years	57	.990		
	Total	973,733	59			

The calculated F value = 463.383. The F value is very high, and because sig < 0.05, then the model means that both variables have a simultaneous influence on the Y variable.

- X1 has a very significant partial influence on Y (t = 19.212, p = 0.000).
- X2 also has a significant partial influence on Y (t = 3.348, p = 0.001).
- The constant is insignificant**,** so it is more focused on the influence of X1 and X2.

e. Coefficient of Determination Test (R2)

Table 8. Test of Determination Coefficient (R2)

Model Summary				
Model	R	R Square	Adjusted R Squared	Standard Error of Estimate
1	.971a	.942	.940	.99489
a. Predictors: (Constant), Product Quality, Digital Marketing				
b. Dependent Variable: Purchase Decision				

The output results of multiple linear regression, $R^2 = 0.758$. This means that 75.8% of the variation in the Purchase Decision variable can be explained by two independent variables, namely the influence of Digital Marketing and Product Quality simultaneously.

f. The Influence of Digital Marketing on Purchasing Decisions

Digital marketing has a real and positive influence on consumer decisions to buy. This is evidenced by a significance value of 0.000, which is far below the limit of 0.05. The coefficient value of 0.902 shows that the better the digital marketing, the more the purchasing decision will increase. In fact, digital marketing is the strongest influencing factor compared to product quality because its t-value is much higher.

g. Product Quality on Purchasing Decisions

Variable X1 affects variable Y with a significance value of less than 0.005. The regression coefficient of 0.153 indicates that increasing perceptions of product quality will slightly increase consumer decisions to purchase.

h. The Influence of Digital Marketing, Product Quality, and Purchasing Decisions

Variables X1 and X2 influence variable Y together. This means that good digital marketing strategies and positive perceptions of product quality play a major role in encouraging consumers to buy INGCO products.

4. Conclusion

Conclusions from this research are:

a. The multiple linear regression analysis results prove that digital marketing has a dominant influence with the highest coefficient value (0.902) and a significance of 0.000. This confirms

the importance of a targeted digital marketing strategy to increase consumer purchasing interest.

b. Product quality is also proven to have a positive and significant influence on purchasing decisions, with a coefficient of 0.153 and a significance of 0.001. This shows that quality aspects such as performance, durability, and product features remain important considerations in consumer decisions.

c. The two independent variables explain 94.2% of the variation in purchasing decisions (R^2 = 0.942), indicating that this research model is very strong and relevant to marketing modern tool products such as INGCO. Thus, companies should integrate effective digital marketing strategies with continuous product quality improvement to achieve high competitiveness and stronger customer loyalty.

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THE IMPACT OF EASY ACCESS TO DIGITAL FUNDING AND OPERATIONAL EFFICIENCY ON THE COMPETITIVENESS OF MSMES IN THE DIGITAL ERA IN MEDAN CITY

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Abstract

This study aims to analyze the influence of ease of access to digital funding and operational efficiency on the competitiveness of Micro, Small, and Medium Enterprises (MSMEs) in Medan City within the digital era. MSMEs play a crucial role in the regional economy but continue to face challenges in accessing funding and managing operations efficiently. The advancement of financial technology (fintech) offers alternative solutions for MSME actors to obtain capital more quickly and with fewer procedural barriers, while also enhancing efficiency through digital business processes.This research adopts a quantitative approach using a survey method. Data were collected through questionnaires distributed to 44 MSME owners in Medan City who utilize digital funding services and apllied digital technologies in their business operations. The data were analyzed using multiple linear regression with the help of SPSS software. The findings indicate that both ease of access to digital funding and operational efficiency have a positive and significant effect on MSME competitiveness, both partially and simultaneously. These results highlight the importance of adopting digital technology as a strategic tool for enhancing the competitiveness of MSMEs amidst global market competition. This study also provides practical recommendations for MSME actors, local governments, and fintech service providers to strengthen the digital ecosystem for small and medium enterprises.
Keywords: Digital Funding; Operational Efficiency; MSME Competitiveness.

1. Introduction

Micro, Small, and Medium Enterprises (MSMEs) play an important role in the Indonesian economy, including in the city of Medan. MSMEs not only contribute to the Gross Regional Domestic Product (GDP) but also become the main source of labor absorption and driving force in the local economy. However, in today's digital era, MSMEs face great challenges to remain competitive and sustainable. One of the main challenges is limited access to funding. Many MSMEs in Medan City experience difficulties in obtaining business capital from conventional financial institutions due to strict requirements and complex processes. This condition hinders their ability to develop their business and compete in an increasingly competitive market. However, advances in financial technology (fintech) have opened up new opportunities for MSMEs to access funding more easily and quickly.

Fintech platforms offer a variety of digital financial services that can help MSMEs obtain business capital, manage finances, and conduct transactions efficiently. Akbar, Silalahi, Persfektif, & Syariah, (2024) indicate that the application of fintech among MSMEs in Medan City shows great potential to improve operational efficiency and access to financing. In addition to access to funding, operational efficiency is also a crucial factor in increasing the competitiveness of MSMEs.

Financial Technology (Fintech) is an integration between information technology innovation and financial service systems that results in a significant transformation in the way transactions are conducted. The development of Fintech has brought fundamental changes in payment

and financing systems, which were previously conventional and require face-to-face and cash, to become all-digital and can be accessed remotely. Financial transactions can now be done quickly, efficiently, and in real-time only through digital devices such as smartphones.

In the context of Micro, Small, and Medium Enterprises (MSMEs), Fintech plays a strategic role in expanding access to financial services, especially for business actors who have been experiencing obstacles to reach formal financial institutions such as banks. Research conducted on MSMEs in Pekalongan, Batang, and Pemalang Regencies shows that Fintech not only accelerates the transaction and financing process, but also contributes to increasing financial literacy, namely MSME actors' understanding of available financial products and services. This is important because good literacy can improve the ability of business actors to manage finances, measure risks, and make the right decisions in running a business.(Wachyu & Winarto, 2020).

Digitization of business processes, such as the use of e-wallet applications, digital financial management systems, and e-commerce platforms, allows MSMEs to manage their operations more efficiently and be responsive to market changes.(Sari Purba, Ikhsan Harahap, & Nurbaiti, 2023) shows that business digitalization can improve the operational efficiency of MSMEs, expand market reach, and increase revenue. The digital era has brought major transformations in various sectors, including the financial sector and Micro, Small, and Medium Enterprises (MSMEs). Digital technology not only facilitates access to information, but also speeds up the transaction process and opens up wider market opportunities. For MSMEs, digitalization is not just a tool to increase efficiency, but the key to survive and grow in the midst of increasingly fierce competition. The use of digital technology such as electronic payment systems, e-commerce platforms, social media, to big data analysis and fintech services is the main pillar in increasing the competitiveness of MSMEs. Therefore, microfinance institutions that partner with MSMEs need to transform digitally to provide faster, easier, and more inclusive financial services for business actors.

The digital payment system is an innovation that allows the process of transferring funds electronically through various devices and applications, such as OVO, DANA, GoPay, and ShopeePay. The presence of this system accelerates and facilitates transactions both at the place of business and on digital platforms, while supporting the efficiency of business processes. However, despite its increasing use in Indonesia, equitable adoption of digital technology remains a challenge, especially in rural areas that face limited infrastructure and internet access.

The digital economy offers a great opportunity to drive the growth of various sectors, including culture, tourism, and the creative economy. Local products can now reach global markets through e-commerce platforms, while the tourism sector leverages digital applications to expand the reach of promotions. In the MSME sector, digitalization is the key to creating a more adaptive and competitive business model. However, obstacles such as low digital literacy and resistance to change still hinder the optimization of the benefits of technology.

In Medan, the local government has taken steps to encourage the digitalization of MSMEs through various programs and trainings. However, the adoption of digital technology among MSMEs still faces various obstacles, such as limited digital literacy, uneven technological infrastructure, and resistance to change.According to Fauziah, Rahmawati, Salsabila, & Zahra (2025) these challenges need to be overcome through a holistic and collaborative approach between the government, the private sector, and MSME actors themselves. Taking into account the importance of access to digital funding and operational efficiency in increasing the competitiveness of MSMEs in the digital era, this study aims to analyze the impact of these two factors on the competitiveness of MSMEs in Medan City. This research is expected to

contribute to formulating effective strategies for MSME empowerment through the use of digital technology.

2. Methodology

1.1 Data Types and Sources

This study uses quantitative data, which can be measured and analyzed statistically. Quantitative methods were chosen to objectively assess the influence of ease of access to digital funding and operational efficiency on the competitiveness of MSMEs in Medan City.

The data in this study are derived from both primary and secondary sources. Primary data were collected directly from respondents through the distribution of questionnaires to MSME actors who utilize digital technology in their business activities.Secondary data were obtained from various relevant sources such as official government reports, academic journals,and published literature.

2.2 Population and Sample

The population in this study consists of MSMEs operating in Medan City that have adopted digital funding services and digital technologies in their operations. Sampling was conducted using purposive sampling, a non-probability sampling technique where respondents were selected based on specific criteria that align with the research objectives. The criteria include: (1) MSME actors who are actively operating in Medan City, (2) have used fintech platforms for financing purposes, and (3) have implemented digital technology in their operational processes.

The number of samples is determined based on the Slovin's formula as follows:

$$n = N / (1+(N \times e2) \quad (1)$$

where:
n = samples size
N = total of MSME population in Medan City
e = margin of error (set to 5%)

Based on the calculation, a total of 44 respondents were selected as the sample for this research.

2.3 Data Collection Techniques

Data collection was carried out using a survey method with questionnaires as the main instrument. The questionnaire was compiled based on indicators from each variable studied, namely ease of access to digital funding, operational efficiency, and competitiveness of MSMEs. Each statement in the questionnaire uses a five-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree), so that respondents can provide an assessment according to their perception of each indicator presented.

2.4 Data Analysis Techniques

The data obtained was analyzed quantitatively using the help of SPSS software. The analysis begins with descriptive statistics to illustrate the characteristics of the data. Furthermore, validity and reliability tests were carried out to ensure the feasibility of the research instrument. Hypothesis testing was carried out through multiple linear regression analysis to see the effect of ease of access to digital funding and operational efficiency on the competitiveness of

MSMEs. In addition, the determination coefficient (R^2) test was used to determine the amount of contribution of the two independent variables in explaining the dependent variables.

3. Results and Discussion

3.1 Results

The number of respondents in this study was determined using *the Solvin* formula, which resulted in a total of 44 MSMEs. The respondents are business owners or MSME actors who have been running their business for at least 1 year. A total of 44 questionnaires were distributed to the respondents and the results were then processed and presented in a descriptive table as follows:

Table 1. Respondent demographics

Characteristics		Frequency	Percent
Gender	Man	22	50
	Woman	22	50
	Amount	44	100
Long Running Business	< 1 Years	16	36,4
	< 3 Years	18	40,9
	> 5 Years	10	22,7
	Amount	44	100
Type Of Business	Culinary/Food/Beverage	25	56,8
	Fashion/Clothing	12	27,3
	Handicrafts/Souvenirs	4	9,1
	Trade/Grocery Store	3	6,8
	Amount	44	100

Respondents in this study consisted of men and women in balanced numbers, showing the active involvement of both genders in running MSMEs. The majority of respondents are in the early to intermediate stages of running a business, with 36.4% having only been running a business for 1 year, 40.9% less than 3 years, and 22.7% more than 5 years. In terms of business type, most are engaged in the culinary (56.8%) and fashion (27.3%) sectors, while the rest run handicraft businesses (9.1%) and grocery stores (6.8%). These data reflects that MSMEs in Medan City are dominated by sectors that are consumptive and adaptive to digitalization and are relevant in assessing the influence of digital funding access and operational efficiency on business competitiveness.

3.2 Summary of Respondents' Answers

In this section, a recapitulation of the respondents' answers to each statement contained in the research questionnaire is presented. The presentation was carried out based on each research variable, namely Ease of Access to Digital Funding (X_1), Operational Efficiency (X_2), and MSME Competitiveness (Y).

Each indicator is measured using a 5-point Likert scale, this recapitulation aims to find out the tendency or perception of respondents towards each statement. The average scores of each indicator were used to describe the respondents' level of acceptance of the variables studied.

Table 2. Digital funding respondent answers, X_1

No	Statement	Respondents' answers										Amount
		SS		S		N		TS		STS		
		F	%	F	%	F	%	F	%	F	%	
1.	I was able to access funding from digital platforms (such							0	0%	0	0%	44

	as fintech) in a relatively short time.	10	23 %	21	48 %	13	30 %					
2.	The process of disbursing funds from digital platforms does not require complicated procedures.	6	14 %	23	52 %	15	34 %	0	0%	0	0%	44
3.	The requirements requested by the digital platform are easy for me to meet (without guarantees/collateral).	10	23 %	20	45 %	14	32 %	0	0%	0	0%	44
4.	I no longer depend on banks or cooperatives in finding venture capital.	9	20 %	23	52 %	12	27 %	0	0%	0	0%	44
5.	Digital funding helps me increase my stock of goods or expand my business.	9	20 %	17	39 %	18	41 %	0	0%	0	0%	44
6.	I feel that my business productivity has increased after receiving digital funding.	6	14 %	17	39 %	21	48 %	0	0%	0	0%	44
	Average		19 %		46 %		35 %		0%		0%	100%

There were no respondents who expressed Disagree or Strongly Disagreed with the entire statement, which shows that the respondents' perception of the ease of access to digital funding through platforms such as fintech is quite good. This reflects that digital funding has begun to be received and utilized by MSME actors in meeting their business capital needs.

Table 3. Operational efficiency respondent answer, X_2

No	Statement	Respondents' answers SS		S		N		TS		STS		Amount
		F	%	F	%	F	%	F	%	F	%	
1.	I record daily financial transactions using a digital system/app	12	27 %	16	36 %	16	36 %	0	0%	0	0%	44
2.	I use software or applications (such as POS, digital accounting, CRM) to manage my business	14	32 %	22	50 %	7	16 %	1	2%	0	0%	44
3.	I use an automated ordering system or chatbot to serve customers	16	36 %	24	45 %	3	7%	1	2%	0	0%	44
4.	The implementation of a digital system helps me reduce the burden of business operational costs.	15	34 %	23	52 %	5	11 %	1	2%	0	0%	44
5.	The use of technology has made me more efficient in managing stock, finances, and services.	15	34 %	25	57 %	4	9%	0	0%	0	0%	44
6.	Digitalization makes it easier for me to monitor my business performance in real-time.	23	52 %	17	39 %	4	9%	0	0%	0	0%	44
	Average		33 %		50 %		16 %		1%		0%	100%

Based on Table 3, it can be seen that the majority of respondents gave positive answers to statements in the Operational Efficiency (X_2) variable**.** Most respondents answered Agree

(50%) and Strongly Agree (33%), with 16% of respondents being Neutral**,** and almost no one expressing disapproval. This shows that digitalization in operational activities has benefited MSME actors. The use of digital applications, automated ordering systems, and digital financial recording is considered to have helped business actors manage operational activities more efficiently, cost-effectively, and in real-time. These findings show that operational efficiency through digitalization is an important factor that supports the sustainability and development of MSMEs in the midst of increasingly competitive competition.

Table 4. MSME competitiveness respondents' answers (Y)

No	Statement	Respondents' answers										Amount
		SS		S		N		TS		STS		
		F	%	F	%	F	%	F	%	F	%	
1.	I regularly update the products or services I offer.	10	27 %	27	61 %	7	16 %	0	0%	0	0%	44
2.	I have no trouble getting business capital from available funding sources.	7	32 %	22	50 %	14	32 %	1	2%	0	0%	44
3.	I am quick to adapt to using new technologies that are relevant to my business.	6	36 %	24	55 %	12	27 %	2	5%	0	0%	44
4.	I use social media, e-commerce, or other digital platforms to reach consumers.	9	34 %	26	59 %	8	18 %	1	2%	0	0%	44
5.	Digital technology helps me increase customer loyalty and market reach	14	32 %	23	52 %	7	16 %	0	0%	0	0%	44
6.	The competitiveness of my business has increased along with the use of digital technology in operational activities.	11	25 %	24	55 %	9	20 %	0	0%	0	0%	44
	Average		22 %		55 %		22 %		2%		0%	100%

Based on Table 4, most respondents gave positive responses to statements in the MSME Competitiveness variable (Y). The majority of respondents' answers were in the Agree (55%) and Strongly Agree (22%) categories, with only 2% answering No and 22% Neutral**.** This data shows that MSME actors in Medan City generally feel that the use of digital technology encourages an increase in the competitiveness of their businesses. This increase is shown through the ability to adapt to technology, the use of digital media for marketing, the ease of obtaining funding, and the increase in customer loyalty and market reach. These results support the argument that digitalization is not just an operational tool, but a key strategy in building the competitive advantage of MSMEs in the midst of an era of digital competition.

3.3 Validity Test

The validity test is carried out to find out the extent to which the research instrument (in this case a questionnaire) is able to measure what should be measured. The validity test used the Pearson Product Moment correlation technique with SPSS in which each item was tested for its relationship with the total score of its respective variable.
The validity testing criteria are as follows:

- If the value of r is calculated > r of the table (at a significant level of 5%), then the item is declared valid.

In this study, the number of respondents was 44 people, so the value of the table r (df = n – 2 = 42) at a significant level of 0.05 was around 0.297.

Table 5. Results of the validity test of digital ease of access (X1)

No	Statement	Correlation value (r calculated)	Sig. (2-tailed)	Information
1	X1.1	0.571	0	Valid
2	X1.2	0.698	0	Valid
3	X1.3	0.813	0	Valid
4	X1.4	0.621	0	Valid
5	X1.5	0.79	0	Valid
6	X1.6	0.472	0.001	Valid

Table 6. Results of the operational efficiency validity test (X2)

No	Statement	Correlation value (r calculated)	Sig. (2-tailed)	Information
1	X2.1	0.424	0.004	Valid
2	X2.2	0.588	0	Valid
3	X2.3	0.748	0	Valid
4	X2.4	0.712	0	Valid
5	X2.5	0.732	0	Valid
6	X2.6	0.388	0.009	Valid

Table 7. Validity test of MSME competitiveness (Y)

No	Statement	Correlation value (r calculated)	Sig. (2-tailed)	Information
1	Y1	0.565	0	Valid
2	Y2	0.75	0	Valid
3	Y3	0.778	0	Valid
4	Y4	0.628	0	Valid
5	Y5	0.497	0.001	Valid
6	Y6	0.415	0.005	Valid

Based on the results of the validity test using Pearson Product Moment correlation analysis on 44 respondents, all statement items from the three research variables, namely Ease of Access to Digital Funding (X1), Operational Efficiency (X2), and MSME Competitiveness (Y) showed a correlation value (r calculated) that was greater than the r table (0.297) and the significance value (Sig. 2-tailed) < 0.05.

The highest correlation values for each variable are indicated by items X1.3 (0.813), X2.3 (0.748), and Y3 (0.778), while the lowest values remain above the minimum limit of validity, namely X1.6 (0.472), X2.6 (0.388), and Y6 (0.415). Thus, all items in each variable are declared valid and suitable for use in the next stage of analysis.

3.4 Reliability Test

The reliability test aims to find out the extent to which a research instrument is reliable and consistent in measuring the variables in question. Reliability indicates the stability and consistency of respondents' answers to the statement items in the questionnaire. In this study,

reliability testing was carried out using *Cronbach's Alpha technique* with the help of SPSS software.
An instrument is said to be reliable if *Cronbach's Alpha* value ≥ 0.60**.** The higher the alpha value is closer to 1, the more consistent the instrument will be. The following are the results of the reliability test for each variable in this study :

Table 8. Reliability test

Variable	Cronbach's Alpha	Condition	Reliability Levels
Digital Ease of Access	0,744		Reliable
Operational Efficiency	0,619	>0,60	Reliable
MSME Competitiveness	0,663		Reliable

Based on the results of the reliability test using Cronbach's Alpha, all variables in this study were declared reliable because they had an alpha value above 0.6. The variable of Ease of Access to Digital Funding (X1) obtained a score of 0.744, Operational Efficiency (X2) of 0.619, and Competitiveness of MSMEs (Y) of 0.663. These three values show that the instruments used in each variable have good internal consistency and are suitable for further analysis in this study.

3.5 Multiple Linear Regression Test

Multiple linear regression tests are used to analyze the influence of two or more independent variables on a single dependent variable. In this study, multiple linear regression tests were used to determine the extent to which Ease of Access to Digital Funding (X1) and Operational Efficiency (X2) affect the Competitiveness of MSMEs (Y), both simultaneously and partially.

Table 9. Multiple linear regression test

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.224	3.33		0.968	0.339
	EASE OF DIGITAL ACCESS	0.509	0.095	0.584	5.336	0
	OPERATIONAL EFFICIENCY	0.352	0.115	0.336	3.067	0.004

a) Constant (a) of 3.224 indicates that if the value of the variables Ease of Access to Digital Funding and Operational Efficiency is 0, then the value of MSME Competitiveness is at 3.224 (in the Likert scale unit). This means that even though there is no influence from these two variables, MSMEs still have a basic competitiveness level of 3,224.

b) The regression coefficient X_1 (Ease of Access to Digital Funding) of 0.509 indicates that every 1 unit increase in the ease of access to digital funding will increase the competitiveness of MSMEs by 0.509 units, assuming other variables remain the same. Significance values of 0.000 < 0.05 indicate that this influence is significant.

c) The regression coefficient of X_2 (Operational Efficiency) of 0.352 means that every 1 unit increase in operational efficiency will increase the competitiveness of MSMEs by 0.352 units. The significance value is 0.004 < 0.05, which means the effect is also significant.

The results of the analysis show that the two independent variables, namely Ease of Access to Digital Funding and Operational Efficiency, have a positive and partially significant effect on

the Competitiveness of MSMEs. Thus, the research hypothesis that states the positive influence of both variables on the competitiveness of MSMEs is acceptable.

3.6 Hypothesis Test (T Test)

The t-test, or often called the partial test, is one of the statistical tests used in regression analysis to find out whether each independent variable (X) individually (partially) has a significant influence on the dependent variable (Y).

Table 10. T test (Partial)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.224	3.33		0.968	0.339
	EASE OF DIGITAL ACCESS	0.509	0.095	0.584	5.336	0
	OPERATIONAL EFFICIENCY	0.352	0.115	0.336	3.067	0.004

a) Variable of Ease of Access to Digital Funding (X_1)

The t-value is calculated as 5.336 with a significance value of 0.000. Because the significance value < 0.05, it can be concluded that the Ease of Access to Digital Funding has a positive and partially significant effect on the competitiveness of MSMEs. This means that the easier access to digital funding owned by MSMEs, the higher their competitiveness.

b) Operational Efficiency Variable (X_2)

The t-value is calculated as 3.067 with a significance value of 0.004. Because the significance value < 0.05, it can be concluded that Operational Efficiency also has a positive and partially significant effect on the Competitiveness of MSMEs. This means that the more efficient the business operations, the higher the competitiveness of the MSMEs.

Both Ease of Access to Digital Funding and Operational Efficiency have a positive and partially significant influence on the Competitiveness of MSMEs. This shows that the increase in one of these two factors will have an impact on increasing the competitiveness of MSMEs.

3.7 F Test (Simultaneous)

The F test was used to test whether the variables of Ease of Access to Digital Funding (X_1) and Operational Efficiency (X_2) simultaneously had an effect on the Competitiveness of MSMEs (Y).

Table 11. Simultaneous test results (F Test)

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	139.770	2	69.885	22.621	.000[b]
	Residual	126.662	41	3.089		
	Total	266.432	43			

a. Dependent Variable: The Competitiveness of Msmes
b. Predictors: (Constant), Operational Efficiency, Ease of Digital Access

Based on Table 11, the F value of 22,621 was obtained with a significance of 0.000. Because the significance value is smaller than 0.05 (0.000 < 0.05), H_0 is rejected and H_a is accepted, which means, Ease of Access to Digital Funding and Operational Efficiency simultaneously have a significant effect on the Competitiveness of MSMEs. This shows that together, the two independent variables contribute greatly to increasing the competitiveness of MSMEs in the digital era.

3.8 Coefficient Determination Test

This test aims to find out the extent to which Ease of Access to Digital Funding (X1) and Operational Efficiency (X2) are jointly related and contribute to explaining the Competitiveness of MSMEs (Y).

Table 12. Determination coefficient test results (R2)

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.724[a]	.525	.501	1.75765

a. Predictors: (Constant), Operational Efficiency, Ease Of Digital Access

Based on Table 12, the R value (multiple correlation coefficient) of 0.724 shows that there is a strong and positive relationship between the variables of Ease of Access to Digital Funding and Operational Efficiency on the Competitiveness of MSMEs. This value is close to 1, which means that the relationship between the free variable and the bound variable is quite tight. Furthermore, the R Square value (determination coefficient) of 0.525 indicates that 52.5% of the MSME Competitiveness variable can be explained by the Ease of Access to Digital Funding and Operational Efficiency. Meanwhile, the remaining 47.5% was explained by other factors not included in this research model.

The results of this study show that the variables of Ease of Access to Digital Funding and Operational Efficiency have a significant effect on the Competitiveness of MSMEs in the City of Medan. The discussion of these results was carried out by comparing the field findings with relevant theories and the results of previous research.

1. The Effect of Easy Access to Digital Funding on the Competitiveness of MSMEs

The results of the t-test showed that the Ease of Access to Digital Funding (X_1) had a positive and significant influence on the Competitiveness of MSMEs, with a significance value of 0.000 < 0.05 and a regression coefficient of 0.509. This means that the easier it is for MSME actors to access funding sources through digital platforms, the higher their competitiveness will be. Stated that easy access to funding from fintech can help MSMEs obtain business capital quickly, cheaply, and efficiently. With better access to funding, MSMEs can increase productivity, improve product quality, and innovate that has an impact on competitive advantage.

2. The Influence of Operational Efficiency on the Competitiveness of MSMEs

Based on the results of the t-test, the variable Operational Efficiency (X_2) also had a positive and significant effect on the competitiveness of MSMEs**,** with a significance value of 0.004 < 0.05 and a regression coefficient of 0.352. This shows that the more efficient business operations are, the stronger the competitiveness of MSMEs. Operational efficiencies, such as time management, the use of digital technology, and good financial recording and management, allow MSMEs to reduce costs, speed up services, and respond to the market

more flexibly. This result is in line with the view of Heizer & Render (2016) who stated that high operational efficiency is the key to achieving sustainable competitiveness.

3. The Simultaneous Influence of the Two Variables on the Competitiveness of MSMEs

Through the F test, it is known that Ease of Access to Digital Funding and Operational Efficiency simultaneously have a significant effect on the Competitiveness of MSMEs with a significance value of 0.000 and F calculation of 22,621. This shows that these two factors complement each other and together play an important role in increasing the competitiveness of MSMEs. With an R Square of 0.525, this model is able to explain 52.5% of the variation in the competitiveness of MSMEs. This shows that ease of access to funding and operational efficiency are two key aspects that must be considered in encouraging MSMEs to remain able to compete in the midst of the digital era and dynamic market competition.

4. Conclusion

Based on the results of the data analysis and discussions that have been carried out, it can be concluded that several important points can be concluded as follows:

1. Ease of Access to Digital Funding has a positive and significant effect on the competitiveness of MSMEs.
   The results of the t-test show that the easier it is for MSMEs to access funding through digital platforms (such as fintech), the higher the competitiveness of their business. Digital funding provides ease in obtaining capital without complicated procedures, which allows business actors to increase stock, expand the market, and increase business productivity more flexibly and quickly.

2. Operational Efficiency also has a positive and significant effect on the Competitiveness of MSMEs.
   The application of digital systems in business operations, such as financial recording, stock management, and the use of business support applications, has been proven to be able to increase work efficiency and effectiveness. This has a direct impact on service speed, cost savings, and improving the quality of business management, which ultimately increases the competitiveness of MSMEs in the market.

3. Ease of Access to Digital Funding and Operational Efficiency simultaneously have a significant effect on the competitiveness of MSMEs.
   The results of the F test and the determination coefficient (R^2) showed that the two independent variables were able to explain 52.5% of the variation in the competitiveness of MSMEs. This means that the combination of ease of access to capital and efficiency of operational management greatly determines the success of MSMEs in facing competition in the competitive and dynamic digital era

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OPTIMIZATION OF SOCIAL MEDIA AS AN ONLINE BUSINESS PLATFORM FOR HOUSEWIVES TO IMPROVE FAMILY ECONOMY AT FNL BABY KIDS STORE

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Abstract

Online business continues to grow in line with the advancement of social media. The use of social media has become increasingly common in society, particularly among housewives. Many housewives seek to engage in productive activities beyond their domestic responsibilities, especially as a means to improve their family's economic conditions. This study employs a field approach with a descriptive qualitative research design. Data collection techniques include interviews, observations, and documentation. The findings reveal that social media usage at FNL Baby Kids Store is highly effective for operating an online business. Instagram and Facebook are identified as the most effective platforms for product marketing. To achieve optimal results, FNL Baby Kids Store implements several strategies, including scheduling a minimum of three videos per day at designated times, collaborating with bloggers, using paid social media advertisements, organizing giveaways, and maintaining quick interaction with customers. These strategies demonstrate that social media is an effective platform for housewives in managing online businesses and significantly contributes to improving family economic welfare.
Keywords: Online Business; Housewives; Family Economy.

1. Introduction

In today's digital era, social media has become one of the primary and most effective tools to support online business activities. The rapid development of information technology has significantly influenced marketing patterns and consumer behaviour. Many entrepreneurs, including homemakers, run their businesses through online platforms. The utilization of social media as a platform to sell products enables business owners to reach a broader market without the need for a physical store. FNL Baby Kids Store is an example of how social media can be leveraged in online business. Managed by a female entrepreneur who is a housewife.

One of the uses of social media is evident in the business activities of the FNL Baby Kids store. This business is run by a housewife who recognized the great potential in marketing baby and children's products. Product through platforms such as Facebook and Instagram. With relatively low capital and flexible scheduling, social media enables homemakers to manage businesses from home while still fulfilling their domestic roles.
FNL Baby Kids store is an example of how social media can be effectively optimized to market products, foster customer interaction, and drive sales. Ultimately, social media plays a crucial role in increasing family income and economic stability. To achieve success, a strong understanding of market strategies, creative content, and consistent consumer trust-building is required.

2. Methodology

This study employs a descriptive qualitative approach to thoroughly explore the optimization of social media used by homemakers in running an online business at Fnl Baby Kids Store. The aim is to understand the processes, challenges, and impact of social media use on the family economy. The research was conducted at Fnl Baby Kids Store, located at Jalan Tuba II, Tegal Sari, Mandala III, Medan Denai District, Medan City, North Sumatra. The study was carried out between April and June 2025. The main subject of this study is the owner and manager of Fnl Baby Kids Store, who is also a housewife. Other informants include the store's employees. Data collection was conducted through in-depth interviews with the store owner and two employees, direct observation of online business activities on Instagram and Facebook, and documentation. The data were analyzed descriptively through data reduction, presentation, and conclusion. Data validity was ensured through triangulation of methods and sources.

3. Results and Discussion

The results of this study demonstrate that FNL Baby Kids Store has successfully optimized social media as an effective online business platform for homemakers to increase their family income. The following are some key findings:
Utilization of Social Media Platforms FNL Baby Kids Store actively uses Instagram and Facebook as the main media to promote its products. Instagram is used to showcase products through features such as feed posts, stories, and reels, while Facebook is used to reach broader communities and foster wider engagement.

A. Content Strategy

The content strategy of FNL Baby Kids Store includes,
1. Attractive and professional product photos
2. Unboxing videos and customer testimonials
3. Discount promotions and giveaways to boost engagement
4. Informative and persuasive captions
These contents are created regularly to help build customer loyalty and increase sales.
B. Customer Interaction and Communication
The store owner and employees actively respond to inquiries and handle orders through direct messages (DM) and comments. This communication builds consumer trust and comfort, which are key to customer retention.
C. Impact on Family Economy
Interview results indicate that income from the FNL Baby Kids Store has increased significantly due to the effective utilization of social media. This additional income significantly supports household needs, including daily expenses, family savings, and educational costs.
D. Challenges Faced
The interviews also reveal several challenges in utilizing social media :
High competition in online business, cChanges in social media algorithms, tTime constraints between domestic and business responsibilities, and the There is a need for continuous learning about digital marketing trends.

4. Conclusion

Based on the results of this study, it can be concluded that social media optimization is an has proven to be the most effective strategy for homemakers to run online businesses, as seen in FNL Baby Kids Store. Through the use of platforms like Instagram and Facebook, homemakers can market their products more broadly, build strong communication with customers, and enhance their branding and competitiveness.

Engaging content, active customer interaction, and consistency in managing social media accounts are key factors in the business's success. As a result, the family's income has increased significantly, demonstrating that social media is not only a promotional tool but also a direct contributor to improving the household economy.

Nevertheless, success also comes with challenges such as algorithm changes, market competition, and limited time. Therefore, continuous effort is necessary to enhance digital skills and marketing strategies, ensuring the business continues to grow optimally. Social media optimization offers a valuable opportunity for homemakers to achieve economic independence without compromising their primary role within the family.

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BREAK EVEN POINT (BEP) ANALYSIS FOR BUSINESS SUSTAINABILITY OF UMKM JJ KEJORA WOVEN FABRIC (ULOS)

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Abstract

JJ Kejora Woven Fabric (Ulos) is an MSME engaged in regional handicrafts that monitors selling prices, units sold, and costs incurred. This can be studied using the break-even point analysis. Break-even point analysis i identifies the sales level at which the company neither makes a profit nor incurs a loss. Break-even analysis distinguishes between variable and fixed cost behavior. This study applies break-even analysis to determine the sales units required to reach break-even and to estimate the profit achieved by JJ Kejora Woven Fabric (Ulos). In this study, fixed costs at JJ Kejora Woven Fabric (Ulos) from December 2024 to May 2025 were Rp. 471,000. Variable costs were Rp. 1,555,500 in December 2024, Rp. 1,258,500 in January 2025, and Rp. 960,500 from February to May 2025. During the observation period, the highest break-even point was Rp. 662,159, while the lowest was Rp.623,862. **Keywords:** Break Even Point; Micro;Small and Medium Enterprises (MSMEs);Profit Planning

1. Introduction

Profit planning is the development of an operating plan in order to achieve the goals and objectives of the company. Profit is important in planning because the main goal of a plan is satisfactory profit. A budget is a plan stated financial and quantitative terms . The profit plan of a company consists of a detailed operating budget and budgeted financial Invalid source specified. Basically, businesses are established to achieve short-term and long-term goals. Making a profit is a short-term goal that must be achieved by a company, and increasing the value of the company is a long-term goal. Profit is generated from company revenue minus costs. Companies usually use the profits they make to develop and maintain the sustainability of the company.

Profit planning includes the steps taken to achieve profit targets. Therefore, it is influenced by sales and cost planning. Invalid source specified. In this context, we discuss the Ulos fabric from North Sumatra. The Ulos fabric developed in North Sumatra is a traditional garment of the Batak people. Historically, Ulos fabric was used to keep the body warm. Ulos fabric is also one of the oldest civilizations in Asia, dating back 4,000 years to the Batak culture, even predating the Europeans' knowledge of textiles. Ulos woven fabric has become a strong cultural tradition in every cultural activity. The use of ulos fabric is a strong symbol of the Batak people, with many traditions and customs of the Batak people almost entirely using the traditional fabric of North Sumatra, namely ulos fabric. The use of ulos fabric is like an integral part of the cultural traditions that we most often and commonly encounter, namely at wedding ceremonies. Therefore, one tool in profit planning is the break-even point method. **Invalid source specified.** Break-Even Point (BEP) analysis relates to budgeted sales, and indicates how much sales can fall without incurring losses, i.e., the margin of safety **Invalid source**

specified. Information on the margin of safety can be expressed as a percentage or ratio between budgeted sales.

2. Methodology

The subject of this study is the business owner who provided explanations about conditions at the research site; the research object is the issue in calculating sales at the JJ Kejora Woven Fabric (Ulos) using the Break-Even Point method. To get the results of the break-even point (BEP) in this study, the formula can be used:

Break-Even Point
Operationally, break-even point analysis is a method used to determine or plan the production or sales volume at which a company neither makes a profit nor incurs a loss **Invalid source specified.** The break-even formula **Invalid source specified.** is given in**Invalid source specified.**.

Calculation on a Unit Basis
BEP Formula (In Units)

$$\text{BEP (Unit)} = \frac{\text{Fixed Cost}}{\text{Selling Cost Unit} - \text{Variable Cot Unit}}$$

Calculation based on Rupiah
To calculate the break-even point in sales dollars, variable costs are defined as a percentage of sales, not as the number of units sold. By using the break-even approach in units sold, the break-even equation in rupiah sales will be obtained as follows:
BEP Formula (In Rupiah)

$$\text{BEP (Rupiah)} = \frac{\text{Fixed cost}}{1 - \text{Variable Cost/Sales}}$$

Margin Contribution in Ratio
Contribution Margin Formula The contribution margin formula :

$$\text{CMR} = \frac{\text{CM}}{\text{Sales}} \text{ X } 100\%$$

The formula has two core components when calculating the contribution margin, including revenue and variable costs. The contribution margin ratio formula :
(Total Sales - Total Variable Cost)/(Total Sales)

3. Result and Discussion

Data Analysis
Sales are buying and selling activities between sellers and buyers for business continuity. Sales volume is the amount of merchandise sold. The selling price is the price set by the seller to cover production costs plus profit.

Table 1.1. Classification of Fixed Costs of MSME JJ Kejora Woven Fabric (Ulos)

	December 2024	January 2025	February 2025	March 2025	April 2025	May 2025
Cost peny. Machinery	Rp. 20.000	Rp. 20.000	Rp. 20.000	Rp. 20.000	Rp.20.000	Rp.20.000
Building rental fee	Rp.416.66	Rp.416.66	Rp.416.66	Rp.416.66	Rp.416.666	Rp.416.666
Electricity cost	Rp.35.000	Rp.35.000	Rp.35.000	Rp.35.000	Rp.35.000	Rp.35.000
Total	Rp.471.000	Rp.471.000	Rp.471.000	Rp.471.000	Rp.471.000	Rp.471.000

Table 1.2. Fixed costs of UMKM JJ Kejora woven fabrics (ulos)

Bulan	Biaya tetap
December 2024	Rp. 471.000
January 2025	Rp. 471.000
February 2025	Rp. 471.000
March 2025	Rp. 471.000
April 2025	Rp. 471.000
May 2025	Rp. 471.000
Total	Rp.471.000

Table 1.3. Classification of Variable Costs of UMKM JJ Kejora Woven Fabric (Ulos)

	Desember 2024	Januari 2025	Februari 2025	Maret 2025	April 2025	Mei 2025
Wol yarn cost	Rp. 264.000	Rp. 220.000	Rp. 176.000	Rp. 176.000	Rp. 176.000	Rp. 176.000
Weft yarn cost	Rp. 360.000	Rp. 300.000	Rp. 240.000	Rp. 240.000	Rp. 240.000	Rp. 240.000
Yarn cost	Rp.787.500	Rp.630.500	Rp.472.500	Rp.472.500	Rp.472.500	Rp.472.500
Purada yarn cost	Rp.144.000	Rp.108.000	Rp.72.000	Rp.72.000	Rp.72.000	Rp.72.000
Total	Rp.1.555.500	Rp.1.258.500	Rp.960.500	Rp.960.500	Rp.960.500	Rp.960.500

After the sales budget data is known, the profit plan can be calculated using the contribution method as shown in the following table:

Table 1.4. profit plan can be calculated using the contribution method

	Desember 2024	Januari 2025	Februari 2025	Maret 2025	April 2025	Mei 2025
Goods sold / Unit	200	180	150	150	150	140
Selling price	Rp.28.000	Rp.28.000	Rp.28.000	Rp.28.000	Rp.28.000	Rp.28.000
Sales	Rp.5.600.000	Rp.5.040.000	Rp.4.200.000	Rp.4.200.000	Rp.4.200.000	Rp.3.920.000
Variabel cost	Rp.1.555.500	Rp.1.258.500	Rp.960.500	Rp.960.500	Rp.960.500	Rp.960.500
Contribution Margin	Rp.2.018.000	Rp.2.052.000	Rp.1.808.000	Rp.1.808.000	Rp.1.808.000	Rp.1.808.000
Fixed cost	Rp.471.000	Rp.471.000	Rp.471.000	Rp.471.000	Rp.471.000	Rp.471.000
Total	Rp.3.573.500	Rp.3.310.500	Rp.2.768.500	Rp.2.768.500	Rp.2.768.500	Rp.2.488.500

Contribution Margin Ratio

Contribution Margin Ratio in December 2024 can be calculated as follows:

$$\text{CMR} = \frac{\text{CM}}{\text{Sales}} \text{ X } 100\%$$

$$\text{CMR} = \frac{\text{Rp. } 3.573.500}{\text{Rp. } 5.600.000} \text{ X } 100\% = \ 63{,}81\ \%$$

Contribution Margin Ratio (CMR) is an important policy, because it shows how the contribution margin is affected by total sales. In March, UMKM JJ Kejora had a Contribution Margin Ratio (CMR) of 63.81%. This means that if MSME JJ Kejora plans sales of Rp.5,600,000 for December 2024, management can determinecontribution margin of Rp. 2,018,000 and obtain a profit of Rp. 3,573,500.

Contribution Margin Ratio in January 2025 can be calculated as follows:

$$\text{CMR} = \frac{\text{CM}}{\text{Sales}} \text{ X } 100\%$$

$$\text{CMR} = \frac{\text{Rp. } 3.310.500}{\text{Rp. } 5.040.000} \text{ X } 100\% = \ 65{,}68\ \%$$

Contribution Margin Ratio (CMR) is very important in determining business policy, because it shows how contribution margin will be affected by total sales. In March, UMKM JJ Kejora had a Contribution Margin Ratio (CMR) of 66.41%. This means that UMKM JJ Kejora plans to increase sales by Rp.5,040,000 for the month of January 2025, management can determine a contribution margin of Rp. 2,052,000 and obtain a profit of Rp. 3,310,500.
Contribution Margin Ratio in February 2025 can be calculated as follows:
In February, March, and April, the contribution margin showed consistent revenue, with sales remaining the same in all three months. Therefore, to reduce repetition, only one calculation is listed.
CMR Margin Ratio in February, March, April 2025 can be calculated as follows:

$$\text{CMR} = \frac{\text{CM}}{\text{Sales}} \text{ X } 100\%$$
$$\text{CMR} = \frac{\text{Rp. } 2.789.500}{\text{Rp. } 4.200.000} \text{ X } 100\% = \ 66{,}41\ \%$$

Contribution Margin Ratio (CMR) is very important in determining business policy, because it shows how contribution margin will be affected by total sales. In March, UMKM JJ Kejora had a Contribution Margin Ratio (CMR) of 66.41%. This means that UMKM JJ Kejora plans to increase sales by Rp.4,200,00 for the month of February 2025 management can determine a contribution margin of Rp. 1,080,000 and obtain a profit of Rp. 2,768,500.
Contribution Margin Ratio in May 2025 can be calculated as follows:

$$\text{CMR} = \frac{\text{CM}}{\text{Sales}} \text{ X } 100\%$$
$$\text{CMR} = \frac{\text{Rp. } 2.789.500}{\text{Rp. } 3.920.000} \text{ X } 100\% = \ 71{,}16\ \%$$

Contribution Margin Ratio (CMR) in May MSME JJ Kejora has a Contribution Margin Ratio (CMR) of 71.16%. This means that UMKM JJ Kejora plans to increase sales by Rp.3,920,00 for the month of May 2025 management can determine a contribution margin of Rp. 1,080,000 and obtain a profit of Rp. 2,488,500.

Discussion & Interpretation of Research Results
Break Even Point
Break Even Point in December 2024 is as follows:

$$\text{BEP (Rupiah)} = \frac{\text{Fixed cost}}{1 - \text{ Variable Cost/Sales}}$$
$$\text{BEP (Rp)} = \frac{\text{Rp. } 471.000}{1 - \text{ Rp. } 1.555.500 - \text{Rp. } 5.600.000.}$$
$$\text{BEP (Rp)} = \frac{\text{Rp. } 471.000}{0{,}722232}$$
$$\text{BEP (Rp)} = \ 652{,}145$$

$$\text{BEP (Unit)} = \frac{\text{Fixed Cost}}{\text{Selling Cost Unit} - \text{ Variable Cot Unit}}$$
$$\text{BEP (Unit)} = \frac{\text{Rp. } 471.000}{\text{Rp. } 28.000 - \text{ Rp. } 7.777}$$
$$\text{BEP (Unit)} = \frac{\text{Rp. } 471.000}{\text{Rp. } 20.223}$$
$$\text{BEP (Unit)} = \ 23{,}29$$
$$= \ (2 \text{ Unit})$$

Break Even Point in January 2025 is as follows:

$$\text{BEP (Rupiah)} = \frac{\text{Fixed cost}}{1 - \text{ Variable Cost/Sales}}$$

$$\text{BEP (Rp)} = \frac{\text{Rp. } 471.000}{1 - \text{ Rp. } 1.258.500 - \text{Rp. } 5.040.000.}$$

$$\text{BEP (Rp)} = \frac{\text{Rp. } 471.000}{0{,}750297}$$

$$\text{BEP (Rp)} = 627{,}751$$

$$\text{BEP (Unit)} = \frac{\text{Fixed Cost}}{\text{Selling Cost Unit} - \text{ Variable Cot Unit}}$$

$$\text{BEP (Unit)} = \frac{\text{Rp. } 471.000}{\text{Rp. } 28.000 - \text{ Rp. } 6.991}$$

$$\text{BEP (Unit)} = \frac{\text{Rp. } 471.000}{\text{Rp. } 21.009}$$

$$\text{BEP (Unit)} = 22{,}41$$

$$= (2 \text{ Unit})$$

Break Even Point in February, March, April 2025 is as follows:

$$\text{BEP (Rupiah)} = \frac{\text{Fixed cost}}{1 - \text{ Variable Cost/Sales}}$$

$$\text{BEP (Rp)} = \frac{\text{Rp. } 471.000}{1 - \text{ Rp. } 960.500 \text{ / Rp. } 4.200.000.}$$

$$\text{BEP (Rp)} = \frac{\text{Rp. } 471.000}{0{,}771309}$$

$$\text{BEP (Rp)} = 662{,}159$$

$$\text{BEP (Unit)} = \frac{\text{Fixed Cost}}{\text{Selling Cost Unit} - \text{ Variable Cot Unit}}$$

$$\text{BEP (Unit)} = \frac{\text{Rp. } 471.000}{\text{Rp. } 28.000 - \text{ Rp. } 6.403}$$

$$\text{BEP (Unit)} = \frac{\text{Rp. } 471.000}{\text{Rp. } 21.570}$$

$$\text{BEP (Unit)} = 23{,}29$$

$$= (2 \text{ Unit})$$

The Break Even Point in May is as follows:

$$\text{BEP (Rupiah)} = \frac{\text{Fixed cost}}{1 - \text{ Variable Cost/Sales}}$$

$$\text{BEP (Rp)} = \frac{\text{Rp. } 471.000}{1 - \text{ Rp. } 960.500/\text{Rp. } 3.920.000.}$$

$$\text{BEP (Rp)} = \frac{\text{Rp. } 471.000}{0{,}754974}$$

$$\text{BEP (Rp)} = 623{,}862$$

$$\text{BEP (Unit)} = \frac{\text{Fixed Cost}}{\text{Selling Cost Unit} - \text{ Variable Cot Unit}}$$

$$\text{BEP (Unit)} = \frac{\text{Rp. } 471.000}{\text{Rp. } 28.000 - \text{ Rp. } 6.403}$$

$$\text{BEP (Unit)} = \frac{\text{Rp. } 471.000}{\text{Rp. } 21.570}$$
$$\text{BEP (Unit)} = 21{,}83$$
$$= (2 \text{ Unit})$$

Based on these calculations, ithe Break Even Point in rupiah in June 2022 occurred at Rp.623,862. in this situation, MSMEs does not earn a profit or incur a loss. he Break Even Point in quantity (kg) reached at a sales level of 21.83 or as many as 2 units. From the margin-of-safety calculation above, the maximum decrease in factory sales is 84.08% or Rp. 2,396,138. In other words, the maximum limit that sales can fall so that the factory does not suffer losses in May 2025 is 84.08% of sales. If sales drop by less than 84.08% the factory earns a profit, but if sales drop more than 84.08%, the factory incurs a loss; and if thesales are at 84.08% the factory break-even.

4. Conclusion

Through this analysis, UMKM JJ Kejora Ulos Woven Fabric is expected to determine at what level of sales volume they will be in a state of no loss. In addition, the break-even analysis also helps companies determine the minimum sales figures that need to be achieved to achieve predetermined profit targets. Applying the break-even point (BEP) method is important to ensure the accuracy of data used in calculations and analysis. This is done in order to avoid errors in data calculations, which can have a significant impact on financial management in these MSME businesses. By using Break-Even Point analysis, businesses are expected to increase efficiency in production to reduce variable costs that can affect the amount of profit to be obtained. Break-even point (BEP) analysis provides information on the relationship between sales volume, costs, and profit at a given sales level. Break-Even Point (BEP) analysis can be useful if the Break-Even Point (BEP) point can be maintained for a certain period. Based on the above conclusions, business actors are advised to maintain product quality and motifs that are in demand and to offer affordable prices. They should increase and expand the marketing network by promoting and selling through currently growing social-media platforms, perhaps by implementing a strategy that identifies the target market and likely buyers, enabling effective promotions and discounts.

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APLIKASI PENGURUSAN KEWANGAN DI TELEFON PINTAR: MEMBANTUKAH PENGURUSAN KEWANGAN PELAJAR?

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Abstrak

Pengurusan kewangan adalah aspek yang paling penting dalam kalangan pelajar. Teknologi dalam telefon pintar pada masa kini telah membolehkan banyak aplikasi pengurusan kewangan di “Play Store” boleh di pasang di telefon pintar secara percuma. Justeru itu, kajian ini dijalankan untuk menilai sejauh mana aplikasi pengurusan kewangan telah memberi manfaat kepada pelajar. Sampel kajian ini adalah dalam kalangan pelajar politeknik yang terdiri daripada pelbagai jabatan termasuklah pelajar dari aliran kejuruteraan. Untuk mendapatkan data, borang soal selidik digunakan dan diedarkan secara rawak. Data yang diperoleh dianalisis secara deskriptif menggunakan perisian IBM-SPSS v.29. Hasil analisis mendapati, masih ramai lagi dalam kalangan pelajar yang tidak menggunakan aplikasi pengurusan kewangan walaupun ianya boleh dipasang secara percuma di telefon pintar (32.1%). Penggunaan aplikasi kewangan di telefon pintar adalah pada tahap sederhana. Dapatan juga menunjukkan bahawa mereka yang memasang aplikasi pengurusan kewangan di telefon pintar mereka, telah mendapat manfaat dari segi panduan membeli belah dan dapat merancang perbelanjaan mereka. Kajian ini sangat penting bagi mendapatkan maklum balas sejauh mana aplikasi pengurusan kewangan yang terdapat di “Play Store” boleh membantu pengurusan kewangan pelajar. Hasil dapatan ini juga dapat membuka ruang untuk menambah baik aplikasi yang sedia ada dan pelajar mesti didedahkan dengan pendidikan kewangan dan kaunseling kewangan.
Kata kunci: Aplikasi; Pengurusan kewangan; Perbelanjaan.

1. Pengenalan

Pengurusan kewangan dalam kalangan pelajar merupakan perkara yang perlu dipandang serius (Azer & Mohamad, 2018). Ini kerana apabila pelajar mempunyai pengurusan kewangan yang lemah, boleh menyebabkan pelajar akan menghadapi masalah kewangan untuk meneruskan perbelanjaan sepanjang berada di kampus (Rahim et al., 2020). Selain itu, ianya juga akan mengundang kegusaran dalam kalangan ibu bapa pelajar khususnya mereka yang dari kumpulan B40 (yang merujuk kepada 40% isi rumah terendah di Malaysia dari segi pendapatan) apabila anak mereka sering meminta wang tambahan akibat daripada perbelanjaan yang tidak terkawal.

Dengan perkembangan teknologi dalam dunia hari ini, aplikasi kewangan peribadi boleh menjadi kaedah yang baik untuk menjadikan pengurusan kewangan seseorang termasuklah pengurusan kewangan pelajar supaya bertambah efektif. Dengan adanya aplikasi pengurusan kewangan yang dimuat turun di telefon bimbit, mereka boleh merujuk pada aplikasi tersebut bagi membantu mereka membuat anggaran bajet, merekodkan perbelanjaan dan sumber kewangan. Aplikasi ini sangat bermanfaat bagi mereka yang kurang pengetahuan mengenai pendidikan kewangan. Selain penggunaan yang mudah, aplikasi moden ini dapat membantu pelajar meningkatkan literasi kewangan mereka dalam jangka panjang. Aplikasi kewangan peribadi tersebut dapat membantu menjadikan konsep penganggaran,

penghasilan dan penjimatan menjadi lebih mudah bagi semua orang. Mereka dilengkapi dengan pelbagai ciri yang dapat mempermudah semua tugas kewangan penting yang diperlukan dalam pengurusan kewangan peribadi pelajar ataupun menjalankan perniagaan.
Terdapat banyak aplikasi percuma yang boleh dimuat turun di telefon pintar untuk membantu pengurusan kewangan yang baik. Antara aplikasi yang tersebut adalah HeyAlfred, Mint, Monefy, Goodbudget, Money Manager, 1Money, Belanjawan, Monthly Budget, Bajet dan banyak lagi. Namun begitu, dari dulu sehingga kini banyak laporan dan kajian dijalankan mendapati banyak pelajar menghadapi masalah kewangan yang tidak terkawal sehingga terpaksa berhemat dalam perbelanjaan sepanjang pengajian ataupun terpaksa mencari kerja sampingan untuk menampung perbelanjaan harian di kampus sehingga boleh menjejaskan prestasi pembelajaran mereka (Hariri, 1997; Andin et al., 2010; Alavi et al. 2020). Justeru itu, kajian ini dijalankan untuk menilai sama ada pelajar menggunakan aplikasi pengurusan kewangan dan sejauh mana aplikasi pengurusan kewangan telah memberi manfaat kepada pelajar.

Kajian yang dijalankan oleh Widener (2017) mendapati umumnya pengurusan kewangan dalam kalangan pelajar kolej umumnya adalah lemah. Dapatan tersebut mendapati menjelaskan pelajar gagal membuat perbelanjaan yang bijak, tiada perancangan kewangan dan mempunyai bebanan pinjaman kewangan. Kesan daripada kelemahan pengurusan kewangan, mereka mengalami tekanan emosi, yang dikaitkan dengan kekurangan kemampuan kewangan dan sikap buruk terhadap wang (Graves & Savage, 2015). Menurut Goetz et al. (2011) keputusan kewangan yang kurang baik yang dibuat oleh pelajar dikaitkan dengan literasi atau pengetahuan kewangan yang rendah.
Pengurusan kewangan yang buruk boleh mengundang kepada risiko yang lebih buruk. Menurut Avery dan Turner (2012), risiko yang paling jelas akibat kelemahan pengurusan kewangan adalah hutang. Ramai pelajar mengambil pinjaman pendidikan yang sangat tinggi, dan dengan itu mewujudkan tahap risiko kewangan mereka yang tidak terkawal. Kajian yang dijalankan oleh Archuleta et al. (2013) mendapati kira-kira 50% siswazah baru, belum berjaya mendapatkan pekerjaan, tetapi mereka terpaksa memikirkan pembayaran pinjaman. Akibatnya, pembayaran hutang pinjaman pendidikan berkemungkinan akan berlanjutan sehingga usia pertengahan atau tua (Archuleta et al., 2013).
Menurut Shahryar dan Tan (2014), pelajar lelaki biasanya tertarik untuk membeli barang yang mahal dan berjenama, sementara pelajar wanita lebih cenderung berbelanja untuk solekan, pakaian, beg dan kasut yang dianggap penting, kerana mereka ingin kelihatan cantik pergi ke kelas. Senario ini menunjukkan mereka lebih mementingkan harga diri dan pandangan sosial berbanding dengan budget yang mereka ada (Ngadiman et al. 2019). Perkara ini tidak seharusnya menjadi mentaliti pelajar pada masa kini kerana akan membawa mereka ke krisis kewangan. Oleh itu, pengurusan kewangan adalah penting bagi pelajar untuk mengetahui sumber yang tepat untuk mengalirkan sumber kewangan mereka untuk tujuan pendidikan dan keperluan peribadi. Ringkasnya, pengurusan wang sangat penting dalam kehidupan pelajar kerana wang sangat penting dalam kehidupan pelajar tetapi boleh membahayakan pelajar jika mereka tidak mengambil serius pengurusan kewangan. Oleh itu, adalah penting untuk mempunyai asas yang kuat dalam pengurusan kewangan untuk mempersiapkan pelajar dalam melangkahi kehidupan bekerja.

2. Metodologi

Responden yang dipilih dalam kajian ini adalah pelajar Politeknik Sultan Idris Shah. Instrumen yang digunakan untuk mendapatkan data adalah dengan menggunakan borang selidik yang diedarkan secara dalam talian. Seramai 106 pelajar telah memberikan respon mereka berkaitan kepentingan aplikasi pengurusan kewangan terhadap mereka. Semua item kajian seperti yang ditunjukkan dalam Jadual 1 diukur pada skala Likert 5-poin di mana 1 = sangat tidak setuju, 2 = tidak setuju, 3 = neutral, 4 = setuju dan 5 = sangat setuju. Instrumen yang gunapakai di adaptasi daripada kajian- kajian yang lepas oleh Sabri et. al (2024), Xiao & Porto (2017) dan Lai & Tan (2019). Hasil daripada analisis kebolehpercayaan menggunakan

Cronbach's Alpha menunjukkan nilai α = 0.984, menandakan soal selidik ini mempunyai kebolehpercayaan yang sangat tinggi (Hair et. al, 2022). Maka, semua item adalah konsisten dalam mengukur persepsi terhadap keberkesanan aplikasi pengurusan kewangan dalam kalangan pelajar. Penentuan sejauh mana aplikasi kewangan memberi manfaat kepada pelajar pula diukur berdasarkan nilai skor min sebagaimana ditunjukkan dalam Jadual 2 (Syed Najmuddin et al., 2009).

Jadual 1. Item kajian

Kod Item	Item	Dimensi
FA1	Aplikasi pengurusan kewangan membantu saya melakukan penyediaan anggaran kewangan	Perancangan Kewangan
FA2	Aplikasi pengurusan kewangan membantu saya untuk menabung	
FA3	Aplikasi pengurusan kewangan membantu saya membelanjakan mengikut anggaran saya.	
FA4	Aplikasi pengurusan kewangan membantu saya komited dengan anggaran yang dirancang	Kawalan perbelanjaan
FA5	Aplikasi pengurusan kewangan membantu saya membuat perbandingan harga.	
FA6	Aplikasi pengurusan kewangan membantu saya berhemat dalam pembelian	
FA7	Aplikasi pengurusan kewangan membantu saya menangguhkan perbelanjaan yang tidak penting.	
FA8	Aplikasi pengurusan kewangan membantu saya menyimpan resit.	Penyimpanan maklumat kewangan
FA9	Aplikasi pengurusan kewangan membantu saya mencatat perbelanjaan.	
FA10	Aplikasi pengurusan kewangan membantu saya mencari nilai terbaik untuk wang saya.	Nilai Wang

Jadual 2. Penetuan Sikap Berdasarkan Skor Min

Skor Min	Tafsiran
1.00– 1.99	Lemah
2.00– 2.99	Rendah
3.00– 3.99	Sederhana
4.00– 5.00	Tinggi

3. Dapatan dan Perbincangan

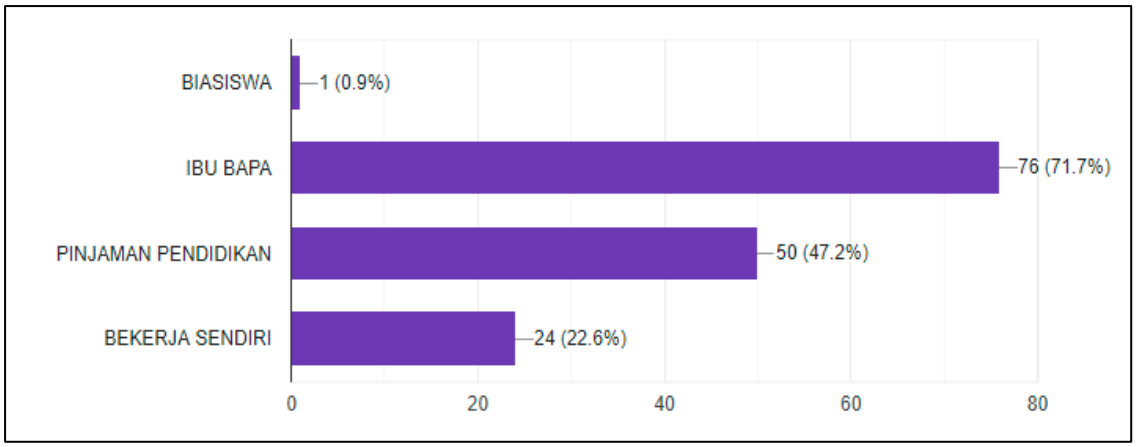
Jadual 3. Analisis Demografi

	Item	n	%
Jantina	Lelaki	28	26.4
	Perempuan	78	73.6
Kediaman Pelajar	Kolej kediaman	15	14.2
	Rumah keluarga	88	83.0
	Rumah sewa	3	2.8
Tahun Pengajian	1	18	17.0
	2	55	51.9
	3	33	31.1

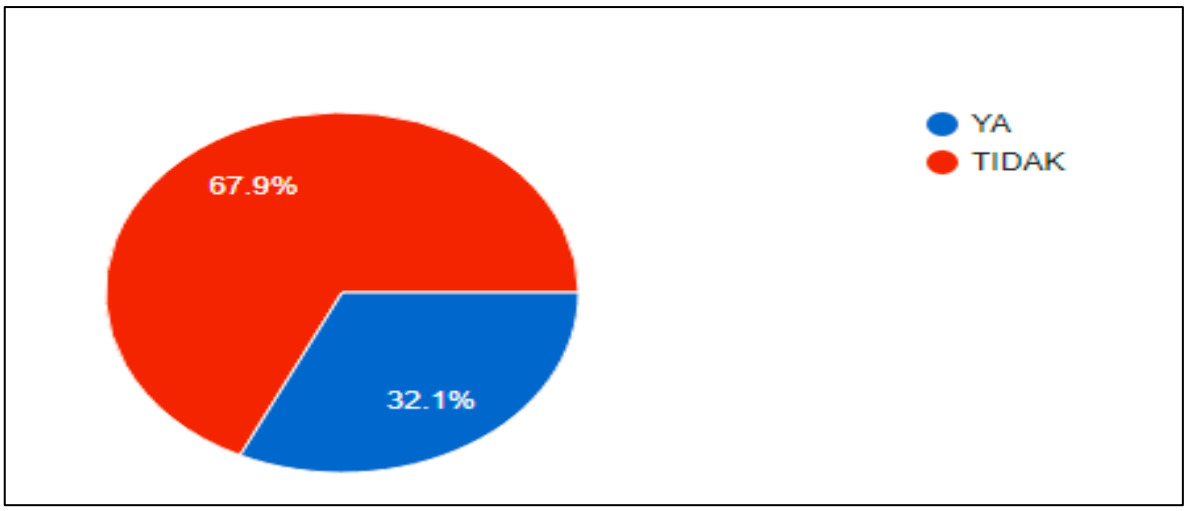
Pendapatan Ibu Bapa	RM1000 - RM4849	85	80.2
	RM4850 - RM10959	18	17.0
	RM10960 dan ke atas	3	2.8
Himpunan Purata Nilai Mata (HPNM)	2.00 - 2.99	4	3.8
	3.00 - 3.33	9	8.5
	3.43 - 3.67	42	39.6
	3.68 - 4.00	33	31.1

Berdasarkan kepada Jadual 1, responden kajian ini adalah daripada pelajar Politeknik Sultan Idris Shah yang terdiri daripada pelajar lelaki (26.4 %) dan perempuan (73.6 %). Majoriti responden adalah tinggal di rumah keluarga masing-masing semasa pengajian berlangsung. Pelajar daripada tahun kedua pengajian atau yang berada dalam semester 3 dan 4 merupakan yang paling ramai menjawab soal selidik ini. Sekiranya diperhatikan daripada prestasi pelajar yang dinilai melalui HPNM, majoriti responden mempunyai HPNM yang baik iaitu antara 3.43 – 3.67 (39.6%). Sementara itu, berdasarkan kepada Rajah 1, sumber pendapatan utama pelajar adalah daripada ibu bapa (71.7%), diikuti oleh pinjaman pendidikan (47.2%). Terdapat juga sebilangan pelajar yang mendapat tajaan biasiswa iaitu sebanyak 0.9% sahaja, manakala sebanyak 22.6% membiayai pengajian mereka di politeknik melalui pendapatan yang diperoleh dengan bekerja sendiri. Keadaan ini tidak dinafikan kerana kemudahan telefon pintar juga dapat membantu para pelajar menjalankan perniagaan secara atas talian.

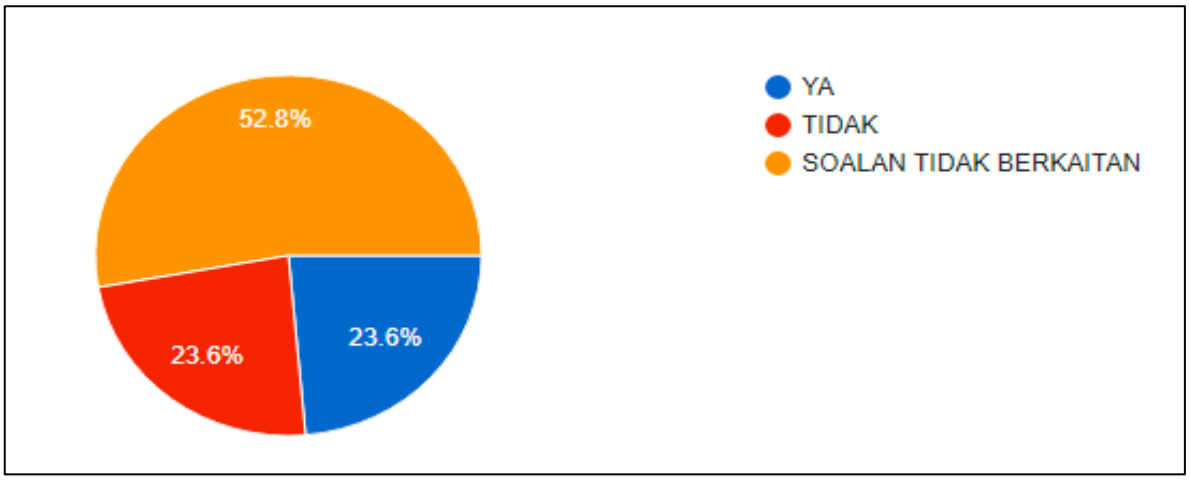
Fokus kajian ini adalah untuk menilai sejauh mana aplikasi pengurusan kewangan telah memberi manfaat kepada para pelajar. Berdasar kepada Rajah 2, hanya 67.9% sahaja dalam kalangan pelajar yang memasang sebarang aplikasi berkaitan pengurusan kewangan daripada Play Store/ Google Play. Namun begitu hanya 23.6% sahaja yang aktif menggunakan aplikasi kewangan berkaitan pengurusan kewangan daripada Play Store/ Google Play.



Rajah 1. Sumber Pendapatan Pelajar (responden boleh memilih lebih dari satu jawapan)



Rajah 2. Peratusan pelajar yang memasang sebarang aplikasi berkaitan pengurusan kewangan daripada Play Store/ Google Play



Rajah 3. Peratusan pelajar yang aktif menggunakan sebarang aplikasi berkaitan pengurusan kewangan daripada Play Store/ Google Play

Jadual 4. Analisis item kajian

Kod item	Sisihan piawai	Skor min	Tahap
FA1	1.08	3.65	Sederhana
FA2	1.09	3.59	Sederhana
FA3	1.03	3.52	Sederhana
FA4	1.03	3.53	Sederhana
FA5	1.04	3.62	Sederhana
FA6	1.01	3.58	Sederhana
FA7	1.07	3.63	Sederhana
FA8	1.12	3.59	Sederhana
FA9	1.10	3.71	Sederhana
FA10	1.07	3.55	Sederhana
Purata	**1.06**	**3.60**	**Sederhana**

Berdasarkan kepada Jadual 4, item yang memperoleh skor min paling tinggi ialah item FA9 (Aplikasi pengurusan kewangan membantu saya mencatat perbelanjaan) iaitu 3.71, diikuti oleh item FA1 (Aplikasi pengurusan kewangan membantu saya melakukan penyediaan

anggaran kewangan) iaitu 3.65. Manakala item yang memperoleh skor min paling rendah adalah item FA3 (Aplikasi pengurusan kewangan membantu saya membelanjakan mengikut anggaran saya) iaitu 3.52. Secara puratanya, skor min adalah 3.60 iaitu berada pata tahap sederhana. Penentuan tahap dalam analisis ini adalah berdasarkan kepada Syed Najmuddin et al. (2009) seperti yang ditunjukkan dalam Jadual 2.

4. Kesimpulan

Objektif kajian ini dijalankan untuk menilai sejauh mana aplikasi pengurusan kewangan telah memberi manfaat kepada pelajar Politeknik Sultan Idris Shah. Berdasarkan kepada hasil analisis yang dijalankan, secara puratanya pelajar memanfaatkan aplikasi pengurusan kewangan di telefon pintar pada tahap sederhana (skor min 3.60). Majoriti bersetuju bahawa aplikasi pengurusan kewangan membantu pelajar melakukan perancangan dan penyediaan anggaran kewangan. Di samping itu, aplikasi ini dapat membantu pelajar untuk mencatat perbelanjaan. Dapatan ini selari dengan kajian Franzen dan Bradaric (2018) yang mendapati bahawa aplikasi kewangan dapat membantu pengurusan kewangan pelajar. Di zaman ini penggunaan telefon pintar sudah menjadi umum dalam kalangan pelajar di institusi pengajian tinggi. Oleh yang demikian, seharusnya pelajar memanfaatkan teknologi ini untuk memasang sebarang aplikasi percuma yang dapat menambah baik pengurusan kewangan mereka. Hari ini terdapat lebih dari seribu aplikasi kewangan yang tersedia untuk telefon pintar, tablet dan komputer untuk membantu penganggaran dan pengurusan budget yang senang untuk digunakan (Anders, 2015). Di samping itu, aplikasi kewangan juga dapat membantu pelajar memperoleh pengetahuan dan pengalaman kewangan yang diperlukan dan boleh menjadi mahir dalam menguruskan kewangan mereka.

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THE EFFECT OF QRIS IN TRANSACTION AT WARKOP MIE ACEH AGAM BERKAH MEDAN

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Abstract

This study aims to determine the effect of QRIS usage on purchase transactions at Warkop Mie Aceh Agam Berkah located in Medan, North Sumatra. Using an associative quantitative approach and survey method, this study involved several customers as a sample selected through purposive sampling techniques. Data were obtained from questionnaires, short interviews, observations, and transaction documentation. The result of a simple linear regression analysis shows that QRIS usage has a positive and significant effect on the volume and value of daily transactions. QRIS is considered to provide convenience, speed, and efficiency in the payment process, thereby increasing customer convenience and encouraging increased transactions. This study contributes to UMKM in understanding the important role of digital payment in improving business performance.
Keywords: QRIS; Transaction.

1. Introduction

The digitalization of the payment system in Indonesia is growing rapidly with the presence of QRIS (Quick Response Code Indonesia Standard). QRIS, as a QR code-based payment system standardized by Bank Indonesia, aims to unify various digital payment methods (N. I. Tasya, 2023). UMKM, including coffee shops, are one of the primary targets for implementing QRIS because of their significant economic potential, according to Gea (T. Yuliati and T. Handayani, 2021). This study focuses on the effect of QRIS use on purchasing transactions at Warkop Mie Aceh Agam Berkah. By understanding the relationship, it is hoped that it can provide helpful information for business actors and policymakers in supporting the adoption of financial technology. Someone can pay for a transaction by scanning the code in the store. Moreover, according to the data from Bank Indonesia (2023), 70 % of QRIS users still come from big cities in Java (Deki Nur Fitrian, 2024).

With the rise of digital technology in Indonesia, non-cash payment methods are increasingly popular, especially among small businesses, such as local coffee shops (warkop), cafes, and other similar establishments. Currently, one of the most widely used is QRIS. This allows

customers to pay simply by scanning the QR code and using a digital wallet. QRIS can also improve the efficiency of transactions to support the growth of every UMKM in Indonesia. At Warkop Mie Aceh Agam Berkah Medan, QRIS has been implemented since 2023. Since then, several changes in customers' behavior and transaction systems have been observed. In this case, not all customers are familiar with or have access to digital payment apps, so they may struggle to use QRIS for daily transactions or when making payments at Warkop Mie Aceh Agam Berkah Medan. We often find out about issues, such as poor internet signals, that can delay the payment process. Even though some customers face difficulties in making payments, this could be the best way for Warkop Mie Aceh Agam to expand its business. Moreover, apps like GoPay, DANA, and OVO are mainly used by some people (primarily Gen–Z) for transactions using QRIS.

Fig. 1. Customer doing a transaction

2. Methodology

1.1. Associative Quantitative

The quantitative method is a research approach that focuses on collecting and analyzing numerical data to understand patterns, relationships, or trends. It is often used to test hypotheses, measure variables, and make predictions using statistical techniques. Associative quantitative research aims to determine the relationship between two or more variables and to examine whether and how these variables are related. causation (cause and effect), but rather to explore whether and how the Variable is related.

1.2. Data Collection

In this article, we use the purposive sampling method. Purposive Sampling is a non-probability sampling technique where the researcher selects participants based on specific characteristics, traits, or purposes relevant to the research. In other words, the researcher intentionally chooses people who are most suitable or knowledgeable about the topics. For this research, the author had collected a sample of 90 from the questionnaire, with 30 samples.
Research Hypothesis
H0: There is no significant effect of QRIS use on purchasing transactions
H0(Null Hypothesis)
States that the use of QRIS does not affect the number or frequency of purchase transactions.

The implication is that even though QRIS is available, there is no significant change in consumer purchasing behavior.
H1: There is a significant effect of QRIS use on purchasing transactions
H1(Alternative Hypothesis)
States that the use of QRIS has a significant effect on purchase transactions.
The implication is that the use of QRIS can increase or decrease the number or frequency of purchase transactions or change the types of transactions made.

3. Results and Discussion

In this study, 30 people participated to see whether they prefer QRIS or cash. We find that 54% of people use QRIS for transactions, while the remaining 46% still prefer cash. QRIS is faster and easier, so it needs fewer changes. However, one of the beliefs among UMKM is that QRIS is simple to use and hassle-free. We also ask 46% why they still choose cash. Some people do not have an e-wallet and prefer cash. Some people may only use e-wallets in their area but still prefer cash and QRIS. Others do not have an e-wallet and choose to pay with cash. Additionally, some individuals might use e-wallets only where they live but still prefer cash. There are also those who cannot use an e-wallet to pay in their area.

1.3. Validity Test
1.3.1. Validity test of X

From the table above, the significant results for variable Y are below 0.05, meaning it is declared valid. In our group, we believe QRIS can be better. We know that almost every day, we do transactions, such as buying things, paying for college, paying for food, and many more. We believe people still can use cash in this era. However, we know that modernism and globalism have already contributed to preventing something from happening. Moreover, we are sure that many restaurants or cafes prefer to use cashless payment.

Table 1. Validity test of X

Correlations								
		X1.1	X1.2	X1.3	X1.4	X1.5	X1.6	X1.7	X1.8
X1.1	Pearson Correlation	1	.680**	.785**	.790**	.787**	.781**	.668**	.662**
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.000	.000
	N	30	30	30	30	30	30	30	30
X1.2	Pearson Correlation	.680**	1	.810**	.680**	.746**	.818**	.656**	.599**
	Sig. (2-tailed)	.000		.000	.000	.000	.000	.000	.000
	N	30	30	30	30	30	30	30	30
X1.3	Pearson Correlation	.785**	.810**	1	.842**	.746**	.818**	.740**	.622**
	Sig. (2-tailed)	.000	.000		.000	.000	.000	.000	.000
	N	30	30	30	30	30	30	30	30
X1.4	Pearson Correlation	.790**	.680**	.842**	1	.815**	.813**	.766**	.643**
	Sig. (2-tailed)	.000	.000	.000		.000	.000	.000	.000
	N	30	30	30	30	30	30	30	30
X1.5	Pearson Correlation	.787**	.746**	.746**	.815**	1	.817**	.776**	.775**
	Sig. (2-tailed)	.000	.000	.000	.000		.000	.000	.000
	N	30	30	30	30	30	30	30	30
X1.6	Pearson Correlation	.781**	.818**	.818**	.813**	.817**	1	.811**	.780**
	Sig. (2-tailed)	.000	.000	.000	.000	.000		.000	.000
	N	30	30	30	30	30	30	30	30
X1.7	Pearson Correlation	.668**	.656**	.740**	.766**	.776**	.811**	1	.822**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000		.000
	N	30	30	30	30	30	30	30	30
X1.8	Pearson Correlation	.662**	.599**	.622**	.643**	.775**	.780**	.822**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	
	N	30	30	30	30	30	30	30	30

**. Correlation is significant at the 0.01 level (2-tailed).

From the table above, the significant results for variable Y are below 0.05, meaning it is declared valid.

1.3.2. Validity text of Y

Table 2. Validity test of Y

Correlations								
		Y1.1	Y1.2	Y1.3	Y1.4	Y1.5	Y1.6	Y1.7
Y1.1	Pearson Correlation	1	.676**	.762**	.808**	.733**	.814**	.695**
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.000
	N	30	30	30	30	30	30	30
Y1.2	Pearson Correlation	.676**	1	.806**	.774**	.778**	.823**	.767**
	Sig. (2-tailed)	.000		.000	.000	.000	.000	.000
	N	30	30	30	30	30	30	30
Y1.3	Pearson Correlation	.762**	.806**	1	.753**	.787**	.718**	.796**
	Sig. (2-tailed)	.000	.000		.000	.000	.000	.000
	N	30	30	30	30	30	30	30
Y1.4	Pearson Correlation	.808**	.774**	.753**	1	.830**	.908**	.619**

	Sig. (2-tailed)	.000	.000	.000		.000	.000	.000
	N	30	30	30	30	30	30	30
Y1.5	Pearson Correlation	.733**	.778**	.787**	.830**	1	.815**	.643**
	Sig. (2-tailed)	.000	.000	.000	.000		.000	.000
	N	30	30	30	30	30	30	30
Y1.6	Pearson Correlation	.814**	.823**	.718**	.908**	.815**	1	.626**
	Sig. (2-tailed)	.000	.000	.000	.000	.000		.000
	N	30	30	30	30	30	30	30
Y1.7	Pearson Correlation	.695**	.767**	.796**	.619**	.643**	.626**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	
	N	30	30	30	30	30	30	30

**. Correlation is significant at the 0.01 level (2-tailed).

1.4. Reliability Test

1.4.1. Reliability test of X

Table 3. Reliability test of X

Reliability Statistics	
Cronbach's Alpha	N of Items
.959	8

From the table above, the Cronbach's Alpha value for variable X >0.6, so it can be stated as reliable.

1.4.2. Reliability test of Y

Table 4. Reliability test of Y

Reliability Statistics	
Cronbach's Alpha	N of Items
.955	7

From the table above, the Cronbach's Alpha value for variable Y >0.6, meaning it can be stated as reliable.

1.5. Correlation Test

Table 5. Correlation Test

Correlations			
		TotalX	TotalY
TotalX	Pearson Correlation	1	.936**
	Sig. (2-tailed)		.000
	N	30	30
TotalY	Pearson Correlation	.936**	1
	Sig. (2-tailed)	.000	
	N	30	30

**. Correlation is significant at the 0.01 level (2-tailed).

From the table above, the minimum significant value for the correlation of X and Y is <0.05 (significant) and >0.05 (not significant). So, the significant value for X and Y is 0.936 so it is stated as having a correlation.

1.6. R2 Determination Test

Table 6. Correlation Test

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.936[a]	.877	.873	2.881

a. Predictors: (Constant), TotalX

From the table above, the R2 value of 0.877 shows that the independent variable has an influence of 87.7% on the dependent variable. t-test.

1.7. Test T

Table 7. Test T

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	.021	1.336		.016	.987
	TotalX	.900	.064	.936	14.128	.000

a. Dependent Variable: TotalY

From the table above, the significant value for the t-test is 0.987, indicating a significance level of 98.7%.

4. Conclusion

QRIS (Quick Response Code Indonesia Standard) is a digital payment system that enables cashless transactions through QR codes. Created by Bank Indonesia and the Indonesian Payment System Association (ASPI), QRIS aims to ensure interoperability among various digital payment services. It offers a convenient, simple, and secure digital payment solution that benefits the community, MSMEs, and the government by promoting the digital economy and financial inclusion. However, ongoing efforts are needed to expand its reach to remote areas of Indonesia and facilitate adoption abroad, helping Indonesian citizens. QRIS is increasingly important in the digital age, as many restaurants and local coffee shops (warkops) already accept non-cash payments. It is expected to become one of the leading payment methods in Indonesia. As society becomes more digitally literate, cashless transactions are likely to be the norm. Overall, QRIS has a bright future in Indonesia's digital economy. With continued support and development, it can better serve the needs of the modern digital era.

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THE EFFECT OF FINTECH PAYMENT ON PERSONAL FINANCIAL MANAGEMENT OF STUDENTS IN MEDAN CITY

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Abstract

This study aims to analyze the effect of fintech payment usage on personal financial management among students in Medan. Fintech payment services such as e-wallets, mobile banking, and digital payment apps are increasingly being used by students, making it important to understand their impact on financial management behavior. This study adopts a quantitative approach through a survey method to obtain data regarding student behavior in using fintech applications. The sample was selected using random sampling and successfully collected 128 student respondents in the city of Medan. Data analysis was conducted using simple linear regression with the assistance of SPSS version 30. The results of the study indicate that fintech payments have a positive and significant impact on personal financial management. This is evidenced by the calculated F value of 57.485 > F table 3.92 and significance 0.001 < 0.050. This means that the higher the intensity of fintech payment usage, the better students' ability to manage their finances, such as recording expenses, budgeting, and saving. This study concludes that fintech payments can support financial literacy and healthy financial behavior among students.
Keywords: Fintech Payment; Personal Financial Management.

1. Introduction

Internet connectivity has become essential in our daily lives, especially for students, as most activities, including education and financial transactions, have shifted to digital platforms. In response to this shift, various fintech applications such as e-wallets, online banking, and investment platforms have emerged and grown rapidly in Indonesia to help users, particularly students, manage their personal finances. One result of this digitalization is the growth of fintech, which plays a major role in digital-based payment systems. Fintech is the integration of financial services with modern technology to improve effectiveness, efficiency, and ease of access for users. One of the fastest-growing types of fintech is fintech payment, which is a digital financial transaction service that allows users to make online payments using digital wallets, mobile banking, QRIS, and other payment platforms (A. W. M. P. B. R. K. A. Akbar, 2023).

Fintech payment, also known as e-payment, is defined as the process of transferring funds electronically between two parties, whether individuals, businesses, banks, or governments, for the purpose of transacting goods and services. Examples include the use of debit cards, credit cards, or apps such as OVO, DANA, ShopeePay, and GoPay (Anisah, Crisnata, & Accounting, 2021). Features such as bank transfers, bill payments, mobile top-ups, and donations can now be done through a single digital app. Factors such as trust, risk, mobility, attitude toward technology, and self-efficacy also influence the level of fintech payment usage (Amihsah et al., 2020) (D. P. SARI, 2022).

Indicators used to measure the use of fintech payments include: ease of use, personal mobility, service credibility, social influence, attention to privacy, perceived benefits, and user confidence (Kim et al., 2016) in (N. D. M. S. Aqilla Fatimah Azzahra, 2024) (N. D. M. S. Aqilla

Fatimah Azzahra, 2024). This convenience and speed does provide comfort, but it can also lead to consumptive behavior if it is not accompanied by good financial literacy (S. F. Wahyuni R. R., 2022)(S. F. Wahyuni R. R., 2022).
This study focuses solely on fintech payments for several reasons. First, payments are one of the most basic and vital financial functions in everyday life. Second, fintech payments have undergone significant development in recent years and have become one of the most sought-after fintech payment services among citizens. Third, fintech payments have the ability to improve the efficiency and security of financial transactions, making them highly significant to study in depth.

Digital financial services in Indonesia are predicted to continue to grow, including cashless payments, digital investments, insurance, Buy Now Pay Later, and fund transfers. The value of cashless payment transactions is estimated to reach USD 266 billion in 2022 and is predicted to grow to USD 421 billion in 2025 (G. bersama T. dan B. & Co, 2022). The increase can be seen in Figure 1 below:

Fig. 1. Growth of Gross Transaction Value (GTV) of Non-Cash Digital Payment Services in Indonesia (2022–2025)

However, this convenience also poses challenges and new financial principles in personal financial management. The financial principle in question is to buy goods or services according to need, but this is often forgotten, so people prefer to buy goods they want rather than goods they need (S. F. Wahyuni R. R., 2023). Personal financial management is a way for individuals to plan and evaluate their income and expenses in order to sustain their family life.

Features that facilitate payment can encourage consumptive behavior if not supported by sufficient financial understanding. Prita said that a consumptive culture for lifestyle is one of the reasons why young people find it difficult to prepare for their future needs. Furthermore, young people who have high consumptive patterns will find it difficult to pay off their mortgage loans, as quoted from the UI website on Friday (10/2/2023) (T. Wulandari, 2024).

A lecturer at the Department of Accounting, Faculty of Economics and Business (FEB) UI explained that this prediction is based on research conducted by Rumah123.com and Karir.com in 2017, which showed that the average normal salary increase outside of promotions throughout 2016 was 10 percent, while the surge in house prices was at least 20 percent. He noted that, according to a survey by Indonesia Property Watch (IPW) released in

2022, over 50 percent of millennials own a home thanks to their parents' support. Meanwhile, only 40.95 percent actually used their own hard-earned money. Of the 39.05 percent of millennials, their parents helped them pay the down payment or mortgage installments. Additionally, 12.38 percent were fully supported by their parents. The remainder did not purchase property because they received an inheritance(T. Wulandari, 2024).

Personal financial management is the ability of an individual to plan, organize, control, and evaluate their financial condition in order to achieve long-term well-being. This includes financial planning, expenditure control, debt management, saving and investing activities, and ongoing financial evaluation. Factors that influence personal financial management include income, lifestyle, financial goals, social influences, self-discipline, and the use of financial technology (Nurlaila, 2020; Hidayat & Nurdin, 2020) in (Khoirunnisa, 2021).

Some of the theories underlying this research include Christensen's Disruptive Innovation Theory (1997), which explains how innovations such as fintech payments can disrupt old systems by providing convenience and efficiency. Then, there is the Theory of Financial Management Behavior (Sampoerno & Haryono, 2021) in (Lasmanah, 2022) explains that good financial behavior depends on rational and consistent decisions in managing funds. Davis' Technology Acceptance Model (TAM) (1989) is also used to explain how perceptions of the ease and benefits of technology influence users' decisions to adopt fintech payments.

Therefore, financial management behavior shows that money has many meanings depending on one's level of understanding and personality. Among other things, money plays a central role in life, influencing respect, living standards, freedom, and even criminal behavior. Every person has a different pattern of behavior in managing finances, and usually someone who understands their financial condition has wise financial management behavior (J. H. Napitupulu, 2021).

Medan, as one of Indonesia's major cities, has a high number of students, reaching 404,298 students from both public and private universities (Statistik, 2024). Most students already have access to the internet and digital devices, so it is not surprising that they are active users of fintech payment services. Given the large number of students, it is safe to assume that nearly all of them use gadgets and access the internet, along with the various features available on their devices. This phenomenon suggests that they are also likely to use fintech payment apps such as OVO, DANA, GO-PAY, LINK AJA, and others to simplify payment transactions. The increasing prevalence of app-based cashless payments among students may influence their behavior toward more consumerist tendencies (S. Nuke Betharini, 2023).

A survey by the Indonesian Internet Service Providers Association (APJII) (2020) shows that North Sumatra Province has the highest internet penetration rate in the Sumatra region, accounting for 5.8% of Indonesia's total penetration rate. The second, third, fourth, and fifth positions are held by South Sumatra (3.5%), Lampung (2.7%), West Sumatra (2.5%), and Riau (2.2%). The percentage of internet users in the city of Medan reaches 82.5% of the total population (APJII, 2020). In line with this, a report by the Bank of Indonesia's North Sumatra branch in 2019 states that 70% of digital wallet users in the province are located in the city of Medan, in the thesis (WEDHASMARA, 2022). This indicates that Medan is the main center for the use of digital financial services in the Sumatra region.

According to a Populix research report titled Consumer Preference Towards Banking and E-Wallet Apps, the highest percentage of users are in Jakarta at 43%. This is followed by other cities in Indonesia at 27%. Then Bandung at 10%, Surabaya at 7%, Semarang at 5%, Medan at 5%, and other cities in Java at 5%. For users aged 18-25 years, 31% are aged 26-35 years, 13% are aged 36-45 years, and 2% are aged 46-55 years (Laucereno, 2025). Findings from Populix's research report show that although Medan only accounts for around 5% of total e-wallet users in Indonesia, this still reflects a significant active user base in the region,

especially when compared to the local population. Medan ranks among the top five cities with the highest e-wallet usage rates in Indonesia outside of Jakarta, Bandung, and Surabaya, indicating substantial potential for the development and utilization of financial technology in this region.
Additionally, from a demographic perspective, the data indicate that the 18–25 age group is the largest user of e-wallets, accounting for 31% of users, which corresponds to the age range of university students. This further reinforces the relevance of Medan as a research location for studying the impact of fintech payment usage on the financial management behavior of university students. As part of the digital native generation, university students have proven to be one of the primary users of digital financial services.

Given this situation, Medan is an ideal location to study the impact of fintech payments on students' personal financial management. Therefore, it is crucial to understand the extent to which fintech payments influence how students manage, plan, and utilize their finances. The emergence of fintech payments not only replaces traditional transaction methods but also impacts individuals' attitudes and financial management, particularly among students. As a digital generation, students are active users of fintech payments due to their ease, speed, and efficiency compared to traditional payment methods.

Therefore, the above description of the influence of fintech payments on students' personal financial management is expected to contribute to the development of more efficient and effective financial strategies for students. Based on this background, the author is interested in conducting further research with the title: “The Influence of Fintech Payments on Students' Personal Financial Management in Medan City.”

To support the understanding of the relationship between the use of fintech payment applications and students' personal financial management, a conceptual framework has been constructed. This framework clarifies the direction of the relationship between variables and serves as the foundation for developing research instruments and hypothesis testing.

Fig.2. Conceptual Framework of the Study

Based on this framework, it is assumed that the use of fintech payment applications as the independent variable influences students’ personal financial management as the dependent variable. This relationship will be further analyzed using a quantitative approach in the subsequent chapters.

2. Methodology

Research Object

The population in this study consists of students in the city of Medan who use fintech payment applications, totaling approximately 404,298 individuals. Since the population variance is unknown, the Slovin formula was used to determine the appropriate sample size.

$$n = \frac{N}{1 + N.(e^2)}$$

Where:

N=404,298 (population size)

e=0.10e = 0.10e=0.10 (margin of error, or 10%)

The calculation is as follows:

$$n = \frac{404.298}{1 + 404.298 \,.\, (0.10^2)} = \frac{404.298}{1 + 4.042.98} = \frac{404.298}{4.043.98} \approx 99.97$$

Thus, the required sample size was rounded to 100 respondents. The study employed a random sampling technique, ensuring that every individual in the population had an equal chance of being selected, thereby minimizing selection bias. The researcher then used simple random sampling to collect responses, eventually obtaining 128 valid respondents.

Research Procedures

In this study, the stages began with the preparation of instruments, the formulation of statements for each variable, the submission of research permits, the distribution of questionnaires online using Google Forms, the collection of respondent information or data, the analysis of respondent information or data, and the preparation of reports. This study used a quantitative approach.

Size and Material

In this study, the researchers used a closed-ended questionnaire as the main tool for collecting data from respondents. The questionnaire was chosen because it was able to measure students' responses in a structured manner to two research variables, namely the use of fintech payments as the independent variable (X) and personal financial management as the dependent variable (Y). To facilitate measurement, all statements in the questionnaire were arranged using a 5-point Likert scale, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree), so that respondents could express their level of agreement on a scale for each item.

The statements in the questionnaire were not entirely based on basic theory, but were adapted from previous research in the form of relevant theses and scientific articles. This was done to ensure that the instrument used has a high level of relevance to the context of students in Indonesia, particularly in the city of Medan. For the variable of fintech payment usage (X), the questionnaire statements were taken and adapted from a thesis (D. P. SARI, 2022), who previously researched the influence of fintech payments, lifestyle patterns, and financial knowledge on the financial behavior of final-year students at the Faculty of Economics and Business, University of Muhammadiyah Sumatera Utara. As for the personal financial management variable (Y), the questionnaire was adapted from research (D. N. Avivah, 2024), who previously researched the influence of financial self-efficacy and fintech payments on the personal financial management of students at Universitas Cendekia Mitra Indonesia. The following are the statements from variables X and Y:

The independent variable (X) is the use of fintech payments, which is measured by the following seven statements:

1. I use m-payment because it facilitates personal mobility.
2. I feel the benefits of using fintech payment because it makes transactions particularly convenient.
3. I find it easy to make payments using fintech payment because it doesn't take long to understand how to use it.
4. I believe that the reliability of fintech payment helps me effectively in payment transactions.
5. I use fintech payments because of the influence of the people around me. For example, following online payments on apps like OVO, Go-Pay, Dana, ShopeePay, and others.
6. I believe fintech payment apps can protect my privacy well.
7. I feel confident that using fintech payment apps is very easy, so I can do it myself without help from others.

The dependent variable (Y) is personal financial management, which is also measured through the following seven statements:

1. I always record and keep track of my expenses. 2.
2. I always stick to the budget or spending plan that I have made.
3. I always pay my bills (rent) and other expenses on time.
4. The allowance I receive is enough to cover my needs for a month.
5. I avoid borrowing money from friends unless it is an emergency.
6. If I borrow money from friends, I pay it back on time according to the agreed terms.
7. I save money periodically (regularly, consistently, on a schedule) from the money I have earned.

The items in the questionnaire were adapted to the context of this study and designed to measure students' perceptions of fintech payment usage and their habits in managing personal finances. After developing the instrument, the process continued to the data collection stage, which was conducted online. Data collection was conducted online using Google Forms. The questionnaire link was shared with active students in Medan City through class WhatsApp groups. Data collection took place over a two-month period from April to May 2025, using random sampling to obtain a representative sample. The number of respondents successfully collected in this study was 128 active users of fintech payment services.

In this study, data analysis was performed using SPSS version 30. Data processing and analysis were conducted through several stages of statistical testing to ensure that the research instruments were valid, the data met the requirements of the analysis model, and to test the influence between variables. The first stage was instrument testing, which consisted of validity and reliability tests. The validity test was used to determine the extent to which the items in the questionnaire were able to measure the intended construct. This test was conducted by comparing the calculated r value with the table r value.

If the calculated r value was greater than the table r value at a significance level of 5%, the item was declared valid and suitable for use. Next, a reliability test is conducted to measure the internal consistency between items within a single variable. This test uses Cronbach's Alpha formula, where an instrument is deemed reliable if the alpha value is greater than 0.60. A value close to 1 indicates a strong level of reliability, meaning that the items in the questionnaire are consistent in measuring the same variable.

After the instrument was deemed valid and reliable, classical assumption tests were conducted to meet the prerequisites for regression analysis. Several tests were conducted, including normality, linearity, and heteroscedasticity tests. The normality test was conducted to ensure that the data was normally distributed, which is an important requirement in linear regression. The distribution is considered normal if the significance value (Sig.) of the Kolmogorov-Smirnov test is greater than 0.05. Next, a linearity test is conducted to ensure a linear relationship between the independent and dependent variables. The relationship is considered linear if the significance value in the Deviation from Linearity test is greater than 0.05.

Meanwhile, a heteroscedasticity test is conducted to see if there is a difference in variance between observations. Heteroscedasticity can be detected through the Glejser test, where if the significance value of each variable is greater than 0.05, then the model is free from heteroscedasticity. If all classical assumptions are met, the analysis can proceed to the next stage. To analyze the relationship between the independent and dependent variables, simple linear regression analysis is used.

This method is employed to determine the extent to which fintech payments (X) influence students' personal financial management (Y). Additionally, hypothesis testing is conducted using the F-test (ANOVA). This test is used to determine the significance of the regression

model as a whole. The decision rule in the F test is: if the significance value (Sig.) < 0.05, then H0 is rejected, which means that there is a significant influence between the independent variable and the dependent variable. Conversely, if the significance value > 0.05, then H0 is accepted and it can be concluded that there is no significant influence.

3. Results and Discussion

Respondent Characteristics

This study was conducted from April to May 2025 for two months, with data collection carried out online using the Google Forms platform. The questionnaire was distributed through several channels, including class WhatsApp groups. A total of 170 questionnaires were successfully distributed to students in Medan City via the Google Forms link. Of these, 134 questionnaires were successfully returned. However, after checking for completeness and consistency in completion, 6 questionnaires were found to be incomplete or not in the correct format, and therefore could not be processed and were not included in the subsequent analysis. As a result, the total number of valid data used in this study is 128 respondents.

The description of respondent characteristics aims to provide context for the analyzed data. Information such as age and gender can help understand the demographic distribution of the sample and explain variations in respondent behavior. These characteristics are also useful for describing the representation of participating respondents and mapping the extent to which the research results can be generalized. The following is a description of respondent characteristics based on age and gender categories.

1. Respondent Characteristics Based on Gender

   To see the distribution of respondents based on gender, please refer to the following table:

Table 1. Gender of Respondents

No	Gender	Number	Percentage
1	Male	22	17.2%
2	Female	106	82.8%
	TOTAL	128	100%

Source: Processed Data (2025)

   Based on Table 1, the majority of respondents in this study were female students, accounting for 82.8% of the total respondents. Meanwhile, male respondents accounted for 17.2%. The total number of respondents in this study was 128 people.

2. Respondent Identity Based on Age

   The characteristics of respondents based on age groups are presented in the following table. This information helps to provide an overview of the age range of respondents involved in this study.

Table 2. Age of Respondents

No	Age	Number	Percentage
1	17-19 years old	12	9.4%
2	19-22 years old	87	8%
3	22-25 years old	29	22.7%
	TOTAL	128	100%

Source: Processed Data (2025)

Based on Table 2, the majority of respondents in this study were in the 19-22 age range, accounting for 68%. This age group typically consists of active students in the middle to final stages of their studies. Additionally, 22.7% of respondents were aged 22-25, who are also considered final-year students. Meanwhile, 9.4% of respondents were aged 17-19, who can be categorized as students in the early stages of their academic careers.

Validity Test

In the validity test stage, researchers compared the Pearson correlation values of each statement item with the r values in the table. A statement was deemed valid if the calculated r value was greater than the table r value. In this study, the table r value was 0.1460. The complete results of the validity test can be seen in the following table.

Table 3. Results of the Validity Test of Fintech Payment Variables (X)

Variable	Statement Item	r-count	r-table	Description
X	1	0.789	0.1460	Valid
	2	0.860	0.1460	Valid
	3	0.876	0.1460	Valid
	4	0.848	0.1460	Valid
	5	0.696	0.1460	Valid
	6	0.740	0.1460	Valid
	7	0.835	0.1460	Valid

Source: Data Processing Results SPSS 30 (2025)

Table 4. Results of the Validity Test of Personal Financial Management Variables (Y)

Variable	Statement Item	r-count	r-table	Description
Y	1	0.670	0.1460	Valid
	2	0.772	0.1460	Valid
	3	0.618	0.1460	Valid
	4	0.748	0.1460	Valid
	5	0.583	0.1460	Valid
	6	0.616	0.1460	Valid
	7	0.763	0.1460	Valid

Source: Data Processing Results SPSS 30 (2025)

Based on Tables 3 and 4, it can be seen that all items in the fintech payment (X) and Individual Financial Management (Y) variables have validity coefficients (r calculated) greater than r table. Thus, all items in both variables can be declared valid and suitable for use in this study.

Uji Reliabilitas

The reliability test in this study was conducted using Cronbach's Alpha (α) method, because all statement items were arranged in an interval measurement scale. An instrument is considered reliable if the alpha (α) value obtained is greater than 0.60. The complete results of the reliability test can be seen in the table below:

Table 5. Reliability Test Results for Fintech Payment (X) and Personal Financial Management (Y) Variables

No	Variables	Cronbach's Alpha	Description

1	*Fintech Payment* (X)	0.905	Reliable
2	Personal Financial Management (Y)	0.811	Reliable

Source: Data Processing Results SPSS 30 (2025)

The reliability test results presented in Table 5 show that the fintech payment variable (X) has a Cronbach's Alpha value of 0.905, and the Personal Financial Management variable (Y) has a value of 0.811. Since both have alpha values above 0.60, the instruments for both variables can be considered reliable and consistent for use in this study.

Classical Assumption Test

1. Normality Test

   The normality test was carried out to determine whether the data is normally distributed or not. This test is important as part of the classical assumption test to ensure that the data meets the normality requirements before regression analysis is performed. There are several methods that can be used to test normality, including the following:

a. Kolmogorov Smirnov Test

   In this study, the normality test was conducted using the Kolmogorov-Smirnov (K-S) method to determine whether the data used is normally distributed or not. The basis for decision-making in this test is: if the significance value (Sig.) is greater than 0.05, then the data is considered to be normally distributed. Conversely, if the significance value is less than 0.05, then the data is not normally distributed.

Table 6. Normality Test Results with Kolmogorov-Smirnov

One-Sample Kolmogorov-Smirnov Test		
		Unstandardize d Residual
N		128
Normal Parameters^{a,b}	Mean	.0000000
	Std. Deviation	3.7747
Most Extreme Differences	Absolute	.118
	Positive	.063
	Negative	-.118
Kolmogorov-Smirnov Z		1.338
Asymp. Sig. (2-tailed)		.056

Source: Data Processing Results SPSS 30 (2025)

Based on Table 6, the results of the normality test using the Kolmogorov-Smirnov (K-S) method show a significance value of 0.056, which is greater than the significance threshold of 0.05. Thus, the data in this study can be declared normally distributed and meet the requirements to proceed to the next classical assumption test.

b. Normal P-Plot Test of Regression Standardized Residual

   In this study, normality testing was also conducted through Normal P-P Plot graphical analysis. This test aims to see whether the residual points are consistently scattered along the diagonal line. If the distribution of residual points is close to or follows the diagonal line evenly, then the data can be said to be normally distributed. The following is the Normal P-P Plot graph from the test results:

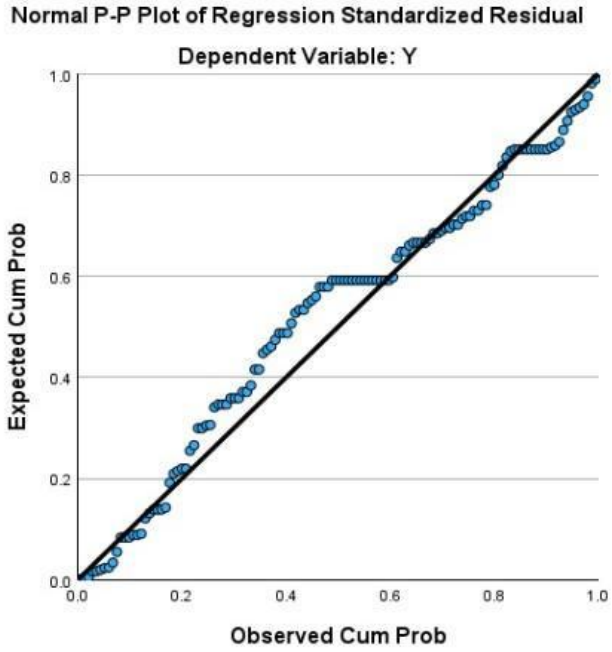

Fig. 3. Normal P-Plot Graph for Data Normality Test
Source: Data Processing Results SPSS 30 (2025)

In Figure 3, it can be seen that the points on the plot are scattered close to the diagonal line. This pattern indicates that the residual data is normally distributed. Thus, the normality test has been met, and the data is suitable for further analysis.

2. Linearity Test

In this study, a linearity test was conducted to ensure that the relationship between the fintech payment variable (X) and Personal Financial Management (Y) is linear. The test was conducted using the ANOVA (Analysis of Variance) method. Based on the decision criteria, the relationship between the two variables is considered linear if the significance value is greater than 0.05. Conversely, if the significance value is less than 0.05, the relationship between variables X and Y is considered non-linear.

Table 7. Linearity Test Results

			Sum of Squares	df	Mean Square	F	Sig
Financial Management Pribadi* *Fintech Payment*	Between Groups	(Combined)	1137.804	17	66.930	4.917	<0.001
		Linearity	825.571	1	825.571	60.651	<0.001
		Deviation from Linearity	312.232	16	19.515	1.434	.139
	Within Groups		1497.314	110	13.612		
	Total		2635.117	127			

Source: Data Processing Results SPSS 30 (2025)

Based on Table 7, the significance value obtained is 0.139, which is greater than 0.05. This indicates that the relationship between the fintech payment variable (X) and Personal Financial Management (Y) is linear. Thus, the assumption of linearity in this study has been fulfilled.

3. Heteroscedasticity Test

The heteroscedasticity test in this study was conducted to determine whether there were differences in the variance of the residuals in each observation. The purpose of this test is to ensure that the regression model meets the assumption of homoscedasticity, i.e., constant residual variance. One method used is to examine the pattern in the scatterplot graph. If the points on the graph are randomly scattered and do not form a specific pattern, it can be concluded that there is no heteroscedasticity.

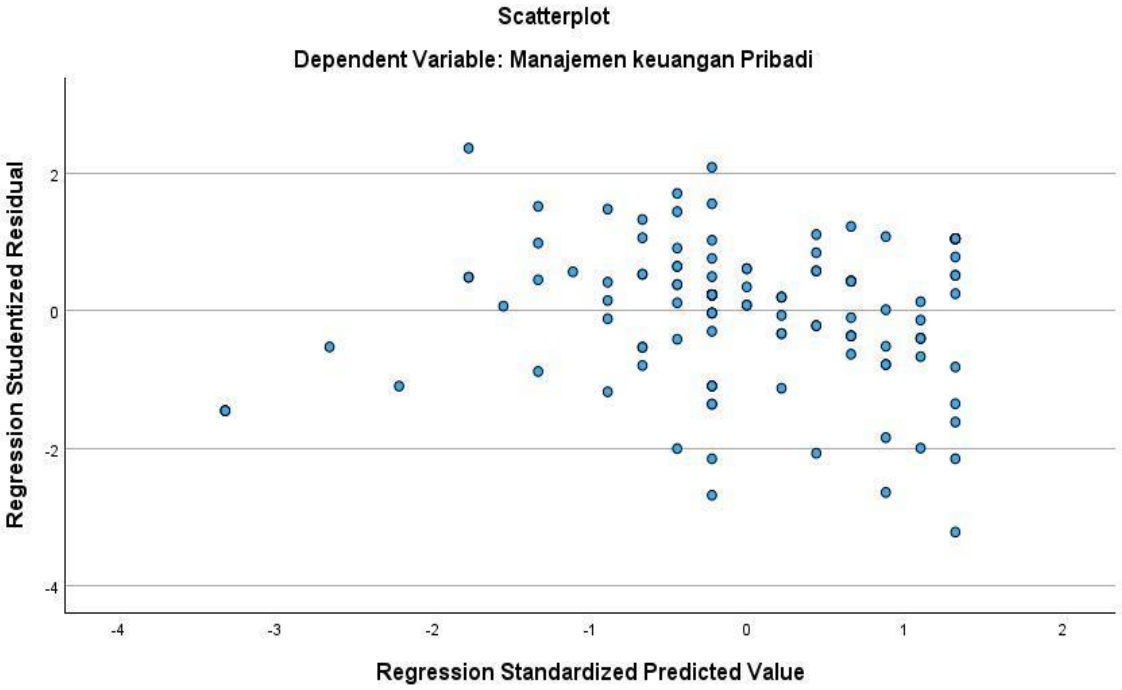

Fig. 4. Heteroscedasticity Test Results
Source: Data Processing Results SPSS 30 (2025)

In Figure 4, it can be seen that the distribution of points on the scatterplot graph is random and does not form a specific pattern. This indicates that there are no signs of heteroscedasticity in the regression model. Thus, it can be concluded that the model meets the assumption of homoscedasticity and is suitable for use in further analysis.

Simple Linear Regression Test

This study uses a simple linear regression test to determine whether there is a significant effect of the fintech payment variable (X) on the Personal Financial Management variable (Y). This test aims to see how much the X variable contributes to explaining the Y variable. The results of the simple linear regression analysis are presented in the following table:

Table 8. Simple Linear Regression Test Results

Coefficients[a]

Model		Unstanardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	11.350	2.182		5.202	<0.001

	Fintech Payment	.563	.074	.560	7.582	<0.001

Source: Data Processing Results SPSS 30 (2025)

Based on Table 8, the results of the simple linear regression test show that the constant value (a) is 11.350, while the regression coefficient for the fintech payment variable (X) is 0.563. Thus, the regression equation obtained is:

$$Y = 11{,}350 + 0{,}563X$$

This means that every one-unit increase in the use of fintech payment will increase the personal financial management score by 0.563 units. Additionally, the significance value of 0.001 < 0.05 indicates that the effect is positive and significant. Thus, it can be concluded that the fintech payment variable (X) has a significant effect on the personal financial management variable (Y).

Hypothesis Test Results

1. F Test

   In this study, the F test was used to determine whether the independent variable of fintech payment (X) simultaneously affected the dependent variable of Personal Financial Management (Y) in the regression model. The test was conducted by comparing the calculated F value with the table F value, based on the degree of freedom (df) = k–1; n–k, at a significance level of 5% (0.05). The results of the F test are shown in the following table:

Table 9. F-test results

ANOVA^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	825.571	1	825.571	57.485	<0.001^b
	Residual	1809.546	126	14.361		
	Total	2635.117	127			

Source: Data Processing Results SPSS 30 (2025)

Based on Table 9, the F-test results show that the calculated F-value of 57.485 is greater than the F-table value of 3.92. This indicates that the regression model used is statistically significant. Therefore, it can be concluded that the fintech payment variable (X) simultaneously has a significant effect on the Personal Financial Management variable (Y) among students in Medan City.

2. Coefficient of Determination (R^2)

   Table 10 shows the result of the model summary which includes the R value, R^2 (coefficient of determination), Adjusted R^2, and Standard Error of the Estimate. These values indicate the strength and explanatory power of the regression model used in this study.

Table 10. Coefficient of Determination (R^2)

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.560^a	.313	.308	3.790

Source: Data Processing Results SPSS 30 (2025

The R^2 value in the model summary is 0.313, which means that approximately 31.3% of the variation in students' personal financial management behavior can be explained by the use of fintech payment applications.
The remaining 68.7% of the variation is likely influenced by other factors not included in the model, such as financial literacy, peer influence, or saving behavior. This indicates that the model has moderate explanatory power, and fintech usage plays a relevant role, but not the only one, in determining students' financial management.

These findings highlight that the use of fintech payments has a positive and significant effect on the personal financial management of students in Medan. This is based on the results of simple linear regression, where a significance value of < 0.001 and a simple linear regression coefficient of 0.563 indicate that the greater the use of fintech payments, the better the personal financial management of students. Therefore, the regression model is deemed significant in the F-test, with the calculated F value of 57.485 being greater than the table F value of 3.92. This finding aligns with previous research by (N. D. M. S. Aqilla Fatimah Azzahra, 2024) and (J. H. Diva Zahira, 2025) which showed that the use of digital wallets supports the regularity of students' financial behavior. This indicates that financial technology not only facilitates transactions but can also promote financial discipline when used wisely.

Features in fintech payment apps like OVO, DANA, GoPay, and ShopeePay, such as automatic recording, easy access, and expenditure control, have helped students plan and manage their daily budgets. This finding is further supported by (Azzahraa, 2022)who emphasized that financial attitudes and financial literacy play a crucial role in maximizing the benefits of fintech payments.

However, these results differ from the research by (A. Mursalim, 2024), which found that fintech payments actually increase students' consumption behavior in Makassar. This discrepancy can be explained by differences in contextual factors such as consumption culture, social environmental influence, and varying levels of financial understanding across regions. This study indicates that students in Medan tend to use fintech payments in a more controlled and prudent manner.

In this study, the majority of respondents are accustomed to recording their expenses, saving regularly, and avoiding debt except in emergencies or urgent needs. This indicates that fintech payments have the potential to become a necessity in forming healthy financial management patterns, provided that students can control themselves well and exercise self-discipline.

However, despite the positive results of this study, there are still some limitations that need to be noted. The researcher only conducted the study in Medan City and used a quantitative approach. Therefore, the results may not be generalizable to the student population in other regions. The researcher hopes that financial literacy guidance will always be needed to guide students away from impulsive or excessive spending.

The results of this study reinforce the phenomenon that the use of fintech payments, supported by self-control and consistent financial literacy, can yield positive outcomes for students' personal financial management. This study serves as evidence that, when used correctly, technological advancements can become an educational tool that reinforces responsible financial behavior. The results of this study are expected to provide a foundation for future researchers to explore this phenomenon further using broader approaches (qualitative) and more diverse methodologies.

4. Conclusion

This study aims to determine the influence of fintech payment usage on personal financial management among students in Medan City. Based on the results of simple linear regression analysis, it is concluded that fintech payment has a positive and significant influence on personal financial management. An increase in fintech payment usage influences students' financial management, such as budgeting, saving, recording expenses, and avoiding consumptive behavior.

This study also shows that students utilize features provided by fintech payment applications, such as transaction convenience, real-time tracking, and payment reminders, which contribute to more disciplined financial management patterns. Students in Medan City demonstrate significantly healthier financial attitudes with easy access to financial technology.

Therefore, this study contributes to the literature by showing that the use of fintech payment among students not only improves transaction efficiency but also supports responsible personal financial management among students. This study expands on the phenomenon of how fintech payment can be used for financial management needs among the younger generation.

This study has several limitations that need to be considered. One of them is the relatively low number of respondents, which is only 128 students, even though the student population in Medan City is substantial. Therefore, Medan serves as an ideal location to examine the impact of fintech payments on students' personal financial management. This low response rate can affect the representativeness of the results and the generalization of the research findings. Therefore, the researcher suggests that future studies use strategies to increase the response rate, such as a personal approach or providing incentives to respondent In this study, the participants were students who used fintech payment services in Medan.s.

Additionally, the low coefficient of determination (R^2) value indicates that there may be other variables influencing the results that have not been included in the model. For this reason, the researcher recommends that future studies incorporate additional variables, such as financial literacy and consumer behavior. This addition is expected to provide a more comprehensive picture. The researcher also suggests expanding the study area and using a qualitative approach in further research. This aims to obtain a more in-depth description of students' attitudes toward using financial technology.

Furthermore, future studies are recommended to incorporate additional variables such as financial literacy, saving behavior, and peer influence to enrich the explanatory power of the model. These factors may have a significant impact on students' financial management but were not included in the current study. Including such variables could provide a more comprehensive understanding of the determinants influencing the use of fintech and financial behavior among young consumers.

This study has several limitations that must be acknowledged. First, the data was collected exclusively from university students in the city of Medan, which may limit the generalizability of the findings to broader populations. Although students are highly active users of fintech payment applications, their financial behavior may differ significantly from that of other demographic groups such as working professionals, older adults, or those in rural areas. Second, the sample only included respondents from one urban region, and the study did not account for socio-economic diversity, regional digital infrastructure, or varying levels of fintech literacy across Indonesia. As such, the conclusions drawn from this study should be interpreted with caution and may not fully represent the national population.

SMART TECH & CONTENT: PERCEPTION OF USING AI TOOLS IN DIGITAL ENTREPRENEURSHIP COURSE

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Abstract

Artificial Intelligence (AI) is increasingly utilised across global sectors, notably in management, commerce, and education. While its benefits are widely recognized, challenges remain as particularly for novice users such as students. Most prior research has focused on AI adoption among large firms and experienced entrepreneurs, leaving a gap in understanding its use in student-driven entrepreneurship. This study investigates the perceived effectiveness and challenges of using AI tools for digital marketing content among students enrolled in the Digital Entrepreneurship education at a Malaysian polytechnic specifically PTSB. As AI platforms like Canva AI, CapCut AI, and ChatGPT become popular in online marketing, the study explores how students adopt and interact with these tools. It also examines whether gender moderates the relationship between AI usage, perceived effectiveness, and challenges faced. A quantitative research design was employed, with data collected from 105 students using a structured questionnaire and convenience sampling. SPSS was used for descriptive statistics and multiple regression, while PROCESS Macro (Model 1) was applied to test moderation effects. Results show that students perceive AI tools as effective for generating creative marketing ideas, understanding content performance, and enhancing social media engagement. However, students also reported challenges such as over-reliance on AI, lack of training, and concerns over data privacy. Despite these issues, neither challenges nor gender significantly influenced AI usage. The findings highlight the importance of perceived effectiveness in promoting AI adoption and suggest that digital entrepreneurship education in TVET institutions should include more inclusive, practical support to enhance AI integration among students.

Keywords: artificial intelligence (AI); Perceive effectiveness; Challenges using AI tools

1. Introduction

Artificial intelligence (AI) is one of the key resources that plays an important role in helping entrepreneurs embrace the digital transformation. Known as a generator that can mimic human behaviour and thinking, software that uses artificial intelligence, such as Canva AI, ChatGPT, and CapCut AI, has great potential in helping to increase market and sales on e-commerce platforms. The capabilities of artificial intelligence engines are undeniable, such as analyzing user interest in a product, increasing the frequency of product promotions to users based on information searches on search engines, and helping to answer customer questions about products and other functions that greatly assist entrepreneurs in increasing sales. Madanchian's (2024) study shows that the use of AI-based marketing strategies, including chatbots, personalisation engines, and predictive analytics, can significantly increase customer acquisition rates and sales conversion rates. Recognizing the importance of digital tools in business, the digital entrepreneurship course offered at Polytechnic equips students with the knowledge and skills to run business using online marketing platforms, especially through social media. The course also introduces modern technologies like AI, blockchain and digital currency, enabling students to explore emerging trends in the digital business.

For students enrolled in this course who are often busy with various assignments from various assignments, generate digital marketing content using AI is more efficient and at lower cost. As reported by Emplifi (2024) and SEOSandwitch (2024), using AI can reduce up to 50% time spent making content for their digital marketing. Also, there is about 30% to 69% less cost spent on marketing through automation and less outsourcing (WinSavvy, 2004; FitSmallBusiness, 2024).

There are also several challenges associated with students using AI. According to Pitts et al. (2025) and Innovation Bubble (2024), the quality of the content is always a big challenge for using AI. Then, some areas do not have reliable internet access (Wikipedia, 2025). Some students did not know how to use AI platforms (Chen et al., 2021; Chiu et al., 2023) and high in subscription costs (Pitts et al., 2025). Sometimes, customers may not trust or want to buy AI-generated marketing materials as much as they do human-written ones, which can make marketing less effective (Doerer, 2024; Innovation Bubble, 2024; Aljarah et al., 2024).

Overall, the perceived use of AI brings various challenges to students, such as doubts about the quality of work, unstable internet access, a lack of skills in using artificial intelligence platforms, and subscription costs of artificial intelligence platforms exceeding their financial capacity. In addition, customers' concerns about the quality of products compared to promotional materials exposed to the touch of artificial intelligence may be an obstacle to marketing effectiveness.

Most existing studies on artificial intelligence (AI) have primarily focused on large corporations and experienced entrepreneurs, with limited exploration of its application among small businesses or novice users such as students (Klinger et al., 2020; Tominc et al., 2024). As a result, the unique context and needs of students, particularly those engaged in digital entrepreneurship, remain underexplored in current literature. Such studies are essential due to the limited research that specifically focuses on students; this study will focus on perceptions of the students.

While prior research has emphasised the technical performance and computational efficiency of AI systems, there is a need to examine how AI tools perform from the perspective of end users, specifically in terms of content quality, sales reach, and audience engagement (Chiu et al., 2023). For student entrepreneurs, the adoption of AI presents potential benefits such as reduced content production time and marketing costs (Emplifi, 2024), yet also introduces challenges including lack of technical skills, unstable internet connectivity, limited financial resources, and concerns about the authenticity of AI-generated materials (Doerer, 2024; Pitts et al., 2025). The focus of the study, which looks at the effectiveness of marketing content involving AI in terms of sales reach and user acceptance, is also a step towards obtaining a new body of information, especially when involving a sample of students who are business start-ups. Therefore, this study is important to fill the knowledge gap regarding the actual effectiveness of AI-based digital content used by students as well as the challenges they face, to enable educational institutions to design interventions that are more effective or supportive.

This study aims to identify the perceived effectiveness and challenges of using artificial intelligence (AI) tools for digital marketing content creation among students enrolled in the Digital Entrepreneurship course. Specifically, the study aims to assess how these perceptions and challenges influence AI adoption and explore potential moderating effects of gender.

As one of the TVET institutions that supports skills-based learning using the latest digital technology in line with industry needs, this study is very useful for curriculum developers to look in more detail at AI applications that are appropriate for learning needs. This is important to further improve student success in the Digital Entrepreneurship course and make curriculum improvements over time. The study findings can also help students understand issues related

to the use of AI in product marketing, thus increasing students' confidence and skills related to the use of this AI application. In addition, this study can contribute to the broader TVET field by providing more practical data on the use of AI in teaching and learning entrepreneurship, as well as helping to achieve the goals of the Malaysian Digital Education Policy (DPD).

Artificial intelligence (AI) has become an increasingly valuable tool in higher education, particularly in supporting students' learning objectives and enhancing their digital productivity. Simion & Popescu (2023) found that AI tools empower students to create more engaging and professional-quality content with minimal technical skills, thereby lowering barriers to high-level digital expression. Similarly, Herusatoto and Rini (2024) emphasize that AI has seen widespread adoption in higher education, serving as a valuable tool that helps students achieve their learning objectives. With automation and customization, AI technologies drastically change content workflows. The integration of AI technologies has significantly transformed content creation process by enabling automation, customization and efficiency, allowing students to focus on strategic and creative aspects of their tasks (Ota et al., 2024). In particular, advanced language models such as GPT-3 have demonstrated the ability to generate human-like text, thereby facilitating scalable content production across academic and entrepreneurial contexts. Furthermore, Simion & Popescu (2023) found that AI tools enable students to create more engaging and professional-looking content with minimal technical skills. The findings of this study indicate that Canva's AI features enable students to collaborate on group assignments easily, create creative presentations, and enhance efficiency and user experience in completing tasks by providing accessible AI tools for design and editing (Syahputria & Nugrahab, 2024).

Recent research has underscored the transformative role of AI in advancing innovation and entrepreneurship education within higher education institutions. Li and He (2024) explored how AI technology enhances innovation and entrepreneurship education in higher education institutions by supporting personalized learning experiences, intelligent assessment methods, virtual reality-based simulations, and smart mentorship. Their findings highlight AI's contribution to bridge the gap between universities and industries while strengthening the overall educational infrastructure for entrepreneurship. Complementing this, Hidayat and Yuliana (2025) reported that using AI tools in entrepreneurship education helps boost students' interest in the value of data analysis, business simulations, and virtual guidance, while also stressing the importance of ethics and hands-on learning. Meanwhile, Chen et al. (2024) found that the application of AI in entrepreneurship education requires more advanced pedagogical approaches, specifically in diagnosis, prediction, intervention, prevention, and recommendation. These approaches should be integrated with specific entrepreneurial content and processes, while aligning with the principles of entrepreneurial pedagogy. Collectively, these studies suggest that AI not only enhances educational delivery but also serves as a strategic enabler in shaping future-ready entrepreneurs.

The integration of AI into entrepreneurship educating and practice has shown significant promise, particularly in enhancing digital capabilities among students. Liu et al., (2023) explored the impact of AI adoption on digital entrepreneurship among vocational students. Their findings reveals that integrating AI into digital ventures helps automate routine tasks, improve efficiency, and drive innovation factors that collectively support the expansion of digital entrepreneurship. It also highlights how AI strengthens entrepreneurial skills, sharpens decision-making, and opens up new business opportunities and models. The article concludes that AI plays a key role in accelerating digital transformation within entrepreneurial practices. Similarly, Hassan et al. (2025) explore Generative AI tools, such as ChatGPT influences university students' interest in digital entrepreneurship. Their findings indicate that AI increases their confidence and motivation, especially when combined with an entrepreneurial mind-set and creative business ideas. The perceived ease of use, usefulness, and available support were also found to be significant drivers of AI adoption, reinforcing students' readiness to explore digital business opportunities. According to Statista (2024), AI-driven marketing is

projected to contribute approximately USD 47 billion to the global economy by 2025. Moreover, AI has shown to enhance marketing effectively by facilitating data-driven decision-making, automating campaign management, and scheduling content delivery in a strategic way. Other than that, AI tools also strengthen the creative element in marketing by producing innovative content and enhance time efficiency by reducing reliance on manual tasks. Collectively, these insights point to AI as a catalyst for both digital transformation and entrepreneurial innovation, particularly within student-driven enterprises.

Research shows repeatedly that students often do not know enough about AI or have the right skills to use AI tools well in school. This makes them less confident and less ready to use AI tools well in school. The Digital Education Council Global AI Student Survey (2024) found that 58% of students do not think they know enough about AI, and almost half do not think they are ready for a job that uses AI. Students really want their colleges and universities to offer more AI literacy classes and training to fill this gap (Digital Education Council, 2024). Lim et al. (2023) also found that students are less likely to use AI tools effectively when they do not fully understand AI principles and technical terms (Lim et al., 2023; Ali et al., 2024a). People are still worried about what AI does with school data and whether it does it right. There are studies that say it is not a big deal, but many people are worried that the data could be used in the wrong way. Merikko et al. (2022) and Lim et al. (2023) say that AI in education needs clear and fair rules because students do not like giving out too much personal information. Using AI in TVET schools is difficult, especially in developing countries, because of weak internet and poor facilities. Ukala and Iheukwumere (2024) explained that Nigerian TVET schools face problems like not having enough AI tools, high costs, and limited budgets. These issues make it hard for students to use AI and reduce its benefits for learning skills (Ukala & Iheukwumere, 2024).

2. Methodology

This study employed quantitative research design using a survey method to examine students' usage, perceived effectiveness, and challenges of artificial intelligence (AI) tools in digital entrepreneurship. The goal was to identify key factors influencing AI tool adoption and assess whether gender moderates the relationship between these factors and AI usage. The target population comprised students enrolled in the Digital Entrepreneurship course at a Malaysian polytechnic, specifically at Polytechnic Tuanku Sultanah Bahiyah (PTSB) which located in Kulim, Kedah Malaysia. About 129 students were invited to participate and after screening and cleaning process, only 105 valid responses were qualified to analyse, yielding a response rate of 81%. The sampling method was convenience sampling, as all students were accessible through course enrolment.

A structured questionnaire was developed, consisting of four main sections: Section A : Background of Respondents, Section B : Use of AI tools (10 items), Section C : Effectiveness of AI tools (10 items) and Section D : Challenges in using AI tools (10 items). Items in Section B, C, and D were measured using a 5-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). The development of these items was based on the adaptation of established constructs and insights from prior studies. Specifically, items related to AI usage were adapted from Simion and Popescu (2023) and Mustaffa et al. (2024). Chen and Ifenthaler (2023) and UNESCO (2025) inspired statements on the perceived effectiveness of AI tools. Meanwhile, findings from Springer (2023) and Mustaffa et al. (2024) guided questions related to challenges. To ensure the reliability of the instrument, internal consistency was evaluated using Cronbach's Alpha, which yielded a value of .941, indicating excellent reliability (Cronbach, 1951). The questionnaire was distributed online via Google Forms during class sessions. Students were informed of the purpose of the study and their rights as participants. Participation was voluntary, and anonymity was assured.

Data analysed using SPSS Version 22 for descriptive statistics, correlation analysis, and multiple regression. Additionally, extended to SPSS is PROCESS Macro Version 4 (Hayes, 2022) used to test moderation effects (Model 1), particularly to determine whether gender moderates the relationship between perceived effectiveness or challenges of AI tools and the use of AI tools.

3. Results and Discussion

Descriptive Results for Demographic Background

The demographic profile of the 105 respondents shows that the majority were female (74.3%), while male respondents comprised 25.7%. In terms of age, most participants were between 18 and 20 years old (81.9%), followed by 21 to 23 years old (16.2%), and a small portion above 23 years old (1.9%). This indicates that the respondents were predominantly young individuals. Regarding business experience, 69.5% had less than 6 months of experience, 22.9% had between 6 months to 1 year, and only 7.6% had more than 1 year of experience. Overall, the findings suggest that the sample mainly consist of young, female and novice entrepreneurs, which may influence their perceptions in digital adoption for their study.

Result for Perceived Effectiveness of AI Tools

In table 1, result for perceived effectiveness of AI tools where the results indicate a high level of agreement among students regarding the positive usage of AI tools in digital content creation. The most agreed-upon aspect was that spark creativity (Mean = 4.14), followed by a strategic advantage (Mean = 4.09) and stronger online impact (Mean = 4.07). This finding similar with Madanchian et al. (2024) which also found that AI-based marketing strategies improve customer acquisition and content effectiveness on digital platforms. Other than that, Dwivedi et al. (2021) also said that AI technologies make personalisation, creativity, and communication much better in online marketing settings. The results show that students see AI tools as useful for making their marketing more effective, which is similar to what happens in more established businesses. These findings recommend that students of Digital Entrepreneurship education find AI tools highly beneficial in boosting creativity, engagement, and efficiency in their digital entrepreneurship efforts.

Table 1. Result for Perceived Effectiveness of AI Tools

	Item	Mean	Std. Deviation
C3.	AI tools give me creative ideas for making marketing content	4.14	.739
C7.	AI helps me understand what content works best	4.09	.750
C9.	Better engagement on social media with AI content	4.07	.748
C8.	AI-generated content gains more customer attention	4.05	.764
C2.	AI helps improve product promotion online	4.04	.733
C10.	My business is more efficient with AI	4.04	.746
C1.	AI makes my content more attractive	4.01	.766
C5.	I feel more confident after using AI	4.01	.791
C6.	AI allows me to compete better online	4.00	.772
C4.	AI contributed to increased sales	3.95	.739
	TOTAL	4.04	.675

Result for challenges of AI tools as shown as Table 2. The biggest problems were depending issue (M = 3.47), lack of training and guidance (M = 3.41), and security or privacy issue (M = 3.40). However, these problems did not have a big impact on how people used AI. This is similar to what Gonzalez-Perez et al. (2023) found that even though young people in emerging markets face problems like not having enough technical skills or resources, they are still excited about starting their own businesses when they think that innovation is valuable. This means that when the benefits are greater than the barriers, challenges may not stop people

from acting. Nguyen et al. (2022) also stressed that the perception of usefulness is often more important than structural barriers when it comes to AI adoption.

Table 2. Results for Challenges of AI Tools

	Item	Mean	Std. Deviation
D8.	I fear becoming too dependent on AI	3.47	1.020
D5.	I need training or guidance to use AI more effectively	3.41	0.958
D9.	Privacy or security concerns when using AI platforms	3.40	0.986
D6.	Worry about AI content quality or accuracy	3.33	0.987
D10.	Feeling overwhelmed by too many AI tools	3.28	0.985
D1.	Difficulty understanding AI for digital marketing	3.11	1.003
D7.	Hard to integrate AI tools with platforms	3.04	1.064
D3.	Not enough time to learn AI	2.94	1.082
D4.	Lack of equipment or facilities	2.90	1.148
D2.	Not confident in AI-generated content	2.90	1.088
	TOTAL	3.18	.885

Table 3 shows the Pearson correlation analysis, which revealed a strong and significant positive correlation between the effectiveness of AI and the use of AI tools ($r = .712$, $p < .01$), indicating that students who perceive AI as effective tend to use it more in their digital content creation. Conversely, no significant correlation was found between challenges in using AI and actual usage ($r = .104$, $p > .05$), nor between gender and any of the other variables, suggesting that these factors do not substantially influence AI usage in this context.

Perceived effectiveness was a strong predictor of AI use ($\beta = .708$, $p < .001$), but challenges were not ($\beta = .057$, $p = .416$). The model was important ($F(2,102) = 53.08$, $p < .001$) and had $R2 = .510$. These results support Davis's (1989) Technology Acceptance Model (TAM), which says that how useful people think a technology is is a key factor in whether or not they use it. This study backs up the use of TAM in the TVET setting and suggests that raising perceived value may be more effective than lowering perceived barriers.

Table 3. Coefficients of Regression Analysis Predicting Use of AI

Predictor	B	SE	β	t	p
Constant	*1.497*	*0.285*	—	*5.255*	*.000*
Effectiveness of AI	0.628	0.062	.708	10.194	.000 **
Challenges of AI	0.038	0.047	.057	0.817	.416

Note: **p < .001

These findings suggest that improving students' perception of the effectiveness of AI may encourage greater adoption of AI tools in digital entrepreneurship, while perceived challenges, although present, do not significantly deter usage.

Table 4 shows the gender did not change the link between AI use and effectiveness ($\beta = –.1558$, $p = .2796$) or the link between AI use and challenges ($\beta = –.1579$, $p = .2634$). These results are in line with what Koivupalo et al. (2020) found: there were only small differences between male and female university students when it came to using digital tools. This means that both male and female students generally have the same attitudes towards educational technology. The fact that there wasn't a big difference between the two groups means that gender-neutral strategies can be used to help AI adoption in TVET.

The results support the Technology Acceptance Model (Davis, 1989) by showing that how effective students think AI is has a big effect on whether or not they use these tools. Students thought that AI tools were useful for improving creativity and productivity in digital content marketing, which is in line with Madanchian et al. (2024). Challenges may not have had a big effect on students because they are strong or because they can adapt when they think the

benefits are strong (Gonzalez-Perez et al., 2023). Gender did not have a big effect on how people used things, which is in line with research by Koivupalo et al. (2020) that found that people in school settings had neutral attitudes towards technology. This means that when trying to get student entrepreneurs to use AI tools, gender-specific interventions might not be needed.

Table 4. Moderation Regression Coefficients

Variable	Coefficient (B)	SE	t	p	95% CI
Constant	0.6178	1.0541	0.5860	0.5592	[–1.4734, 2.7089]
Effectiveness of AI	0.9065	0.2592	3.4976	0.0007	[0.3924, 1.4207]
Gender	0.5599	0.5840	0.9587	0.3400	[–0.5986, 1.7184]
Effectiveness × Gender	–0.1558	0.1433	–1.0870	0.2796	[–0.4402, 0.1286]

Note: **p < .001

4. Conclusion

The findings of this study highlight the critical role of perceived effectiveness in driving the use of AI tools among students in digital entrepreneurship education. Despite challenges such as limited training, privacy concerns, and overreliance on AI tools, these barriers are not significant barriers to adoption. Furthermore, the study reveals that gender does not moderate the relationship between perception and AI adoption, suggesting that digital learning interventions can be designed to benefit all students equitably.

Study limitations include the use of a convenience sample from a single institution, which limits generalizability. The cross-sectional design also limits causal inference, and self-reported data may be subject to social desirability bias. Future research should consider longitudinal designs to assess changes over time in AI adoption behaviour. Including diverse institutions, fields of study, and deeper exploration of digital literacy levels may reveal more nuanced influences on AI adoption. In addition, qualitative findings provide richer insights into students' experiences with AI tools.

Based on the results, there are several recommendations for how TVET institutions can effectively use AI tools in their digital entrepreneurship courses. Academics should use tools like Canva AI, ChatGPT and CapCut AI to demonstrate how useful they are in real life by doing activities that are more practical and project-based learning specifically for digital marketing content. The reason for using AI is because it is so useful and people think AI has a big impact on the number of people using it. While things like skills gaps and subscription costs are not the main reasons why people use the service, they are still a big concern for students. Therefore, to make things easier, top of the list should be training programs, easy-to-find AI resources and institutional support such as subsidized tools or dedicated digital labs. Since AI is gender-neutral, interventions can be open to everyone and do not favour one gender over another.

This way, all students have an equal opportunity. Finally, ensuring that course content aligns with national plans such as the Malaysian Digital Education Policy (DPD) will help students learn skills that will be useful in the future and ensure that entrepreneurship education is up-to-date in the rapidly changing digital economy. In general, giving students' real-world experience with AI programs, making them easier to use and building their confidence can make student entrepreneurs more interested and creative.

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PENILAIAN KEBERKESANAN KURSUS BAIK PULIH TELEFON BIMBIT TERHADAP PENINGKATAN KEMAHIRAN DAN PELUANG KERJA PESERTA

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Abstrak

Kolej Komuniti di seluruh Malaysia menawarkan program pendek sepenuh masa yang diiktiraf oleh kerajaan. Program ini dikenali dengan Pembelajaran Sepanjang Hayat (PSH). Jabatan Pendidikan Kolej Komuniti (JPKK) menawarkan program PSH kepada enam golongan sasaran iaitu golongan orang kurang upaya, berpendapatan rendah, warga emas, ibu tunggal, belia dan orang asli. Program PSH merupakan satu alternatif bagi meningkatkan kuantiti tenaga kerja mahir tempatan terutama di perusahaan kecil dan sederhana. Kolej Komuniti Hulu Langat (KKHL) telah menganjurkan Program Upaya Bakat 2024 dibawah PSH yang dikhususkan bagi baik pulih telefon bimbit. Kursus Baik Pulih Telefon Bimbit ini bertujuan untuk memberikan panduan praktikal berkenaan baikpulih serta penjagaan asas sebuah telefon bimbit. Satu kajian telah dijalankan selepas kursus ini dijalankan. Kajian ini bertujuan untuk menilai keberkesanan Kursus Baik Pulih Telefon Bimbit terhadap peningkatan kemahiran dan peluang kerja kepada peserta. Secara tidak lansung dapat meningkatkan pendapatan serta merancakkan ekonomi setempat. Metodologi kajian ini menggunakan model model *ADDIE* (*Analyze*, *Design*, *Develop*, *Implement*, *Evaluate*) manakala analisis data dibuat secara kaedah kajian kualitatif menggunakan perisian "*Microsoft Excel*". Sampel kajian ini terdiri daripada 15 orang responden yang terdiri daripada peserta Kursus Baik Pulih Telefon Bimbit dimana data dikumpul selepas 9 bulan kursus dijalankan. Proses pengumpulan data pula diambil melalui instrumen borang soal selidik yang perlu dilengkapkan oleh peserta melalui "*google form*" selepas kursus dijalankan. Hasil kajian mendapati 60% daripada responden telah memulakan perniagaan baik pulih telefon secara kecil-kecilan. Seramai 54% daripada jumlah tersebut telah telah berjaya melakukan baik pulih dengan bilangan diantara 6 ke 10 telefon bimbit yang menyumbang pendapatan diantara RM 100 - RM 500. Manakala dapatan kajian juga menunjukkan 44% dikalangan mereka telah membaik pulih telefon bimbit melebihi bilangan 10 yang menyumbang pada anggaran pendapatan sebanyak RM 1000. Secara kesimpulannya, Kursus Baik Pulih Telefon Bimbit berkesan dalam meningkatan kemahiran dan peluang kerja kepada responden. Bagi cadangan akan datang, pelbagai kursus pendek bakal dilaksanakan menerusi PSH kepada komuniti setempat. Kursus yang meliputi kemahiran seharian bagi memenuhi keperluan masyarakat setempat.
Kata Kunci: Pembelajaran Sepanjang Hayat; Kursus Baik Pulih Telefon Bimbit; Kemahairan dan Peluang Kerja.

1. Pengenalan

Kolej Komuniti menyediakan kursus dalam jangka masa pendek bagi menyokong teras pembelajaran sepanjang hayat (PSH). Kursus yang fleksibel dan relevan dengan masyarakat setempat ini menepati misi Kolej Komuniti iaitu "membangun komuniti setempat sebagai tenaga kerja berpengetahuan dan terlatih untuk memenuhi tuntutan dunia pekerjaan melalui Pendidikan dan Latihan Teknikal dan Vokasional dan Pembelajaran Sepanjang Hayat" (Garis Panduan Pelaksanaan Program PSH Kolej Komuniti, Edisi 2017).

Kertas kajian yang bertajuk “Pembelajaran Sepanjang Hayat: Kecenderungan Permintaan Industri Dari Perspektif Institusi Pengajian Tinggi Awam”, PSH merupakan kursus yang melibatkan semua peringkat umur yang terdiri dari kalangan belia, warga emas, ibu tunggal, orang kurang upaya (OKU), miskin dan orang asli (Hasami et al., 2024). Penyertaan mereka dalam program PSH merupakan usaha bagi bebas dari belenggu kemiskinan (Azhari et al., 2024). Kemahiran yang diperoleh dijadikan perniagaan bagi menjana sumber pendapatan serta meningkatkan taraf ekonomi keluarga.

Kajian yang bertajuk “Perlaksanaan Program Latihan Berasaskan Teknologi kepada Belia Berprestasi Rendah Akademik dalam Meningkatkan Kualiti Hidup”, menyatakan program latihan kemahiran berasaskan teknologi memberi impak yang positif kepada golongan belia (Latif et al., 2021). Ini dilihat sebagai alternatif atau peluang kedua bagi mereka untuk meningkatkan pengetahuan dan kemahiran diri beasakan teknologi. Justeru dapat mengurangkan jurang ekonomi, sosial dan juga fizikal diantara masyarakat.

Penyertaan dalam kursus PSH dipengaruhi oleh pelbagai faktor, diantaranya ialah motivasi individu, sokongan institusi, dan dasar kerajaan (Ishak et al., 2021). Sebagaimana yang diketahui, peserta merupakan elemen utama bagi memastikan keberkesanan sesuatu kursus (Taib et al., 2024). Kursus yang berjaya tidak terhad latihan dan kemahiran yang diperoleh, namun kursus yang berjaya dan berkesan adalah apabila ilmu tersebut dapat dimanfaatkan dalam kehidupan seharian (Kadir et al., 2024). Malah menjadi kebanggaan apabila ilmu tersebut dapat menjana pendapatan dan meningkatkan taraf ekonomi mereka.

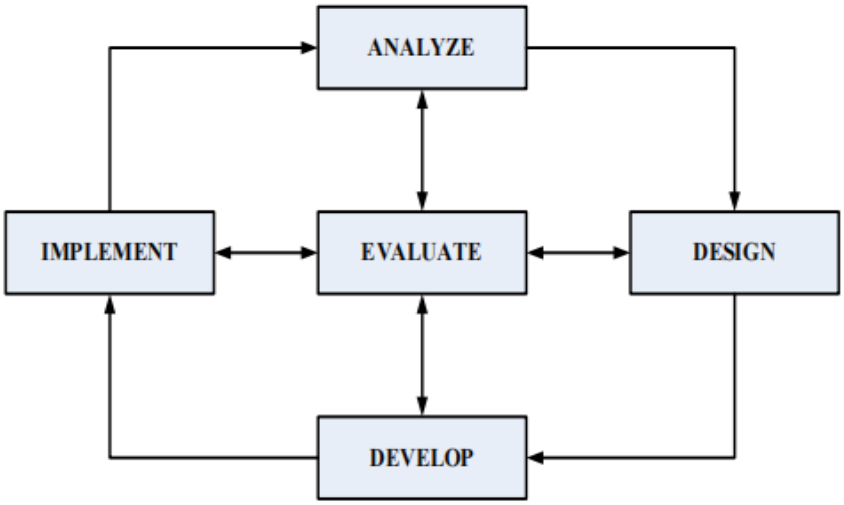
Kajian ini merupakan kajian penilaian keberkesanan Kursus Baik Pulih Telefon Bimbit yang telah dijalankan pada Jun 2024. Kursus ini melibatkan 5 elemen asas iaitu konsep asas telefon bimbit, masalah umum dan penyelesaian, pemeliharaan telefon bimbit, salinan simpanan data dan pemulihan dan keselamatan dan perlindungan. Satu set soal selidik diberikan secara “*google form*” terhadap peserta selepas 9 bulan kursus dijalankan. Ini bagi menilai keberkesanan Kursus Baik Pulih Telefon Bimbit terhadap peningkatan kemahiran dan peluang kerja kepada responden.

2. Metodologi Kajian

Kajian ini menggunakan rekabentuk model *ADDIE* dimana model ini sesuai untuk penambahbaikan yang berterusan serta dapat menjimatkan masa kerana masalah ataupun kekurangan dapat diatasi sebaik sahaja dikenalpasti (Muhammad Afzhal Bin Abdul Wahab et al., 2022). Manakala data di analisis secara kaedah kajian kualitatif menggunakan perisian “*Microsoft Excel*”.

Kajian ini bertujuan untuk menilai keberkesanan Kursus Baik Pulih Telefon Bimbit terhadap peningkatan kemahiran dan peluang kerja kepada responden. Data daripada model ini dijana menggunakan perisian “*google form*” dan diedarkan kepada responden melalui emailsetelah sebulan kursus dijalankan. Kaedah ini mampu mendapatkan maklumbalas responden pada kos yang rendah dan membolehkan pengkaji mengawal kualiti data dan mengelakkan kes penduaan atau ralat ‘*missing*’ (Syahirah Che Lah & Norshamliza Chamhuri 2021). Seramai 15 responden yang terdiri daripada peserta Kursus Baik Pulih Telefon Bimbit terlibat dalam kajian ini.

Metodologi yang digunakan bagi kajian ini adalah model *ADDIE* bagi memantau dan merangka pelaksanaan program. Model ini terdiri daripada 5 fasa iaitu “*Analyze*” (analisis), “*Design*” (reka bentuk), “*Develop*” (pembinaan), “*Implement*” (pelaksanaan), dan “*Evaluate*” (penilaian). Rajah 1 menunjukkan model *ADDIE*:



Rajah1. Model *ADDIE* (Hidayat, 2021)

Fasa "*Analyze*" (analisis)
Fasa Analisis membincangkan penyata masalah, matlamat dan objektif bagi mendapatkan gambaran menyeluruh berkenaan kajian yang dijalankan. Dalam kajian ini, penyelidik mendapati keperluan permintaan penggunaan telefon bimbit dikalangan masyarakat. Sesuai dengan tujuan PSH bagi meningkatkan kuantiti tenaga kerja mahir tempatan serta menaiktaraf ekonomi penduduk setempat.

Fasa "*Design*" (reka bentuk)
Fasa reka bentuk menyatakan strategi bagi kajian ini dianalisis, direka bentuk dan distruktur secara komprehensif. Kursus Baik Pulih Telefon Bimbit telah dicadangkan dalam Kertas kerja Program Upaya Bakat 2024 dibawah PSH.

Fasa "*Develop*" (pembinaan)
Kursus Baik Pulih Telefon Bimbit dijalankan dengan kerjasama pihak penasihat KKHL dan Persatuan Suri Rumah Rahmah Malaysia. Seramai 15 peserta terlibat yang terdiri daripada komuniti setempat, golongan B40, belia dan ibu tunggal.

Fasa "*Implement*" (pelaksanaan)
Kursus Baik Pulih Telefon Bimbit dijalankan pada Jun 2024 di KKHL. 5 konsep asas sesebuah telefon bimbit diperkenalkan iaitu:

i. Konsep asas telefon bimbit
Peneranagn ringkas tentang komponen utama telefon bimbit seperti skrin, bateri, pemproses dan lain-lain. Penjelasa berkenaan fungsi setiap komponen dan bagaimana mereka saling berinteraksi.

ii. Masalah umum dan penyelesaian
Senarai masalah yang kerap berlaku pada telefon bimbit seperti skrin pecah, bateri cepat habis atau prestasi yang kurang memuaskan. Penyelesaian langkah demi langkah untuk setiap maslah termasuk penukaran komponen jika perlu.

iii. Pemeliharaan telefon bimbit
Teknik pemeliharaan yang boleh dilakukan bagi menjaga telefon bimbit seperti penjagaan bateri, pembersihan skrin dan penjagaan fizikal.

iv. Salinan simpanan data dan pemulihan
Keperluan untuk membuat salinan simpanan data secara berkala pada telefon bimbit. Panduan untutk membuat salinan simpanan data ke komputer atau storan awan. Cara memulihkan data jika terdapat masalah serius pada telefon bimbit.

v. Keselamatan dan perlindungan

Tips untuk menjaga keselamatan telefon bimbit daripada ancaman siber sepertivirus dan perisian berbahaya, Cadangan penggunaan kata laluan yang kuat dan aktivasi fungsi keselamatan

Rajah 2 menunjukkan gambar perta semasa Kursus Baik Pulih Telefon Bimbit dijalankan pada Jun 2024 di KKHL. Rajah 2 (a) adalah sesi pengenalan konsep asas telefon bimbit , 2 (b) adalah sesi penerangan masalah umum telefon bimbit serta penyelesaiannya. Manakala Rajah 2(c) dan 2(d) merangkumi proses pemeliharaan, keselamatan dan perlindungan telefon bimbit, diamana, Rajah 2 (c) adalah sesi pembersihan komponen serta skrin telefon bimbit dan Rajah 2 (d) merupakan sesi penukaran skrin telefon bimbit. Penerangan dan latihan diberikan oleh Encik Muhammad Rehan Bin Zulkifli dari *Ase Tech Academy* yang mempunyai kelayakan Sarjana Muda Kejuruteraan (Komputer). Setiap peserta berpeluang merasai sendiri membaik pulih telefon bimbit setelah penerangan diberikan.

(a) (b)

(c) (d)

Rajah 2. Kursus Baik Pulih Telefon Bimbit: (a) pengenalan konsep asas telefon bimbit, (b) penerangan masalah umum telefon bimbit serta penyelesaiannya, (c) pembersihan komponen dan skrin dan (d) penukaran skrin.

Fasa "*Evaluate*" (penilaian)

Fasa penilaian dimulakan dengan memberikan satu set soal selidik secara "*google form*" terhadap responden selepas 9 bulan kursus dijalankan. Ini bagi menilai keberkesanan Kursus Baik Pulih Telefon Bimbit terhadap peningkatan kemahiran dan peluang kerja kepada responden. Kemudian data terkumpul di analisis secara kaedah kajian kualitatif menggunakan perisian "*Microsoft Excel*".

3. Dapatan dan Perbincangan

Satu set soal selidik berkenaan Kursus Baik Pulih Telefon Bimbit telah diedarkan melalui "*google form*". Semua data terkumpul dianalisa secara kaedah kajian kualitatif menggunakan perisian "*Microsoft Excel*". Seramai 15 orang responden yang terdiri daripada peserta kursus dan soal selidik ini diagihkan setelah 9 bulan kursus dijalankan. Tujuan kajian ini adalah untuk menilai keberkesanan kursus terhadap peningkatan kemahiran dan peluang kerja kepada responden.

Jadual 1. Dapatan Maklumat Demografi Responden Kajian

No.	Demografi	Ciri-ciri	Kekerapan
1	Jantina	Lelaki	13
		Perempuan	2
2	Umur	20 tahun - 30 tahun	7
		Kurang dari 40 tahun	6
		Kurang dari 50 tahun	2
3	Pekerjaan	Pelajar	2
		Bekerja tetap	2
		Bekerja sendiri	8
		Tidak bekerja	3

Kursus Baik Pulih Telefon Bimbit ini dijalankan dibawah PSH selama dua hari di KKHL. Jadual 1 menunjukkan dapatan maklumat demografi bagi responden yang terlibat dalam kajian ini. Bilangan terbesar adalah 13 responden lelaki yang mencapai peratusan 86.6% berbanding peratusan 13.4% iaitu seramai 2 orang bagi responden perempuan. Kursus yang dijalankan lebih menarik minat responden lelaki kerana berasaskan teknikal dan teknologi. Berbeza dengan kursus dalam bidang kecantikan dan spa dan juga bidang dandanan rambut yang lebih menarik minat responden perempuan (Sabarem, et al., 2024). Kajian oleh Kamaruddin, et al. (2024) juga responden perempuan lebih cenderung terhadap kursus yang berasaskan bakeri dan pastri. Bidang kursus memainkan peranan penting dalam penentuan demografi jantina bagi sesebuah kajian.

Bagi maklumat demografi umur, responden yang berusia diantara 20 tahun ke 30 tahun mencapai kekerapan maksimum dengan jumlah 46.7%. Diikuti dengan peratusan 40% iaitu responden yang berusia kurang dari 40 tahun. Berbaki 13.3% responden yang berumur kurang dari 50 tahun yang menyertai kursus ini. Kadar umur diantara 20 tahun ke 40 tahun mencatat kekerapan maksimum bagi penyertaan PSH (Sabarem, et al., 2024) dan (Kamaruddin, et al. 2024). Faktor komitmen bagi mensejahterakan sesebuah keluarga mendorong golongan ini untuk menyertai PSH bagi meningkatkan kemahiran justeru menyumbang kepada peningkatan ekonomi keluarga.

Manakala dapatan maklumat demografi responden menunjukkan bahawa majoriti iaitu 53.2% responden mempunyai pekerjaan sendiri. Diantaranya ialah berniaga, mengurut, *freelance* dan *videographer*. Mereka cenderung mengikuti Kursus Baik Pulih Telefon Bimbit untuk menambah ilmu pengetahuan disamping berusaha untuk menjadikannya salah satu dari punca ekonomi keluarga. Dapatan juga menunjukkan 13.4% pelajar serta responden yang mempunyai pekerjaan tetap berminat menyertai kursus ini. Selain itu, terdapat 20% responden yang tidak mempunyai pekerjaan berusaha menambah kemahiran melalui kursus

yang dijalankan. Kursus-kursus pendek yang dijalankan dibawah PSH ini memberi kesempatan kepada masyarakat untuk menambah ilmu dan kemahiran. Justeru dapat memberi manfaat dalam kehidupan seharian dan peningkatan ekonomi serta taraf hidup masyarakat setempat.

Kursus Baik Pulih Telefon Bimbit ini telah banyak memberi latihan secara teori dan praktikal kepada peserta. Ini dibuktikan oleh dapatan kajian berkenaan kelebihan kursus ini. Kesemua responden bersetuju bahawa ilmu baik pulih telefon bimbit diberikan secara teori dan praktikal sepanjang kursus dijalankan. Terdapat bimbingan daripada tenaga pengajar yang mahir serta peralatanbaik pulih yang lengkap seperti *toolset DIY* dan telefon bimbit terpakai. Selain itu, responden juga bersetuju bahawa kursus ini dapat membina *networking* dikalangan peserta untuk bertukar fikiran, pendapat dan idea dimasa akan datang.

Dapatan kajian seterusnya adalah berkenaan manfaat Kursus Baik Pulih Telefon Bimbit dari segi peluang pekerjaan atau usaha perniagaan. Kesemua responden memperoleh kemahiran tambahan yang boleh digunakan pada masa hadapan. Sejumlah 66.7% responden telah memulakan perniagaan baik pulih telefon bimbit secara kecil-kecilan. Perniagaan ini dilakukan secara sambilan dan dapat menambah sumber pendapatan keluarga mereka. Hasil kajian mendapati 60% daripada responden telah memulakan perniagaan baik pulih telefon secara kecil-kecilan. Seramai 56% daripada jumlah tersebut telah telah berjaya melakukan baik pulih dengan bilangan diantara 6 ke 10 telefon bimbit. Ini menyumbang kepada anggaran pendapatan sebanyak RM 100 ke RM 500. Manakala dapatan kajian juga menunjukkan 44% dikalangan mereka telah membaik pulih telefon bimbit melebihi bilangan 10. Ini menyumbang kepada anggaran pendapatan sebanyak RM 1000.

Manakala 20% responden masih belum memanfaatkan kemahiran baik pulih telefon bimbit ini dalam pekerjaan atau perniagaan. Ini berikutan daripada kurang keyakinan untuk membaiki telefon sendiri atau pelanggan. Responden merasakan latihan yang diberikan semasa Kursus Baik Pulih Telefon Bimbit masih tidak mencukupi dan ingin mengikuti kursus lanjutan dari pihak KKHL. Malah mereka mencadangkan agar pihak pengurusan dapat menambah durasi latihan, atau tambah perkakas untuk latihan *hands on soldering*. Selain itu, responden juga berharap agar peserta didedahkan dengan kemahiran baik pulih pelbagai jenis telefon bimbit yang mempunyai ciri-ciri tersendiri.

Namun begitu, terdapat 13.3% responden yang bercadang untuk memulakan perniagaan baik pulih telefon bimbit sendiri dalam masa terdekat. Ini adalah kerana responden tidak mempunyai modal untuk membeli peralatan dan alat ganti untuk proses baik pulih. Selain itu, ada juga responden yang sibuk dengan pekerjaan utama atau komitmen lain. Responden juga ada mencadangkan agar ada slot perkongsian berkenaan ilmu asas berniaga agar mereka dapat mengaplikasikan kemahiran baik pulih telefon bimbit ini sebagai sumber pendatapatan tambahan.

4. Kesimpulan

Secara keseluruhannya, Kursus Baik Pulih Telefon Bimbit berkesanan terhadap peningkatan kemahiran dan peluang kerja kepada peserta. Hasil kajian mendapati 60% daripada responden telah memulakan perniagaan baik pulih telefon secara kecil-kecilan. Seramai 54% daripada jumlah tersebut telah telah berjaya melakukan baik pulih dengan bilangan diantara 6 ke 10 telefon bimbit yang menyumbang pendapatan diantara RM 100 - RM 500. Manakala dapatan kajian juga menunjukkan 44% dikalangan mereka telah membaik pulih telefon bimbit melebihi bilangan 10 yang menyumbang pada anggaran pendapatan sebanyak RM 1000.
Pengkaji mencadangkan agar pelbagai kursus pendek dilaksanakan menerusi PSH kepada komuniti setempat. Kursus yang meliputi kemahiran seharian bagi memenuhi keperluan masyarakat setempat serta membantu mereka menjana pendapatan dan meningkatkan taraf kehidupan keluarga.

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PENGARUH PENETAPAN HARGA DAN KUALITAS PRODUK CAT NIPPON PAINT TERHADAP KEPUTUSAN KONSUMEN UNTUK BERBELANJA DI PANGLONG UD. HANJAYA PATUMBAK, DELI SERDANG

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Abstrak

Penelitian ini bertujuan untuk mengetahui pengaruh penetapan harga dan kualitas produk terhadap keputusan konsumen dalam memilih berbelanja cat Nippon Paint di Panglong UD. Hanjaya, Patumbak, Deli Serdang. Populasi penelitian ini adalah seluruh konsumen cat Nippon Paint di Panglong UD. Hanjaya, Patumbak, Deli Serdang, sedangkan sampel adalah sebanyak 100 responden. Metode yang digunakan dalam penelitian ini adalah pendekatan kuantitatif dengan pengumpulan data melalui kuesioner kepada konsumen. Metode analisis yang digunakan adalah regresi linier berganda. Analisis data dilakukan untuk melihat sejauh mana variabel harga dan kualitas produk berpengaruh terhadap keputusan pembelian. Hasil penelitian ini menunjukkan bahwa secara parsial penetapan harga berpengaruh terhadap keputusan konsumen, kualitas produk berpengaruh terhadap keputusan konsumen. Selanjutnya secara simultan penetapan harga dan kualitas produk berpengaruh terhadap keputusan konsumen dalam memilih berbelanja cat Nippon Paint di Panglong UD. Hanjaya, Patumbak, Deli Serdang.
Kata kunci: Penetapan Harga; Kualitas Produk; Keputusan Konsumen.

1. Pendahuluan

Industri cat di Indonesia menunjukkan pertumbuhan yang signifikan dalam beberapa tahun terakhir, seiring dengan meningkatnya pembangunan infrastruktur dan perumahan. Menurut data dari Asosiasi Produsen Cat Indonesia (APCI), total konsumsi cat di Indonesia mencapai 1,3 juta metrik ton (MT) atau sekitar Rp 90 triliun pada tahun 2024. Namun, konsumsi per kapita di Indonesia masih relatif rendah, yaitu sekitar 4,5 kg per orang per tahun, dibandingkan dengan negara tetangga seperti Malaysia yang mencapai 10–14 kg per kapita. Hal ini menunjukkan bahwa potensi pertumbuhan industri cat di Indonesia masih sangat besar (kompas.com).

Dalam industri cat dekoratif, persaingan antar merek semakin ketat. Berdasarkan data Top Brand Award 2024, Dulux memimpin pasar dengan tingkat popularitas sebesar 46,7%, diikuti oleh Nippon Paint dengan 31,9%, dan Jotun dengan 11,9% . Nippon Paint, sebagai merek cat asal Jepang, telah menunjukkan peningkatan popularitas dari 27,2% pada tahun 2023 menjadi 31,9% pada tahun 2024. Dengan prinsip "Refreshing Your Life", Nippon Paint terus berinovasi untuk memenuhi kebutuhan konsumen dan memperkuat posisinya di pasar global (Top Brand Award, 2024).

Nippon Paint merupakan salah satu produsen cat dan pelapis terkemuka di Asia dan dunia yang telah hadir di Indonesia sejak tahun 1969 melalui PT Nipsea Paint and Chemicals. Perusahaan ini dikenal dengan inovasi teknologi dan diversifikasi produknya, seperti cat tembok, cat kayu, cat besi, dan cat anti-bakteri. Di pasar Indonesia, Nippon Paint menguasai sekitar 45% pangsa pasar dan menduduki posisi sebagai pemimpin pasar dalam kategori cat

dekoratif. Keunggulan perusahaan ini terletak pada penggunaan teknologi mutakhir seperti mesin pewarna otomatis (tinting machine), sistem distribusi yang luas, serta citra merek yang kuat. Dalam menghadapi persaingan yang semakin ketat, Nippon Paint secara aktif mengembangkan produk ramah lingkungan dan menyesuaikan harga untuk tetap kompetitif di berbagai segmen konsumen, mulai dari proyek besar hingga ritel skala kecil seperti panglong.

Penetapan harga dan kualitas produk merupakan dua faktor utama yang memengaruhi keputusan pembelian konsumen. Penelitian oleh Ashari dan Supriono (2023) menunjukkan bahwa persepsi harga yang wajar dan sesuai dengan kualitas produk mendorong konsumen untuk melakukan pembelian. Konsumen cenderung mempertimbangkan harga sebagai indikator nilai produk, sehingga harga yang kompetitif dapat meningkatkan minat beli. Selain itu, studi oleh Lutfiany et al. (2023) mengungkapkan bahwa dalam bauran pemasaran 4P, harga secara parsial berpengaruh signifikan terhadap keputusan pembelian cat Nippon Paint di Surabaya Timur. Hal ini menunjukkan bahwa strategi penetapan harga yang tepat dapat menjadi faktor kunci dalam menarik konsumen. Meskipun belum ada penelitian spesifik di Panglong UD. Hanjaya, temuan-temuan ini dapat menjadi acuan bahwa harga yang kompetitif dan sesuai dengan ekspektasi konsumen berpotensi meningkatkan keputusan pembelian cat Nippon Paint di lokasi tersebut.

Selanjutnya kualitas produk memiliki pengaruh yang signifikan terhadap keputusan pembelian konsumen cat Nippon Paint di Panglong UD. Hanjaya. Penelitian oleh Ashari dan Supriono (2023) menunjukkan bahwa persepsi kualitas produk yang tinggi mendorong konsumen untuk melakukan pembelian, karena mereka mengasosiasikan kualitas dengan nilai dan kepuasan yang diperoleh dari produk tersebut. Demikian pula, studi oleh Muslikhun et al. (2023) menemukan bahwa kualitas produk berpengaruh positif dan signifikan terhadap keputusan pembelian cat Nippon Paint di Semarang, dengan kontribusi yang besar dalam mempengaruhi keputusan konsumen. Meskipun belum ada penelitian spesifik di Panglong UD. Hanjaya, temuan-temuan ini dapat menjadi acuan bahwa kualitas produk yang unggul berpotensi meningkatkan keputusan pembelian cat Nippon Paint di lokasi tersebut.

Beberapa penelitian terdahulu sudah meneliti mengenai pengaruh penetapan harga terhadap kualitas produk. Penelitian oleh Ashari dan Supriono (2023) di Gresik menunjukkan bahwa persepsi harga memiliki pengaruh signifikan terhadap keputusan pembelian cat Nippon Paint, sementara promosi tidak memberikan dampak yang berarti. Studi lain oleh Lutfiany et al. (2023) di Surabaya Timur menemukan bahwa bauran pemasaran, termasuk harga dan kualitas produk, secara simultan berpengaruh signifikan terhadap keputusan pembelian. Namun, penelitian-penelitian tersebut lebih fokus pada wilayah perkotaan dan belum banyak mengeksplorasi perilaku konsumen di daerah semi-perkotaan seperti Patumbak, Deli Serdang.

Panglong UD. Hanjaya di Patumbak merupakan salah satu toko bangunan yang menjual produk cat Nippon Paint dan memiliki basis pelanggan yang cukup besar. Namun, belum ada penelitian yang secara khusus menganalisis bagaimana penetapan harga dan kualitas produk Nippon Paint memengaruhi keputusan pembelian konsumen di panglong ini. Dengan demikian, penelitian ini bertujuan untuk mengisi kesenjangan tersebut dengan mengkaji pengaruh penetapan harga dan kualitas produk terhadap keputusan konsumen untuk berbelanja di Panglong UD. Hanjaya.

Hasil dari penelitian ini diharapkan dapat memberikan wawasan bagi pemilik panglong dan produsen cat dalam merumuskan strategi pemasaran yang lebih efektif, serta memberikan kontribusi akademik dalam bidang pemasaran, khususnya dalam konteks toko bangunan di daerah semi-perkotaan.

2. Metodologi

Penelitian ini dilakukan pada konsumen yang berbelanja cat Nippon Paint di Panglong UD. Hanjaya, yang berlokasi di Patumbak, Kabupaten Deli Serdang. Pengambilan sampel dilakukan dengan menggunakan teknik *purposive sampling* terhadap konsumen yang pernah melakukan pembelian produk cat Nippon Paint di panglong tersebut. Jumlah responden dalam penelitian ini adalah 100 orang konsumen.

Variabel yang digunakan dalam penelitian ini terdiri dari:

1. Variabel bebas (independen), yaitu:
    a. Penetapan harga, dengan indikator: keterjangkauan harga, kesesuaian harga dengan kualitas produk, daya saing harga, dan kesesuaian harga dengan manfaat (Kotler & Keller, 2016).
    b. Kualitas produk, dengan indikator: daya tahan cat, kualitas produk aplikasi, tampilan akhir (warna dan kilap), serta keamanan dan ramah lingkungan (Kotler & Keller, 2016).
b. Variabel terikat (dependen), yaitu:
    a. Keputusan pembelian, dengan indikator: faktor budaya, faktor sosial, faktor pribadi, dan faktor psikologis (Kotler & Keller, 2016).

Pengumpulan data dilakukan melalui penyebaran kuesioner tertutup kepada para konsumen yang menjadi responden. Data dianalisis menggunakan pendekatan deskriptif kuantitatif, dan untuk menguji pengaruh antar variabel digunakan analisis regresi linier berganda (Sugiyono, 2019). Uji hipotesis yang digunakan dalam penelitian ini meliputi uji koefisien determinasi (R^2), uji t (parsial), dan uji F (simultan).

3. Dapatan dan Perbincangan

1. Karakteristik responden

Karakteristik responden merupakan identitas responden yang menjadi sampel penelitian. Sampel penelitian sebanyak 100 konsumen yang berbelanja cat Nippon Paint di Panglong UD. Hanjaya, yang berlokasi di Patumbak, Kabupaten Deli Serdang yang telah mengisi kuesioner berdasarkan jenis kelamin, usia, dan pendidikan. Berikut ini disajikan data karakteristik responden sebagai berikut:

Jadual 1. Karakteristik responden berdasarkan jenis kelamin

Usia	Jumlah Responden	Persentase
Laki-Laki	49	49.0%
Perempuan	51	51.0%
Total	100	100.0%

Sumber: Data Primer 2025, (diolah)

Berdasarkan data pada jadual di atas, diketahui bahwa jumlah responden berjenis kelamin perempuan adalah sebanyak 51 orang (51%), sedangkan responden berjenis kelamin laki-laki berjumlah 49 orang (49%). Hal ini menunjukkan bahwa distribusi responden berdasarkan jenis kelamin relatif seimbang.

Jadual 2. Karakteristik responden berdasarkan usia

Usia	Jumlah Responden	Persentase
18-20 Tahun	20	20.0%
21-30 Tahun	36	36.0%
31-40 Tahun	35	35.0%
>40 Tahun	9	9.0%
Total	100	100%

Sumber: Data Primer 2025, (diolah)

Jadual 2 menunjukkan bahwa responden yang paling dominan berada dalam kelompok usia

produktif, yaitu 21–30 tahun sebanyak 36 orang (36,0%). Sedangkan responden yang berada pada kelompok usia di atas 40 tahun hanya berjumlah 9 orang (9,0%), menunjukkan bahwa sebagian besar konsumen cat Nippon Paint di Panglong UD. Hanjaya berada pada kelompok usia muda hingga dewasa awal.

Jadual 3. Karakteristik responden berdasarkan pendidikan

Pendidikan	Jumlah Responden	Persentase
SMA	36	36.0%
Diploma	16	16.0%
S1	30	30.0%
S2	14	14.0%
S3	4	4.0%
Total	100	100.0%

Sumber: Data Primer 2025, (diolah)

Jadual 3 menunjukkan bahawa sebagian besar responden memiliki penetapan harga SMA sebanyak 36 orang (36,0%), diikuti oleh lulusan S1 sebanyak 30 orang (30,0%). Adapun responden dengan penetapan harga tertinggi yaitu S3 hanya berjumlah 4 orang (4,0%), menunjukkan bahwa mayoritas konsumen berasal dari kelompok pendidikan menengah hingga sarjana.

Jadual 4. Karakteristik responden berdasarkan profesi

Profesi	Jumlah Responden	Persentase
Lainnya	12	12.0%
Petani/Pedagang	12	12.0%
PNS	42	42.0%
Wiraswasta	34	34.0%
Total	100	100.0%

Sumber: Data Primer 2025, (diolah)

Berdasarkan data pada jadual 4, diketahui bahawa sebagian besar responden berprofesi sebagai Pegawai Negeri Sipil (PNS), yaitu sebanyak 42 orang (42,0%). Sementara itu, jumlah responden paling sedikit berasal dari kategori Petani/Pedagang dan profesi lainnya, masing-masing sebanyak 12 orang (12,0%).

2. Rekaptulasi jawaban responden variabel penetapan harga

Untuk mengukur penetapan harga, digunakan 4 indikator sesuai dengan teori yang ada. Berdasarkan pernyataan-pernyataan yang telah dijawab oleh responden, maka dihasilkan data sebagai berikut:

Jadual 5. Rekapitulasi jawaban responden variabel penetapan harga

No	Pernyataan	Alternatif Jawaban					Rata-rata
		STS	TS	KS	S	SS	
1.	Saya merasa harga cat Nippon Paint terjangkau oleh kemampuan keuangan saya.	1	4	25	45	25	3,89
2.	Saya merasa puas dengan kualitas yang saya dapatkan dibandingkan dengan harga yang saya bayarkan.	1	4	31	37	27	3,85
3.	Harga cat Nippon Paint lebih kompetitif dibandingkan merek lain..	1	3	30	34	32	3,93

No	Pernyataan	Alternatif Jawaban					Rata-rata
		STS	TS	KS	S	SS	
4.	Manfaat yang saya dapatkan dari cat Nippon Paint sebanding dengan harga yang saya bayar	1	3	31	40	25	3,85
	Rata-rata						3,88

Sumber: Data Primer 2025, (diolah)

Berdasarkan data pada jadual 5, dapat diketahui bahawa secara umum persepsi responden terhadap variabel penetapan harga berada pada kategori tinggi, dengan rata-rata total sebesar 3,88. Pernyataan yang memperoleh nilai rata-rata tertinggi adalah "Harga cat Nippon Paint lebih kompetitif dibandingkan merek lain" dengan skor 3,93, yang menunjukkan bahwa mayoritas responden setuju bahwa harga produk Nippon Paint relatif lebih kompetitif dibandingkan produk sejenis di pasaran. Sementara itu, pernyataan dengan nilai rata-rata terendah, yaitu 3,85, muncul pada dua indikator, yaitu "Saya merasa puas dengan kualitas yang saya dapatkan dibandingkan dengan harga yang saya bayarkan" dan "Manfaat yang saya dapatkan dari cat Nippon Paint sebanding dengan harga yang saya bayar". Meskipun nilainya sedikit lebih rendah, rata-rata skor tersebut tetap menunjukkan bahwa responden cenderung setuju terhadap pernyataan-pernyataan tersebut. Secara keseluruhan, hasil ini mengindikasikan bahwa konsumen Panglong UD. Hanjaya Patumbak menilai bahwa harga produk cat Nippon Paint sudah sesuai dan sebanding dengan kualitas serta manfaat yang diterima.

3. Rekaptulasi jawaban responden variabel kualitas produk

Jadual 6. Rekapitulasi jawaban responden variabel kualitas produk

No	Pernyataan	Alternatif Jawaban					Rata-rata
		STS	TS	KS	S	SS	
1.	Saya jarang melakukan pengecatan ulang ketika menggunakan cat Nippon Paint.	2	3	8	31	56	4,36
2.	Cat Nippon Paint mudah digunakan saat pengecatan.	2	3	10	22	63	4,41
3.	Warna cat Nippon Paint sesuai dengan yang saya harapkan.	3	4	24	36	33	3,92
4.	Saya merasa aman menggunakan cat Nippon Paint karena tidak berbau menyengat.	2	3	23	44	28	3,93
	Rata-rata						4,15

Sumber: Data Primer 2025, (diolah)

Berdasarkan data pada jadual 6, dapat diketahui bahwa persepsi responden terhadap variabel kualitas produk tergolong sangat baik, dengan rata-rata total sebesar 4,15. Nilai ini menunjukkan bahwa secara umum, responden setuju hingga sangat setuju terhadap kualitas produk cat Nippon Paint. Pernyataan dengan nilai rata-rata tertinggi terdapat pada indikator "Cat Nippon Paint mudah digunakan saat pengecatan" dengan skor 4,41. Hal ini mengindikasikan bahwa kualitas produk dalam pengaplikasian menjadi salah satu keunggulan utama yang dirasakan oleh konsumen. Pernyataan selanjutnya yang juga memperoleh nilai tinggi adalah "Saya jarang melakukan pengecatan ulang ketika menggunakan cat Nippon Paint", dengan rata-rata 4,36, yang mencerminkan persepsi

konsumen bahwa daya tahan cat termasuk baik. Sementara itu, pernyataan dengan rata-rata terendah adalah "Warna cat Nippon Paint sesuai dengan yang saya harapkan" dengan skor 3,92, diikuti oleh "Saya merasa aman menggunakan cat Nippon Paint karena tidak berbau menyengat" sebesar 3,93. Meskipun memiliki nilai terendah di antara indikator lainnya, kedua pernyataan tersebut tetap menunjukkan kecenderungan setuju, sehingga masih tergolong positif. Secara keseluruhan, hasil ini mencerminkan bahwa konsumen Panglong UD. Hanjaya Patumbak menilai kualitas cat Nippon Paint secara positif, terutama dalam aspek kualitas produk penggunaan dan daya tahan produk.

4. Rekaptulasi jawaban responden variabel keputusan konsumen

Jadual 7. Rekapitulasi jawaban responden variabel keputusan konsumen

No	Pernyataan	Alternatif Jawaban					Rata-rata
		STS	TS	KS	S	SS	
1.	Saya membeli cat Nippon Paint karena sesuai dengan kebiasaan keluarga saya.	1	7	28	42	22	3,77
2.	Saya membeli cat Nippon Paint berdasarkan rekomendasi teman atau kerabat	1	2	27	43	27	3,93
3.	Saya memilih cat Nippon Paint karena sesuai dengan kebutuhan dan selera pribadi.	1	2	19	54	24	3,98
4.	Saya termotivasi membeli cat Nippon Paint karena memiliki citra merek yang baik.	1	2	25	52	20	3,88
	Rata-rata						3,89

Sumber: Data Primer 2025, (diolah)

Berdasarkan data pada Tabel 7, dapat diketahui bahwa persepsi responden terhadap variabel keputusan konsumen berada pada kategori tinggi, dengan rata-rata keseluruhan sebesar 3,89. Hal ini menunjukkan bahwa sebagian besar responden setuju terhadap faktor-faktor yang memengaruhi keputusan mereka dalam membeli cat Nippon Paint. Pernyataan dengan nilai rata-rata tertinggi terdapat pada indikator "Saya memilih cat Nippon Paint karena sesuai dengan kebutuhan dan selera pribadi" dengan skor 3,98, yang mengindikasikan bahwa faktor pribadi menjadi aspek utama dalam memengaruhi keputusan pembelian konsumen. Disusul oleh pernyataan "Saya membeli cat Nippon Paint berdasarkan rekomendasi teman atau kerabat" dengan nilai 3,93, yang menunjukkan bahwa faktor sosial juga memainkan peran penting dalam pengambilan keputusan pembelian. Pernyataan "Saya termotivasi membeli cat Nippon Paint karena memiliki citra merek yang baik" memperoleh skor 3,88, mencerminkan pengaruh faktor psikologis terhadap keputusan konsumen.

Sedangkan pernyataan dengan nilai rata-rata terendah adalah "Saya membeli cat Nippon Paint karena sesuai dengan kebiasaan keluarga saya" sebesar 3,77. Meskipun menjadi nilai terendah di antara pernyataan lainnya, angka tersebut tetap berada pada kategori setuju, yang menunjukkan bahwa faktor budaya tetap memiliki pengaruh meskipun tidak dominan. Secara keseluruhan, hasil ini menunjukkan bahwa keputusan konsumen untuk membeli cat Nippon Paint di Panglong UD. Hanjaya dipengaruhi secara kuat oleh faktor pribadi, sosial, dan psikologis, dengan faktor budaya berperan relatif lebih rendah.

5. Uji Validitas

Berdasarkan hasil analisis seluruh pernyataan dinyatakan valid karena memiliki tingkat signifikansi di bawah 5%. Hasil uji validitas dijelaskan pada Jadual 8.

Jadual 8. Hasil Uji Validitas

No. Pernyataan		Variabel	Koefisien Korelasi	Nilai Kritis5%	Ket
1	A1	Penetapan Harga	0,852	0,196	Valid
2	A2		0,867		
3	A3		0,951		
4	A4		0,931		
5	B1	Kualitas Produk	0,841	0,196	Valid
6	B2		0,878		
7	B3		0,893		
8	B4		0,859		
9	C1	Keputusan Konsumen	0,808	0,196	Valid
10	C2		0,840		
11	C3		0,889		
12	C4		0,855		

Sumber: Data Primer 2025, (diolah)

Berdasarkan Jadual 8 dapat dijelaskan bahwa hasil uji validitas pada seluruh item pernyataan pada kuesioner dinyatakan valid, karena memiliki nilai koefisien korelasi yang lebih besar dari nilai kritis korelasi product moment pada taraf signifikansi 5% yaitu sebesar 0,196. Hal ini menunjukkan bahwa setiap butir pertanyaan dalam kuesioner mampu mengukur aspek variabel yang dimaksud secara tepat dan konsisten

6. Uji Reliabilitas

Uji kehandalan item pertanyaan dari suatu kuesioner tersebut menggunakan nilai *Cronbach Alpha.* Ini hanya dilakukan satu kali pada sekelompok responden pada masing-masing variabel. Hasil uji reliabilitas dapat dilihat pada jadual 9.

Jadual 9. Hasil Uji Reliabilitas

No	Variabel	Jumlah Item	Cronbach's Alpha		Keterangan
			Hitung	Standar	
1	Penetapan Harga	4	0,922	0,600	Handal
2	Kualitas Produk	4	0,891	0,600	Handal
3	Keputusan Pembelian	4	0,866	0,600	Handal

Sumber: Data 2025 (diolah).

Berdasarkan Jadual 9 dapat dijelaskan bahawa hasil uji reliabilitas terhadap instrumen penelitian menunjukkan bahwa semua variabel memiliki nilai Cronbach's Alpha di atas standar minimum yang ditetapkan, yaitu 0,600, sehingga seluruh variabel dapat dikatakan reliable atau handal.

7. Uji Asumsi Klasik

a. Uji Normalitas

Hasil pengujian normalitas data penelitian ini dapat dilihat pada Tabel 10.

Jadual 10. Hasil Uji Normalitas

One-Sample Kolmogorov-Smirnov Test		
		Unstandardized Residual
N		100
Normal Parameters[a,b]	.0000000	.0000000
	.41263194	.37478561
Most Extreme Differences	.077	.052
	.045	.052
	-.077	-.050
Test Statistic		.077
Asymp. Sig. (2-tailed)		.146[c]

a. Test distribution is Normal.
b. Calculated from data.
c. Lilliefors Significance Correction.
d. This is a lower bound of the true significance.

Sumber: Hasil Output SPSS

Berdasarkan jadual 10 dapat dijelaskan bahwa nilai signifikansi dari uji normalitas sebesar 0,146 (0,146 > 0,05). Artinya data residual berdistribusi secara normal. Hasil dari uji diatas juga didukung dengan hasil analisis grafik, yaitu grafik seperti terlihat pada Rajah 1.

b. Uji Multikolinieritas

Uji multikolinearitas bertujuan untuk menguji apakah pada model regresi ditemukan adanya korelasi antar variabel independen. Jika terjadi korelasi, maka terdapat masalah multikolinearitas. Pada model regresi yang baik tidak terjadi korelasi diantara variabel independen. Untuk uji multikolinearitas pada penelitian ini adalah melihat nilai Toleranse atau nilai *Variance Inflation Factor* (VIF) pada jadual 11.

Jadual 11. Hasil Uji Multikolinearitas

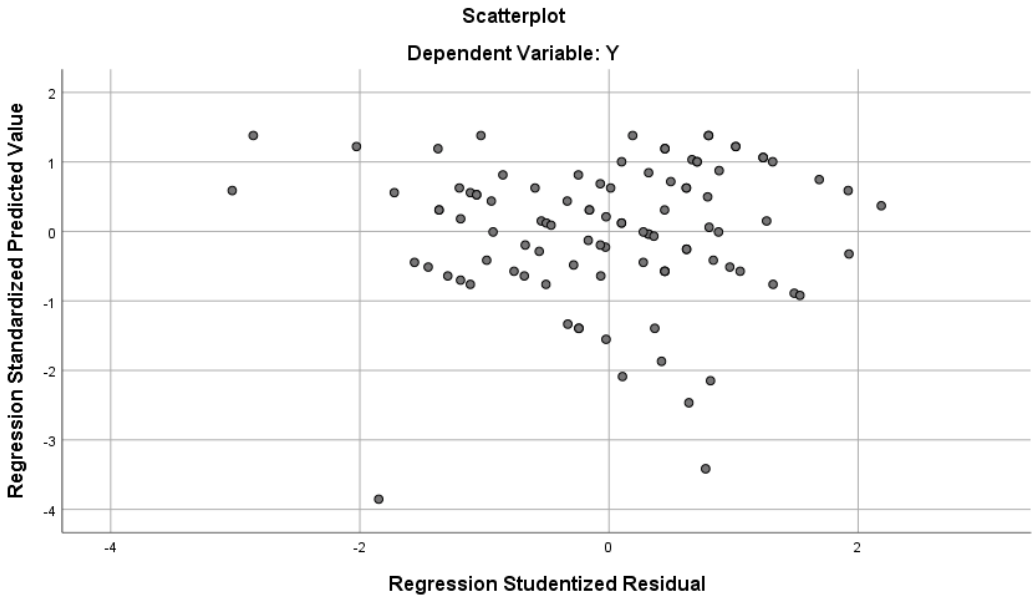
Variabel Bebas	Tolerance	VIF	Keterangan
Penetapan Harga	0.639	1.565	Bebas dari Multikolinieritas
Kualitas Produk	0.639	1.565	Bebas dari Multikolinieritas

Sumber: Data 2025 (diolah).

Berdasarkan Jadual 11 dapat dijelaskan bahwa semua variabel independen memiliki nilai Tolerance lebih dari 0,10, berarti tidak ada korelasi antara variabel independen. Begitu juga hasil perhitungan nilai *Variance Inflation Factor* (VIF) juga menunjukan hal yang sama bahwa semua variabel independen yang memiliki nilai VIF kurang dari 10. Jadi dapat disimpulkan bahwa tidak terjadi multikolonieritas antar variabel independen dalam model regresi pada penelitian ini.

c. Uji Heteroskedastisitas

Uji heteroskedastisitas bertujuan untuk menguji apakah dalam sebuah regresi terjadi ketidaksamaan varians dari residual pada satu pengamatan ke pengamatan yang lain. Hasil dapat dilihat pada rajah 1.



Rajah 1. Uji Heteroskedastisitas
Sumber: Hasil Output SPSS

Berdasarkan Rajah 1 dapat dijelaskan bahwa titik-titik menyebar dengan pola yang tidak jelas diatas dan dibawah angka 0 pada sumbu Y, jadi dapat disimpulkan bahwa tidak terjadi masalah heteroskedastisitas pada model regresi.

8. Hasil uji Regresi Linear Berganda

Analisis linear berganda bertujuan untuk menjawab permasalahan dalam penelitian ini. Analisis ini digunakan untuk menganalisis pengaruh antara variabel independen terhadap variabel dependen. Berdasarkan data yang diperoleh, kemudian dilakukan perhitungan atau pengolahan data dengan menggunakan program SPSS. Persamaan hasil regresi analisis data diperoleh nilai-nilai sebagai berikut:

Jadual 12. Hasil uji Regresi Linear Berganda

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	.740	.237		3.117	.002		
	X1	.428	.066	.487	6.516	.000	.639	1.565
	X2	.359	.065	.416	5.562	.000	.639	1.565

a. Dependent Variable: Y

Dengan demikian maka hasil perhitungan statistik dapat dituliskan persamaan regresi linier berganda simultan sebagai berikut :

$$Y = 0{,}487X_1 + 0{,}416X_2$$

Dari hasil persamaan regresi diatas diketahui hasil dari penelitian sebagai berikut:

1. Koefisien regresi pengaruh penetapan harga sebesar 0,487 menjelaskan setiap adanya kenaikan pada penetapan harga maka akan dapat meningkatkan keputusan konsumen sebesar 0,487, artinya terdapat pengaruh positif variabel penetapan harga terhadap keputusan konsumen
2. Koefisien regresi pengaruh kualitas produk sebesar 0,416 menjelaskan setiap kenaikan kualitas produk maka akan dapat meningkatkan keputusan konsumen sebesar 0,416, artinya terdapat pengaruh positif variabel kualitas produk terhadap keputusan konsumen

9. Pengujian Hipotesis

a. Koefisien Determinasi (R^2)

Koefisien dterminasi berganda adalah suatu koefisien yang menjelaskan besarnya pengaruh secara serentak variabel-variabel bebas terhadap variabel terikatnya.

Jadual 13. Hasil uji koefisisen determinasi

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.808[a]	.654	.646	.41686	2.229

a. Predictors: (Constant), X2, X1

b. Dependent Variable: Y

Dari hasil output SPSS di peroleh Adjusted R Square adalah sebesar 0,646. Nilai Adjusted R Square sebesar tersebut menjelaskan, peran variabel penetapan harga (X1) dan kualitas produk (X2) dalam mempengaruhi keputusan konsumen (Y) adalah sebesar 0,646 atau 64.6%. Sementara sisa (nilai residu) dari peran variabel tersebut adalah sebesar 0.354 atau 35.4% dipengaruhi oleh variabel lainnya yang tidak dilibatkan dalam penelitian ini.

b. Uji Simultan (Uji F)

Uji F dilakukan untuk melihat pengaruh variabel independen terhadap variabel dependen secara bersama-sama (secara simultan). Bila $F_{hitung} > F_{tabel}$ dengan tingkat signifikan 5% maka dapat disimpulkan bahwa secara bersama-sama variabel independen berpengaruh signifikan terhadap variabel dependen. Sebaliknya jika $F_{hitung} < F_{tabel}$ tingkat signifikan 5% maka dapat disimpulkan variabel independen berpengaruh terhadap variabel dependen.

Jadual 14. Hasil uji simultan

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	31.809	2	15.904	91.522	.000[b]
	Residual	16.856	97	.174		
	Total	48.665	99			

a. Dependent Variable: Y

b. Predictors: (Constant), X2, X1

Hasil pembagian Mean Square regresi dengan Mean Square residual diperoleh nilai F hitung sebesar 91,522 dengan batasan nilai probabilitas signifikansi adalah 0,000. Sementara nilai F tabel pada taraf signifikan 5% dan df 97 adalah sebesar 3,09. Dengan demikian nilai F hitung (91,522) lebih besar dari F tabel (3,09) sehingga dapat diambil suatu keputusan yaitu menerima hipotesis alternatif (Ha) dan menolak hipotesis Ho, penetapan harga (X_1) dan kualitas produk (X_2) secara bersama-sama berpengaruh terhadap keputusan konsumen (Y).

c. Uji Parsial (Uji t)

Uji ini dilakukan untuk melihat signifikan dari pengaruh variabel independen secara individu terhadap variabel dependen (secara parsial). Dengan menganggap variabel lainnya konstan. Bila $t_{hitung} \geq t_{tabel}$ dengan signifikansi 5% maka dapat disimpulkan bahwa secara parsial variabel independen berpengaruh signifikan terhadap variabel dependen. Jika $t_{hitung} < t_{tabel}$ dengan tingkat signifikansi 5% maka dapat disimpulkan variabel independen berpengaruh terhadap dependen.

Jadual 15. Hasil uji parsial

Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF

1	(Constant)	.740	.237		3.117	.002		
	X1	.428	.066	.487	6.516	.000	.639	1.565
	X2	.359	.065	.416	5.562	.000	.639	1.565

a. Dependent Variable: Y

Berdasarkan Tabel 15, maka dapat dijelaskan hasil sebagai berikut.

a. Dari hasil perbandingan nilai koefisien regresi dengan standar eror diperoleh nilai t hitung untuk pengaruh variabel penetapan harga adalah sebesar 3,601 pada batasan nilai probabilitas signifikansi 0,000. Sementara nilai t_{tabel} pada df 98 dan tingkat signifikan 5% adalah sebesar 1,984. Hasil perhitungan ini menunjukan bahwa penetapan harga secara parsial berpengaruh signifikan terhadap keputusan konsumen karena nilai signifikansi < 0,05.
b. Dari hasil perbandingan nilai koefisien regresi dengan standar eror diperoleh nilai t hitung untuk pengaruh variabel kualitas produk adalah sebesar 2,445 pada batasan nilai probabilitas signifikansi 0,006. Sementara nilai t_{tabel} pada df 98 dan tingkat signifikan 5% adalah sebesar 1,984. Hasil perhitungan ini menunjukan bahwa kualitas produk secara parsial berpengaruh signifikan terhadap keputusan konsumen karena nilai signifikansi < 0,05.

Hasil penelitian ini konsisten dengan berbagai studi sebelumnya yang menegaskan bahwa penetapan harga merupakan faktor kunci dalam memengaruhi keputusan pembelian konsumen. Dalam teori bauran pemasaran (marketing mix) yang dikemukakan oleh Kotler dan Keller (2016), harga termasuk salah satu dari empat elemen utama (produk, harga, tempat, dan promosi) yang harus dikelola perusahaan untuk memengaruhi respon pasar. Harga yang dianggap terjangkau, sesuai dengan kualitas, serta kompetitif dibandingkan produk sejenis mampu meningkatkan keinginan beli konsumen. Hal ini diperkuat oleh temuan Suryani dan Haryono (2021), yang menjelaskan bahwa persepsi harga yang sepadan dengan kualitas memberikan dampak positif terhadap keputusan pembelian konsumen, khususnya pada produk cat tembok. Penelitian serupa juga dilakukan oleh Rahmawati dan Fadilah (2022) yang menemukan bahwa strategi penetapan harga yang kompetitif mampu meningkatkan minat beli konsumen pada produk bahan bangunan. Selain itu, Prasetyo dan Nugroho (2020) menegaskan bahwa harga yang dirasa sesuai dengan manfaat yang ditawarkan produk berpengaruh signifikan terhadap loyalitas konsumen di sektor ritel. Temuan dari Fitriana dan Hidayat (2021) juga memperkuat argumen ini, di mana konsumen cenderung melakukan pembelian ulang ketika mereka menilai harga produk tidak hanya terjangkau, tetapi juga sesuai dengan kualitas dan nilai tambah yang diberikan.

Selain itu, Ramadhani dan Pramono (2020) menyatakan bahwa harga menjadi pertimbangan utama bagi konsumen ketika memilih produk yang memiliki fungsi penting dalam rumah tangga, seperti cat tembok. Temuan ini sejalan dengan penelitian Fitriana dan Hidayat (2021), yang menyebutkan bahwa harga yang kompetitif dan sesuai dengan daya beli konsumen akan meningkatkan niat pembelian ulang. Hasil serupa juga diungkapkan oleh Prasetyo dan Nugroho (2020), di mana mereka menegaskan bahwa konsumen cenderung menilai kesesuaian antara harga dan kualitas sebagai faktor penentu utama sebelum melakukan pembelian. Selain itu, Rahmawati dan Fadilah (2022) menemukan bahwa strategi penetapan harga yang tepat dapat menciptakan persepsi positif terhadap nilai produk dan memengaruhi keputusan pembelian, terutama untuk produk yang bersifat fungsional dan digunakan dalam jangka panjang seperti cat tembok. Konsumen biasanya membandingkan harga dengan kualitas dan manfaat yang ditawarkan. Teori customer value yang dikemukakan oleh Zeithaml (1988) juga menyebutkan bahwa persepsi nilai konsumen terbentuk dari evaluasi antara kualitas produk dengan pengorbanan yang dikeluarkan, salah satunya harga. Dengan demikian, penetapan harga yang sesuai dengan kualitas produk akan memperkuat persepsi positif konsumen terhadap merek.

Dalam konteks pemasaran produk cat, strategi harga tidak hanya menyangkut keterjangkauan, tetapi juga harus disesuaikan dengan segmen pasar yang dibidik. Menurut Tjiptono (2019), perusahaan perlu melakukan market-based pricing, yaitu menetapkan harga berdasarkan nilai yang dirasakan konsumen, bukan hanya berdasarkan biaya produksi. Pendekatan ini efektif dalam membangun persepsi bahwa produk yang ditawarkan memiliki value for money yang lebih baik dibandingkan kompetitor. Oleh karena itu, perusahaan cat seperti Nippon Paint perlu melakukan riset pasar secara berkelanjutan untuk menentukan strategi harga yang kompetitif.

Di samping harga, kualitas produk juga menjadi variabel penting yang memengaruhi keputusan pembelian. Dalam bauran pemasaran, kualitas produk adalah elemen utama yang merepresentasikan nilai yang ditawarkan kepada konsumen. Konsumen cenderung memilih produk yang memiliki kualitas unggul, seperti daya tahan cat yang lama, hasil aplikasi yang rapi, tampilan akhir yang menarik, serta ramah lingkungan. Penelitian oleh Nurhalimah dan Sulistyowati (2022) menunjukkan bahwa kualitas produk berpengaruh signifikan terhadap keputusan pembelian konsumen pada produk bahan bangunan.

Lebih lanjut, Garvin (1984) dalam teorinya mengenai dimensi kualitas menyebutkan bahwa kualitas produk dapat diukur dari aspek daya tahan, keandalan, kesesuaian dengan spesifikasi, dan fitur tambahan yang relevan. Dalam konteks produk cat, faktor-faktor ini menjadi pertimbangan utama konsumen, terutama daya tahan terhadap cuaca, tingkat kilap yang sesuai, serta keamanan bagi kesehatan. Konsumen modern cenderung mengutamakan produk yang tidak hanya indah secara estetika tetapi juga aman dan ramah lingkungan.

Yuliana dan Wibowo (2023) menambahkan bahwa konsistensi kualitas produk merupakan salah satu kunci untuk meningkatkan loyalitas konsumen. Jika konsumen merasa puas dengan hasil akhir dari suatu produk, mereka akan cenderung melakukan pembelian ulang dan merekomendasikan produk tersebut kepada orang lain. Oleh karena itu, kualitas produk yang terjaga akan memberikan efek jangka panjang pada peningkatan pangsa pasar.

Selain faktor harga dan kualitas, promosi sebagai bagian dari bauran pemasaran juga memiliki peran dalam membentuk persepsi konsumen. Namun, promosi hanya akan efektif jika didukung oleh harga yang kompetitif dan kualitas produk yang dapat dipercaya. Kotler dan Keller (2016) menyatakan bahwa keberhasilan strategi pemasaran bergantung pada integrasi yang baik antara seluruh elemen bauran pemasaran. Hal ini menunjukkan bahwa harga dan kualitas tidak dapat dipisahkan dari strategi promosi, distribusi, dan manajemen merek.

Hasil penelitian ini memperkuat konsep value-based marketing, di mana konsumen tidak hanya menilai produk dari sisi harga, tetapi juga dari manfaat dan kualitas yang diberikan. Perusahaan perlu memastikan bahwa strategi penetapan harga mereka sejalan dengan persepsi nilai konsumen. Dengan demikian, konsumen akan merasa bahwa produk tersebut memberikan keuntungan maksimal dengan biaya yang wajar. Nippon Paint, misalnya, dapat mempertahankan reputasinya dengan mengedepankan inovasi kualitas dan tetap menjaga harga dalam rentang yang kompetitif.

Ke depan, perusahaan cat tembok disarankan untuk melakukan evaluasi berkelanjutan terhadap harga dan kualitas produk yang ditawarkan, serta mengombinasikannya dengan strategi promosi yang tepat sasaran. Dalam era persaingan yang semakin ketat, kemampuan perusahaan untuk menjaga keseimbangan antara harga, kualitas, dan promosi akan menentukan keberhasilan dalam memenangkan hati konsumen. Dengan memanfaatkan teori bauran pemasaran, perusahaan dapat merancang strategi yang holistik untuk meningkatkan keputusan pembelian konsumen.

4. Kesimpulan

Berdasarkan hasil penelitian yang telah dilakukan, dapat disimpulkan bahwa penetapan harga dan kualitas produk berpengaruh secara signifikan terhadap keputusan pembelian konsumen pada produk cat Nippon Paint di Panglong UD. Hanjaya Patumbak, Deli Serdang. Penetapan harga yang dianggap terjangkau, kompetitif, dan sesuai dengan manfaat yang diterima membuat konsumen merasa puas dan terdorong untuk membeli. Di sisi lain, kualitas produk seperti daya tahan, kemudahan aplikasi, tampilan akhir yang memuaskan, serta keamanan dan ramah lingkungan juga menjadi pertimbangan penting dalam keputusan pembelian. Dengan demikian, kedua variabel tersebut berperan penting dalam memengaruhi perilaku konsumen.

Berdasarkan temuan penelitian ini, disarankan agar Panglong UD. Hanjaya dan pihak distributor Nippon Paint terus mempertahankan serta meningkatkan strategi harga yang kompetitif dan kualitas produk yang unggul. Penyesuaian harga dengan daya beli konsumen lokal tanpa mengurangi kualitas akan memperkuat posisi merek di pasar. Selain itu, promosi terkait keunggulan produk seperti daya tahan, hasil akhir yang maksimal, dan keamanan penggunaan perlu lebih ditingkatkan untuk membentuk persepsi positif dan meningkatkan keputusan pembelian konsumen secara berkelanjutan.

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THE INFLUENCE OF SERVICE QUALITY AND BRAND IMAGE ON CUSTOMER SATISFACTION AT TREAT COFFEE AND BEANS

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Abstract

This study aims to analyze the influence of service quality and brand image on customer satisfaction at Treat Coffee and Beans, Medan. Using a quantitative associative approach, data were collected via questionnaires distributed to 60 respondents. The variables measured include service quality (tangible, reliability, responsiveness, assurance, empathy), brand image (strength, uniqueness, advantage), and customer satisfaction (product quality, price, emotional factor, convenience). The data analysis was conducted using multiple linear regression with the help of SPSS 26. The results indicate that both service quality and brand image significantly and positively influence customer satisfaction, both partially and simultaneously. These findings highlight the importance of improving service delivery and strengthening brand perception in the coffee shop business sector.
Keywords: Service quality; Brand image; Customer satisfaction.

1. Introduction

Customer satisfaction is a critical factor for business sustainability in the highly competitive coffee shop industry. Despite offering quality products and a strategic location, Treat Coffee and Beans has encountered several customer complaints regarding service consistency, hygiene, and parking facilities. Service quality and brand image are widely recognized as important determinants of customer satisfaction. Service quality includes physical evidence, reliability, responsiveness, assurance, and empathy (Tjiptono, 2018), while brand image involves perceptions of product excellence, uniqueness, and credibility (Keller, 2020). This study investigates the extent to which these two variables affect customer satisfaction, particularly in the context of a local coffee business in Medan. In the current competitive landscape of the food and beverage industry, customer retention and satisfaction have become key indicators of business success. Coffee shops, as a lifestyle and social destination, are no longer judged solely on the quality of their products, but also on how well they deliver service and establish brand identity. Consumers expect not only high-quality beverages, but also comfortable ambiance, responsive service, and a recognizable brand that resonates with their values and experiences. Treat Coffee and Beans is one such coffee shop that has emerged as a local favorite, yet still faces various challenges such as inconsistent food quality, limited parking space, and customer service complaints. These issues, if not addressed, could potentially erode customer trust and satisfaction. Therefore, understanding the influence of service quality and brand image on customer satisfaction becomes crucial for enhancing competitive advantage and fostering long-term loyalty. In the rapidly growing coffee industry, consumer expectations have evolved beyond merely enjoying a good cup of coffee. The modern customer demands a holistic experience—ranging from the quality of service, the ambiance of the place, to the emotional and symbolic connection they feel toward the brand. These expectations shape the dynamics of customer satisfaction, which in turn determines customer loyalty and long-term business sustainability (Tjiptono, 2018; Keller, 2020). Service quality has long been recognized as a pivotal determinant of customer satisfaction. It encompasses various dimensions such as reliability, responsiveness, assurance, empathy, and tangible aspects (Parasuraman et al., 1988). When customers perceive that they receive

high-quality service, their overall evaluation of the business becomes more positive. In service-based businesses like coffee shops, the intangible nature of the product makes service encounters even more critical in shaping customer perception. Parallel to service quality, brand image plays an equally important role in forming customer satisfaction. A positive brand image not only influences customers' purchase intentions but also instills trust and emotional attachment. According to Keller (2020), brand image reflects the consumer's perception of a brand based on their experiences and associations with it. When a coffee shop successfully cultivates a strong brand identity—through consistency in quality, effective marketing, and customer engagement—it can create a competitive edge that fosters loyalty. Treat Coffee and Beans, a growing local coffee shop in Medan, seeks to position itself as a modern café that blends quality coffee with a community-centric experience. While the café has garnered attention for its unique coffee offerings and use of locally sourced beans, several challenges have emerged. Customer complaints about inconsistent service, limited parking space, and cleanliness suggest that aspects of service delivery are falling short of expectations. Simultaneously, the café's brand presence—both offline and on digital platforms—has not been optimally leveraged to reinforce customer perception and trust. Given these issues, it becomes essential to empirically examine how service quality and brand image influence customer satisfaction in the context of Treat Coffee and Beans. By understanding these relationships, business owners and managers can devise more targeted strategies to improve service encounters and strengthen brand equity. Furthermore, this study contributes to the literature by applying marketing theory in a local SME context, offering practical insights for similar businesses in the coffee shop industry.

Service Quality

Service quality is one of the most widely studied concepts in the field of marketing, especially within the service industry. Parasuraman, Zeithaml, and Berry (1988) introduced the SERVQUAL model**,** which consists of five key dimensions: tangibles**,** reliability**,** responsiveness**,** assurance**,** and empathy**.** This model is widely used to measure customers' perceptions of service performance. Tjiptono (2018) defines service quality as the level of excellence expected by customers and the organization's ability to control that excellence to meet or exceed customer expectations. In the context of a coffee shop, tangible aspects may include the cleanliness of the space, the aesthetics of interior design, and the physical appearance of staff. Meanwhile, responsiveness and empathy are closely linked to the speed and attentiveness of service staff in addressing customer needs. A study by Fiqihta et al. (2020) found that responsiveness and reliability significantly affect customer satisfaction in the food and beverage sector. This confirms that quick, friendly, and consistent service delivery is a major contributor to positive customer perceptions.

Brand Image

Brand image is defined as a consumer's perception of a brand based on their direct or indirect experiences (Keller, 2020). A strong brand image is a key differentiator in highly competitive markets, especially in industries where physical product differences are minimal, such as coffee shops. Keller (2020) explains that brand image comprises various associations held in consumers' minds, including strength**,** uniqueness**,** and advantage**.** For Treat Coffee and Beans, brand image can be shaped through distinctive coffee taste, a visually appealing environment, and an engaging presence on social media platforms. A positive brand image builds psychological trust and emotional connection, encouraging repeat purchases and customer advocacy. Syaifullah and Mira (2018) demonstrated that brand image significantly influences customer satisfaction and plays a role in developing loyalty, particularly in small and medium-sized businesses.

Customer Satisfaction

Customer satisfaction is the emotional response resulting from an evaluation of a product or service experience (Kotler & Keller, 2016). Satisfaction occurs when customers perceive that their expectations are met or exceeded. In the coffee shop context, customer satisfaction is influenced not only by the product itself but also by the quality of service, ambiance, and brand perception. According to the disconfirmation theory, satisfaction arises when the actual experience exceeds customer expectations. Therefore, consistent and empathetic service delivery, combined with a compelling brand experience, can enhance customer satisfaction and increase the likelihood of loyalty. Empirical research suggests that customer satisfaction often serves as a mediating variable between service quality and brand image with customer loyalty (Tjiptono, 2018; Fiqihta et al., 2020). In other words, even when service quality and brand image are strong, they must also result in customer satisfaction to have a meaningful impact on long-term loyalty.

Theoretical Implications

This review emphasizes the interconnectedness between service quality, brand image, and customer satisfaction. Service quality forms the foundation of positive experiences, while brand image shapes customers' expectations and perceived value. Together, these constructs significantly influence how customers evaluate their overall satisfaction with a brand or service.

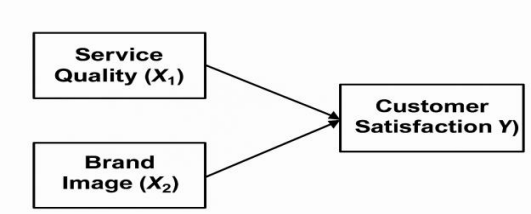

Fig. 1. Theoretical implications

2. Methodology

This study employed a quantitative research approach with an associative design, aiming to investigate the relationship and influence of two independent variables service quality and brand image on the dependent variable, customer satisfaction. This approach was chosen to objectively describe the relationships among variables based on numerical data collected from respondents.

Population and Sample

The population in this study consisted of all customers of Treat Coffee and Beans in Medan City, estimated at approximately 150 individuals based on the average number of monthly visits. The sample size was determined using Slovin's formula with a 10% margin of error, resulting in a sample of 60 respondents. Sampling was conducted using random sampling techniques among customers who were willing to complete the questionnaire on-site at the coffee shop.

Research Instrument

Data were collected through the distribution of a structured questionnaire using a 5-point Likert scale, ranging from "strongly disagree" (1) to "strongly agree" (5). The questionnaire was divided into three main sections:

Service Quality (X_1): Measured using five dimensions adapted from Parasuraman et al. (1988): tangibility, reliability, responsiveness, assurance, and empathy.

Brand Image (X_2): Measured based on customer perceptions regarding brand strength, uniqueness, and competitive advantage (Keller, 2020).
Customer Satisfaction (Y): Measured through indicators related to satisfaction with product, price, emotional experience, and service convenience.

Validity and Reliability Testing

Prior to the main analysis, the questionnaire was tested for both validity and reliability. Validity testing was performed using Pearson Product-Moment correlation, and reliability testing used Cronbach's Alpha. The results indicated that all items were valid (r-count > r-table) and reliable ($\alpha > 0.60$).

Data Analysis Techniques

Data analysis was conducted using SPSS version 26 and involved the following stages:
a. Classical Assumption Tests**,** including normality, multicollinearity, and heteroscedasticity tests.
b. Multiple Linear Regression Analysis to examine the influence of the independent variables (X_1 and X_2) on the dependent variable (Y).
c. Partial Significance Test (t-test) to assess the individual effect of each independent variable.
d. Simultaneous Significance Test (F-test) to evaluate the combined influence of the independent variables on customer satisfaction.
e. Coefficient of Determination (R^2) to determine the proportion of variance in customer satisfaction explained by service quality and brand image.

3. Results and Discussion

Descriptive Statistics

The respondents in this study were composed of 60 customers of Treat Coffee and Beans, representing various demographic characteristics. Descriptive analysis showed that most respondents rated service quality and brand image positively, indicating a generally favorable perception of the coffee shop's offerings and experience.

Validity and Reliability Results

All questionnaire items passed the validity test, with correlation coefficients exceeding the critical value of r-table ($n = 60$, $\alpha = 0.05$). The reliability test results showed that Cronbach's Alpha for each variable exceeded 0.70, indicating high internal consistency and reliability of the instrument.

Regression Analysis Results

The multiple linear regression analysis produced the following equation:

$$Y = 2.545 + 0.343X_1 + 0.390X_2 \quad (1)$$

Where:
Y = Customer Satisfaction
X = Service Quality
X_2 = Brand Image

This equation suggests that for every one-unit increase in service quality, customer satisfaction increases by 0.343 units, and for every one-unit increase in brand image, customer satisfaction increases by 0.390 units.

Partial Significance Test (t-test)

a. Service Quality (X_1): The t-value was 2.654 with a significance level of 0.010 (< 0.05), indicating a significant effect on customer satisfaction.
b. Brand Image (X_2): The t-value was 3.278 with a significance level of 0.002 (< 0.05), also indicating a significant effect on customer satisfaction.

These results confirm that both service quality and brand image have a statistically significant influence on customer satisfaction when tested individually.

Simultaneous Significance Test (F-test)

The F-test value was 60.341 with a significance level of 0.000 (< 0.05), indicating that both independent variables collectively have a significant influence on customer satisfaction.

Coefficient of Determination (R^2)

The coefficient of determination (R^2) was 0.682, which means that 68.2% of the variation in customer satisfaction can be explained by service quality and brand image, while the remaining 31.8% is influenced by other variables not included in this model, such as pricing strategy, physical environment, or product innovation.

The results show that both service quality and brand image significantly affect customer satisfaction. The t-test results indicate that each independent variable (X1 and X2) has a significant positive influence on the dependent variable (Y), with p-values less than 0.05. The F-test confirms that the model is statistically significant, with both independent variables collectively explaining 68.2% of the variance in customer satisfaction (R^2 = 0.682). These findings are consistent with previous studies (Syaifullah & Mira, 2018; Fiqihta et al., 2020), emphasizing that quality service and strong brand image contribute to improved customer perceptions and loyalty. Tangible aspects such as cleanliness and responsiveness proved crucial in forming positive service experiences, while brand familiarity and credibility played important roles in shaping customer expectations and emotional connections.

4. Conclusion

This study empirically examined the influence of service quality and brand image on customer satisfaction at Treat Coffee and Beans in Medan. The results of the multiple linear regression analysis confirmed that both independent variables—service quality and brand image—significantly and positively affect customer satisfaction, both individually and simultaneously. The findings highlight that consistent, responsive, and empathetic service delivery, along with a strong and credible brand image, are essential elements in achieving high levels of customer satisfaction. With a coefficient of determination (R^2) of 68.2%, the study demonstrates that these two factors account for a substantial portion of the variance in satisfaction levels among customers. These insights have several practical implications. Management should prioritize training service personnel, developing service standards, and strengthening the shop's brand identity, both online and offline. By doing so, Treat Coffee and Beans can enhance the overall customer experience, increase satisfaction, and foster long-term customer loyalty. Future studies are encouraged to incorporate additional variables such as price fairness, product quality, and customer loyalty to build a more comprehensive understanding of customer behavior in the coffee shop industry. This study concludes that service quality and brand image significantly influence customer satisfaction at Treat Coffee and Beans. Improvements

in service delivery—such as speed, courtesy, and consistency—along with brand reinforcement through digital media and strategic marketing, are recommended to enhance customer experiences. Future research may explore other variables such as pricing strategies, product innovation, or customer loyalty programs to provide a more comprehensive view. The results of this study provide strong empirical evidence supporting the theoretical link between service quality, brand image, and customer satisfaction. Both variables—service quality (X_1) and brand image (X_2)—were shown to have a significant and positive influence on customer satisfaction (Y), both individually and collectively.

Service Quality and Customer Satisfaction

The statistical results demonstrate that service quality significantly contributes to customer satisfaction. This is consistent with the SERVQUAL model (Parasuraman et al., 1988), which posits that customers evaluate services based on their perceptions across several key dimensions: tangibles, reliability, responsiveness, assurance, and empathy. In the case of Treat Coffee and Beans, responsiveness and empathy were found to be especially important, as customers often seek not just fast service but also personalized and friendly interactions. This finding aligns with Fiqihta et al. (2020), who found that fast and consistent service delivery plays a key role in enhancing customer perceptions in food and beverage businesses. Inconsistent or inattentive service, on the other hand, can negatively affect satisfaction, even when product quality is high. Thus, improving internal service standards, regular staff training, and establishing clear service procedures are necessary steps to enhance the overall customer experience.

Brand Image and Customer Satisfaction

Brand image also emerged as a significant predictor of satisfaction. This reinforces Keller's (2020) theory, which describes brand image as the sum of consumer perceptions based on past experiences, emotions, and brand associations. A strong and favorable brand image fosters emotional attachment, trust, and pride in the consumption experience—especially in industries where differentiation is subtle, such as coffee. In the context of Treat Coffee and Beans, brand image can be influenced not only by visual aesthetics and logo design but also by digital presence, storytelling, and alignment with customer values (e.g., supporting local farmers, sustainable packaging). A weak or inconsistent brand presentation may diminish the perceived value of the product, regardless of its intrinsic quality. These findings are in line with Syaifullah and Mira (2018), who found that a positive brand image directly impacts satisfaction and indirectly fosters customer loyalty. Therefore, strengthening digital branding efforts and curating a unique brand story could significantly elevate customer satisfaction levels.

Integrated Effect

The regression model showed that both service quality and brand image together explain 68.2% of the variance in customer satisfaction. This is a relatively high explanatory power in behavioral research, indicating that these two variables are highly influential in shaping customer responses. However, it also suggests that other factors—such as pricing, product innovation, ambiance, and personal preferences—may account for the remaining 31.8%. This opens an opportunity for future research to explore additional variables that influence satisfaction, such as customer engagement, loyalty programs, or customer personality traits.

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PENERIMAAN TEKNOLOGI DRON DI KALANGAN PELAJAR DIPLOMA GEOMATIK DI POLITEKNIK

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Abstrak

Teknologi dron semakin mendapat tempat dalam bidang geomatik sebagai alat pengumpulan data topografi yang efisien dan kos yang efektif. Kajian ini dijalankan bagi tujuan untuk mengenalpasti tahap pengetahuan pelajar program Diploma Geomatik (DGU) terhadap penggunaan teknologi dron di Politeknik Tuanku Sultanah Bahiyah (PTSB). Responden kajian ini terdiri daripada 52 orang pelajar DGU PTSB, terdiri daripada pelajar semester 1 hingga semester 4 DGU Sesi II:2024/2025 telah menjawab soal selidik yang merangkumi tahap pengetahuan pelajar, tahap pendedahan pelajar dan minat pelajar terhadap pembelajaran dron. Data-data yang diperolehi di analisis menggunakan perisian IBM SPSS Statistics 20. Hasil kajian menunjukkan, purata tahap pengetahuan memperoleh min 4.05 dan sisihan piawai 1.001 mencerminkan tahap pengetahuan yang tinggi dengan variasi yang tinggi, pendedahan pelajar terhadap penggunaan dron menunjukkan purata min 3.75 dengan sisihan piawai 1.281 menandakan pendedahan tinggi dengan variasi yang sangat tinggi, manakala hasil minat terhadap penggunaan dron sangat tinggi dengan purata min 4.36, dengan sisihan piawai 0.869. Dapatan kajian ini menunjukkan bahawa pelajar DGU di PTSB mempunyai tahap pengetahuan, pendedahan, dan minat yang positif terhadap penggunaan teknologi dron dalam bidang geomatik, justeru penambaikan dari aspek struktur program DGU perlu diberi penekanan terhadap teknologi dron oleh pihak pembangunan kurikulum politeknik. Selari dengan usaha ini, kemudahan peralatan dron di Makmal Geomatik PTSB perlu ditingkatkan dari semasa ke semasa.
Kata kunci: Dron; Soalan Soal selidik; Minat.

1. Pengenalan

Politeknik merupakan salah satu institusi utama TVET negara yang berperanan menyediakan pelajar berkemahiran dalam bidang teknikal dan teknologi sejajar dengan keperluan industri semasa. Revolusi Industri 4.0 (IR4.0) telah membawa perubahan ketara dalam pelbagai sektor termasuk bidang pendidikan (Hamzah, 2024) dan pengurusan serta analisis data geospatial (Yusoff et al., 2021).

Dalam era ini, bidang geomatik juga tidak terkecuali menerima impak perlaksanaan IR4.0 dari segi teknikal dan pembangunan sistem seperti aplikasi Projek SmartKAdaster, Aplikasi teknologi *Geographical Information System* (GIS) untuk pandemik COVID-19, *Light Detection and Ranging* (LiDAR) dan *Unmanned Aircraft System* (UAS). Terdapat dua badan professional yang menguruskan dan mengelola data geomatik iaitu Jabatan Ukur dan Pemetaan Malaysia (JUPEM) dan Lembaga Jurukur Tanah (LJT). JUPEM adalah salah satu agensi kerajaan di bawah Kementerian Tenaga dan Sumber Asli (KeTSA) manakala LJT merupakan sebuah badan yang ditubuhkan pada 1 Mei 1958 di bawah Akta Juruukur Tanah Berlesen 1958 yang berperanan untuk mengawalselia juruukur-juruukur tanah berlesen dan urusan-urusan berkaitan di Malaysia (Abidin, 2020).

DGU merupakan salah satu program yang menawarkan kursus berkaitan dengan geomatik di bawah Kementerian Penddikan Tinggi, Jabatan Pengajian Politeknik dan Kolej Komuniti

(KPT, JPPKK). Program ini menawarkan kursus berkaitan dengan Ukur Kadaster, Pengiraan Ukur, Ukur Kejuruteraan, Ukur Hidrografi, Pemetaan Utiliti, Geodesi, Astronomi, Pelarasan Ukur, CADD, Sistem Maklumat Geografi (GIS), Fotogrametri, Remote Sensing, Kartografi, Undang-undang Tanah, Pengurusandan Pembangunan Tanah (Portal Pengambilan Pelajar Politeknik Dan Kolej Komuniti, 2025). Kursus-kursus yang ditawarkan ini memerlukan kepada pengumpulan data topografi samada berskala kecil atau berskala besar. Bagi mencapai hasrat keperluan pembangunan negara dan kelebihan penggunaan dron, kebanyakkan syarikat-syarikat ukur telah mengambil inisiatif menggunakan dron untuk pengumpulan data spatial yang lebih pantas, tepat dan selamat. Selain itu, kelebihan penggunaan dron dalam kerja-kerja pemetaan dapat mengurangkan masa operasi, meningkatkan keselamatan pekerja di lapangan, dan mampu meliputi kawasan yang luas dengan resolusi data yang tinggi.

Oleh yang demikian, sebagai institusi utama TVET, pelajar DGU di politeknik khususnya perlu diberi pendedahan yang mencukupi terhadap teknologi dron bagi memastikan pelajar kompeten, relevan dan bersedia menyumbang kepada pembangunan negara yang berasaskan teknologi tinggi. Kajian oleh (Phang et al., 2021) menunjukkan bahawa integrasi teknologi dron dalam kurikulum kejuruteraan dan teknikal masih belum menyeluruh dan tidak semua pelajar diwajibkan untuk mempelajari teknologi ini, sekali gus mengurangkan keberkesanan penguasaan teknologi ini dalam kalangan pelajar TVET.Kesan ini akan mewujudkan jurang antara pengetahuan pelajar dengan kehendak industri. Selain itu, tahap kesediaan politeknik dari segi penyediaan kemudahan dron yang lengkap dan menyeluruh kepada semua politeknik yang menawarkan program DGU (Omar et al., 2022). Perbezaan kemudahan peralatan dron yang disediakan di antara politeknik menyebabkan tahap kemahiran graduan tidak selaras dengan politeknik yang menawarkan program yang sama.

Oleh itu, bagi memenuhi kehendak pasaran tenaga kerja negara dan pelajar politeknik sebagai penyumbang utama tenaga kerja teknikal, kajian ini berkenaan dengan penerimaan teknologi dron dalam kalangan pelajar Diploma Geomatik adalah sangat relevan dan wajar diberi perhatian.

2. Metodologi

Kajian ini menggunakan pendekatan kuantitatif deskriptif berbentuk tinjauan (*survey*) bagi menilai penerimaan pelajar DGU terhadap penggunaan teknologi dron di PTSB. Reka bentuk ini memberikan gambaran tentang keadaan semasa dan tahap penerimaan pelajar. Kaedah kaji selidik melibatkan proses pemilihan sampel daripada sebilangan populasi untuk dijadikan responden dalam kajian. Saiz populasi akan menentukan jumlah sampel yang diperlukan berdasarkan jadual Krijie and Morgan (Krijie & Morgan 1970). Sampel kajian yang digunakan di dalam kajian seramai yang terdiri daripada pelajar Program Diploma Geomatik dari semester 1 hingga semester 4 bagi sesi II:2024/2025. Borang soal selidik yang digunakan di dalam kajian ini melibatkan 4 bahagian utama iaitu Bahagian A melibatkan maklumat Demografi, Bahagian B melibatkan Tahap Pengetahuan Pelajar Terhadap Teknologi Dron, Bahagian C melibatkan Tahap Pendedahan Terhadap Penggunaan Dron dan Bahagian D melibatkan Kesediaan Pelajar Terhadap Penggunaan Teknologi Dron. Soalan ini menggunakan skala likert 5 mata yang terdiri daripada skala 1 sangat tidak setuju hingga skala 5 sangat setuju.

Sebelum soalan ini digunakan, satu ujian pra ujian (*Pilot Test*) telah dijalankan terhadap 20 orang responden bagi menguji kebolehpercayaan instrumen. Nilai *Cronbach Alpha* yang dicatatkan adalah 0.917. Manakala statistik kebolehpercayaan mengikut pembolehubah item yang diuji adalah seperti di dalam Jadual 1:

Jadual 1. Statistik kebolehpercayaan

Bil	Item	Nilai Cronbach Alpha
1	Tahap Pengetahuan Pelajar Terhadap Teknologi Dron	0.794
2	Tahap Pendedahan Terhadap Penggunaan Dron	0.869
3	Minat dan Kesediaan Pelajar	0.942

Berdasarkan kepada Jadual 1, semua soalan yang diuji mencapai *Cronbach Alpha* di antara 0.70-0.89 menunjukkan indicator yang tinggi dan nilai melebihi 0.90 menunjukkan indicator yang sangat tinggi (Yaakob et al., 2021). Ini menunjukkan kebolehpercayaan bagi instrumen yang diuji bagi sesuatu kajian.

Bagi memudahkan pengumpulan data, pengedaran soal selidik secara dalam talian iaitu kaedah *Google Form* yang dikongsi secara bersemuka kepada semua responden yang terlibat di dalam kelas. Responden diberi masa yang mencukupi untuk menjawab soal selidik. Data yang diperolehi ini dianalisis menggunakan perisian *SPSS Statistics 20* untuk mendapatkan Statistik Deskriptif untuk min, peratus dan kekerapan bagi mengenalpasti tahap pengetahuan responden. Manakala untuk item tahap pengetahuan, tahap pendedahan, minat dan kesediaan pelajar dianalisis menggunakan min dan sisihan piawai. Bagi interpretasi skor min seperti di Jadual 2 manakala interpretasi sisihan piawai seperti di Jadual 3.

Jadual 2. Tahap Interpretasi Skor Min (Yaakob et al., 2021)

Skor min	Interpretasi
1.00 – 2.33	Rendah
2.34 – 3.67	Sederhana
3.68 – 5.00	Tinggi

Jadual 3. Tahap Interpretasi Sisihan Piawai (Yaakob et al., 2021)

Skor min	Interpretasi
0.00-0.25	Sangat rendah
0.26-0.50	Rendah
0.51-0.75	Sederhana
0.76-1.00	Tinggi
>1.01	Sangat tinggi

3. Dapatan dan Perbincangan

Bahagian ini membincangkan berkaitan dengan analisis hasil dapatan soal selidik berdasarkan objektif kajian yang dipersembahkan dalam bentuk jadual dan penerangan ringkas.

Bahagian A: Profil Responden (Demografi)

Maklumat demografi dianalisis menggunakan analisis deskriptif yang melibatkan kekerapan dan peratusan. Maklumat responden yang dianalisis menggunakan data kelas, jantina dan maklumat responden berkaitan dengan kursus dron seperti Jadual 4.

Jadual 4. Taburan Kekerapan dan Peratusan Responden (N=52)

Demografi	Kekerapan (N)	Peratusan (%)
Jantina		
Lelaki	35	67
Perempuan	17	33
Kelas		
Semester 2	28	54
Semester 4	24	46
Bilangan pernah berkursus dron		
Ya	21	40
Tidak	31	60

Jadual 4 menunjukkan taburan demografi responden seramai 52 orang pelajar yang terdiri daripada 35 (67%) orang pelajar lelaki dan 17 (33%) orang pelajar Perempuan. Seramai 28 orang responden (54%) merupakan pelajar Semester 2, manakala 24 orang responden (46%) terdiri daripada pelajar Semester 4. Hanya 21 orang responden (40%) pernah menghadiri kursus dron, manakala majoriti iaitu 31 orang (60%) tidak pernah mengikuti sebarang kursus dron. Ini memberi gambaran bahawa terdapat keperluan bagi pendedahan lebih meluas terhadap teknologi dron dalam kalangan pelajar.

Bahagian B: Tahap Pengetahuan Pelajar Terhadap Teknologi Dron

Bahagian ini menjawab kepada objektif 1 kajian iaitu ‘mengenal pasti tahap pengetahuan pelajar DGU terhadap teknologi dan komponen asas dron’.

Jadual 5. Analisis Tahap Pengetahuan Pelajar Terhadap Teknologi Dron

Bil	Item	Min	Sisihan Piawai	Interpretasi
1	Saya tahu bahawa dron mempunyai pelbagai jenis dan fungsi.	4.50	0.642	tinggi, sederhana
2	Saya faham tentang komponen asas sesebuah dron (contoh: motor, GPS, kawalan jauh).	3.87	1.121	Tinggi, sangat tinggi
3	Saya tahu cara asas mengendalikan dron	3.67	1.279	Sederhana,sangat tinggi
4	Saya mengetahui aplikasi dron dalam bidang kejuruteraan.	3.85	1.195	Tinggi, sangat tinggi
5	Saya tahu bahawa dron digunakan dalam bidang seperti pemetaan, pemantauan dan pemeriksaan struktur.	4.37	0.768	Tinggi,tinggi
	Purata	4.05	1.001	Tinggi, sangat tinggi

Jadual 5 menunjukkan nilai min dan sisihan piawai bagi lima item soal selidik berkaitan tahap pengetahuan pelajar kejuruteraan terhadap penggunaan dron. Berdasarkan hasil analisis ini menunjukkan Item 1 iaitu berkaitan nilai yang konsistensi yang baik di kalangan responden iaitu nilai min 4.50 dan sisihan piawai 0.642 dan diikuti dengan Item 5 dengan nilai min 4.37 dan sisihan piawai dengan nilai 0.768. Manakala nilai variasi yang sangat tinggi iaitu Item 3

berkaitan pengetahuan pelajar berkenaan dengan cara mengendalikan dron dengan nilai min 3.67 dan sisihan piawai 1.279. Terdapat 2 Item seterusnya yang menunjukkan jurang perbezaan yang tinggi dan sangat tinggi iaitu Item 2 dengan nilai min 3.87 dan sisihan piawai dengan nilai 1.121 dan Item 4 dengan nilai min 3.85 dan sisihan piawai 1.195.
Pengetahuan pelajar terhadap teknologi dron di PTSB berada pada tahap yang memberangsangkan terutama dalam aspek fungsi umum dan aplikasi teknikal seperti pemetaan. Namun begitu, terdapat jurang dalam aspek pengetahuan aplikasi kejuruteraan dan kemahiran praktikal yang memerlukan penambahbaikan untuk menggalakan pelajar untuk mengikuti kursus-kursus dron di lapangan yang dianjurkan oleh institusi atau pihak luar.
Bahagian C: Tahap Pendedahan terhadap Penggunaan Dron
Bahagian C menerangkan analisa berkenaan dengan objektif 'Menilai tahap pendedahan pelajar terhadap penggunaan dron dalam bidang kejuruteraan'.Terdapat 5 item yang dianalisis bagi menilai tahap pendedahan pelajar terhadap penggunaan dron seperti di Jadual 6.

Jadual 6. Analisis Tahap Pendedahan Terhadap Penggunaan Dron

Bil	Item	Min	Sisihan Piawai	Interpretasi
1	Saya pernah melihat demonstrasi penggunaan dron dalam pengajian atau bengkel	3.67	1.368	Sederhana, Sangat Tinggi
2	Saya pernah mengendalikan dron dalam aktiviti akademik atau kokurikulum	3.13	1.597	Sederhana, Sangat Tinggi
3	Pensyarah saya pernah menerangkan tentang penggunaan dron dalam bidang kejuruteraan	4.04	1.137	Tinggi, Sangat Tinggi
4	Saya tahu terdapat subjek atau modul yang melibatkan penggunaan dron	4.04	1.066	Tinggi, Sangat Tinggi
5	Saya mengetahui projek atau kajian pelajar lain yang menggunakan dron	3.87	1.237	Tinggi, Sangat Tinggi
	Purata	3.75	1.281	Tinggi, Sangat Tinggi

Merujuk kepada Jadual 6, analisis terhadap tahap pendedahan pelajar terhadap teknologi dron menunjukkan bahawa terdapat beberapa item yang memperoleh nilai min yang tinggi, iaitu dalam julat 3.68 hingga 5.00. Item 3, mencatatkan nilai min sebanyak 4.04, Item 4 mencatatkan min 4.04 dan Item 5, memperoleh nilai min 3.87.

Walau bagaimanapun, terdapat dua item yang mencatatkan nilai min pada tahap sederhana iaitu Item 1, memperoleh nilai min sebanyak 3.67, manakala Item 2 mencatatkan nilai min yang lebih rendah iaitu 3.13. Dapatan ini menunjukkan bahawa sebahagian besar pelajar DGU di PTSB belum pernah menyaksikan demonstrasi dron secara langsung, dan ramai juga yang belum mempunyai pengalaman secara praktikal dalam mengendalikan dron.

Namun begitu, pelajar menunjukkan kesedaran terhadap penggunaan dron dalam bidang geomatik melalui penerangan yang disampaikan oleh pensyarah semasa sesi pengajaran. Malah, pelajar turut menyedari kewujudan projek atau kajian yang melibatkan dron yang dijalankan oleh rakan pelajar lain di PTSB.

Pendedahan ini bagaimanapun terhad kepada pelajar yang aktif menyertai sesi kuliah secara konsisten atau yang mengikuti kursus asas pengendalian dron yang dianjurkan oleh institusi. Hal ini disokong oleh nilai sisihan piawai bagi kesemua item (Item 1 hingga item 5) yang melebihi nilai 1.00, sekali gus menunjukkan adanya variasi yang tinggi dalam kalangan responden. Keadaan ini menggambarkan bahawa tidak semua pelajar mempunyai peluang yang sama untuk terlibat dalam program berkaitan dron, dan tahap pendedahan yang diperoleh adalah berdasarkan inisiatif individu.

Oleh itu, terdapat ketidakseragaman dalam tahap pendedahan terhadap teknologi dron dalam kalangan pelajar DGU. Bagi mengurangkan nilai sisihan piawai ini beberapa cadangan perlu dikemaskini iaitu dengan memasukkan elemen *hand-on* di dalam silibus yang berkaitan dengan pemetaan seperti fotogrametri bagi membolehkan semua pelajar mempelajari dan memahami teknologi ini sebelum melangkah ke alam pekerjaan. Dengan kelebihan yang mampu menghasilkan resolusi hasil yang berkualiti dengan kos yang murah (Rabiu & Ahmad, 2023) menyebabkan semua sektor mengaplikasi dan kewajipan perlu kepada pelajar untuk mempelajari teknologi ini.

Bahagian D: Minat dan Kesediaan Pelajar

Bahagian D menerangkan berkenaan dengan minat dan kesediaan pelajar DGU semester 2 dan semester 4 terhadap teknologi dron. Bahagian ini menjawab objektif ketiga berkaitan dengan menganalisis minat dan kesediaan pelajar untuk mempelajari penggunaan dron dalam pengajian mereka.

Jadual 7: Analisis Minat dan Kesediaan Pelajar Terhadap Penggunaan Dron

Bil	Item	Min	Sisihan Piawai	Interpretasi
1	Saya berminat untuk mempelajari cara mengendalikan dron.	4.35	.905	Tinggi, tinggi
2	Saya ingin mengetahui lebih lanjut tentang aplikasi dron dalam bidang kejuruteraan saya.	4.35	.905	Tinggi, tinggi
3	Saya bersedia untuk menyertai kursus tambahan berkaitan dron	4.21	.957	Tinggi, tinggi
4	Saya rasa teknologi dron perlu diperkenalkan dalam pengajian teknikal secara lebih menyeluruh.	4.42	.750	Tinggi, sederhana
5	Saya percaya kemahiran menggunakan dron akan memberi kelebihan dalam kerjaya kejuruteraan saya.	4.48	.828	Tinggi, tinggi
	Purata	4.36	0.869	Tinggi, tinggi

Data seperti di jadual 7 menunjukkan secara keseluruhan item yang diuji di bahagian ini menunjukkan nilai min yang sangat tinggi (antara 4.58 hingga 4.67). Nilai ini menunjukkan bahawa pelajar DGU, PTSB mempunyai minat dan kesediaan yang sangat tinggi terhadap pembelajaran dan penglibatan dalam teknologi dron. Manakala sisihan piawai untuk keseluruhan item memperoleh nilai kurang daripada 1.00 dimana pelajar mempunyai pandangan hampir yang sama semasa menjawab soalan soal selidik ini. Manakala item 4 mempunyai nilai konsisten tinggi dengan memperoleh nilai 0.750. Ini menunjukkan hampir semua pelajar menyokong supaya penggunaan dron diperkenalkan dalam pengajian secara menyeluruh. Hal ini memberi isyarat bahawa terdapat kesediaan tinggi untuk penerimaan kurikulum berasaskan teknologi dron sekiranya ia diperkenalkan secara formal.

4. Kesimpulan

Kajian menunjukkan sebahagian pelajar DGU mempunyai tahap pengetahuan yang baik terhadap teknologi dron dan sebahagian lagi menunjukkan tahap pengetahuan yang rendah berkenaan dengan dron. Hal ini berlaku disebabkan terdapat beberapa kekangan dari segi pendedahan praktikal dan pengalaman mengendalikan dron. Melalui hasil analisis minat dan kesediaan pelajar, menunjukkan pelajar minat untuk mendalami ilmu penggunaan dron secara lebih meluas di politeknik. Oleh yang demikian, Bahagian Kurikulum JPPKK perlu mempertimbangan topik berkaitan dengan dron dalam kursus yang berkaitan bagi memenuhi kehendak industri dengan mewajibkan setiap pelajar mengikuti kursus asas pengendalian dron sebelum menjalani latihan industri. Selain itu bagi memberi peluang kepada pelajar untuk

meningkatkan kemahiran penggunaan dron, pelajar perlu diberi lebih banyak pendedahan melalui kajian projek, pertandingan, kolaborasi dengan industri atau khidmat masyarakat sehingga menghasilkan output dron untuk dikongsi dengan orang awam. Kaedah kolaborasi dan khidmat Masyarakat ini dapat membantu institusi mempromosi program DGU dengan pihak luar.

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MENINGKATKAN PENGUASAAN ISO DALAM KALANGAN PELAJAR MELALUI PENDEKATAN PEMBELAJARAN BERPUSAT PELAJAR

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Abstrak

Penguasaan pelajar terhadap penggunaan kamera DSLR, khususnya dalam aspek ISO yang mengawal tahap kepekaan sensor terhadap cahaya, merupakan asas penting dalam membentuk kemahiran teknikal dalam bidang fotografi. Kajian ini bertujuan menilai tahap pemahaman, minat, dan penguasaan pelajar terhadap penggunaan ISO. Kefahaman terhadap fungsi ISO dapat membantu pelajar membuat keputusan teknikal dengan lebih yakin serta meningkatkan kualiti imej melalui kawalan pencahayaan yang lebih optimum. Kajian ini melibatkan seramai 18 orang pelajar Semester Satu, Sesi II 2024/2025, Diploma Teknologi Digital Produksi Video di Politeknik METrO Tasek Gelugor yang mengikuti kursus DVA10143 Creative Photography. Pendekatan kuantitatif digunakan melalui pengedaran borang soal selidik pasca pengajaran. Data dianalisis menggunakan skor purata setiap item dengan bantuan perisian Microsoft Excel. Dapatan kajian menunjukkan bahawa pelajar berjaya memahami konsep dan fungsi ISO, serta dapat mengaplikasikannya secara berkesan dalam situasi sebenar. Secara keseluruhan, kajian ini membuktikan bahawa pendekatan pembelajaran berpusatkan pelajar berkesan dalam meningkatkan penguasaan pelajar terhadap penggunaan ISO dalam fotografi.
Kata kunci: Fotografi; ISO; Berpusatkan Pelajar.

1. Pengenalan

Istilah fotografi berasal daripada perkataan *Greek* iaitu 'photo-' yang bermaksud cahaya dan ‘graphia' yang merujuk kepada proses melakar atau menulis. Oleh itu, fotografi secara literal bermakna "menulis atau melukis dengan cahaya" (Sir John Herschel, 1839). Gambar dalam fotografi berperanan sebagai bentuk komunikasi bukan lisan yang menyampaikan maklumat melalui visual. Ia menjadi medium ekspresi peribadi seorang jurugambar terhadap apa yang dilihat dan dirasainya. Berdasarkan pengertian ini, fotografi bukan sekadar rakaman visual, tetapi juga saluran mesej kepada masyarakat yang melihat foto tersebut (Diaz, 2012).

Fotografi asas tidak bergantung kepada jenis kamera yang digunakan sama ada mahal atau murah, profesional atau amatur. Apa yang penting ialah pemahaman tentang cahaya, struktur kamera, dan elemen penting seperti kanta, pengatup, bahan sensitif cahaya dan ISO. Penguasaan pelajar terhadap penggunaan kamera DSLR khususnya dalam aspek ISO, iaitu tahap kepekaan sensor terhadap cahaya, merupakan elemen asas yang penting bagi membolehkan mereka menguasai teknik fotografi dengan lebih berkesan. DSLR. ISO adalah salah satu kawalan yang penting pada kamera terutamanya dalam situasi seperti mengambil gambar di tempat yang kurang pencahayaan seperti majlis malam, konsert, atau dalam bangunan yang malap. Dalam keadaan sebegini, pelajar perlu memahami bagaimana menetapkan ISO dengan betul untuk memastikan subjek kekal jelas tanpa menghasilkan noise yang keterlaluan dalam imej. ISO merupakan asas penting dalam penghasilan imej

berkualiti dan ISO juga adalah salah satu komponen utama dalam segitiga pendedahan, berfungsi untuk menentukan seberapa sensitif sensor kamera terhadap cahaya yang masuk. Pemahaman pelajar terhadap konsep ini mempengaruhi keupayaan mereka menghasilkan gambar yang baik terutamanya dalam keadaan pencahayaan rendah. Justeru itu, pendekatan latihan praktikal dan eksperimen ISO dalam pelbagai suasana nyata dilihat mampu memantapkan penguasaan teknikal pelajar.

ISO biasanya ditunjukkan dalam bentuk nombor seperti 100, 200, 400, 800 dan seterusnya. Semakin tinggi nilai ISO, semakin tinggi sensitiviti terhadap cahaya, tetapi ianya juga turut meningkatkan kemungkinan kemunculan *noise* dalam imej. ISO meningkatkan sensitiviti *sensor* kamera terhadap cahaya, seumpama bagaimana mata manusia menyesuaikan diri dalam keadaan gelap untuk membolehkan penglihatan yang lebih jelas. Prinsip ini selari dengan konsep segitiga pendedahan dalam fotografi yang mengimbangi antara ISO, *apertur* dan *shutter speed* (Peterson, 2010).

Berdasarkan pemerhatian awal pengkaji terhadap pelajar semester satu, didapati bahawa majoriti pelajar masih belum mempunyai kemahiran ketika menggunakan kamera DSLR. Hanya sebilangan kecil yang menunjukkan kecekapan asas, kebanyakannya adalah pelajar yang pernah mengambil subjek fotografi atau aktif dalam kelab fotografi semasa di sekolah. Maka, kajian ini dijalankan bagi melihat dan memahami tahap minat serta pengetahuan asas pelajar terhadap ISO, serta menilai tahap penguasaan mereka dalam menggunakan kamera DSLR dari aspek kawalan ISO melalui pendekatan pembelajaran berpusatkan pelajar.

Tujuan kajian ini adalah untuk menilai keberkesanan pembelajaran berpusatkan pelajar dalam mengukuhkan penguasaan mereka terhadap ISO dalam penggunaan kamera DSLR, khususnya dari aspek kepekaan sensor cahaya. Bagi mencapai tujuan tersebut, objektif kajian ini dirumuskan seperti berikut iaitu menilai tahap minat pelajar terhadap fungsi ISO dalam fotografi, mengenal pasti tahap pengetahuan asas pelajar berkaitan ISO serta mengenal pasti tahap penguasaan teknik iso dalam kalangan pelajar selepas sesi pembelajaran berpusatkan pelajar

Kajian ini terdiri daripada 18 orang responden pelajar Diploma Teknologi Kreatif Digital Produksi Video yang mengambil kursus DVA10143 *Creative Photography* semester satu bagi sesi II 2024/2025 di Politeknik METrO Tasek Gelugor, Pulau Pinang. Kajian ini bertujuan meneliti sejauh mana pelajar menguasai kemahiran yang berkaitan dalam konteks penggunaan kamera DSLR dari aspek ISO sahaja. Komponen lain seperti Kelajuan Pengatup dan *Apertur* tidak diambil kira. Teknik pembelajaran adalah berdasarkan pembelajaran berpusatkan pelajar.

2. Metodologi Kajian

Seperti yang dijelaskan oleh Hornby (1985), metodologi ialah himpunan pendekatan atau teknik yang diaplikasikan bagi melaksanakan kajian terhadap sesuatu topik. Justeru, kajian ini menggunakan instrumen soal selidik bagi mengumpul data berkaitan topik yang dikaji. Menurut David Lim et al. (2010), soal selidik merujuk kepada satu set soalan bercetak yang bertujuan memperoleh data secara langsung daripada responden melalui pelaporan kendiri. Pemilihan instrumen ini dianggap sesuai kerana format soal selidik mudah difahami oleh pelajar dan boleh dilaksanakan dengan lancar semasa sesi pengajaran dan pembelajaran. Selain itu, pengkaji juga berpeluang mengedarkan borang secara terus kepada responden sambil menerangkan objektif kajian, sekali gus memastikan maklum balas yang diperoleh lebih tepat dan jujur. Mengikut pandangan De Vaus (2013), memberi borang soal selidik secara langsung membolehkan pelajar lebih jelas tentang tujuan kajian, dan mengurangkan kekeliruan responden.

Instrumen soal selidik dalam kajian ini terdiri daripada dua bahagian utama. Bahagian pertama merangkumi maklumat asas responden seperti jantina, bangsa, umur dan jabatan pengajian. Bahagian kedua pula memfokuskan kepada tiga elemen utama iaitu minat pelajar terhadap fotografi, tahap pengetahuan asas mereka, serta tahap pencapaian dalam penguasaan ISO selepas mengikuti sesi pembelajaran berasaskan pelajar. Soal selidik ini menggunakan skala Likert lima mata, daripada 'sangat tidak setuju' hingga 'sangat setuju', bagi membolehkan pelajar memberikan respons secara sistematik berdasarkan kefahaman masing-masing.

Sebanyak 18 orang pelajar semester satu kursus DVA10143 Creative Photography di Politeknik METrO Tasek Gelugor telah dipilih secara rawak sebagai responden kajian ini. Dapatan daripada soal selidik ini merupakan data kuantitatif yang digunakan untuk tujuan analisis kajian.Data kuantitatif diperoleh daripada responden melalui item soal selidik yang menggunakan pilihan aneka jawapan dan skala Likert. Analisis data dilaksanakan secara deskriptif dengan bantuan Microsoft Excel, merangkumi kiraan min dan nilai peratusan. Menurut Mohd Majid (1990), statistik deskriptif merupakan organisasi dan ringkasan data yang diperolehi daripada pemerosesan data. Operasinya boleh dalam bentuk jadual, ilustrasi dalam bentuk rajah atau graf tentang data atau maklumat. Manakala interprestasi skor min bagi kajian ini menggunakan sumber dari Dr.Jamil Ahmad (2002). Pemupukan budaya penyelidikan di kalangan guru sekolah. Satu penilaian tesis Pemeringkatan skala skor min seperti dalam Jadual 2.1 di bawah.

Jadual 2.1. Skala Skor Min dan Interpretasi

Skor Min	Interpretasi Skor Min	
1.00 hingga 2.33	Rendah	(Kurang setuju/kurang membantu/kurang mahir/kurang memenuhi/ tidak pasti/kadang-kadang/tiada/sebahagian kecil)
2.34 hingga 3.66	Sederhana	(Setuju/membantu/mahir/memenuhi/separuh)
3.67 hingga 5	Tinggi	(Sangat setuju/sangat membantu/sangat mahir/sangat memenuhi/sangat selalu/semua/sebahagian besar)

Item yang menggunakan respon aneka pilihan jawapan adalah bagi bahagian maklumat latarbelakang responden, manakala item respon skala likert dengan menjalankan pentaksiran dua bentuk instrumen ini kepada kumpulan yang mengambil bahagian dalam kajian ini. Berikut adalah yang menunjukkan dapatan dari kajian ini selaras dengan objektif kajian yang digariskan.

Jadual 2.2. Taburan Respon Terhadap Objektif Kajian di Dalam Instrumen Kajian

Instrumen Kajian		Objektif Kajian		
Soal Selidik		1	2	3
Bahagian A : Maklumat Diri Responden				
Bahagian B	Item 1 : Mengenal pasti tahap minat pelajar terhadap fotografi	✓		
	Item 2 : Mengenal pasti tahap pengetahuan asas pelajar		✓	
	Item 3 : Mengenal pasti tahap pencapaian pelajar dalam penguasaan ISO selepas melalui pembelajaran berpusatkan pelajar			✓

Jadual 2.2 di atas menunjukkan bahagian item pentaksiran yang terdapat di dalam instrumen kajian iaitu soal selidik yang digunakan bagi mengukur respon dari sempel selaras dengan objektif kajian yang ditetapkan pada awalnya. Taburan bahagian item pentaksiran ini, dapat merumuskan bahawa ia meliputi kesemua sasaran yang digariskan dalam objektif kajian serta menjawab soalan kajian.

3. Dapatan dan Perbincangan

Berdasarkan data yang dipaparkan dalam Jadual 3.1, dapat disimpulkan bahawa sebahagian besar pelajar menunjukkan minat yang tinggi terhadap fotografi. Hal ini dibuktikan melalui tahap persetujuan yang tinggi dalam setiap item yang berkaitan dengan minat dan penglibatan mereka dalam kelas fotografi.

Jadual 3.1. Mengenal pasti tahap minat pelajar terhadap fotografi

Item	Nilai skor (min)	Petunjuk purata skor
Saya sentiasa fokus dan memberi perhatian penuh semasa sesi pdp fotografi berlangsung.	4.7222	Tinggi
Saya hadir ke kelas fotografi mengikut jadual.	4.8888	Tinggi
Saya sedia membantu rakan dalam aktiviti fotografi.	4.7222	Tinggi
Saya aktif dalam setiap aktiviti dalam kelas fotografi.	4.5	Tinggi
Total	4.72	Tinggi

Jadual 3.2 berikut menunjukkan analisis nilai min bagi item-item berkaitan pengetahuan asas pelajar terhadap ISO. Secara keseluruhan, purata skor min berada dalam julat tinggi (3.67–5.00) sebagaimana ditakrifkan oleh skala interpretasi Dr. Jamil Ahmad (2002). Item “Saya memahami fungsi asas butang pada kamera DSLR” mencatat skor tertinggi iaitu 4.6666, menunjukkan bahawa majoriti pelajar memiliki pemahaman asas yang kukuh berkaitan kawalan teknikal pada kamera. Penemuan ini mengesahkan bahawa pendekatan pembelajaran berpusatkan pelajar telah membantu meningkatkan pengetahuan asas pelajar terhadap ISO dalam konteks fotografi.

Jadual 3.2. Tahap Pengetahuan Asas Pelajar Berkaitan ISO

Item	Nilai skor (min)	Petunjuk purata skor
Saya memahami fungsi asas butang pada kamera DSLR.	4.6666	Tinggi
Saya mengenali dan memahami fungsi setiap butang utama pada kamera DSLR.	4.3333	Tinggi
Saya pernah menyertai kelab fotografi semasa di sekolah.	2.3333	Rendah
Saya mengetahui mengenai ISO dan kesannya terhadap noise dalam gambar	4.2777	Tinggi
Saya faham bahawa fotografi melibatkan penggunaan cahaya sebagai elemen utama dalam penghasilan imej.	4.4444	Tinggi
Saya sering menjalankan aktiviti fotografi di luar waktu pembelajaran formal.	4.1666	Tinggi
Total	4.04	Tinggi

Berdasarkan data dalam Jadual 3.3, dapat disimpulkan bahawa tahap penguasaan pelajar terhadap ISO selepas mengikuti sesi pembelajaran berpusatkan pelajar adalah tinggi. Sebahagian besar responden menunjukkan keyakinan dalam mengendalikan mod manual serta memahami tahap ISO yang sesuai bagi mengelakkan *noise* dalam imej. Hasil ini menunjukkan bahawa latihan praktikal yang dijalankan secara konsisten dalam sesi PdP membantu pelajar meningkatkan keupayaan teknikal mereka dalam aspek kepekaan *sensor* terhadap cahaya (ISO).

Jadual 3.3. Tahap Penguasaan Pelajar Terhadap ISO Selepas Mengikuti Pembelajaran Berpusatkan pelajar

Item	Nilai skor (min)	Petunjuk purata skor
Saya membuat latihan ISO secara praktikal selepas kelas.	4.0555	Tinggi
Saya tahu menggunakan tetapan ISO yang sesuai dalam situasi pencahayaan rendah	4.2777	Tinggi
Saya faham perbezaan noise antara ISO rendah dan tinggi.	4.3333	Tinggi

Saya tahu memilih ISO yang sesuai berdasarkan keadaan cahaya.	4.2352	Tinggi
Saya yakin menggunakan mod manual selepas belajar tentang ISO.	4.4444	Tinggi
Total	4.27	Tinggi

4. Kesimpulan

Dapatan daripada soal selidik menunjukkan bahawa kaedah pembelajaran berasaskan pelajar berkesan dalam memperkukuh pemahaman mereka terhadap aspek teknikal seperti ISO dalam bidang fotografi. Melalui aktiviti latihan praktikal, pelajar lebih mudah memahami kesan perubahan tetapan ISO terhadap kualiti imej. Kemahiran ini bukan sekadar meningkatkan kecekapan teknikal, bahkan menyumbang kepada penghasilan imej yang lebih berkualiti dan profesional. Oleh itu, kajian ini mencadangkan agar pendekatan pembelajaran berpusatkan pelajar diteruskan dalam kursus yang melibatkan pengendalian kamera secara manual. Untuk kajian akan datang, disarankan agar teknologi seperti video berasaskan AI digunakan sebagai alat bantu mengajar bagi memperkukuh pemahaman dan meningkatkan minat pelajar.

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KESAN KURSUS ASAS FOTOGRAFI MENGGUNAKAN TELEFON PINTAR TERHADAP PENGUASAAN KEMAHIRAN TVET DALAM KALANGAN PELAJAR TAHFIZ

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Abstrak

Kesan kursus asas fotografi menggunakan telefon pintar terhadap penguasaan kemahiran TVET dalam kalangan pelajar tahfiz merupakan asas penting dalam menilai tahap penguasaan pelajar terhadap kemahiran asas fotografi selepas mengikuti kursus, menilai aspek pelaksanaan kursus dari sudut pengajaran, kandungan dan kesesuaian latihan dengan keperluan pembelajaran pelajar tahfiz, serta menilai sejauh mana kursus ini berkesan dalam meningkatkan keyakinan dan minat pelajar terhadap bidang fotografi sebagai satu potensi kerjaya atau peluang keusahawanan dalam konteks pendidikan TVET. Kajian ini melibatkan 20 0rang pelajar pondok/ tahfiz, dari Madrasah Al Aminiah, Maahad Tahfiz Al Falah dan Maahad Tahfiz Al-Quran Darus Syatibiah, Pulau Pinang. Pendekatan kuantitatif digunakan melalui pengedaran borang soal selidik pasca pengajaran. Data dianalisis menggunakan skor purata setiap item dengan bantuan perisian Microsoft Excel. Dapatan kajian menunjukkan peningkatan kefahaman terhadap asas fotografi dan keyakinan dalam penggunaan peralatan seperti mini studio, lampu dan telefon pintar. Kajian ini mencadangkan bahawa kursus fotografi boleh dijadikan sebahagian daripada strategi pendidikan teknikal untuk golongan pelajar tahfiz yang mempunyai Kemahiran usahawan serta mempunyai Kemahiran dalam bidang TVET dan berkeyakinan tinggi.
Kata kunci: Fotografi; TVET; Tahfiz.

1. Pengenalan

Dalam era digital masa kini, kemahiran dalam bidang fotografi bukan sahaja menjadi satu aset tambahan, tetapi juga membuka peluang keusahawanan kepada pelajar dari pelbagai latar belakang. Namun begitu, pelajar tahfiz sering kali kurang didedahkan kepada pendekatan berbentuk teknologi dan TVET yang mampu memperkukuh potensi mereka. Kajian ini dilaksanakan bagi mengkaji kesan kursus asas fotografi menggunakan telefon pintar terhadap penguasaan kemahiran TVET dalam kalangan pelajar tahfiz. Pendekatan ini turut disokong oleh Kukulska-Hulme (2009), yang menyatakan bahawa teknologi mudah alih berupaya memperkukuh pembelajaran aktif dan membina motivasi dalam kalangan pelajar.

Dalam era pendidikan inklusif, keperluan untuk merapatkan jurang antara aliran agama dan teknikal semakin mendesak (Hashim & Embong, 2017). Pelajar tahfiz, yang lazimnya terlibat dalam pendidikan berbentuk hafazan dan keagamaan, kini menunjukkan minat untuk menyertai bidang kemahiran berasaskan TVET (Technical and Vocational Education and Training) (UNESCO-UNEVOC, 2012). Salah satu bidang yang dilihat berpotensi untuk diterapkan kepada pelajar tahfiz ialah fotografi satu kemahiran yang menggabungkan aspek teknikal, kreativiti dan penghasilan visual (Bonwell & Eison, 1991).

Kursus fotografi telah diperkenalkan sebagai sebahagian daripada inisiatif memberi pendedahan kemahiran baharu kepada pelajar tahfiz. Ia dilaksanakan dalam bentuk latihan intensif merangkumi asas pengendalian kamera *digital single lens reflex* (DSLR), teknik pencahayaan, komposisi imej dan penyuntingan digital (Litchfield,2009). Kajian ini bertujuan untuk menilai sejauh mana kursus ini dapat membantu pelajar tahfiz menguasai kemahiran fotografi dan bagaimana mereka menanggapi bidang ini sebagai satu bentuk pembangunan kerjaya masa depan. Maka, kajian ini dijalankan bagi bertujuan untuk menilai tahap penguasaan pelajar terhadap kemahiran asas fotografi selepas mengikuti kursus, menilai aspek pelaksanaan kursus dari sudut pengajaran, kandungan dan kesesuaian latihan dengan keperluan pembelajaran pelajar tahfiz, serta menilai sejauh mana kursus ini berkesan dalam meningkatkan keyakinan dan minat pelajar terhadap bidang fotografi sebagai satu potensi kerjaya atau peluang keusahawanan dalam konteks pendidikan TVET.

Menurut Litchfield (2009), penggunaan teknologi mudah alih seperti telefon pintar dapat meningkatkan interaktiviti dan keberkesanan pembelajaran kendiri. Kajian oleh Bonwell dan Eison (1991) pula menyokong pembelajaran aktif sebagai pendekatan terbaik untuk pelajar memahami konsep teknikal melalui pengalaman hands-on. Dalam konteks pendidikan Islam, pembelajaran berasaskan nilai (values-based learning) yang menyepadukan elemen spiritual dan kemahiran praktikal adalah penting bagi melahirkan pelajar yang holistik.

Objektif kajian ini adalah untuk menilai keberkesanan kursus Asas Fotografi Menggunakan Telefon Pintar terhadap penguasaan kemahiran visual dalam kalangan pelajar tahfiz. Secara khususnya, kajian ini bertujuan untuk menilai tahap penguasaan pelajar terhadap kemahiran asas fotografi selepas mengikuti kursus, menilai aspek pelaksanaan kursus dari sudut pengajaran, kandungan dan kesesuaian latihan dengan keperluan pembelajaran pelajar tahfiz, serta menilai sejauh mana kursus ini berkesan dalam meningkatkan keyakinan dan minat pelajar terhadap bidang fotografi sebagai satu potensi kerjaya atau peluang keusahawanan dalam konteks pendidikan TVET.

Kajian ini melibatkan seramai 20 orang peserta daripada kalangan pelajar pondok dan tahfiz yang mengikuti kursus asas fotografi menggunakan telefon pintar sebagai induksi multimedia dalam Program TVET-Tahfiz di Politeknik Metro Tasek Gelugor (PMTG). Skop kajian memfokuskan kepada penilaian tahap penguasaan pelajar terhadap kemahiran asas menghasilkan imej berkualiti menggunakan kamera telefon pintar, khususnya dari aspek komposisi visual dan pencahayaan asas.
Kajian ini tidak merangkumi penggunaan kamera profesional atau kawalan teknikal lanjutan, sebaliknya menumpukan kepada keberkesanan pendekatan pembelajaran berasaskan hands-on dalam membantu pelajar memahami teknik asas fotografi menggunakan peranti mudah alih. Fokus utama adalah kepada keberkesanan latihan dalam membina kemahiran visual yang sesuai untuk aplikasi dalam konteks pendidikan TVET, serta potensi penggunaannya dalam bidang keusahawanan kreatif.

2. Metodologi

Kajian ini menggunakan pendekatan kuantitatif yang bertujuan untuk menilai impak kursus asas fotografi menggunakan telefon pintar terhadap penguasaan kemahiran pelajar tahfiz. Kaedah ini merangkumi pengumpulan data melalui soal selidik berskala Likert dan dianalisis menggunakan statistik deskriptif bagi mendapatkan gambaran menyeluruh (Fraenkel, Wallen & Hyun, 2012).

2.1 Instrumen Kajian

Instrumen soal selidik dalam kajian ini terdiri daripada dua bahagian utama. Bahagian pertama merangkumi maklumat asas responden seperti jantina, bangsa, umur dan jabatan pengajian. Bahagian kedua pula memfokuskan kepada tiga elemen utama iaitu menilai tahap

penguasaan pelajar terhadap kemahiran asas fotografi selepas mengikuti kursus, menilai aspek pelaksanaan kursus dari sudut pengajaran, kandungan dan kesesuaian latihan dengan keperluan pembelajaran pelajar tahfiz, serta menilai sejauh mana kursus ini berkesan dalam meningkatkan keyakinan dan minat pelajar terhadap bidang fotografi sebagai satu potensi kerjaya atau peluang keusahawanan dalam konteks pendidikan TVET.

Soal selidik ini menggunakan skala likert lima mata, daripada 'sangat tidak setuju' hingga 'sangat setuju', bagi membolehkan pelajar memberikan respon secara sistematik berdasarkan kefahaman masing-masing. Sebanyak 20 orang peserta daripada kalangan pelajar pondok dan tahfiz telah dipilih secara rawak sebagai responden kajian ini. Dapatan daripada soal selidik ini merupakan data kuantitatif yang digunakan untuk tujuan analisis kajian.data kuantitatif diperoleh daripada responden melalui item soal selidik yang menggunakan pilihan aneka jawapan dan skala Likert. Analisis data dilaksanakan secara deskriptif dengan bantuan Microsoft Excel, merangkumi kiraan min dan nilai peratusan.

Jadual 1 menunjukkan skala Likert dan skor yang digunakan dalam instrumen kajian. Pada Bahagian B instrumen yang disediakan, sampel kajian akan disuruh untuk menandakan pilihan bagi setiap soalan yang dikemukakan menggunakan skala Likert. Skala Likert yang digunakan mempunyai lima skor iaitu skor 1 hingga 5. Menurut Fraenkel et al. (2012), skor 5 pada Bahagian B bermaksud sangat setuju dan skor 1 adalah sangat tidak setuju. Manakala interprestasi skor min bagi kajian ini menggunakan sumber dari Dr. Jamil Ahmad (2002). Pemupukan budaya penyelidikan di kalangan guru sekolah. Satu penilaian tesis. Pemeringkatan skala skor min seperti jadual dalam Jadual 2 di bawah.

Jadual 1. Skala Likert dan Skor (Sumber: Fraenkel et al., 2012)

Skala Likert	Skor
Sangat Setuju	5
Setuju	4
Tidak Pasti	3
Tidak Setuju	2
Sangat Tidak Setuju	1

Jadual 2. Skala Skor Min dan Interpretasi (Sumber: Dr. Jamil Ahmad (2002)

Skor Min	Interpretasi Skor Min	
1.00 hingga 2.33	Rendah	(Kurang setuju/kurang membantu/kurang mahir/kurang memenuhi/ tidak pasti/kadang-kadang/tiada/sebahagian kecil)
2.34 hingga 3.66	Sederhana	(Setuju/membantu/mahir/memenuhi/separuh)
3.67 hingga 5	Tinggi	(Sangat setuju/sangat membantu/sangat mahir/sangat memenuhi/sangat selalu/semua/sebahagian besar)

3. Hasil dan Perbincangan

1.1 Menilai tahap penguasaan Kemahiran visual pelajar tahfiz selepas kursus

Berdasarkan data yang dipaparkan dalam Jadual 3, Dapatan menunjukkan bahawa tahap penguasaan kemahiran visual pelajar tahfiz selepas mengikuti kursus fotografi adalah tinggi. Skor min tertinggi (4.85) direkodkan pada item berkaitan pemahaman teknik asas fotografi, diikuti kemahiran mengambil gambar menggunakan telefon pintar (4.75). Skor purata keseluruhan adalah 4.53, menunjukkan bahawa kursus ini berjaya meningkatkan pengetahuan dan kemahiran asas fotografi pelajar, selaras dengan keperluan pendidikan TVET.

Jadual 3. Menilai tahap penguasaan Kemahiran visual pelajar tahfiz selepas kursus

Item	Nilai skor (min)	Petunjuk purata skor
Saya lebih memahami teknik asas fotografi selepas mengikuti kursus ini.	4.85	Tinggi

Saya lebih mahir mengambil gambar yang berkualiti menggunakan telefon pintar.	4.75	Tinggi
Saya dapat menggunakan aplikasi penyuntingan dengan lebih yakin.	4.5000	Tinggi
Saya tahu cara menghasilkan imej yang sesuai untuk konteks pembelajaran.	4.0	Tinggi
Total	4.53	Tinggi

Jadual 4 menunjukkan bahawa pelaksanaan kursus dinilai sangat positif oleh pelajar, dengan skor purata keseluruhan mencapai 4.83. Item berkaitan struktur kursus, kesesuaian kandungan, keberkesanan latihan, dan bimbingan tenaga pengajar semuanya memperoleh skor min melebihi 4.7. Ini menunjukkan bahawa kursus ini bukan sahaja terancang dan mudah difahami, tetapi juga berjaya menyampaikan kandungan secara efektif, sejajar dengan objektif pembelajaran.

Jadual 4. Pelaksanaan kursus dinilai sangat positif oleh pelajar

Item	Nilai skor (min)	Petunjuk purata skor
Kursus ini dijalankan secara teratur dan sistematik.	4.85	Tinggi
Kandungan kursus mudah difahami dan sesuai dengan tahap saya.	4.9	Tinggi
Latihan dan aktiviti yang dijalankan membantu saya memahami topik dengan lebih baik.	4.72	Tinggi
Tenaga pengajar memberikan bimbingan yang jelas dan mudah difahami.	4.85	Tinggi
Total	4.83	Tinggi

Dapatan dalam Jadual 5 menunjukkan bahawa kursus ini berkesan dalam meningkatkan pengetahuan, keyakinan dan minat peserta terhadap fotografi menggunakan telefon pintar. Skor purata keseluruhan ialah 4.60, dengan item tertinggi mencatat 4.95 bagi pendedahan baharu yang berguna. Ini membuktikan bahawa kursus memberi impak positif bukan sahaja terhadap kefahaman, tetapi juga terhadap motivasi dan potensi keusahawanan pelajar tahfiz dalam bidang visual kreatif.

Jadual 5. Menilai sejauh mana kursus ini berkesan dalam meningkatkan keyakinan dan minat pelajar terhadap bidang fotografi

Item	Nilai Skor (Min)	Petunjuk Purata Skor
Kursus ini membantu saya memahami asas fotografi menggunakan telefon pintar.	4.75	Tinggi
Kursus ini memberi pendedahan baharu yang berguna untuk kegunaan masa hadapan.	4.95	Tinggi
Saya lebih yakin mengambil gambar selepas mengikuti kursus ini.	4.0	Tinggi
Kursus ini memberi impak positif terhadap minat saya terhadap fotografi.	4.7	Tinggi
Total	4.60	Tinggi

4. Kesimpulan

Kajian ini membuktikan bahawa kursus asas fotografi menggunakan telefon pintar dan pendekatan TVET telah memberikan impak positif yang signifikan terhadap penguasaan kemahiran teknikal dan visual pelajar tahfiz. Melalui kaedah kuantitatif, dapatan menunjukkan peningkatan skor min dalam aspek kefahaman, kemahiran dan keyakinan pelajar terhadap fotografi asas, selari dengan pandangan Litchfield (2009) yang menekankan kepentingan penguasaan fotografi dalam era digital moden. Program ini bukan sahaja memperkukuh penguasaan pelajar terhadap teknik fotografi, malah meningkatkan minat dan keyakinan

mereka untuk meneroka bidang visual kreatif sebagai potensi kerjaya masa hadapan, selaras dengan aspirasi pendidikan TVET (Kementerian Pendidikan Malaysia, 2020). Pendekatan *hands-on* dan penggunaan teknologi mudah alih menjadikan pembelajaran lebih praktikal, relevan dan mesra pelajar, terutamanya dalam konteks institusi tahfiz yang sebelum ini kurang mendapat pendedahan terhadap latihan teknikal moden. Pelaksanaan kursus ini juga menunjukkan bahawa pelajar tahfiz mempunyai keupayaan tinggi untuk menguasai kemahiran teknikal apabila diberi pendekatan pembelajaran yang sesuai, seiring dengan prinsip pembelajaran aktif seperti yang diketengahkan oleh Bonwell dan Eison (1991). Selain memberi kesan terhadap kemahiran teknikal, kursus ini turut membuka ruang ke arah pembangunan potensi keusahawanan dalam kalangan pelajar tahfiz. Ini seiring dengan saranan Zainuddin dan Halim (2021) berkenaan integrasi pendidikan Islam dan kemahiran vokasional. Oleh itu, kajian ini mencadangkan agar kursus seumpama ini diperluas ke lebih banyak institusi tahfiz dan pondok dengan sokongan fasiliti, modul *micro credential*, platform latihan dalam talian dan program *mentoring* bersama jurufoto profesional.

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THE INFLUENCE OF INBOUND OPERATIONAL MANAGEMENT AND DELIVERY EFFECTIVENESS ON EMPLOYEE PRODUCTIVITY PT. JNE EXPRESS MEDAN BRANCH

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Abstract

This study sought to ascertain the impact of inbound operational management and delivery on worker productivity at the Medan branch of PT. JNE Express. A total of 90 people were inbound to the study, and 90 people were sampled using saturated sampling. The dependent variable in this study was employee productivity, while independent variables were inbound operational management and delivery effectiveness. A questionnaire with a Likert scale of 1–5 was used as the data collection method. Multiple linear regression tests were used in the data analysis process. The t-test (partial) and F-test (simultaneous) were implemented in this study for hypothesis testing, and SPSS26 was used for data processing. The findings demonstrated that inbound operational management and delivery effectiveness were able to account for the variances in employee productivity at PT. JNE Express Medan Branch, with a coefficient determination of 0.731, or 73.1%. Other factors not included in this study accounted for the remaining 26.9% of the variation, and inbound operational management and delivery effectiveness both had a positive and significant impact on employee productivity.
Keywords: Inbound Operational Management; Delivery Effectiveness; Employee Productivity.

1. Introduction

In the era of e-commerce, which has grown rapidly since 2020, the demand for fast and accurate logistics services has increased. PT. JNE Express, as one of the logistics sectors in Indonesia, faces operational challenges inbound (receiving, sorting, and allocating packages) and delivery effectiveness (on-time delivery and route accuracy). Inefficient inbound management often results in bottlenecks in the warehouse, while ineffective delivery reduces customer trust and affects courier productivity.

Employee productivity, particularly among warehouse staff and field couriers, plays an important role in maintaining the company's overall performance. Productivity is not only about the number of packages processed, but also the quality of service in the form of accuracy, security, and customer satisfaction. This highlights the urgency to further evaluate how operational and delivery management can improve employee productivity at PT. JNE.

The variables of inbound operational management and delivery effectiveness were chosen because both are crucial elements in today's logistics value chain. Effective inbound ensures minimal package waiting times and reduces errors. Effective delivery supported by ERP systems and real-time tracking affects the speed and agility of response to customers. The combination of these two variables can directly impact employee productivity ranging from the quality and quantity of work to motivation and customer satisfaction. There has been no research that comprehensively tests these two variables on productivity in the JNE environment, so this study has the potential to make a significant contribution to the science of operational management and HR in the logistics sector.

Initial survey results at several JNE warehouses in Medan showed a fairly wide disparity in package processing times between shifts. Some units reported that sorting times could be very fast, but in other shifts there were long queues of packages due to the inbound system not being fully automated, indicating suboptimal operational management.

On the delivery side, the courier team noted problems such as re-delivery due to incorrect addresses, as well as inefficient routes that take a lot of time. This shows that even though the technology infrastructure is starting to be used, namely package tracking, it is not enough to drive consistent productivity if delivery management is not evaluated as a whole.

2. Methodology

This research was conducted at PT JNE Express Medan between May and June 2024. The data collection methods included company documentation review, questionnaires distributed to respondents, direct observations at hotels, and literature review through journals, theses, and books. The study population consisted of 90 inbound employees, and a saturated sampling technique was applied, resulting in 90 respondents determined using the Slovin formula. Data were analyzed using quantitative descriptive methods and multiple linear regression.

3. Results and Discussion

Validity Test

Validity test is used to see the accuracy of the instrument used in the study. The instrument is said to be valid if r count ≥ 0.207. The validity results of each research variable instrument are as follows:

Table 4.1 Validity of the Inbound Operational Management Variable Instrument (X1)

Instrument	Validity Value		Description
	rhitung	Rtable	
Inbound Operational Management 1	0.594	0.207	valid
Inbound Operational Management 2	0.606		valid
Inbound Operational Management 3	0.789		valid
Inbound Operational Management 4	0.596		valid
Inbound Operational Management 5	0.514		valid
Inbound Operational Management 6	0.785		valid
Inbound Operational Management 7	0.723		valid
Inbound Operational Management 8	0.814		valid

Based on Table 4.1, it can be seen that the testing of each inbound operational management variable instrument has an r count ≥ 0.207, thus it can be concluded that all statement instruments of the inbound operational management variable used are valid.

Table 4.2 Validity of the Delivery Effectiveness Variable Instrument (X2)

Instrument	Validity Value		Description
	rhitung	Rtable	
Delivery Effectiveness 1	0.691	0.207	valid
Delivery Effectiveness 2	0.712		valid
Delivery Effectiveness 3	0.748		valid
Delivery Effectiveness 4	0.747		valid
Delivery Effectiveness 5	0.762		valid

Delivery Effectiveness 6	0.833	valid
Delivery Effectiveness 7	0.606	valid
Delivery Effectiveness 8	0.716	valid
Delivery Effectiveness 9	0.800	valid

Based on Table 4.2, it can be seen that the testing of each instrument of the delivery effectiveness variable has an r count ≥ 0.207, thus it can be concluded that all statement instruments of the delivery effectiveness variable used are valid.

Table 4.3. Validity of the Employee Productivity Variable Instrument (Y)

Instrument	Validity Value rhitung	Rtable	Description
Employee Productivity 1	0.684	0.207	valid
Employee Productivity 2	0.850		valid
Employee Productivity 3	0.767		valid
Employee Productivity 4	0.707		valid
Employee Productivity 5	0.631		valid
Employee Productivity 6	0.803		valid
Employee Productivity 7	0.812		valid
Employee Productivity 8	0.748		valid

From Table 4.3, it can be seen that the testing of each instrument of the employee productivity variable (Y) has an r count ≥ 0.207, it can be concluded that all instruments of the employee productivity variable used are valid.

Reliability Test

To make sure the instrument is dependable, consistent, and stable when used repeatedly at various times, reliability testing is done. If the Cronbach alpha value is ≥ 0.60, the instrument is considered reliable. The reliability test's findings are as follows:

Table 4.4. Reliability Results

No	Variables	Cronbach's Alpha	Decision
1	Inbound Operational Management(X1)	0.821	Reliable
2	Delivery Effectiveness(X2)	0.888	Reliable
3	Employee Productivity(Y)	0.875	Reliable

The results of the reliability test show that the Cronbach's alpha value of all variables is greater than 0.60, so it can be concluded that the questionnaire in this study is declared reliable.

Partial Test (T-Test)

To ascertain each independent variable's partial influence on the dependent variable, a partial test is performed. By comparing the Sig. t value with the alpha value of 0.05 and the t count with the t table, one can perform a partial test using t-test statistics. The following is the foundation for decision-making.

Table 4.5. Partial Test Results Coefficients[a]

Model		Unstandardized	Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	4.964	1.7		2.92	0.004
	Manajemen Operasional Inbound	0.38	0.074	0.389	5.15	0
	Efektifitas Delivery	0.43	0.06	0.543	7.192	0

a. Dependent Variable: Productivitas Karyawan

With a mark count of 5.150 ≥ t-table 1.987 and a significant value of 0.000 ≤ alpha 0.05 (5%) for the inbound operational management variable, H0 is accepted and H1 is rejected, indicating that employee productivity is positively and significantly impacted by partially inbound operational management.

With a mark count of 7.192 ≥ t-table 1.987 and a significant value of 0.000 ≤ alpha 0.05 (5%), H0 is rejected and H1 is accepted, indicating that employee productivity is positively and significantly impacted by delivery effectiveness.

Simultaneous Test (F Test)

To ascertain the impact of multiple independent variables on a single dependent variable the foundation for decision making simultaneous testing is performed.

Table 4.6. Simultaneous Test Results (ANOVA[a])

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1411.741	2	705.870	118.471	0.00[b]
	Residual	518.360	87	5.958		
	Total	1930.100	89			

a. Dependent Variable: Productivitas Karyawan
b. Predictors: (Constant), Efektifitas Delivery, Manajemen Operasional Inbound

Based on the table above, it can be seen that the value Fcount 118.471 ≥ from the Ftable value of 3.10 and a significant value of 0.000 ≤ from alpha 0.05. Then H0 is rejected H3 is accepted, thus simultaneously inbound operational management and delivery effectiveness have a positive and significant effect on employee productivity at PT. JNE Express Medan Branch.

Multiple Linear Regression Analysis

This test was conducted to determine the effect of inbound operational management and delivery effectiveness on employee productivity at PT. JNE Express Medan Branch. The following table presents the results of the multiple linear regression for each variable, namely:

Table 4.7. Multiple Linear Regression Results

Model		Unstandardized	Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	4.964	1.7		2.92	0.004
	Manajemen Operasional Inbound	0.38	0.074	0.389	5.15	0
	Efektifitas Delivery	0.43	0.06	0.543	7.192	0

a. Dependent Variable: Productivitas Karyawan

Based on the test results above, the following multiple linear regression equation is obtained:

$$Y= 4.964+0.380X1+0.430X2 \quad (1)$$

If the independent variables of inbound operational management and delivery effectiveness have values of zero, then the dependent variable of employee productivity is 4.964, which is the constant value of employee productivity in the multiple linear regression model. Each independent variable's regression coefficient is positive, indicating that inbound operational management and delivery effectiveness can have an impact on employee productivity at the PT. JNE Express Medan Branch.

Coefficient of Determination

The degree to which the model accounts for the variance of the dependent variable is indicated by the coefficient of determination. It has a value between 0 and 1, with the closer it is to 1, the more the independent variable influences the dependent variable. The table below displays the coefficient of determination (R2) results.

Table 4.8. Determination Coefficient Results (Model Summary[b])

Model	R	R Square	Adjusted R Square	Std. Errorof the Estimate	Durbin-Watson
1	0.855[a]	0.731	0.725	2.441	2.204

a. Predictors: (Constant), Efektifitas Delivery, Manajemen Operasional Inbound
b. Dependent Variable: Productivitas Karyawan

Employee productivity variations at PT. JNE Express Medan Branch can be explained by free inbound operational management and delivery effectiveness, according to the obtained coefficient of determination value of 0.731, or 73.1%. Other variables not included in this study account for the remaining 26.9%.

Partially, both inbound operational management and delivery effectiveness have been proven to have a positive and significant effect on productivity. This means that the better the inbound operational management is implemented, for example in terms of managing incoming goods flow, punctuality, and process efficiency, the higher the employee work productivity will be. Delivery effectiveness which includes speed, delivery accuracy, and minimal delays also improves employee performance and work enthusiasm, because the workload becomes more measurable and organized. Simultaneously, these two variables also have a positive effect on employee productivity. This shows that collaboration between inbound operations and effective final delivery is an important combination in improving work efficiency, punctuality, and internal employee job satisfaction.

This is in line with the research of Putra & Lestari (2021) in a study entitled the influence of logistics management and workload on employee productivity in expedition companies, it was found that systematic inbound logistics management can increase work effectiveness and operational efficiency. These findings support the results of this study, which show that inbound management plays an important role in increasing employee productivity. Similarly, Rahman, F., et al. (2020) in their study titled delivery performance and its impact on operational productivity concluded that the accuracy and speed of delivery greatly affect the company's internal performance, including the productivity of operational staff. This strengthens the finding that delivery effectiveness contributes significantly to productivity. Another study conducted by Sari & Nugroho (2022) titled operational systems and work motivation on employee productivity in supply chain companies, found that the implementation of an effective operational system, especially in the inbound and delivery flow, increases employee motivation and productivity. This aligns with the findings at PT. JNE. Express shows a positive link between operational management and employee work outcomes.

4. Conclusion

The first hypothesis test results indicate that inbound operational management and delivery effectiveness can affect employee productivity at PT. JNE Express Medan Branch, as demonstrated by the coefficient of determination (R2) value of 73.1%, according to the author's data analysis and testing results. The results of the second hypothesis test demonstrate that inbound operational management and delivery effectiveness can have a positive and significant impact on employee productivity at PT. JNE Express Medan Branch. The F-count value of 118.471 ≥ the F-table value of 3.10 and the significant value of 0.000. ≤ from alpha 0.05 and partially the t-value for the inbound operational management variable is 5.150 ≥ t-table 1.987 and the significant value is 0.000≤ from alpha 0.05 (5%).

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THE INFLUENCE OF FINANCIAL LITERACY ON FINANCIAL BEHAVIOR FOR FLPP KPR FINANCING CUSTOMERS AT BANK SUMUT KISARAN SYARIAH BRANCH

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Abstract

The objective of this study is to examine the effect of financial literacy on financial behavior among FLPP mortgage financing customers at Bank Sumut, Kisaran Syariah Sub Branch. This research is important as it provides an overview of customers' level of financial knowledge, which can assist financial institutions in improving service quality and supporting better financial decision-making for customers. The population of this study consists of 284 active FLPP mortgage financing customers at Bank Sumut, Kisaran Syariah Sub Branch from January 2023 to December 2024, with a sample of 74 respondents selected using random sampling. The observed variables in this research include the independent variable, financial literacy, and the dependent variable, financial behavior. This study employs a quantitative research design. Data were collected through questionnaires using a 1–5 Likert scale. The data analysis method applied is simple linear regression, and hypothesis testing was conducted using the partial t-test, while data processing carried out with SPSS version 26. The results of the study show that the coefficient of determination obtained is 0.732 or 73.2%, indicating that financial literacy can explain the variations in financial behavior among FLPP mortgage financing customers at Bank Sumut, Kisaran Syariah Sub Branch, while the remaining 26.8% is explained by other variables not examined in this study. Furthermore, financial literacy has a positive and significant effect on financial behavior ($p < 0.05$). This study highlights the practical implication that enhancing financial literacy through education and customer assistance is essential to enable customers to manage their finances more wisely, thereby minimizing the risk of nonperforming loans and ensuring the sustainability of the subsidized housing finance program.

Keywords: Financial Literacy; Financial Behavior; FLPP Mortgage.

1. Introduction

Home ownership through the Housing Financing Liquidity Facility Home Ownership Credit (KPR FLPP) scheme is one of the government's solutions to support low-income communities in owning decent housing. Bank Sumut Kisaran Syariah Branch, as one of the FLPP KPR financing distributors, plays a role in channeling this financing to the community. However, in its implementation, customers still encounter difficulties in managing their personal finances, particularly in meeting routine installment obligations. This phenomenon opens up opportunities for further research regarding the extent to which financial literacy skills influence customers' financial behavior.

Financial literacy essentially encompasses a person's understanding of basic financial concepts, income management, financial planning, investments, and the ability to make wise economic decisions. Low financial literacy can lead to mismanagement of personal finances and even the potential for credit default (Astuti & Pratiwi, 2021). Therefore, understanding the relationship between financial literacy and financial behavior is crucial to ensuring customers can meet their financial obligations sustainably. Researchers became deeply interested in this topic after conducting initial observations of FLPP mortgage customers at Bank Sumut Kisaran

Syariah Branch. Several customers admitted to not knowing how to properly prepare a household budget, and were even unaware of the long-term consequences of late installment payments. This demonstrates the continued lack of basic financial literacy among FLPP recipients.

This issue becomes even more crucial considering that the FLPP program is a state subsidy aimed at promoting public welfare. Low financial literacy not only harms the individual but also creates social and fiscal burdens. Several previous studies have shown a link between financial literacy and financial behavior. Research by Nugroho and Fitrani (2022) found that the higher a person's financial literacy, the better their behavior in managing personal finances, including paying credit installments. Research by Rahmawati and Sari (2023) found that financial literacy also influences consumption and savings decisions, which directly impact a person's ability to meet financial obligations.

Other research by Hapsari (2020) states that financial behavior is influenced not only by literacy but also by attitudes, experiences, and social environment. However, literacy remains the primary foundation. According to Iskandar and Purwanti (2021), mortgage customers with medium to high levels of literacy are less likely to experience late payments. Recent research by Prasetya and Wulandari (2024) adds that a financial education-based approach can significantly improve people's financial behavior, particularly in the Syariah-compliant housing finance sector.

2. Methodology

This research was conducted at Bank Sumut Kisaran Syariah Branch in June 2024. The information utilized included both original and supplementary data. Original data were gathered directly from conversations, observations, and surveys given to current customers. Supplementary data were sourced from company documentation, literature, and pertinent publications. Data collection methods included document studies from the company, questionnaires to respondents, direct observation at hotels and library research through journals, theses, and books. The study population was 284 active customers, with a sample of 74 respondents drawn using the Slovin formula which was chosen because it provides an efficient way to calculate an appropriate sample size from a finite population with a known margin of error, ensuring the representativeness of the sample while minimizing bias. The research instrument, a structured questionnaire, was tested for validity (to ensure the instrument measures what it is intended to measure) and reliability (to ensure consistency of the responses), and both tests indicated acceptable levels. Data analysis was conducted using quantitative descriptive methods and simple linear regression. The simple linear regression was applied to assess the relationship between financial literacy (independent variable) and financial behavior (dependent variable), to evaluate the strength of the relationship (R^2), the significance of the effect (p-value), and the direction of the influence. Hypothesis testing was conducted using the t-test to determine whether the independent variable significantly influences the dependent variable.

3. Results and Discussion

Validity Test

Validity assessment is performed to evaluate how accurately the tools used in the study measure what they are intended to measure. An instrument is considered valid if r count is ≥ 0.230. The validity results for each research variable are as follows:

Table 3.1. Validity of the Financial Lliteracy Variable Instrument (X)

Instrument	Validity value		Description
	rhitung	Rtable	
X1	0.738	0.23	valid
X2	0.712		valid
X3	0.721		valid
X4	0.709		valid
X5	0.735		valid
X6	0.703		valid
X7	0.748		valid
X8	0.729		valid
X9	0.751		valid
X10	0.718		valid

Based on Table 3.1, it can be seen that the test of each financial literacy variable instrument has an r count of ≥ 0.230, thus it can be concluded that all statement instruments of the financial literacy variable used are valid.

Table 3.2. Validity of the Financial Behavior Variable Instrument (Y)

Instrument	Validity value		Description
	rhitung	Rtable	
Y1	0.749	0.23	valid
Y2	0.721		valid
Y3	0.702		valid
Y4	0.738		valid
Y5	0.714		valid
Y6	0.703		valid
Y7	0.685		valid
Y8	0.701		valid
Y9	0.711		valid
Y10	0.739		valid

Based on Table 3.2, it can be seen that the test of each financial behavior variable instrument has an r count of ≥ 0.230, thus it can be concluded that all statement instruments of the financial behavior variables used are valid.

Reliability Test

Reliability assessment is carried out to verify that the tool used provides consistent, dependable, and stable results when administered multiple times over different periods. An instrument is deemed reliable if the Cronbach's alpha score is greater than or equal to 0.60. The results of the reliability test are as follows:

Table 3.3 Reliability Results

No	Variables	Cronbach's Alpha	Decision
1	Financial Literacy (X)	0.884	Reliable
2	Financial Behavior (Y)	0.891	Reliable

The results of the reliability test show that Cronbach's alpha value for all variables is greater than 0.60, so it can be concluded that the questionnaire in this study is declared reliable.

Partial Test (t-Test)

A partial analysis is carried out to evaluate the individual impact of each independent variable on the dependent variable. This can be done using t-test statistics by comparing the significance t value against an alpha threshold of 0.05, as well as comparing the computed t value with those in the t table; the criteria for decision-making are as follows:

Table 3.4. Partial Test Results (Coefficientsa)

Model		Unstandardized B	Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	9.273	1.228		7.553	0
	Financial Literacy	0.823	0.094	0.855	8.753	0

a. Dependent Variable: Financial Behavior

Mark thitung for the financial literacy variable 8,753 ≥ ttable 1,993 and a significant value of 0.000 ≤ alpha 0.05 (5%), H0 is accepted and H1 is rejected, thus partially financial literacy has a positive and significant effect on financial behavior.

Simple Linear Regression Analysis

This test was conducted to determine the effect of financial literacy on the financial behavior of FLPP mortgage financing customers at Bank Sumut Kisaran Syariah Branch. The following table presents the results of the simple linear regression test for each variable:

Table 3.5. Simple Linear Regression Results (Coefficientsa)

Model		Unstandardized B	Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	9.273	1.228		7.553	0
	Financial Literacy	0.823	0.094	0.855	8.753	0

a. Dependent Variable: Financial Behavior

Based on the test results above, the following simple linear regression equation is obtained:

$$Y= 9.273+0.823X \quad (1)$$

In the simple linear regression model, the constant value of manase is 9.273, meaning that if the value of the independent variable of financial literacy is 0, then the dependent variable of financial behavior is 9.273. The regression coefficient of each independent variable is positive, meaning that the financial behavior of FLPP mortgage financing customers at Bank Sumut Kisaran Syariah Branch can be influenced by financial literacy.

Coefficient of Determination

The determination coefficient indicates how well a model accounts for the variability in the dependent variable (Ghozali, 2018). Its values range from 0 to 1; the nearer the value is to 1, the greater the effect of the independent variable on the dependent variable. The findings from the determination coefficient (R2) are displayed in the table below.

Table 3.6. Results of the Coefficient of determination

Model Summary				
Model	R	R Square	Adjusted R Square	Standard Error of the Estimate
1	0.855a	0.732	0.728	2.105

a. Predictors: (Constant), Financial Literacy
b. Dependent Variable: Financial Behavior

The coefficient of determination value obtained was 0.732 or 73.2%, indicating that financial literacy was able to explain variations in financial behavior among FLPP mortgage financing customers at Bank Sumut Kisaran Syariah Branch, while the remaining 26.8% was explained by other variables not examined in this study.

The results of this study reveal that financial literacy has a positive and significant impact on financial behavior. This indicates that the better a customer's financial understanding, the wiser they will be in managing their income, making investments, and developing long-term financial plans. This aligns with Sujarweni (2021), who argued that financial literacy is the primary foundation for individual economic decision making. Plakalovic (2021) argues that understanding financial instruments and risks can strengthen responsible saving and investment behavior. Therefore, improving financial literacy can be a strategy for financial institutions, particularly Bank Sumut Syariah, to support the sustainability of the FLPP mortgage program.

4. Conclusion

Based on the results of testing and data analysis obtained by the author regarding financial literacy on financial behavior of FLPP mortgage financing customers at Bank Sumut Kisaran Syariah Branch, it can be concluded that the first hypothesis test show that financial literacy is able to influence financial behavior of FLPP mortgage financing customers at Bank Sumut Kisaran Syariah Branch, as evidenced by the coefficient of determination (R2) value obtained of 73.2%. The results of the second hypothesis test show that partially the t-value for the financial literacy variable is 8.753 ≥ t-table 1.993 and the significance value is 0.000.≤ from alpha 0.05 (5%) thus financial literacy has a positive and significant influence on the financial behavior of FLPP mortgage financing customers at Bank Sumut Kisaran Syariah Branch.

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ANALYSIS OF THE EFFECTIVENESS OF THE APPLICATION OF THE SIMPLE ADDITIVE WEIGHTING (SAW) METHOD IN THE SELECTION OF MSME LOCATIONS BASED ON LITERATURE STUDIES

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Abstract

Many MSME players still choose business locations based on intuition rather than data, which can have an impact on visibility and profitability. This study aims to support more rational decision-making by using the Simple Additive Weighting (SAW) method. Conducted in Medan Johor through direct observation of four different business locations, the study evaluated five criteria: accessibility, population density, rental costs, competition, and proximity to public facilities. The analysis results show that the area near the UISU Laboratory ranks highest due to its strategic access, affordable rental costs, and low competition. These findings indicate that the SAW method is a practical tool for SMEs in selecting business locations more effectively and objectively.
Keywords: SMEs, strategic location; SAW method; Decision-making; Medan Johor (Gedung Johor).

1. Introduction

Micro, small, and medium enterprises (MSMEs) play an important role in driving national economic growth, particularly in job creation and strengthening the local economy. However, many MSME players face difficulties in determining the right location for their business. An unstrategic location can hinder business growth and reduce competitiveness. Given the importance of location in the success of MSMEs, a systematic data-driven approach is needed to support the decision-making process.

This study adopts a Decision Support System (DSS) approach using the Simple Additive Weighting (SAW) method, which is known for its ability to simplify the evaluation of alternatives based on several criteria. In this context, the five main criteria considered are rental costs, accessibility, population density, level of competition, and land availability. SAW enables each alternative location to be evaluated objectively by assigning weights to each criterion according to its level of importance. This study was conducted in the Medan Johor area by directly observing ten potential business locations. Each location was evaluated based on the established criteria, and additional insights were gathered through informal interviews and literature reviews. The primary objective was to assess the effectiveness of the SAW method in identifying the optimal location for SME businesses and to assist business owners in making more accurate and measurable decisions.

The results of this study are expected to contribute not only academically but also practically by offering useful references for MSME players who may not be familiar with technical decision-making methods. By combining field observations and quantitative analysis, this approach is believed to produce relevant and applicable recommendations that support sustainable business development.

2. Methodology

2.1 Research Framework
The research used the SAW method, with the following stages:

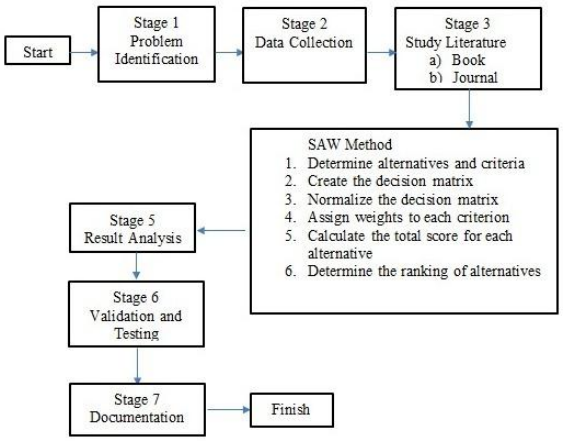

Fig. 1 Research Framework

Figure 2 above explains:
1. Problem Identification
   Identifying and understanding the problem and its limitations so that the research objectives are clear.
2. Data Collection
   Collecting data through observation, interviews, and documentation as a basis for analysis.
3. Literature Study
   Reviewing references to strengthen the theory and identify relevant previous research.
4. SAW Method
   a. Determining criteria and alternatives according to needs
   b. Assigning weights based on importance levels.
   c. Compiling and normalizing the decision matrix.
   d. Calculating the final score from values and weights.
   e. Ranking alternatives based on the highest score
5. Analysis of Result
   Analyzing data to find patterns and decision recommendations
6. Validation and Testing
   Testing the system to ensure the accuracy and suitability of the results.
7. Documentation
   Recording the entire process and results as official reports and development materials.

a. Research Framework
1. Primary Data: Collected from direct field observation and informal interviews with MSME players in Medan Johor.
2. Secondary Data: Derived from previous studies, academic journals, and literature relevant to decision-making and location selection.

2.3 Simple Additive Weighting (SAW)

The Simple Additive Weighting (SAW) method is a simple yet effective decision-making technique, especially when considering multiple criteria in selecting the best alternative. SAW works by summing the values of each alternative multiplied by the weight of each criterion, resulting in an objective and easily calculable outcome. In the context of selecting locations for small and medium-sized enterprises (SMEs), this method helps evaluate various location alternatives based on criteria such as rental costs, accessibility, and market potential. Generally, the SAW process involves: determining the criteria and alternatives, assigning suitability ratings for each alternative across each criterion, creating a decision matrix, and normalizing the data.

2.3.1 Tahapan SAW

The steps in solving problems using the Simple Additive Weighting method are as follows :

1. Determine the criteria that will be used as a reference in decision making
2. Determine the alternatives
3. Determine the suitability rating of each alternative for each criterion
4. Create a decision matrix based on the criteria(C)
5. Normalize the decision matrix based on equations 1 and 2, adjusted to the type of attribut

$$r_{ij} = \begin{cases} \dfrac{X_{ij}}{Max\, x_{ij}} & \text{if the attribute is benefit (1)} \\ \dfrac{Min\, X_{ij}}{X_{ij}} & \text{if the attribute is cost (2)} \end{cases}$$

r_{ij} = Normalized performance rating value
X_{ij} = Attribute value of each criterion
$Max\, x_{ij}$ = Largest value of each criterion
$Min\, x_{ij}$ = Smallest value of each criterion
Benefit = if the largest value is the best
Cost = if the smallest value is the best

Where r_{ij} is the normalized performance rating of alternative Ai on attribute Cj ; i =1,2,3…,m and j=1,2,3…,n.

6. Calculate the preference value (Vi)

The process involves adding the normalized matrix R multiplied by the weight vector to obtain the preference value. The preference value with the highest value is the best alternative.. Equation 3 is used to calculate the preference value:

$$V_i = \sum_{j=1}^{n} W_j r_{ij} \qquad (3)$$

Explanation
V_i = ranking of each alternative
W_j = weight value of each criterion
r_{ij} = normalized performance rating value

3. Results and Discussion

3.1 Alternative Location

Research assesses 10 alternative locations for MSMEs in Medan Johor (Gedung Johor)

Table 3. Alternative locations and general characteristics

Lokasi	Rental Cost	Accessibility	Population Density	Business Competition	Land Availability
Karya Jaya Street	Expensive	Very Easily Accessible (main road, near culinary area)	Very Dense	Too Many Competitors	Very Limited
Karya Wisata Street	Expensive	Very Easily Accessible (two-way access, near main road)	Very Dense	Quite a Lot of Competitors	Quite Available but Limited
Eka Warni Street	Moderate	Easily Accessible (near residential area)	Dense	No Similar Competitors	Very Spacious & Supports Business Activities
Karya Kasih Street	Moderate	Easily Accessible (near schools and housing complexes)	Dense	Very Few Competitors	Available & Adequate for Business
Around JD KOPI & RESTO, Karya Jaya	Quite Expensive	Very Easily Accessible (on the main road)	Very Dense	Quite a Lot of Competitors	Very Limited
Eka Surya Street	Moderate	Very Easily Accessible (near shopping center)	Very Dense	Quite a Lot of Competitors	Available & Adequate for Business
Around Pajak Johor, Karya Wisata	Quite Expensive	Very Easily Accessible (but no parking area)	Dense	Quite a Lot of Competitors	Very Spacious & Supports Business Activities
Karya Darma Street	Cheap	Easily Accessible (busy neighborhood road)	Quite Dense	No Similar Competitors	Very Spacious & Supports Business Activities
Around UISU Laboratory Building	Quite Expensive	Very Easily Accessible (in front of campus)	Dense	No Similar Competitors	Available & Adequate for Business
Office Complex (Johor Riverside)	Expensive	Very Easily Accessible (near main road and shop houses)	Very Dense	No Similar Competitors	Quite Available but Limited

From Table 1 above, it can be seen that all seven studies demonstrate the effectiveness of the SAW method in the context of selecting business locations from various sectors, both products and services. This approach is considered capable of providing objective, measurable results that are in line with the needs of MSME players, making it a method worth considering in strategic decision-making in today's digital and competitive era

3.2 Assessment Criteria

Criteria are important aspects used as the basis for evaluating and comparing various alternative locations for MSMEs. In this study, the criteria were determined based on the results of literature studies and direct observations of field conditions in the Medan Johor area, specifically at the Johor Building. These criteria were selected because they were considered capable of representing the needs of MSME players in choosing a strategic and profitable business location.

Table 4. Criteria, Weighting, and Type

Criteria	Weighting	Type	Priorities	Kodes
Rental Costs	0.30	Benefit	1	C1
Accessibility	0.25	Benefit	2	C2
Population Density	0.20	Benefit	3	C3
Business Competition	0.15	Benefit	4	C4
Land Availability	0.10	Benefit	5	C5

Table 2 above explains the main criteria used in the location assessment process, with each criterion given a weighting based on a specific category to support the quantitative assessment process using the SAW method.

3.3 Location Suitability Rating

Scoring was conducted on a scale of 1–5 based on direct observation of the location, brief interviews with MSME actors in the area, and a review of relevant literature.

Table 5. Alternative Rating Based On Criteria

Location/Alternative	C1	C2	C3	C4	C5
A1	1	5	5	1	2
A2	1	5	5	2	3
A3	3	4	4	5	5
A4	3	4	4	4	4
A5	2	5	5	2	2
A6	3	5	5	2	4
A7	2	5	4	2	5
A8	4	4	3	5	5
A9	2	5	4	5	4
A10	1	5	5	5	3

As shown in Table 3 above, which explains the assessment of alternative locations, the initial assessment was carried out by scoring several alternative MSME locations based on five main criteria that had been determined beforehand. The weights given to each of the above criteria are as follow:

1. Rental Costs (C1)

Table 6. Rental Cost Weight (C1)

Rental Cost Category	Criteria Weight
Very Cheap	5
Cheap	4
Moderate	3
Quite Expensive	2
Very Expensive	1

As shown in Table 4 above, rental costs are a major consideration when choosing a business location. The lower the rental costs, the greater the profits can be earned by MSME players. However, low rental prices must still be considered in relation to facilities and location.

2. Accessibility (C2)

Table 7. Accessibility Weight (C2)

Accessibility Category	Criteria Weight
Very Easy to Reach	5
Easy to Reach	4
Moderately Reachable	3
Hard to Reach	2
Very Hard to Reach	1

As shown in Table 5 above, accessibility is an added value for business locations. Locations that are easily accessible by customers and vehicles will be more attractive and support daily business activities. The higher the value, the easier it is to reach; if the value is low, the location is very difficult to reach.

3. Population Density (C3)

Table 8. Population Density Weights (C3)

Population Density Category	Criteria Weight
Very Dense	5
Dense	4
Moderately Dense	3
Less Dense	2
Sparse / Low Population	1

As shown in Table 6 above, the population around the business location affects market potential. The more densely populated an area is, the more likely it is that consumers will pass by or visit that location.

4. Business Competition (C4)

Table 9. Business Competition Weights (C4)

Competition Category	Criteria Weight
No similar competitors	5
Very Few Competitors	4
Moderate number of competitors	3
Quite a lot of competitors	2
Too many competitors in the same location	1

As shown in Table 7 above, the level of competition around the business location is an important consideration in determining the ideal place to open an MSME. Locations with low competition allow business owners to more easily attract customers and develop their business without pressure from too many similar competitors.

5. Land Availability (C5)

Table 10. Land Availability Weights (C5)

Land Availability Category	Criteria Weight
Very spacious and supports business activities	5
Available and sufficient for business	4
Available but limited	3
Very limited	2
Not available	1

As shown in Table 7 above, spacious and sufficient land will provide business actors with the flexibility to manage production space, storage of goods, and other business activities. Conversely, limited land can hinder business development, especially in the long term.

3.4 Data Normalization

3.4.1 Normalization Process

After all the initial assessment data for each MSME location alternative has been collected, the next step is to perform the normalization process using the Simple Additive Weighting (SAW) method formula. The purpose of this normalization is to equalize the value scale of each criterion that has different units or weights, so that they can be compared fairly and equally between locations.

Through this process, the highest value for each criterion is used as a reference, i.e., it is given a score of 1.00, which reflects the most optimal performance in that aspect. Meanwhile, other locations will receive lower scores based on their relative performance against that criterion. In this way, we can objectively determine which locations are most suitable for establishing SME businesses, as all evaluations are standardized on a uniform scale and can be further processed for final calculations and ranking.

$$C_1$$

$$R_{1.1}=\frac{1}{5}=0.20$$
$$R_{1.2}=\frac{1}{5}=0.20$$
$$R_{1.3}=\frac{3}{5}=0.60$$
$$R_{1.4}=\frac{3}{5}=0.60$$
$$R_{1.5}=\frac{2}{5}=0.40$$
$$R_{1.6}=\frac{3}{5}=0.60$$
$$R_{1.7}=\frac{2}{5}=0.40$$
$$R_{1.8}=\frac{4}{5}=0.80$$
$$R_{1.9}=\frac{2}{5}=0.40$$
$$R_{1.10}=\frac{1}{5}=0.20$$

$$C_2$$

$$R_{2.1}=\frac{5}{5}=1.00$$
$$R_{2.2}=\frac{5}{5}=1.00$$
$$R_{2.3}=\frac{4}{5}=0.80$$
$$R_{2.4}=\frac{4}{5}=0.80$$
$$R_{2.5}=\frac{5}{5}=1.00$$
$$R_{2.6}=\frac{5}{5}=1.00$$
$$R_{2.7}=\frac{5}{5}=1.00$$
$$R_{2.8}=\frac{4}{5}=0.80$$
$$R_{2.9}=\frac{5}{5}=1.00$$
$$R_{2.10}=\frac{5}{5}=1.00$$

$$C_3$$

$$R_{3.1}=\frac{5}{5}=1.00$$
$$R_{3.2}=\frac{5}{5}=1.00$$
$$R_{3.3}=\frac{4}{5}=0.80$$
$$R_{3.4}=\frac{4}{5}=0.80$$
$$R_{3.5}=\frac{5}{5}=1.00$$
$$R_{3.6}=\frac{5}{5}=1.00$$
$$R_{3.7}=\frac{4}{5}=0.80$$
$$R_{3.8}=\frac{3}{5}=0.60$$
$$R_{3.9}=\frac{4}{5}=0.80$$
$$R_{3.10}=\frac{5}{5}=1.00$$

$$C_4$$

$$R_{4.1}=\frac{1}{5}=0.20$$
$$R_{4.2}=\frac{2}{5}=0.40$$
$$R_{4.3}=\frac{5}{5}=1.00$$
$$R_{4.4}=\frac{4}{5}=0.80$$
$$R_{4.5}=\frac{2}{5}=0.40$$
$$R_{4.6}=\frac{2}{5}=0.40$$
$$R_{4.7}=\frac{2}{5}=0.40$$
$$R_{4.8}=\frac{5}{5}=1.00$$
$$R_{4.9}=\frac{5}{5}=1.00$$
$$R_{4.10}=\frac{5}{5}=1.00$$

$$C_5=$$

$$R_{5.1}=\frac{2}{5}=0.40$$
$$R_{5.2}=\frac{3}{5}=0.60$$
$$R_{5.3}=\frac{5}{5}=1.00$$
$$R_{5.4}=\frac{4}{5}=0.80$$
$$R_{5.5}=\frac{2}{5}=0.40$$
$$R_{5.6}=\frac{4}{5}=0.80$$

$$R_{5,7}=\frac{5}{5}=1.00$$
$$R_{5,8}=\frac{5}{5}=1.00$$
$$R_{5,9}=\frac{4}{5}=0.80$$
$$R_{5,10}=\frac{3}{5}=0.60$$

Table 11. Criteria Normalization Results

Alternative	C1 (Benefit)	C2 (Benefit)	C3 (Benefit)	C4 (Benefit)	C5 (Benefit)
A1	0.20	1.00	1.00	0.20	0.40
A2	0.20	1.00	1.00	0.40	0.60
A3	0.60	0.80	0.80	1.00	1.00
A4	0.60	0.80	0.80	0.80	0.80
A5	0.40	1.00	1.00	0.40	0.40
A6	0.60	1.00	1.00	0.40	0.80
A7	0.40	1.00	0.80	0.40	1.00
A8	0.80	0.80	0.60	1.00	1.00
A9	0.40	1.00	0.80	1.00	0.80
A10	0.20	1.00	1.00	1.00	0.60

As explained in Table 4 above, each alternative MSME location has a different initial value for each criterion. Through the normalization process in Table 4, we can see how these values are adjusted to be on the same scale. For example, in criterion C1, the highest value is 5, so a location with a value of 5 receives a normalized score of 1.00, while locations with lower values receive proportional scores based on their comparison, such as A1, which only receives a score of 0.20 because its value is significantly lower than the maximum value. This normalization result is important because it adjusts each value to a uniform scale, making it easier for us to assess the overall performance of each alternative fairly. The table shows that several locations, such as A3, A8, and A10, have high scores in almost all criteria, making them potentially superior when the final calculation is made to determine the most effective location for MSMEs.

3.5 Preference Calculation (Vi)

After going through the normalization stage, each value in the location alternatives is multiplied by the predetermined criteria weights: C1 (30%), C2 (25%), C3 (20%), C4 (15%), and C5 (10%). The results of these multiplications are then summed to obtain the final value or preference value (Vi) for each location. Each normalized value is multiplied by its weight, then summed to obtain the Vi value.

a. A1 - Karya Jaya Street
   V_i = (0.20 × 0.30) + (1.00 × 0.25) + (1.00 × 0.20) + (0.20 × 0.15) + (0.40 × 0.10)
   = 0.60 + 0.250 + 0.200 + 0.030 + 0.040 = 0.580

b. A2 - Karya Wisata Street
   V_i = (0.20 × 0.30) + (1.00 × 0.25) + (1.00 × 0.20) + (0.40 × 0.15) + (0.60 × 0.10)
   = 0.60 + 0.250 + 0.200 + 0.060 + 0.060= 0.630

c. A3 - Eka Warni Street
   V_i = (0.60 × 0.30) + (0.80 × 0.25) + (0.80 × 0.20) + (1.00 × 0.15) + (1.00 × 0.10)
   = 0.180+ 0.200 + 0.160 + 0.150 + 0.100 = 0.790

d. A4 - Karya Kasih Street
   V_i = (0.60 × 0.30) + (0.80 × 0.25) + (0.80 × 0.20) + (0.80 × 0.15) + (0.80 × 0.10)
   = 0.180+ 0.200 + 0.160 + 0.120 + 0.080 = 0.740

e. A5 – Around JD KOPI & RESTO, Karya Jaya
V_i = (0.40 × 0.30) + (1.00 × 0.25) + (1.00 × 0.20) + (0.40 × 0.15) + (0.40 × 0.10)
= 0.120 + 0.250 + 0.200 + 0.060 + 0.040 = 0.670

f. A6 - Eka Surya Street
V_i = (0.60 × 0.30) + (1.00 × 0.25) + (1.00 × 0.20) + (0.40 × 0.15) + (0.80 × 0.10)
= 0.180 + 0.250 + 0.200 + 0.060 + 0.080 = 0.770

g. A7 – Around Pajak Johor, Karya Wisata
V_i = (0.40 × 0.30) + (1.00 × 0.25) + (0.80 × 0.20) + (0.40 × 0.15) + (1.00 × 0.10)
= 0.120 + 0.250 + 0.160 + 0.060 + 0.100 = 0.690

h. A8 - Karya Darma Street
V_i = (0.80 × 0.30) + (0.80 × 0.25) + (0.60 × 0.20) + (1.00 × 0.15) + (1.00 × 0.10)
= 0.340 + 0.200 + 0.120 + 0.150 + 0.100 = 0.810

i. A9 – Around UISU Laboratory Building
V_i = (0.40 × 0.30) + (1.00 × 0.25) + (0.80 × 0.20) + (1.00 × 0.15) + (0.80 × 0.10)
= 0.120 + 0.250 + 0.160 + 0.150 + 0.080 = 0.760

j. A10 – Office Complex (Johor Riverside)
V_i = (0.20 × 0.30) + (1.00 × 0.25) + (1.00 × 0.20) + (1.00 × 0.15) + (0.60 × 0.10)
= 0.060 + 0.250 + 0.200 + 0.150 + 0.060 = 0.720

Thus, as shown in the calculation above, the values obtained for each location can be used as a basis for decision-making in selecting the most strategic and promising location for future business development.

Based on the calculations, the best location for MSME development is A8 (Jalan Karya Darma) with a score of 0.810, followed by A3 (Jalan Eka Warni) and A6 (Jalan Eka Surya). The lowest score was given to A1 (Jalan Karya Jaya) with a score of 0.580 due to its lack of access and business competition.

Table 12. Hasil Perhitungan Vi dan Ranking

Kode	Alternatif	Nilai	Rangking
A 8	Karya Darma Street	0,810	1
A 3	Eka Warni Street	0,790	2
A 6	Eka Surya Street	0,770	3
A 9	Around UISU Laboratory Building	0,760	4
A 4	Karya Kasih Street	0,740	5
A 10	Office Complex (Johor Riverside)	0,720	6
A 7	Around Pajak Johor, Karya Wisata	0,690	7
A 5	Around JD KOPI & RESTO, Karya Jaya	0,670	8
A 2	Karya Wisata Sreet	0,630	9
A 1	Karya Jaya Sreet	0,580	10

The results of the research in Table 5 above show Jl. Karya Darma (A8) as the most strategic location for MSMEs. This location excels in terms of low rental costs, spacious land, and low competition. It is followed by Jl. Eka Warni (A3) and Jl. Eka Surya (A6), which also have high scores due to their balance between rental costs and accessibility. Conversely, Jl. Karya Jaya (A1) has the lowest value due to high rental costs, limited land, and intense business competition. These findings highlight the importance of selecting locations based on multi-criteria analysis, rather than relying solely on intuition or the subjective perceptions of business operators.

4. Conclusion

Based on the results of the study, the application of the Simple Additive Weighting (SAW) method has proven to be effective in assisting the decision-making process for selecting MSME business locations in a more objective and measurable manner. By evaluating ten alternative locations in the Medan Johor area based on five main criteria—rental costs, accessibility, population density, business competition, and land availability—a ranking was obtained showing Jalan Karya Darma as the most strategic choice, followed by Jalan Eka Warni and Jalan Eka Surya. This finding demonstrates that by adopting a data-driven approach and systematic calculations, SME operators can minimize the risk of errors in determining business locations, which significantly impact the sustainability of their operations. Additionally, the use of the SAW method facilitates businesses in comparing each alternative fairly and comprehensively based on differing weightings of importance. Overall, this study demonstrates that the SAW method can serve as a practical and relevant tool for SMEs, particularly in strategic decision-making such as business location selection, enabling them to rely not only on intuition but also on rational analysis that enhances the potential for future business success.

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STAFF COMPETENCY DEVELOPMENT STRATEGIES AT HOTEL GRAND ANTARES IN ENHANCING GUEST SATISFACTION

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Abstract

This study aims to analyze the staff competency development strategies at Hotel Grand Antares to improve guest satisfaction. Adequate staff competence is a crucial factor in delivering quality service in the hospitality industry. This research employs a descriptive qualitative approach, with data collected through observations and interviews with hotel management, staff, and guests. The findings reveal that, despite regular training programs being conducted, staff often struggle to apply the acquired skills effectively, resulting in reduced guest satisfaction. Contributing factors include the lack of regular evaluations, low staff motivation, and an organizational culture that does not fully support professional development. Based on these findings, this study recommends an integrated competency development strategy that includes needs-based training, strengthening self-concept and motivation, and establishing a continuous evaluation system. This strategy is expected to enhance overall staff performance and improve the guest experience.
Keywords: Competence; Hotel staff; Guest satisfaction.

1. Introduction

In an era where customer expectations for service quality are increasing significantly, the hospitality industry faces major challenges. The success of a hotel in delivering satisfying service and staying competitive depends heavily on the competence of its staff. As competition intensifies, organizations are required to enhance employee capabilities through strategic development initiatives that foster a creative and proactive work culture. These strategies often involve fair reward systems, technical skill upgrades, and reinforcement of organizational culture to support both individual and corporate growth.

Previous studies have underscored that intrinsic motivation and career path clarity significantly impact employee performance (Kusnilawati et al., 2024). In the context of human resource management, competency development is seen as a long-term investment that strengthens organizational sustainability and competitiveness (Fadilah et al., 2024). To be effective, training strategies should be grounded in structured performance analysis and continuous feedback, integrating human resource theory with operational flexibility.

A growing body of research has contributed to understanding how staff competency evolves within the service sector. For instance, interpersonal skills serve as a critical link between work ethics and service effectiveness, especially for employees with entrepreneurial training backgrounds (Kusnilawati et al., 2024). Transformational leadership has also been highlighted as essential in enhancing service quality, requiring organizational support (Fadilah et al., 2024). Other studies have shown that social environment and motivation influence learning outcomes, which are transferable to hotel staff performance (Rahmawati et al., 2023). Furthermore, leadership commitment, resource availability, and organized evaluation systems are all vital for establishing effective competency development frameworks (Firdaus et al., 2024). Various training methods, such as case studies, group discussions, and on-the-job training, have been proven to enhance skills and employee confidence (Yulius & Koamesah,

2023). Additionally, the PDCA (Plan-Do-Check-Act) cycle has emerged as a useful tool for optimizing service processes by continuously identifying areas for improvement (Nugrahani et al., 2022).

Additional literature reveals that competence itself can be measured through five key indicators: motivation, personality, self-concept, knowledge, and skills (Hamka et al., 2025). These factors are essential in shaping staff performance and their ability to contribute meaningfully to service delivery in the hospitality sector. On the other hand, guest satisfaction, a vital metric for hotel success, relies on elements such as service quality, staff responsiveness, facility comfort, menu quality, communication skills, security, price fairness, and brand loyalty (Wahyuni & Erawati, 2022; Aryani & Ritonga, 2023).

Despite the routine implementation of training programs at Hotel Grand Antares, initial observations reveal that many staff members struggle to apply the acquired skills in practice, resulting in instances of guest dissatisfaction. These issues suggest that while training exists, the translation of knowledge into service excellence remains a challenge. This gap highlights the need for targeted strategies that align staff competencies with service expectations through structured feedback mechanisms and adaptive operational practices.

In light of these conditions, this study seeks to explore the current state and challenges of staff competency at Hotel Grand Antares, particularly in terms of service delivery. It aims to investigate what strategic competency development approaches can be implemented to address the existing service performance gap. Furthermore, it examines the extent to which such strategies can influence guest satisfaction. By identifying the main barriers to staff development, the study is expected to formulate integrated solutions such as structured training programs, regular evaluations, and the strengthening of a professional work culture that enhances both staff capabilities and service quality.

This study focuses on two main variables: staff competency development as the independent variable and guest satisfaction as the dependent variable. Staff competency development encompasses five key indicators: motivation, which reflects employees' internal drive to achieve optimal performance; personality traits such as discipline, responsibility, and integrity; self-concept, referring to employees' confidence in their ability to complete assigned tasks; knowledge, involving mastery of theoretical and practical job-related content; and skills, both technical and interpersonal, required for effective service delivery in the hospitality sector. Meanwhile, guest satisfaction is measured through several indicators, including service quality (comprising reliability, responsiveness, assurance, and empathy), facility comfort, menu variety and quality, staff communication abilities, safety and security, responsiveness to guest feedback, the perceived fairness between price and received value, as well as brand loyalty and reputation.

These two variables are closely interconnected in determining the success of hotel service performance and in building a sustainable competitive advantage within the hospitality industry. Hotel Grand Antares was selected as the research site due to its status as a star-rated hotel with a high volume of guests, yet it continues to face challenges in consistently maintaining customer satisfaction levels. According to the hotel's internal report in 2024, fluctuations in guest satisfaction scores were observed despite the regular implementation of training programs. This indicates a gap between competency development efforts and their practical application, making the hotel a relevant case for further investigation.

The significance of this research is fourfold. First, for the researcher, it provides a valuable opportunity to deepen academic and practical understanding of human resource strategy within the hospitality industry. Second, for Hotel Grand Antares, the findings can inform decision-making processes regarding staff training, performance evaluation, and service improvement. Third, for Sekolah Tinggi Ilmu Manajemen Sukma, this study offers empirical

insights that bridge theoretical knowledge with real-world practice, serving as a resource for both teaching and research. Finally, for future researchers, this work provides a foundational reference for further studies on the relationship between competency development and guest satisfaction and opens the door for comparative studies across various hotel settings and regions.

While existing literature has laid a solid foundation for understanding competency development, few studies have focused specifically on its practical application within local hotel operations. Therefore, this research addresses that gap by examining staff competency development strategies at Hotel Grand Antares and their influence on service outcomes. The findings are expected to provide significant implications for strengthening organizational performance and sustaining competitive advantage in the hospitality sector.

Although numerous previous studies have discussed the importance of training and leadership in improving service quality, few have specifically examined the link between competency development programs and the gap in their implementation within the context of domestic hotels. This argument highlights the need for a contextual approach to competency development, one that goes beyond technical training to also consider organizational culture and the readiness of evaluation systems.

This study highlights the gap between implemented training programs and their actual outcomes in the field, an area that has received limited attention in the context of local hotels. By integrating data from both guests and employees and applying triangulation of findings, this research offers a novel contribution to understanding the tangible impact of competency development strategies on the guest experience.

2. Methodology

This research was conducted at Hotel Grand Antares, located in Medan, North Sumatra, specifically at Jl. Sisingamangaraja No.328, Siti Rejo I, Medan Kota, Medan, 20216. The study took place over a two-month period, from May to June 2025. The research participants consisted of various key stakeholders selected purposively, including hotel management, front-line staff involved in guest services, and several hotel guests willing to share their experiences. The selected participants were deemed relevant to provide insights into the staff competency development process within the hospitality context.

This research employed a field study approach using qualitative descriptive methods. Data collection involved direct interaction with the research setting and participants. The process began with initial observations of service delivery at Hotel Grand Antares, followed by unstructured interviews with hotel staff, managers, and guests. These interviews aimed to capture experiences, challenges, and perceptions regarding staff competencies and service performance. The researcher acted as the primary instrument throughout the study, engaging directly with informants in a natural setting to explore the phenomena in depth.

Triangulation was conducted by verifying findings through three data sources: interviews with employees, management, and guests. The interview protocol was designed using a semi-structured approach, incorporating guided questions related to training experiences, competency application, and perceptions of evaluation systems and job satisfaction.

The data were sourced from both internal and external stakeholders. Internal data were obtained from hotel leaders and staff members involved in service operations, while external data came from guest interviews and relevant academic literature, including journal articles and previous research findings. In terms of data analysis, the study employed a descriptive qualitative method grounded in post-positivist philosophy (Sugiyono, 2021).

This approach seeks to understand phenomena naturally and holistically, with the researcher serving as the key instrument. Data analysis was conducted inductively, allowing patterns and themes to emerge from the data rather than being imposed by predefined hypotheses. Triangulation was used to ensure the validity of the findings by cross-verifying information from different sources. Descriptive interpretation of interview transcripts was supported with direct quotations to provide a concrete representation of the participants' experiences and reinforce the credibility of the research findings.

The primary data were collected through unstructured interviews as the main measurement tool, allowing respondents to express their views openly without being restricted by fixed questions. Observation sheets and field notes were used to record non-verbal behaviors and service conditions in real time. Supporting materials included secondary data such as internal documents, company profiles, and relevant reports provided by the hotel. Additionally, literature sources such as scholarly journals and previous research findings were consulted to triangulate and enrich the data.

Data analysis was conducted using a qualitative descriptive approach, grounded in post-positivist philosophy (Sugiyono, 2021). The analysis process followed an inductive method, wherein patterns and themes were drawn from the data rather than imposed beforehand. The collected interview transcripts and observation notes were categorized and interpreted to identify recurring concepts and strategies.

Triangulation was applied to validate the findings by cross-referencing various sources, including internal interviews and external literature. Verbatim quotes were included to support the interpretation and ensure the authenticity of the analysis. The goal of this analytical approach was not generalization, but rather an in-depth understanding of how competency development strategies influence guest satisfaction in the specific context of Hotel Grand Antares.

Thematic analysis was conducted to identify key themes, including motivation, training barriers, and perceptions of management. Response frequency analysis was also employed to assess prevailing opinions among guests and staff, while maintaining a qualitative approach. The results indicate that the themes of “management support” and “irregular training schedules” were the most frequently cited during interviews.

3. Results and Discussion

The study involved two groups of respondents: staff and hotel guests. A total of 10 staff members from various departments at Hotel Grand Antares participated in the interviews. They represented different operational divisions, including front office, housekeeping, and F&B, offering diverse insights into their roles, competencies, and training experiences.
Additionally, 17 hotel guests were interviewed, comprising 10 males and 7 females. Their purposes for staying included both leisure (9 respondents) and business (8 respondents). Seven guests were frequent visitors, while the rest were first-time or occasional guests. This diversity reflects a balanced sample of loyal and new customers, providing comprehensive feedback on service satisfaction.

Staff interviews revealed high levels of confidence in daily task execution, attributed to training in communication, guest service, and SOPs. Guest feedback supported this, citing staff responsiveness, friendliness, and professionalism.

Table 1. Summary of staff competency perceptions and guest feedback

Indicator	Staff Perspective	Guest Perspective
Communication Skills	Improved through training	Staff are friendly and responsive
Housekeeping SOP Knowledge	Applied in daily operations	Rooms are clean and well-maintained
Confidence and Initiative	Increased due to a supportive work environment	Staff solve problems promptly and effectively

These findings align with (Firdaus et al., 2024), who highlight the importance of continuous training in enhancing service quality. They also reflect the findings of Wahyudi et al. (2025), who emphasize communication and procedural knowledge as key aspects of hotel staff competence.

Hotel management implemented several strategies, including communication training, performance evaluation, motivation briefings, and on-the-job training. While staff found these initiatives helpful, inconsistent scheduling and heavy workloads were common challenges.

Table 2. Competency development strategies and implementation methods

Strategy Type	Methods Used	Observed Challenges
Communication Training	Briefings, role-play, workshops	Inconsistent schedule
SOP Training	Hands-on practice, peer mentoring	Irregular implementation
Performance Evaluation	Feedback sessions, incentive programs	Perception of unclear reward distribution

These strategies are in line with (Yulius & Koamesah, 2023), who assert that combining practical methods with structured evaluation improves training outcomes. However, as supported by (Nugrahani et al., 2022) consistent application via the PDCA cycle is essential for long-term impact. The main barriers included excessive workloads, irregular training schedules, and unclear reward systems. Staff struggled to balance operational duties with training participation, resulting in a gap between training and field implementation. These limitations are consistent with the findings of (Kusnilawati et al., 2024), who note that organizational readiness and support systems greatly affect training outcomes.

Respondents reported that hotel management plays an active role in supporting staff through career development, open communication, and daily motivation briefings. Still, some suggested improvements in structured performance evaluation and clearer promotion pathways. This reflects the HRM functions of leadership and maintenance (Paillin & Mulyanti, 2023) and aligns with Spencer and Spencer's emphasis on self-concept and motivational development in competency theory.

Guest interviews confirmed that staff competence has a direct impact on satisfaction. Guests appreciated the quality of service, responsiveness, and comfort. However, some guests raised concerns about towel replacement policies and the accessibility of room outlets.

Table 3. Guest satisfaction feedback

Satisfaction area	Positive feedback example	Areas for improvement
Responsiveness	Fast check-in, quick handling of complaints	Training consistency
Professionalism	Staff professionalism noted by multiple guests	Towel replacement policy
Facilities and Cleanliness	Guests appreciated room cleanliness and spaciousness	Towel replacement policy
Communication	Staff provided clear and helpful information	Some guests noted a lack of staff continuity

These findings reinforce Oliver's (2019) satisfaction theory, which suggests that service that meets or exceeds expectations leads to higher customer satisfaction (Sihite & Handayani, 2023). They also correspond to the SERVQUAL dimensions proposed by (Wahyuni & Erawati, 2022; Aryani & Ritonga, 2023), particularly reliability, responsiveness, assurance, and empathy.

This discussion is directly based on data obtained from 27 respondents (10 staff members and 17 guests), with an emphasis on recurring patterns in their responses. The limitations in quantitative data are balanced by the depth of narrative insights, which strengthen the thematic validity of the findings. The results support existing literature and demonstrate the real-world implementation of HRM and competency theory:

- According to Putri et al. (2022), human resources are strategic assets. The staff at Grand Antares demonstrated motivation, knowledge, and interpersonal skills aligned with this perspective.

- Training strategies reflect HRM's "development" and "direction" functions, as noted by Rivai in Rahmah (2021). However, challenges such as workload and irregular training expose a gap in the "functional" HRM goal, as pointed out by Turmudi (2022).

- Competency was observed across Spencer & Spencer's five indicators: motivation, personality, self-concept, knowledge, and skills, and would benefit from more structured and consistent training interventions.

- Guest satisfaction results align with Oliver's (2019) theory and indicate success across most SERVQUAL dimensions, although addressing facility issues could further improve guest experience.

- The management's role in motivation and communication aligns with the HRM leadership function, as described by Rivai (2009), but reward and promotion systems need to be perceived as transparent and based on merit, as noted by Wahyudi et al. (2025)

4. Conclusion

This study concludes that the staff competency development strategies implemented at Hotel Grand Antares have shown positive progress, particularly in enhancing communication, SOP compliance, and motivation among employees. These improvements have contributed to better service responsiveness and professionalism, which in turn support higher levels of guest satisfaction. However, several challenges hinder the full realization of these strategies. The most significant barriers include inconsistent training schedules, high operational workloads, and unclear reward and promotion systems. These issues prevent optimal application of learned skills in day-to-day service delivery. The findings affirm that competency development should be approached holistically by integrating technical and soft-skill training, establishing structured feedback mechanisms, and aligning human resource practices with organizational goals. The active role of management in motivating and guiding staff also proves crucial for sustained performance improvement.

Furthermore, this research supports previous studies that link well-designed training programs and human-centered management practices with improved service outcomes and customer satisfaction. As such, the study recommends that Hotel Grand Antares adopt a more systematic and continuous training framework, enhance its performance evaluation system, and ensure transparent reward mechanisms. These measures are essential not only for developing individual staff potential but also for securing long-term competitive advantage in

the hospitality industry. The research findings are aligned with the stated objectives, namely, to identify competency development strategies and their associated challenges, as well as their relationship to guest satisfaction.

The primary objective of this study has been achieved, namely, to identify the implemented competency development strategies, evaluate the challenges in their application, and examine their relationship with guest satisfaction. Practical recommendations include the implementation of needs-based continuous training systems, enhancement of merit-based evaluation mechanisms, and the integration of a professional work culture to support long-term outcomes.

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IMPLEMENTATION OF THE SEVEN CHARMS AND COMMUNITY-BASED TOURISM IN SUPPORTING SUSTAINABLE TOURISM AT SIOMBAK MANGROVE ECOTOURISM PARK

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Abstract

This study aims to analyze the implementation of the Seven Charms concept and the community-based tourism approach in supporting the development of sustainable tourism at Siombak Mangrove Ecotourism Park. The research employed a descriptive qualitative method, with data collected through observation, interviews, documentation, and literature review. The findings indicate that the core elements of Seven Charms, namely safety, orderliness, cleanliness, coolness, beauty, and hospitality, have been implemented, while the elements of memorable experiences and disaster evacuation information still require improvement. The community-based tourism approach is reflected in the active involvement of local residents in tourism management, including service provision and participation in decision-making, facilitated through both face-to-face discussions and digital communication platforms. This involvement has yielded positive impacts, including increased income, enhanced social skills, and a stronger collective awareness of environmental conservation. The cooperation between the application of Seven Charms elements and community participation provides a strong foundation for achieving sustainable tourism at Siombak Mangrove Ecotourism Park.
Keywords: Seven charms; Community-based tourism; Sustainable tourism.

1. Introduction

The implementation of sustainable tourism in tourist destinations is crucial for preserving nature, local culture, and the welfare of the community. Without this approach, tourism risks damaging the environment, commercializing culture, and creating economic disparities. The integration of sustainability principles enables the development of economically viable, environmentally friendly, and socially inclusive destinations, supported by the active involvement of communities that strengthen local capacities and enhance the sustainability of village potential.

The success of sustainable tourism heavily relies on the implementation of the Seven Charms and the community-based tourism approach. The Seven Charms, with its seven elements (safety, orderliness, cleanliness, coolness, beauty, hospitality, and memorable experiences), serves as a practical guide to creating a comfortable and memorable tourism environment. When applied in community-based tourism, where local residents are actively involved in planning, management, and utilization of resources, a synergy is created that promotes sustainability. Community involvement preserves cultural values and local wisdom, while the Seven Charms enhance service quality and destination appeal. Therefore, the integration of both is a vital strategy for realizing resilient, inclusive, and sustainable tourist destinations.
Previous research has shown varied results. The implementation of the Seven Charms at Balekambang Park in Surakarta was generally good, although cleanliness remained a weakness (Mintardjo, 2022). In Raja Ampat, the application of the Seven Charms successfully improved destination quality and environmental preservation (Mulyani et al., 2025). However, in the context of Community-Based Tourism (CBT) in Alamendah Village, low awareness and

participation of local communities posed significant challenges (Rizky et al., 2025). Conversely, in Samiran Village, active community participation preserved traditions as tourist attractions (Prasta, 2021), and in Mangrove Sari Tourism Village, high participation in management by local groups demonstrated the strengthening of community institutions as a key to sustainability. Despite the significant potential for natural and cultural tourism (Akbar et al., 2021), low youth participation can hinder development (Anarini et al., 2024).

Tourist attractions, such as mangrove parks, are vital assets for the local economy and cultural/natural awareness. Mangrove parks, in particular, serve a dual function as educational-recreational destinations and vital conservation areas that protect coastlines and coastal ecosystems. This diversification of tourism products enriches destination choices and promotes inclusive tourism. The application of the Seven Charms in mangrove parks is essential for creating positive experiences through cleanliness, safety, beauty, and hospitality, which in turn encourages repeat visits and competitiveness.

The involvement of local communities in the management of mangrove parks is crucial. They are not just beneficiaries but also guardians of environmental and cultural preservation. Active participation in conservation, facility management, and local service provision fosters a sense of ownership, local wisdom-based economic opportunities, and adaptive, inclusive tourism management.

If the Seven Charms and community-based tourism are not implemented at Siombak Mangrove Ecotourism Park, the area risks losing its appeal and sustainability. A lack of the Seven Charms will disrupt the tourist experience and damage the destination's image. Without community participation, management will be ineffective, prone to conflict, lacking in ownership, and potentially exploitation of resources without effective control, hindering the achievement of equitable economic benefits and conservation support. Therefore, integrating these two approaches is essential to enhance destination quality, provide equitable benefits, and ensure the sustainability of mangrove areas for future generations.

Thus, this research is expected to contribute to enriching academic and practical understanding of the implementation of the Seven Charms and community-based tourism in supporting sustainable tourism, as well as serve as a reference for more strategic decision-making in the management of similar tourist attractions.

2. Methodology

This research was conducted at Siombak Mangrove Ecotourism Park, located in Paya Pasir Village, Medan Marelan District. This location was chosen because Siombak Mangrove Ecotourism Park is an active tourist destination that provides community-based tourism services and has significant potential for sustainable tourism development. The research was conducted from May to June 2025.

This study employed a descriptive qualitative approach. The sampling technique used purposive sampling method. The samples were obtained from data collected through observation and interviews at Siombak Mangrove Ecotourism Park from May to June 2025. Sample selection was based on the availability and relevance of information related to the implementation of the Seven Charms concept and community-based tourism. Since this research focuses on a single location without comparisons between units, the population and sample are identical in the form of qualitative data from one study object.

Data were collected through two main methods. First, direct observation at Siombak Mangrove Ecotourism Park to observe the condition of the tourist attraction and the implementation of the Seven Charms concept. Second, structured interviews with managers and local residents to gain in-depth information about their experiences and views regarding community-based

tourism. This data is considered valid as it was obtained directly from relevant sources. In selecting respondents for the interviews, the researcher used purposive sampling techniques. The selected respondents included 1 manager/community group member and 10 local residents from Siombak Mangrove Ecotourism Park. This selection was based on the consideration that they possess relevant knowledge and experience related to the implementation of the Seven Charms and community-based tourism at the location.
In this study, the researcher used descriptive qualitative data analysis for the data presentation stages:

- Data Reduction: Data collected from the field will be summarized and focused on relevant information.
- Data Presentation: The reduced data will be presented in the form of descriptive narratives to facilitate understanding.
- Conclusion Drawing: Initial conclusions will be tested and verified with existing data to ensure credibility.

Through systematic methods and measured analysis, this research is expected to provide a clear picture of the relationship between the implementation of the Seven Charms concept and community-based tourism in supporting sustainable tourism at Siombak Mangrove Ecotourism Park.

3. Results and Discussion

Siombak Mangrove Ecotourism Park is an ecotourism area located in Paya Pasir Village, Medan Marelan District, Medan City. Its proximity to Siombak Lake makes this area part of the northern coastal landscape with high natural potential for environmentally based tourism development. The results of this study were obtained through observations and structured interviews with the managers and community members of Siombak Mangrove Ecotourism Park. This section presents data on three main approaches:

Implementation of the Seven Charms concept in supporting sustainable tourism.
Application of the community-based tourism approach in supporting sustainable tourism.
Constraints and challenges in implementing sustainable tourism.

Implementation of the Seven Charms Concept in Supporting Sustainable Tourism at Siombak Mangrove Ecotourism Park:

Observations indicate that safety measures at Siombak Mangrove Ecotourism Park are adequately implemented. The presence of an active security post indicates that the management recognizes the importance of creating a safe environment for visitors. Security personnel are vigilant and responsive, although they are not yet equipped with communication tools or an integrated surveillance system. Activities such as mangrove kayaking are always accompanied by experienced guides who ensure the safety of tourists. However, the absence of emergency information boards is a weakness that needs to be addressed.

Orderliness in the management of the area is beginning to be evident, with well-organized trekking paths. However, there are still shortcomings in the provision of information boards that could help visitors navigate strategic locations. The lack of information boards diminishes the tourist experience and poses risks in emergency situations.

The aspect of cleanliness at Siombak Mangrove Ecotourism Park remains a significant concern. Although the trekking paths are relatively clean and litter is rarely found, the cleanliness of the tourist area shows significant issues. Piles of waste, particularly food wrappers and beverage bottles, are visible in several locations, creating an unkempt impression and leading to accumulation that can damage the area's cleanliness image. Additionally, waste is often carried by tidal flows from Siombak Lake, further exacerbating cleanliness issues in the area.

The coolness of the area is one of its natural advantages. The park is surrounded by green trees that contribute to a cooler environment and fresher air. Local communities actively maintain mangrove vegetation through regular planting programs, which contribute to good air quality. The beauty of Siombak Mangrove Ecotourism Park is prominently displayed through harmonious spatial planning and visual elements. Aesthetic photo spots and the placement of wooden structures create visually appealing scenery. Interactions between local communities and visitors are generally very positive. Tour guides and food vendors exhibit friendly and polite behavior, creating a pleasant atmosphere for tourists.

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Memorable experiences are formed through unique activities during visits, such as tasting local cuisine and participating in mangrove planting. These experiences strengthen tourists' memories of the destination. The coolness and cleanliness of the environment are relatively well-maintained; however, waste management at high-traffic visitor points still needs improvement to maintain ecosystem quality.

Application of the Community-Based Tourism Approach

Siombak Mangrove Ecotourism Park demonstrates active involvement of residents in various tourism activities. The roles of residents as guides, canteen managers, and cleaning staff reflect a fair distribution of functions according to skills. Community involvement in the planning and management of tourism is reflected in regular meetings and the establishment of a WhatsApp group, known as SIMBA. This strengthens the principle of active participation in decision-making. The community actively maintains cleanliness and promotes environmental conservation, also participating in mangrove planting activities. The management has established cleanliness protocols and routine monitoring.

Although not yet fully maximized, management has begun planning for the integration of local cuisine and cultural attractions. Revitalizing local culture is essential through community involvement. The incentive distribution system is conducted transparently between management and local business actors, supporting the theory of social justice in tourism. The management of Siombak Mangrove Ecotourism Park shows a fairly systematic and inclusive approach, with a commitment to environmental sustainability and visitor education. Tourism activities have significant social and economic impacts, leading to improvements in the community's social skills. Educating visitors about the importance of maintaining cleanliness and involving them in mangrove planting activities demonstrates that this area has implemented sustainability principles.

Discussion of Constraints and Challenges in Implementing Sustainable Tourism

The lack of community participation in designing and developing locally based tourist attractions poses a significant challenge. Environmental challenges include waste carried by tidal flows from open water areas to Siombak Lake, which can damage the mangrove forest ecosystem. With the right approach, these challenges can be addressed through cross-sector collaboration and community involvement in environmental management.

The research findings regarding the implementation of the Seven Charms and community-based tourism at Siombak Mangrove Ecotourism Park show both alignment and differences with previous studies on similar topics. This study found that most elements of the Seven Charms have been well implemented, such as safety, orderliness, coolness, beauty, hospitality, and memorable experiences. This aligns with findings at Balekambang Park in Surakarta, where most elements of the Seven Charms were met, although cleanliness remained a weakness. This study also identified similar weaknesses, namely, the limited availability of waste bins at strategic points and suboptimal waste management (Mintardjo, 2022).

Furthermore, the results of this study are consistent with a study at the Raja Ampat tourist area, which found that the application of the Seven Charms contributed to improved

destination quality and environmental preservation (Mulyani et al., 2025). At Siombak Mangrove Ecotourism Park, the aspects of coolness and beauty are also very prominent, particularly due to the well-maintained mangrove vegetation and the community's active role in conservation.

This study also found that community involvement in tourism management, from guides, cleaning staff, and canteen managers, to participation in decision-making, demonstrates the practice of community-based tourism (CBT). These findings align with research in Alamendah Village, which stated that community participation is a crucial factor in achieving sustainable tourism, although participation levels there remain low (Rizky et al,, 2025). In contrast, in Siombak, community participation is considered relatively high and equitable.

Community participation in cultural activities serves as a form of tradition preservation and tourist attraction (Prasta, 2021). In the context of Siombak, cultural preservation remains a challenge due to the limited display of local cultural attractions. However, the management already has plans to develop cultural aspects, such as Malay cuisine, local crafts, and traditional performances. Meanwhile, the research overview in Blimbingsari Village noted that low youth participation hinders tourism development (Anarini et al., 2024). The research in Siombak did not specifically highlight youth involvement but emphasized the importance of involving all community layers to promote social and economic sustainability.

Overall, this research reinforces previous findings that integrating the Seven Charms with the CBT approach is a crucial strategy for creating sustainable tourist destinations. However, the challenges faced, such as participation in cultural preservation and environmental impacts from tidal flows carrying waste, indicate the need for stronger adaptive and collaborative management.

4. Conclusion

Based on the discussion results, it can be concluded that the implementation of the Seven Charms concept and the community-based tourism approach have a significant influence on the sustainability of Siombak Mangrove Ecotourism Park. Therefore, this research recommends that management enhance safety facilities, such as evacuation boards and waste bins, at strategic points, and promote local cuisine through targeted promotional activities. Additionally, management should encourage community participation in developing cultural attractions and environmental management to foster a sense of ownership and responsibility. It is also recommended to establish a monitoring system that includes indicators of the Seven Charms, community participation, and environmental sustainability to support more responsive and data-driven decision-making.

However, this research has limitations as it was conducted over a relatively short period (May to June 2025), so the results obtained only reflect the conditions at the time of the study. This limitation means that the research could not capture long-term changes or dynamics that may occur in the Siombak Mangrove Ecotourism Park area. Therefore, to gain a deeper and more comprehensive understanding of the sustainability of this area, it is recommended that further research be conducted over a longer period of time. Future research is expected to identify trends and changes that occur, providing more accurate recommendations for the management of Siombak Mangrove Ecotourism Park moving forward.

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ANALYSIS OF DETERMINING NEW BRANCHES OF RAMGISYA BAKERY WITH THE WEIGHTED PRODUCT (WP) METHOD

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Abstract

Bakery Ramgisya, as one of the culinary business players, has a plan to expand its business by opening a new branch. In making this decision, an appropriate method is needed so that the selected branch location has high potential in supporting business growth. This study aims to analyze and determine the best location for a new branch of Bakery Ramgisya using the Weighted Product (WP) method. The WP method was chosen because it is able to handle multi-criteria decision making by considering the weight of each criterion. This study uses several criteria such as Market Size, Location and Accessibility, Demographics (Population), Competition, and Rental Costs. The results of the WP method application show that there is one most appropriate alternative location based on the calculation of the highest weight and preference value. This study concludes that the WP method can help management in determining the optimal strategic location for bakery business development.
Keywords: Decision making; New branch; Weighted Product method.

1. Introduction

The growth of the culinary industry in Indonesia has increased rapidly, along with changes in people's lifestyles who prefer practical but still quality food. One type of business that has grown quite significantly is the bread or bakery business. Bakery Ramgisya, as an MSME in this field, sees a great opportunity to expand its market reach by opening new branches. However, the selection of branch locations cannot be done carelessly because many important factors must be considered, such as market potential, level of competition, accessibility, and proximity to production centers. Decisions that are not based on systematic analysis risk causing operational losses and less than optimal market potential.

A common problem often faced by business actors is the tendency to make decisions subjectively. To overcome this, an objective and measurable analysis method is needed. One approach that can be used is the Weighted Product (WP) method, which is a multi-criteria decision-making method that considers the weight of each factor. Previous studies have shown the effectiveness of the WP method in the decision-making process. For example, in a study by Chairul Rizal (2021), the WP method was used to determine the best sales manager candidates objectively, with fast, efficient, and transparent results. Another study by Untoro Apsiswanto (2022) also applied the WP method to help students choose the best cafe based on various important criteria such as price, comfort, and accessibility, the results of which were able to provide objective recommendations.

Seeing the gap that Bakery Ramgisya has not used a systematic approach in determining the location of its new branch, this study was conducted to fill the gap. By applying the Weighted Product (WP) method, this study aims to produce recommendations for the most optimal and strategic new branch locations based on the analysis of relevant criteria. In addition to providing direct benefits for Bakery Ramgisya, the results of this study are also expected to be a practical reference for other MSMEs who face similar challenges in developing their businesses in a measurable and effective manner.

2. Methodology

Decision Support Systems (DSS), According to Haffandi and Hendrik (2024) DSS is very useful in helping organizations solve semi-structured problems, such as selecting a business location, recruitment, or determining business strategy priorities. According to Mushowwiru et al. (2024), a Decision Support System (DSS)-based approach with methods such as Weighted Product (WP) can facilitate location selection by comparing existing alternatives based on several criteria.

Weighted Product (WP) Method: According to Supardi & Sudarsono (2023), the WP method is very suitable for use when each criterion has a different scale, but still wants to be calculated proportionally. Meanwhile, M. Dhanul Paridzhi (2024) compared the WP method with the SAW (Simple Additive Weighting) method, and the results showed that WP is superior in producing more accurate and stable rankings, especially when the weights between criteria are highly influential.

This research involved the owners and management of Ramgisya Bakery as participants, with procedures including observation, interviews, and documentation of three alternative locations for new branches, namely:

a) Alternative 1: New Port, Aceh Singkil
b) Alternative 2: Rimo – Seoraya Hotel Intersection
c) Alternative 3: Burnt – In front of the police station

Assessed based on five main criteria, namely: Market Size, Location and Accessibility, Demographics (population), Competition, and Rental Costs. using the Weighted Product (WP) method, where the analysis is carried out through weighting criteria, forming a decision matrix, calculating vector values, and determining final preferences to obtain the best location recommendations objectively and measurably.

Research framework, Diana, D., Kunang, S. O., & Seprina, I. (2020).(Shandy and Fahmi Ginting 2020) This research framework describes the systematic flow of the steps taken in the research "Analysis of Determining New Branches of Ramgisya Bakery Using the Weighted Product (WP) Method". Prasetya, B., Saripurna, D., & Sitorus Pane, U. F. S. (2023). This study aims to determine the best location for a new branch of Ramgisya Bakery using the Weighted Product (WP) method. Permadi, A., Panjaitan, Z., & Kusnasari, S. (2021).

3. Results and Discussion

Alternative data in the decision support system was created using the Weighted Product method. The final result of this study is an alternative that has the highest value, which will be selected as the best bakery and can be recommended as a new sales branch.

1. Application of Criteria and Alternatives

Below in Table 1, there are 5 (five) criteria used in carrying out the assessment.

Table 1. Criteria used

Criteria Code (C1)	Criteria Terms	Weight
K1	Market Size	(30%)
K2	Location and Accessibility	(25%)
K3	Demographics (Population)	(20%)
K4	Competition	(15%)
K5	Rental costs	(10%)

In the following Table 2, there are 3 (three) new branches that are candidates (alternatives) that will be selected as the best bakery. The following table shows the suitability rating between alternatives from the criteria.

Table 2. Alternative Values in each Criteria

Alternative	Criteria				
	K1	K2	K3	K4	K5
A1	Very good	Very good	Good	Good	7 million/year
A2	Good	Good	Good	Pretty good	9 million/year
A3	Pretty good	Pretty good	Very good	Pretty good	8 million/year

Since the criteria K1, K2, K3, K4, and K5 are linguistic criteria, they must be weighted first. The determination of the weight of each criterion is:

Table 3. Weighting for K1, K2, K3, and K4

Information	Weight Value
Very good	5
Good	4
Pretty good	3
Not good	2
Bad	1

In the K5 Assessment, the nominal amount of rent is still used in the form of numeric figures, which are used for the matrix assessment below.

2. Application of WP Method

The following are the stages in implementing the WP method in selecting a new branch of the bakery sales at Ramgisya. The first stage, forming a Decision matrix taken from table 1, which first the rating values for criteria K1, K2, K3, K4, and K5, are weighted using the table below:

Table 4. Decision Matrix for Criteria

5	5	4	4	7
4	4	4	3	9
3	3	5	3	8

$s_i = \prod(xij)^{wj}$ The second stage, calculate the vector value using the following equation:

To calculate the value of the S vector, the value of each criterion is raised to the power of the weight of the relevant criterion and then multiplied as shown in equation 1 above.

$$S1 = (5^{0.30})(5^{0.25})(4^{0.20})(4^{0.15})(7^{0.10}) = 5.1917$$
$$S2 = (4^{0.30})(4^{0.25})(4^{0.20})(3^{0.15})(9^{0.10}) = 4.0363$$
$$S3 = (3^{0.30})(3^{0.25})(5^{0.20})(3^{0.15})(8^{0.10}) = 3.4008$$

From all the completion processes carried out, the final results were obtained:

Table 5. Alternatives results

Alternative	Criteria Terms	Results	Ranking
A1	New Port, Aceh Singkil	5.1917	1
A2	Rimo Simpang Hotel Seoraya	4.0363	2
A3	Burnt in front of the police station	3.4008	3

From the ranking results in the table above, it can be seen that the largest preference value is in alternative A1 with a preference value of 5.1917, so it can be concluded that the new branch

located in Pelabuhan Baru, Aceh Singkil, is worthy of being a new store recommended as a new sales branch at Ramgisya.

4. Conclusion

This study concludes that the Weighted Product (WP) method is effective in determining the location of the new branch of Bakery Ramgisya objectively and measurably. Of the three alternative locations analyzed, Pelabuhan Baru, Aceh Singkil, was selected as the best location with the highest preference value. These findings indicate that a data-based approach and multi-criteria can help MSMEs make more appropriate strategic decisions. This study also provides practical contributions in the application of the WP method in the local culinary business sector.

The application of the WP method in this study also proves that the business decision-making process can be carried out with a simple but accurate scientific approach. By considering the weight of each criterion proportionally, this method is able to provide transparent results that are easy for business actors to understand. In the future, this method can be used as a reference or further developed in the form of a digital system to help other MSMEs in determining business locations or other strategic decisions.

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ANALYSIS OF THE EFFECT OF PROMOTION AND PRICE PERCEPTION ON NEW STUDENT INTEREST: A CASE STUDY AT AKUBANK NUSANTARA, EAST ACEH

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Abstract

This study aims to analyze the influence of promotion and price perception on new students' interest in choosing a college, with a case study at Akubank Nusantara East Aceh. The research background is based on differing trends in new student enrollment nationally and regionally. While the national level shows an increase, higher education participation in Aceh Province has declined. At Akubank Nusantara, the number of new students still falls short of the institution's target, although it increases annually. This research uses a quantitative associative approach with a survey involving 58 new student respondents. Data were analyzed using multiple linear regression and classical assumption tests. Results show that both promotion and price perception significantly influence student interest, both partially and simultaneously. The t-test shows promotion has a t-value of 3.298 (significance 0.002) and price perception a t-value of 6.266 (significance 0.000), both higher than the t-table value of 2.004. The F-test yields an F-value of 117.842 (significance 0.000). The coefficient of determination (R^2) is 0.810, indicating that 81% of the variation in student interest is explained by these two variables. These findings highlight the importance of effective promotion and pricing strategies to attract prospective students.
Keywords: Promotion; Price perception; Student interest.

1. Introduction

Higher education is a strategic component in national development that aims to produce superior, adaptive, and competitive human resources. The level of technological progress of a country is evidence of the quality of higher education available (Kusuma et al (2021). Higher education has an important role in producing quality and competitive human resources in the current era of globalization (2024). Therefore, the sustainability and competitiveness of a university are very crucial. In this context, universities compete to attract the interest of new students as an effort to maintain their existence and face competition in the increasingly dynamic education industry. In the modern education ecosystem, the success of universities is not only determined by academic quality alone, but also by their ability to manage effective marketing strategies. One of the main issues in the education sector today is the capacity of universities to build and maintain a strong public image, expand the reach of information, and foster the interest of prospective students amidst increasingly fierce competition between universities.

Based on data from the Central Statistics Agency (2020–2022), the number of new student admissions in Indonesia showed an increasing trend, from 7,369,009 in 2020 to 7,875,281 in 2022. However, this trend did not occur in Aceh Province, which during the same period experienced a decline in the number of new students from 150,882 to 145,116. This decline indicates structural and strategic issues in attracting community participation in higher education in the region.

One institution experiencing similar challenges is Akubank Nusantara Aceh Timur, which specializes in accounting and banking education. Despite implementing various promotional strategies and adjusting tuition fees, new student enrollment has not been optimal. Data shows an increase in the number of students from 17 in 2022 to 57 in 2024. However, this number is only around 25% of the established enrollment target, indicating that the strategies implemented have not been fully effective in developing and increasing prospective student interest.

In the context of educational services marketing, promotion, and price perception are two variables that have direct implications for prospective students' decisions. According to Philip Kotler and Gary Armstrong, (2021) "promotion is defined as activities that communicate the benefits of a product and persuade target consumers to purchase it." Promotion serves as a means of conveying institutional information and forming an image in the minds of the public, while price perception reflects the subjective assessment of prospective students regarding the level of reasonableness of educational costs compared to the expected benefits. On the other hand, as explained by Peter and Olson (2024) price perception can be defined as a consumer's reaction to price information and considerations in making purchases, giving a deep impression so that it is used as a reference material for purchases. According to Schiffman & Kanuk in Sandra's research (2024) price perception is a consumer's evaluation of a price considered high or low, and has a major influence on the desire to make a purchase and the level of satisfaction after making a transaction. Previous research (Sukmayanti Harris, Analisis Persepsi Harga dan Perilaku Konsumtif pada Mahasiswa, 2024) confirms that effective promotions and positive price perceptions contribute significantly to the influence of consumer decisions, including in the context of choosing an educational institution.

However, empirical studies on the influence of promotion and price perception on student interest are still limited in the Aceh region, especially in universities that have a specific scientific focus and local market segmentation. This literature gap is important to be studied further in order to gain a contextual understanding that can be used as a basis for developing more effective educational marketing strategies. Putra and Irianto (2023)explain, interest is a person's interest in an activity or thing that they like to express voluntarily. Meanwhile, Sofiyanti and Sukirman (2024) state that interest is a person's interest in something, when someone feels interested in something, they will show that they are truly interested in the object being observed, in line with Finthariasari & Saputri in Kusuma's research (2021), saying that interest is the main internal factor for individuals that will be able to determine someone in making decisions.

Someone who has an interest in something will pay great attention to it because it is an attraction for him, so that it fosters a high sense of curiosity to dig up information about it Lastri & Sumarno (2020). Based on this, this study was conducted to examine the influence of promotion and price perception on the interest of new students at Akubank Nusantara East Aceh. The results of this study are expected to provide theoretical contributions in the development of educational marketing studies, as well as provide recommendations for strategies that can be applied to institutional managers in order to increase the attractiveness and participation of higher education.

2. Methodology

This study uses a quantitative and associative descriptive approach, with the aim of analyzing the influence of promotions and price perceptions on the interest of new students at Akubank Nusantara, East Aceh Campus. To obtain relevant primary data, researchers distributed research instruments in the form of questionnaires to all new students of the 2024/2025 academic year. According to Sugiyono, (2022) primary data is original data collected by the researcher himself to answer his research problems specifically. According to Sugiyono,

(2022) "Population is a generalization area consisting of objects/subjects that have certain qualities and characteristics determined by the researcher to be studied, and then conclusions drawn". The population taken in this study was 58 new students of Akubank Nusantara, East Aceh. According to Sugiyono, (2022) the sample is a portion of the population. The sampling technique used in this study is total sampling. Total sampling is a sampling technique in which all members of the population are used as samples. The sample in this study was 58 people. Each statement item in the questionnaire was measured using a Likert Scale with five categories: Strongly Agree (SS), Agree (S), Undecided (R), Disagree (TS), and Strongly Disagree (STS). Data from all items were then analyzed to obtain percentages for each response category.

Descriptive analysis of the frequency of respondents' answers shows that, regarding the promotion variable, the majority chose "Strongly Agree," with an average proportion of 61%. The statement that received the highest percentage was "Direct explanations from campus representatives helped me understand the advantages of this campus," with 98% of respondents stating, "Strongly Agree." However, there were still respondents who stated "Not Sure" with an average of 7%, which reflects room for improvement in terms of visual communication design and the effectiveness of campus digital promotions.

Regarding the price perception variable, respondents' responses were dominated by "Strongly Agree" (52%) and "Agree" (33%). The statement with the highest level of agreement was "Information regarding tuition fees is conveyed clearly," with a percentage of 69%. However, "Uncertain" responses appeared for several statements related to price competitiveness compared to other universities, with an average of 11%. These findings indicate the need for universities to highlight the comparative value of competitive tuition fees to increase positive student perceptions of the price aspect.

Meanwhile, regarding the interest variable of new students, respondents tended to give a rating of "Strongly Agree" at 47% and "Agree" at 35%. The statement with the highest response was "I am happy to share information about the Akubank Campus with friends or family" at 55%. The average "Undecided" answer of 11% across several indicators indicates that there is still a group of respondents who are not completely sure about their decision to choose the campus.

This frequency analysis provides an initial overview of new students' perceptions of promotional strategies, pricing, and their interest in the campus. The predominance of "Strongly Agree" responses reflects the effectiveness of the campus's approach, particularly in direct promotion and information transparency. However, the presence of "Undecided" and "Disagree" responses suggests that the visual aspects of promotions and the added value of pricing still need to be optimized to increase interest comprehensively and evenly across all prospective student segments.

To ensure that the questionnaire instrument used in this study can measure variables accurately and consistently, validity and reliability tests were conducted. The purpose of the validity test is to determine how well each item reflects the theoretical construct being studied, while the reliability test evaluates the consistency of the responses given by participants to the items in the instrument. The validity test was conducted using the calculated r value and compared with the table r value of 0.258 (N = 58, α = 0.05). The results of the analysis show that all statement items in the three variables have a calculated r value > 0.258, so it can be concluded that all items are valid.

The range of validity values (r count) for each variable is as follows:

Promotion Variable (X_1): the calculated r value ranges from 0.375 to 0.739
Price Perception Variable (X_2): the calculated r value ranges from 0.557 to 0.883

Student Interest Variable (Y): the calculated r value ranges from 0.373 to 0.774.

Thus, all instrument items qualified for further data collection as they met validity criteria. Reliability testing was conducted using Cronbach's Alpha, with a minimum reliability limit of 0.60. The test results indicated that all three variables had a very high level of reliability, as detailed below:

Promotion (X_1): Cronbach's Alpha = 0.894
Price Perception (X_2): Cronbach 's Alpha = 0.950
Student Interest (Y): Cronbach's Alpha = 0.891

Based on these results, it can be concluded that all instruments in this study are reliable and consistent. Before conducting multiple linear regression analysis, this study first conducted a classical assumption test to ensure that the regression model used met the required statistical requirements, so that the results obtained could be scientifically accounted for. In the journal Agha de Aghana, et al. (2024)stated that the classical assumption test is a statistical requirement that must be met in multiple linear regression analysis based on ordinary least squares (OLS). The classical assumption tests performed included normality tests, linearity tests, multicollinearity tests, and heteroscedasticity tests.

The normality test aims to determine whether the confounding variables and residuals, or the dependent and independent variables, are normally distributed in a regression. The normality test was performed using the Kolmogorov-Smirnov method, which yielded a significance value of 0.200. Because this value is greater than the significance level (α = 0.05), it can be concluded that the residual data are normally distributed, thus meeting the assumption of normality.

Additionally, a linearity test was conducted to determine whether there was a linear relationship between the independent variables—promotion and price perception—and the dependent variable, student interest. This test yielded a significance value of 0.089, which exceeds the 0.05 threshold, confirming that the relationship between the variables is linear and suitable for further regression analysis.

The multicollinearity test was conducted by considering the Tolerance and Variance Inflation Factor (VIF) values. The Tolerance value obtained was greater than 0.10 and the VIF value was less than 10, thus concluding that there were no symptoms of multicollinearity among the independent variables. This means that the independent variables do not significantly influence each other, and the regression model can be run without distortion of the correlation between predictors.

The heteroscedasticity test was performed using the scatterplot method on the residual values. The distribution pattern is shown in the following figure.

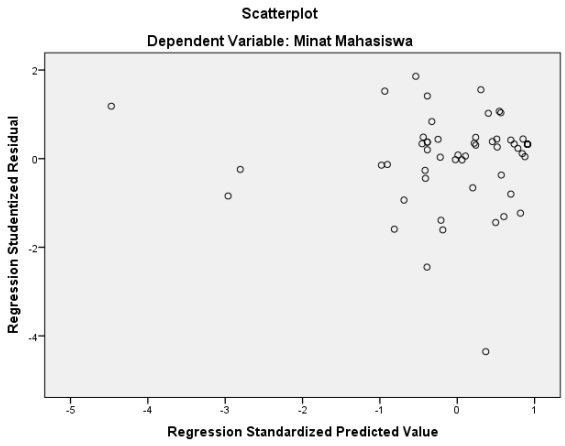

Fig. 1. Scatterplot

The residuals are randomly distributed above and below the horizontal axis without any clear pattern. This indicates that the residual variance is consistent across observations, indicating the absence of heteroscedasticity. Therefore, the regression model meets the homoscedasticity assumption, which strengthens the reliability of the estimated regression coefficients.

After all classical assumptions were met, multiple linear regression analysis was carried out to determine the influence of promotion variables and price perceptions on new student interest simultaneously and partially.
The results of the multiple linear regression data processing are shown in the following table:

Table 1. Multiple linear regression

Coefficient [a]						
Model		Unstandardized Coefficients		Standard Coefficient English	T	Signature
		B	Standard Error			
1	(Constant)	-7,259	4,805		-1,511	.137
	Promotion	.394	.120	.325	3,298	.002
	Price Perception	.678	.108	.618	6,266	.000
a. Dependent Variable: Student Interest						

This equation shows that promotion (X1) and price perception (X2) have a positive effect on student interest (Y) at the Akubank Nusantara Aceh Timur Campus. The constant value of -7.259 indicates that if there are no promotional activities and price perceptions from respondents, the level of student interest tends to be very low.

The regression coefficient of 0.394 for promotion (X_1) indicates that student interest increases by 0.394 units for every one-unit increase in promotion. Similarly, the coefficient of 0.678 for price perception (X_2) implies that student interest increases by 0.678 units for every one-unit increase in price perception.

These findings indicate that price perceptions are more dominant than promotions in influencing new students' interest. Therefore, effective promotional strategies and pricing that align with students' perceptions play a crucial role in shaping their decision to choose a campus as a place to study. To assess the significance of each independent variable on the dependent variable, a t-test was used as a component of the regression analysis.

Table 2. Partial test (T-test)

Coefficient [a]						
Model		Unstandardized Coefficients		Standard Coefficient English	T	Signature
		B	Standard Error			
1	(Constant)	-7,259	4,805		-1,511	.137
	Promotion	.394	.120	.325	3,298	.002
	Price Perception	.678	.108	.618	6,266	.000
a. Dependent Variable: Student Interest						

The t-test results for the promotion variable show a calculated t value of 3.298, which exceeds the t-table value of 2.004, accompanied by a significance value of 0.002, which is below the α level of 0.05. This means that H_0 is rejected and H_1 is accepted, so it can be concluded that promotion has a significant effect on the interest of new students at Akubank Nusantara East

Aceh Campus. Meanwhile, the price perception variable has a calculated t value of 6.266, which is also greater than the t table value of 2.004, and a significance value of 0.000, which is far below the significance limit of 0.05. Thus, H_0 is again rejected and H_1 is accepted, which indicates that price perception partially has a significant effect on student interest. These results strengthen previous findings that both independent variables play an important role in shaping students' decisions in choosing a college.

In addition, to determine the influence of promotional variables and price perception simultaneously on the interest of new students, an F test was conducted. The results of the F test are shown in the following table:

Table 3. Simultaneous Test (f)

Analysis of Variance (ANOVA)						
Model		Sum of Squares	df	Mean Square	F	Signature
1	Regression	7944.004	2	3972.002	117,070 people	.000 billion
	Remainder	1866.065	55	33,928		
	Total	9810.069	57			
a. Dependent Variable: Student Interest						
b. Predictors: (Constant), Price Perception, Promotion						

Based on the results of the F test above, the calculated f value of 117.070 is greater than the f table value of 2.77, the significance value of 0.000 is smaller than alpha 0.05, so it can be concluded that H0 is rejected and H1 is accepted. This means that simultaneously the promotion and price perception variables have a significant effect on the interest of Akubank Nusantara Aceh Timur students.

Next, to determine the extent to which promotion and price perception variables contribute to explaining new student interest, a coefficient of determination analysis was conducted. The test results are shown in the following table:

Table 4. Correlation Coefficient Test

Model Summary				
Model	R	R Square	Adjusted R Squared	Standard Error of Estimate
1	.900 per year	.810	.803	5,825
a. Predictors: (Constant), Price Perception, Promotion				

Based on the table above, it can be explained that the large R Square value, namely 0.810 or 81%, provides an explanation that the research variables (Promotion and Price Perception) are able to explain the student learning interest variable (Y), while the remaining 19% is influenced by other variables not examined in this study.

3. Results and Discussion

The results of multiple linear regression analysis indicate that the promotion and price perception variables simultaneously have a significant influence on new student interest at Akubank Nusantara East Aceh Campus. The coefficient of determination (R^2) value of 0.810 indicates that 81% of the variation in student interest can be explained by these two variables, while other factors outside the scope of this study influence the remaining 19%.
Partially, the t-test results on the promotion variable show a calculated t value of 3.298, which is greater than the t-table value of 2.004 with a significance value of 0.002 <0.05.

This finding confirms that promotion has a positive and significant effect on the interest of new students. in line with research conducted by Ernawati Haskan, Samsinar, and M. Ridwan Tikollah (2023)with the title The Effect of Accreditation, Promotion, and Location on Student

Interest in Choosing Study Programs at Universities and the results of the study obtained that accreditation, promotion, and location simultaneously have a positive and significant effect on student interest in choosing the UNM Accounting Education Study Program. And it can be said that Promotion is a way or path for a marketer in conveying information and explanations to consumers about their products by Reftari, Suryana, & Setiaman (2023). This provides empirical evidence that the more targeted and effective the promotional strategy carried out by an institution, the greater the likelihood that new students will choose the campus as a place to continue their higher education. These results support previous findings, which stated that promotion, along with accreditation and location, had a positive and significant influence on student interest in choosing a study program. This view aligns with the theory (Reftari et al., 2018) , which asserts that promotion is a marketing communication tool aimed at persuasively conveying product value to potential consumers.

Furthermore, the t-test results for the price perception variable showed a calculated t-value of 6.266, exceeding the t-table value of 2.004 with a significance level of 0.000, meaning it is below the threshold of 0.05. This finding indicates that price perception has a positive and statistically significant effect on prospective student interest. The more positive students' perceptions of the affordability and value of educational benefits, the more likely they are to decide to pursue education. This is in accordance with the definition put forward by (Wijaya & Budiani, 2022) , which explains that price perception is an individual's evaluative process in assessing the suitability of price to the benefits received.

This finding is supported by research (Harris et al., 2024) which shows that price perception has a positive effect on student consumptive behavior, demonstrating the importance of price perception in shaping individual decisions, including in the context of higher education. And the results of this study are also in line with the research conducted by Sukmayanti Harris, Andi Muhammad Aditya, Tarmizi Thalib (2024)with the research title, namely Analysis of Price Perception and Consumptive Behavior in Students with the results of data processing analysis show that price perception significantly has a positive influence on price perception in students in Makassar City, meaning that the higher the price perception, the higher the consumptive behavior carried out by students in Makassar City.

The results of the simultaneous test (F) further strengthen the combined influence of the two independent variables. The calculated F value of 117.070 is greater than the F table of 2.77 with a significance level of 0.000 < 0.05. This indicates that promotion and price perception together have a significant influence on new student interest. This finding aligns with research (Lubis & Hamdan, 2020) which shows that promotion and price together make a positive contribution in shaping students' decisions in choosing an educational institution.

Overall, this study confirms that promotion and price perception are important determinants of new student interest. Akubank Nusantara East Aceh Campus is expected to optimize its promotional strategy, ensuring it is not only informative but also attractive and tailored to prospective students' needs. Furthermore, price perception needs to be maintained through transparent presentation of cost information, an inclusive scholarship program, and a flexible payment system. This strategy will not only increase interest but also strengthen the institution's position in interuniversity competition.

4. Conclusion

Based on the research results, it was concluded that promotion and price perception significantly influenced new student interest at the Akubank Nusantara East Aceh Campus. Partially, promotion proved to play a crucial role in attracting prospective students, particularly through targeted and effective communication strategies. Positive price perception also made a significant contribution, particularly when the cost of education was perceived as commensurate with the quality offered. Simultaneously, these two variables formed a strong

synergy in influencing prospective students' decisions to choose the campus as a place to study. Therefore, optimizing promotion and managing good price perception are strategic steps in increasing new student interest.

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THE INFLUENCE OF ACCOMMODATION QUALITY AND ACCESSIBILITY ON TOURIST SATISFACTION AT TAMAN WISATA IMAN DAIRI

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Abstract

This study explores how the quality of accommodation and accessibility influence the satisfaction of tourists visiting the religious tourism site Taman Wisata Iman (TWI) in Dairi Regency, North Sumatra. Using a quantitative research approach, data were gathered through surveys with a Likert-scale questionnaire filled out by 97 visitors to the site. The data was analyzed through several steps. First, validity and reliability tests were used to ensure the quality of the questionnaire. Then, a classical assumption test was conducted to confirm the suitability of the regression model. Finally, the data was processed using multiple linear regression analysis with the help of the latest SPSS software. The findings show that both accommodation quality and accessibility have a positive and significant impact on tourist satisfaction—both individually and when considered together. The coefficient of determination (R^2) was 0.700, meaning that 70% of tourist satisfaction can be explained by these two factors. These results suggest that improving accommodation and making tourist sites easier to access are key strategies for enhancing visitor satisfaction, encouraging tourist loyalty, and ensuring the sustainable development of religious tourism based on service and experience quality.

Keywords: Accommodation quality; Accessibility; Tourist satisfaction.

1. Introduction

Tourism is one of the important sectors in a country's economy, including Indonesia (Yakup, 2019). Its role is not only limited to increasing regional income, but also includes job creation, cultural preservation, and improving community welfare. One form of tourism that is growing rapidly is religious tourism which combines spiritual, cultural, and educational elements in one travel experience. Iman Dairi Tourism Park (TWI), located in Bukit Sitinjo, Dairi Regency, North Sumatra, is one of the religious tourism destinations that offers uniqueness through miniature places of worship from various religions in Indonesia. TWI's main attractions include the miniature life journey of Jesus Christ, Hindu temples, manasik hajj fields, mosques, and Paradise Park. With an area of about 13 hectares, TWI is not only a symbol of tolerance between religious communities but also has great potential as a leading tourist destination in North Sumatra. However, the success of a destination is not only measured by its main attraction. Tourist satisfaction is influenced by various supporting factors, including the quality and accessibility of accommodation (Sabda, 2022; Mulyana & Er Meytha Gayatri, 2022). Adequate accommodation is the main need of tourists as it serves as a place to rest and meet basic needs during the trip (Permatasari, 2023; Tenda et al., 2022) Comfort, cleanliness, service, and strategic location are all important aspects that shape travelers' perception of the value and quality of their experience (Tenda et al., 2022; Christine, 2021).

In addition, accessibility is also a key factor in supporting the success of tourist destinations. Accessibility can be measured from the ease of reaching tourist locations, road infrastructure conditions, availability of public transportation, and access to travel route information (Sefaji

et al., 2018; Saepullah & Himawan, 2024). Easily accessible destinations tend to be more in demand because they provide an efficient and enjoyable travel experience. Although many studies show that there is a significant influence between the quality of accommodation and accessibility on traveler satisfaction.

According to Saway et al., (2021), until now, there has been no research that specifically examines the relationship between the two variables and the level of satisfaction of tourists who visit Iman Dairi Tourism Park. In fact, in the context of religious tourism, the characteristics of tourists who prioritize a spiritual atmosphere, tranquility, and worship facilities require special attention to the quality of support services. This gap is an important basis for conducting this research. Various reviews about accommodation around TWI and the considerable distance from big cities such as Medan show that the quality and accessibility aspects of accommodation deserve to be studied more deeply. Thus, this study aims to identify and analyze the influence of accommodation quality and accessibility on tourist satisfaction in Iman Dairi Tourism Park, as an effort to provide strategic recommendations to increase the competitiveness of religious tourism destinations in a sustainable manner.

2. Methodology

This research method applies to a quantitative approach. According to Alir (2005), one of the quantitative research methods focuses on collecting and analyzing data in the form of numbers to obtain an objective and measurable picture of the phenomenon being studied. This method was chosen because it is in accordance with the main purpose of the study, which is to measure, analyze, and understand the relationship between various variables that contribute to the level of tourist satisfaction.

Causal associative research aims to determine the cause-and-effect relationship between independent variables and dependent variables. In these cases, the quality and accessibility of the accommodation are independent variables and traveler satisfaction is a dependent variable. Dairi Iman Tourism Park (TWI), located in Sitinjo District, Dairi Regency, North Sumatra Province, is the location of this research. The research will be conducted from March to June 2025, and will include the planning, data collection, data processing, and results analysis phases.

The population in this study is tourists who have visited Iman Tourism Park from January to March 2025 as many as 3,000 visitors (Sulistiyowati, 2017). Sampling was done by non-probability sampling, using a simple sampling technique (Adolph, 2016). The number of samples was determined using the Slovin formula with a 10% error rate, i.e.:

$$n = \frac{N}{1 + Ne^2}$$

Where:

i. n = Sample size
ii. N = Total population (3000)
iii. e= Error tolerance rate 10% (e = 0.10)
e2 = (0.10)2 = 0.01, N×e2 = 3000×0.01 = 30, 1+(N×e2) = 1+30 = 31
n = N/1+N e2 = 3000/31
n = 96.77

Thus, the number of respondents is 97.
The research began with the preparation of a research instrument in the form of a questionnaire. The questionnaire was compiled based on indicators taken from theory and previous research results. Respondents were asked to fill out a questionnaire. The main instrument was a closed questionnaire using a 5-point Likert scale:

Table 1. Likert Scale for Ordinal Measurement

Not	Choice	Score
1	Strongly agree	5
2	Agree	4
3	Nervous	3
4	Disagree	2
5	Strongly disagree	1

Variables and Indicators:

i. Accommodation Quality (X1): cleanliness, completeness of facilities, staff service, safety
ii. Accessibility (X2): ease of transport, road directions, road conditions, availability of parking
iii. Traveller Satisfaction (Y): suitability of expectations, return intentions, recommendations, prices and service satisfaction.

Statistical Analysis and Data Fabrication Process
Data processing and analysis are carried out using SPSS software for Windows, with the following steps:

Validity Test
i. Using Pearson Product- Moment correlation
ii. Items are valid if *r* is calculated > *the table r* (Novikasari, 2017; Arikunto, 2019)

Reliability Test
i. Using Alpha Cronbach
ii. This instrument is considered reliable if $\alpha \geq 0.60$ (Janna & Herianto, 2021; Rain, 2022

Classic Assumption Test
i. Normality: using P-P Plot (Usmadi, 2020)
ii. Multicollinearity: using Tolerance and VIF (Haris, 2018)
iii. Heteroscedasticity: using residual scatterplot graphs (Haris, 2018)

Multiple Linear Regression Tests
i. Pattern:

$$Y=a+b1x1+b2x2+\varepsilon$$

Information:
ii. Y = Tourist Satisfaction
iii. X1 = Quality of Accommodation
iv. X2 = Accessibility
v. a = Constant
vi. b1, b2 = Regression coefficient
vii. ε = term error

Hypothesis Test
i. T-test (partial) to determine the influence of each independent variable
ii. F test (simultaneous) to determine the combined effect of independent variables on dependent variables (Soedyafa et al., 2020)

Determination Coefficient (R^2)
i. To measure the magnitude of the contribution of the variables X1 and X2 to Y

3. Results and Discussion

3.1 Characteristics of respondents

The purpose of this study was to find out how respondents rated accessibility, accommodation, and satisfaction with visiting. Using a five-point Likert scale, the results of filling out the questionnaire provided by the respondents became the basis for this assessment. This study involved 97 respondents. Based on gender, there were 51 males (52.6%) and 46 females (47.4%). 43.3% of respondents were between 21 and 30 years old. Most of the population comes from Dairi (49.5%), followed by Medan (18.6%) and Pematang Siantar (10.3%).

3.2 Accommodation variables

Accommodation quality variables are measured using 8 indicators. From the calculation of the total scores, respondents mostly scored in the "agree" to "strongly agree" category, with a score range between 2,639 and 3,880. This rating indicates that in general, visitors feel that the accommodations they use—such as bedrooms, bathrooms, common amenities, and the services of the inn's staff—have provided a decent and acceptable experience. Some indicators such as bed comfort, staff friendliness, and room cleanliness, scored quite highly, indicating that there are positive aspects of the lodging service that must be maintained. However, there are still a number of aspects that are considered less than optimal by some respondents, such as the completeness of indoor facilities (air conditioning, TV, WiFi, etc.), the condition of public facilities, and the speed of staff response to complaints. The not too high value on the indicator shows that there is still room for improvement, both in terms of physical facilities and service quality.

Therefore, even though the accommodation facilities at TWI Dairi have been rated adequate by visitors, management is advised to conduct continuous evaluations and improvements, especially in terms of facility maintenance, more responsive service delivery, and improvement of general comfort. These measures are important to improve overall tourist satisfaction, which can ultimately contribute to increased visitor loyalty, destination image, and potential growth of the local tourism sector.

3.3 Accessibility variables

Accessibility variables are also measured by 8 indicators. The total score is in the same category, i.e. "agree" to "strongly agree" with a range of values between 2,639 and 3,880. Accessibility is in the "Adequate" category. This shows that in general, respondents view that access to and around Dairi Iman Tourism Park (TWI) is at a moderate level of comfort. These results give an idea that although accessibility is not underrated overall, there is still room for infrastructure and service improvements to support tourism access, to create an easier, more convenient and inclusive visit experience for all travelers.

3.4 Traveler Satisfaction

The variable of tourist satisfaction is measured through 8 indicators, including the suitability of expectations, intention to review, and recommendations to others. The majority of respondents also gave positive ratings to this variable, with scores in the range of "agree" to "strongly agree". The Accessibility and Accommodation Indicator for tourist satisfaction is 2095, so the level of tourist satisfaction with Iman Tourism Park is in the "Adequate" category, based on the classification of the value range that has been set previously. This indicates that in general tourists are quite satisfied with the services and facilities available during their visit. This means that the travel experience provided has been able to meet the needs and expectations of visitors within reasonable limits, even though it is not fully optimal to create high or exceptional satisfaction. This "Adequate" rating indicates that while most visitors feel

comfortable and satisfied during their trip, there are still some important aspects that need to be taken into account and further improved. Based on the results of the assessment per indicator, there are weaknesses in several elements, especially related to accessibility to tourist sites, the availability and comfort of public transportation, as well as the quality of service of accommodation staff, such as speed in responding to complaints and friendliness in service. In addition, indicators related to accessibility for tourists with special needs (the elderly and people with disabilities) also obtained relatively low scores, indicating that inclusive facilities in tourist areas are not fully adequate.

3.5 Quantitative Analysis

a. Validity Test

The validity test aims to find out to what extent each item in the questionnaire is capable of measuring what should be measured. In this study, the Pearson Product Moment correlation method was used between the score of each question (item) and the total variable score. The validity criteria used were the value of r calculated > table r (0.1996) at a significance level of 5% and N = 97 (df = 95). If the calculated r-value meets these criteria and the significance value < 0.05, then the item is declared valid. Here are the results of the validity test:

Table 2. Validity Test

Variable	Statement	r Calculations	r Table (dt)	Information	Sig.
Accommodation (X1)	Statement 1	0,849	0,1996	Legitimate	0,000
	Statement 2	0,820	0,1996	Legitimate	0,000
	Statement 3	0,806	0,1996	Legitimate	0,000
	Statement 4	0,751	0,1996	Legitimate	0,000
	Statement 5	0,822	0,1996	Legitimate	0,000
	Statement 6	0,810	0,1996	Legitimate	0,000
	Statement 7	0,806	0,1996	Legitimate	0,000
	Statement 8	0,748	0,1996	Legitimate	0,000
Accessibility (X2)	Statement 1	0,690	0,1996	Legitimate	0,000
	Statement 2	0,775	0,1996	Legitimate	0,000
	Statement 3	0,702	0,1996	Legitimate	0,000
	Statement 4	0,746	0,1996	Legitimate	0,000
	Statement 5	0,800	0,1996	Legitimate	0,000
	Statement 6	0,813	0,1996	Legitimate	0,000
	Statement 7	0,676	0,1996	Legitimate	0,000
	Statement 8	0,753	0,1996	Legitimate	0,000
Traveller Satisfaction (Y)	Statement 1	0,843	0,1996	Legitimate	0,000
	Statement 2	0,750	0,1996	Legitimate	0,000
	Statement 3	0,770	0,1996	Legitimate	0,000
	Statement 4	0,731	0,1996	Legitimate	0,000
	Statement 5	0,666	0,1996	Legitimate	0,000
	Statement 6	0,713	0,1996	Legitimate	0,000
	Statement 7	0,745	0,1996	Legitimate	0,000
	Statement 8	0,688	0,1996	Legitimate	0,000

The results of the above test show that all items in the questionnaire are valid because they meet the criteria of positive correlation, significant, and the sum of r is greater than the r of the table. The correlation value between each item and a total score above 0.1996 is significant at a significance level of 0.01.

b. Reliability test

In the reliability test, the internal consistency of the questionnaire used was assessed. The Alpha Cronbach method is used to evaluate instruments. An instrument is considered reliable if it has an alpha Cronbach value of at least 0.60.

Table 3. Reliability Test

Alpha Cronbach	N item
.954	24

According to Ghozali (2016), the instrument in this study has very high reliability, far exceeding the minimum limit of 0.70, with an Alpha Cronbach value of 0.954. This shows that, for each variable, accessibility, and satisfaction of travelers and the items in the questionnaire use the same construction.

3.5 Classic Assumption Test

a. Normality Test

Normality tests are performed to see if the residual data from the regression model is spread normally. In this study, the Normal P-P Plot method was used.

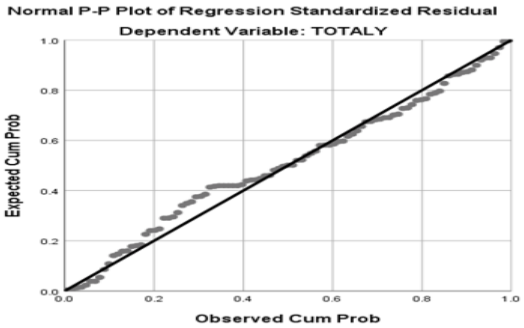

Fig. 1 Normality Test

On the P-P Plot graph, the data points show a pattern spread around the diagonal line, although there are slight deviations in the bottom center and top end. Most of the points remain close to the diagonal line, which indicates that the model residue is distributed in a way that is close to normal. Therefore, it can be concluded that the regression model meets the assumption of normality, so the data is suitable for further analysis.

b. Multicollinearity Test

The multicollinearity test is used to test whether there is a high correlation between independent variables. In this study, two indicators were used, namely Tolerance and Variance Inflation Factor (VIF).

Table 4. Multicollinearity Test

Variable	Tolerance	CLEAR	Information
TOTALX1 (X1)	0,471	2,122	Multicollinearity does not occur
TOTALX2 (X2)	0,471	2,122	Multicollinearity does not occur

A tolerance value greater than 0.1 and a VIF of less than 10 indicate that there are no symptoms of multicollinearity between independent variables. Thus, the regression model is declared free of this problem, and the variables X1 and X2 are worthy of inclusion in the multiple regression model.

c. Heteroscedasticity Test

A heteroscedasticity test is performed to ascertain whether the residual variance is inconsistent. The student's residual value and predicted value are linked with the Scatterplot method to do this. The results of the study show that there are no patterns of any kind, such as wavy, narrowing, or widening of the body. The residual points are evenly distributed above and below the horizontal axis. As a result of the free heteroscedasticity model, the variation of the residue is constant. The results of the three tests showed that the data were normally distributed (normality test), there was no significant linear relationship between independent variables (multicollinearity test) and constant residual variance (heteroskadasticity test). Therefore, all classical assumptions are met, and a number of linear regression models can be used to evaluate the validity and credibility of hypotheses.

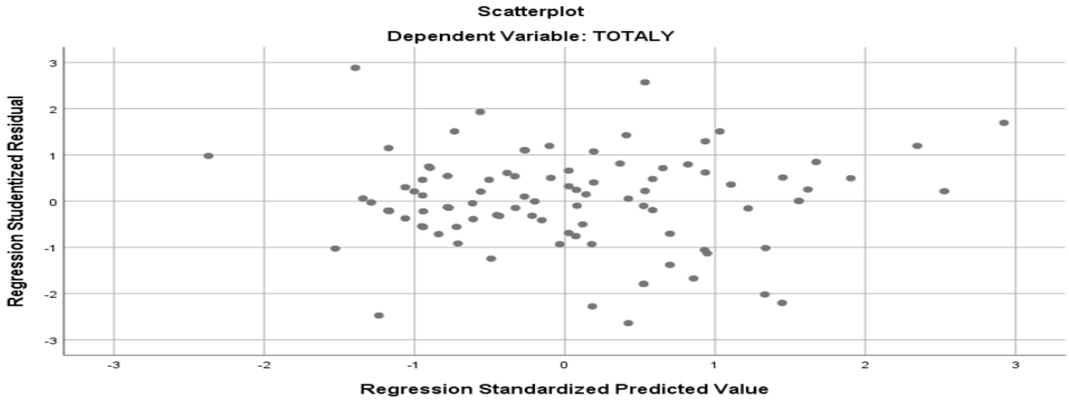

Fig. 2. Heteroscedasticity Test

3.7 Multiple Regression Analysis

To find out how much influence the two independent variables, accommodation (X1) and accessibility (X2), have on the dependent variable, tourist satisfaction (Y), multiple linear regression analysis was used. This method provides a quantitative analysis of the relationship between variables and the influence of each variable on the model.

a. Multiple Regression Tests

The results of multiple regression tests were used to determine the influence of accommodation quality (X1) and accessibility quality (X2) variables on tourist satisfaction (Y) at Iman Dairi Tourism Park.

Table 5. Multiple Regression Test

Coefficient Pattern		Non-Standard Coefficients		Standard Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.227	1.294		3.267	.002
	TOTALX1	.523	.070	.613	7.447	.000
	TOTALX2	.251	.074	.278	3.381	.001
a. Dependent Variable: TOTALY						

Based on the results of the analysis, the regression equation is obtained as follows:
Y: a + b1 X1 + b2 X2e
Y = 4.227 + 0.523X1 + 0.251X2
Information:

Y : Tourist Satisfaction Variable
A : Constant Numbers
b1 : Accommodation Variable Regression Coefficient
b2 : Accessibility Variable Regression Coefficient
X1 : Accommodation Variables
X2 : Accessibility Variable
e :Error

Based on the results of multiple regression, it was found that each unit of accommodation quality improvement (X1) increased tourist satisfaction (Y) by 0.523 and accessibility quality (X2) by 0.251. A constant value of 4.227 indicates that tourist satisfaction persists despite the absence of X1 and X2 contributions.

b. Partial Test (t-test)

The influence of each partially independent variable on the dependent variable is measured by the t-test. The decision-making criteria are as follows: There is a significant influence if the t-count is greater than the t-table
(1.985 for N = 97 and α = 0.05) and significance values less than 0.05.

Table 6. Partial Test (t-test)

Variable	B (Coefficient)	Std. Error	t-count	Sig. (p-value)	Information
Constant	4,227	1,294	3,267	0,002	-
Accommodation (X1)	0,523	0,070	7,447	0,000	Significant for tourist satisfaction
Accessibility (X2)	0,251	0,074	3,381	0,001	Significant for tourist satisfaction

Based on the results of the t-test, it is known that the t-count value for accommodation is 7.447, with a significance level of 0.000. This means that the higher the quality of accommodation that travelers feel, including room cleanliness, staff services, security, and other supporting facilities, the higher the level of satisfaction they experience. This supports the first hypothesis (H1) in this study. The t-count value for accessibility is 3.381, with a significance of 0.001. This confirms that the easier it is for tourists to reach tourist sites, the more information and directions are available, and the better the condition of the road infrastructure to TWI, the level of tourist satisfaction will increase. These findings confirm the second hypothesis (H2) that has been formulated previously.

c. Simultaneous Test (F-Test)

The F test is used to test the influence of the variables X1 and X2 simultaneously on Y.

Table 7. Simultaneous Test (F-Test)

NEW ERA

Pattern		Number of boxes	Df	Square Average	F	Sig.
1	Regression	1975.145	2	987.572	109.815	000b
	Remnant	845.350	94	8.993		
	Entire	2820.495	96			

Dependent variable: TOTALY

Predictors: (Constant), TOTALX2, TOTALX1

The t-test results show that both accommodation and accessibility have a meaningful impact on tourist satisfaction. This is supported by the F-test results, where the F-value (109.815) is

much higher than the required F-table value (3.09), and the significance value (0.000) is clearly below 0.05→ This means the combined effect of accommodation and accessibility on tourist satisfaction is statistically significant

c. Determination Coefficient (R^2)
The determination coefficient indicates how much variation can be caused by dependent variables (traveler satisfaction) and independent variables (accommodation and accessibility).

Table 8. R^2 Test

Modelb Summary				
Pattern	R	R Square	Customized R Box	Std. Estimation Error
1	.837a	.700	.694	2.999

a. Predictor: (Constant), TOTALX1, TOTALX2
b. Dependent Variable: TOTALY

The value found based on the calculation results is: R Square (R2) of 0.700, indicating that the variation in the quality and accessibility of accommodation accounts for 70% of the variation in tourist satisfaction. Other factors not described in this model, such as social interaction, religious atmosphere of destination, ticket prices, spiritual attractions, and other personal factors, account for the remaining 30%. In addition, the R2 adjustment value of 0.694 indicates that, despite adjustments to the number of predictor variables, the model remains stable and robust. In other words, the regression model used in this study can explain well how the free and bound variables interact with each other.

This study found that both accommodation quality and accessibility have a strong effect on how satisfied tourists feel when visiting Taman Wisata Iman (TWI) in Dairi. Accommodation had the stronger impact, with a high t-value of 7.447 and a significance level of 0.000, showing that better places to stay greatly improve tourist satisfaction. Accessibility also played an important role, meaning that the easier it is to reach and move around TWI, the more satisfied visitors are. (t-count = 3.381; sig. = 0.001). Simultaneously, these two variables explain the variation in tourist satisfaction by 70% based on the R^2 value of 0.700.

These findings are in accordance with research that has been carried out by (Christine, 2021) and (Saway et al., 2021), Emphasizing that physical comfort during a stay greatly determines the satisfaction of tourists, especially in the context of spiritual or religious travel. The study reinforces this idea with empirical data showing that the quality of accommodation, including cleanliness, safety, and staff service, plays a key role in creating positive experiences in tourist destinations. Similarly, the results of research that have been carried out by (Muharromah & Anwar, 2020) and (Saepullah & Himawan, 2024) shows that easy access to tourist sites is an important element in forming a positive perception of destinations. The study supports these findings by proving that good accessibility—including road conditions, clarity of directions, and ease of transportation—directly increases traveler satisfaction. Theoretically, these results support the Expectation Disconfirmation Theory, which states that satisfaction occurs when a traveler's perception of a service meets or exceeds initial expectations. In the context of TWI Dairi, travelers who get a comfortable stay experience and an easy trip will feel that their visit is worth their expectations or even exceeds their expectations.

However, the results of this study also open up a space for discussion about limitations. First, the variables used only included two main factors, namely accommodation and accessibility, while other factors such as officer service, spiritual aspects, social interactions, religious attractions, and weather factors were not included in the regression model. This explains why there is still a 30% variation in traveler satisfaction that this model cannot explain. Second, this study is cross-sectional and limited to one religious tourism location. Therefore, generalization of findings to other tourist destinations, both religious and non-religious, must be done carefully. In addition, data is collected through self-reported questionnaires, which

have the risk of biasing individual perceptions or interpretations of the questions asked. The implications of these findings are very important for tourist destination managers, especially in the context of religious tourism. Accommodation and accessibility are not just logistical components but are integral to the overall value of the traveler's experience. The improved quality of accommodation not only increases comfort but also reflects respect for the spiritual purpose of sightseeing travel. Similarly, the increase in accessibility reflects the openness of the destination for all groups, including those from remote areas or with mobility limitations.

The results of this study explain the importance of a holistic approach in the management of tourist destinations. It is not enough to rely solely on spiritual appeal or natural aesthetics; The success of destination management is also determined by supporting infrastructure and integrated services. Going forward, further research is suggested to explore more variables, such as the value of spirituality, the quality of tourism HR services, and social relationships during visits, which may have a strong influence on tourist satisfaction in the context of religious tourism. In addition, longitudinal or comparative studies between destinations can provide a more comprehensive picture of the factors that shape satisfaction in various tourism contexts.

4. Conclusion

From the results of the research that has been carried out, several points of conclusion are obtained as follows: Accommodation Has a Strong Positive Impact on Tourist Satisfaction. The study found that better accommodation leads to higher tourist satisfaction. The results were statistically significant ($p = 0.000$, which is less than 0.05), and the t-value (7.447) was much higher than the required value (1.986), proving this effect is real and meaningful. Accessibility Also Affects Satisfaction in a Positive Way. The easier it is for tourists to get to the location and move around it, the more satisfied they are. This was also statistically significant ($p = 0.001$, t-value = 3.381 > 1.986). Both Factors Together Increase Tourist Satisfaction. When accommodation and accessibility are combined, they have a strong overall influence on satisfaction. The F-test result ($F = 109.815$) was much higher than the required value (3.090), with a p-value of 0.000, meaning this combined effect is very significant. Accommodation and Accessibility Explain 70% of Satisfaction. These two factors explain 70% of the changes in how satisfied tourists are. The remaining 30% comes from other things not covered in this study—like activities, service quality, or personal preferences. The Research Used Reliable and Valid ToolsThe questionnaire used to collect data was tested and found to be very accurate and reliable. All items were valid (r-count > r-table), and the reliability score (Cronbach’s Alpha = 0.954) shows that the tool is highly trustworthy for research purposes.

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THE ROLE OF ROOM ATTENDANTS AND ROOM CLEANING HYGIENE ON GUEST SATISFACTION LEVELS AT THE GRAND CENTRAL PREMIER HOTEL

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Abstract

The aspect of cleanliness in lodging has a strong relationship with hygiene and sanitation management. This has an impact on the standards and comfort of hotel services, as well as becoming an attraction for visitors or customers to visit and utilize lodging services. Cleanliness is mandatory and must be implemented in every hotel room. This research is a qualitative descriptive study that aims to describe and explain the roles and duties of aimed at describing and analyzing the roles and responsibilities of room attendants in maintaining room cleanliness before guests check in and after guests check out of the hotel. From the qualitative descriptive analysis conducted, the results obtained indicate that the implementation of room cleaning, as well as the role of room attendants, significantly impacts guest satisfaction levels at the Grand Central Premiere Hotel. The author suggests conducting further research on room cleaning and the role of room attendants in enhancing guest satisfaction at hotels, and recommends focusing on different research areas and data sources.
Keywords: Hygiene; Cleanliness; Satisfaction.

1. Introduction

Tourism in Indonesia has now become famous among many visitors through social media and promotions. This makes many people and visitors interested in coming and vacationing while enjoying the scenery and services provided by the tourist attractions. Therefore, tourist sites need to have good facilities so that visitors want to come back again, and a common residence in tourist attractions now is a hotel. When we talk about a hotel, what comes to our mind is usually a luxurious building or a multi-storey building that offers comfortable rooms with various complete facilities and is ready to serve guests. Of course, every hotel strives to provide the best service for guest satisfaction. Although every hotel makes maximum efforts to charm guests, sometimes there are things that can make guests feel uncomfortable, so they make complaints.

According to Smaradhana & Lutfie (2021), the definition of a hotel is a company that is oriented towards the service sector and has the idea of integrating goods with services. Usually, the service facilities provided are lodging or room rental, food and beverages, and other facilities in the hotel. The entire accommodation service provided by the hotel is aimed at the general public and is managed with the aim of making a profit. The success rate of a hotel can be seen from how many rooms are occupied, which is an important factor for a hotel. In the ever-changing trend of hotel management according to current market demand, hygiene and sanitation factors have become the main activities in hotel operations. In the principle of hotel or residence management, providing satisfaction to guests through good service is very important. This will be the responsibility of the hotel company to protect the interests of guests, the community, and the surrounding environment. Therefore, it is important to implement and improve hygiene and sanitation. In managing hygiene and sanitation in hotel rooms, the hotel as a service provider must be able to maintain cleanliness, comfort, and health, especially in the hotel room area.

Based on the opinion of Dedy and Alfiandi (2022), quality service is about how to provide services, prepare, organize, and meet all customer needs both individually and in groups in order to meet or even exceed customer expectations. The task of housekeeping or room attendants is crucial, so it is necessary to give responsibility to people who are experts, fast, and skilled. As one of the companies operating in the hospitality service sector, Grand Central Premier Hotel is one of many similar service businesses in Indonesia, especially in Medan. In carrying out its operations, a room attendant sometimes forgets the role and cleanliness of the hotel or guest room, which is the main value for guests staying at a hotel. The author's experience when getting bad or unfavorable comments from customers is when the room is not neat, the equipment in it is not complete and the room is not clean and fragrant. The author wants to know what kind of room attendant and hygiene role can increase the satisfaction of guests staying at the Grand Central Premier hotel. Based on the explanation above, the author focuses on research on the role of janitors in supporting good service efforts and ensuring visitor satisfaction at the Grand Central Premier hotel. The goal is that the Grand Central Premier hotel in the future will be increasingly recognized by many people and make it one of the best hotels with a very competent level of comfort and cleanliness and is ready to compete with other best hotels in the city of Medan.

2. Methodology

Research Type refers to an overarching approach that chooses to integrate the various components of the research in a coherent and logical manner, thus ensuring that the research problem is appropriately addressed. The purpose of a qualitative study is to seek answers to a phenomenon or statement using a structured scientific method through a qualitative approach.

The author determines the research location as the area where the research will be carried out. The research location is Putri Merak Jingga Street No.3A, Kesawan, Kec.Medan Bar., Medan City precisely at the Grand Central Premier Hotel Medan. The data source in this study will be taken from the Grand Central Premier Hotel where there will be 10 rooms that will be the data in this study. In this study, the primary data used comes from conversations or interviews conducted with selected sources.

The interviews conducted by researchers took place in different periods of time with a total of 10 sources while staying at the Grand Central Premier hotel. In this study, researchers used two research methods, namely the documentation method and the interview method. The method of presenting information used in this study comes from the Miles and Huberman model such as 1) Data Reduction, 2) Data Presentation, 3) Drawing conclusions or verification

3. Results and Discussion

3.1 The Role of Room Attendant on Guest Satisfaction Level at Grand Central Premier Hotel

Based on the results of interviews with ten interviewees who have stayed at Grand Central Premier Hotel Medan, it can be concluded that room attendants have an important role in shaping guests' positive perceptions of room cleanliness and comfort. The responses from the interviewees show that the presence of room attendants who are friendly, responsive, and thorough in maintaining room cleanliness is a major factor in creating guest satisfaction. As stated by Aldi, a 23-year-old student

“From the beginning of check-in to checkout, the room attendants were very clean, friendly, fast and responsive when I requested something.”

This statement reflects how the presence of a room attendant is not just a technicality of cleanliness, but also involves aspects of direct service to guests. Aldi also added that he would

recommend this hotel and return someday, signaling the loyalty built from the positive experience. This means that satisfaction arising from direct interaction with room attendants can strengthen repeat visit intentions.

Similarly, Ms. Dewi, a 29-year-old office employee, highlighted the importance of a clean and comfortable atmosphere during her stay. According to her,

“The cleanliness, comfort, and spot view are good, clean, beautiful and cool to enjoy,”.

Indicating that not only is the room clean as an enclosed space, but the entire visual experience is also influenced by the neat work of the housekeeping staff. She also mentioned that she would recommend the hotel, indicating that her stay was very satisfying. The fact that interviewees with different backgrounds gave similar assessments reinforces that the role of room attendants applies universally to all guest segments. A room attendant's job performed to a high standard is proven to create a comfortable atmosphere that is inseparable from overall guest satisfaction. Apart from the physical aspects of the room, the interviewees also appreciated the professional work of the room attendants as part of the hotel's overall service.

Ms. Elis, a 25-year-old Catholic kindergarten teacher, added that she stayed for three days and during that period felt the room attendants' optimal service. She said,

“The hotel is clean, comfortable, the room attendants are friendly and dexterous,”

Reflecting that direct interaction with the room attendants has an impact on the comfort of a medium-term stay. Which reflects that direct interaction with room attendants has an impact on the comfort of a medium-term stay. Her rating of friendliness and dexterity shows that room attendants not only play a role in cleaning rooms, but also represent the face of hotel services. In fact, he affirmed,

“Next time I will recommend this hotel to my relatives too,”

Which shows the organic promotion of satisfied guests. This shows the chain effect of good service provided by room attendants on the hotel's marketing efforts indirectly. It can be concluded that the interpersonal skills of room attendants play an important role in fostering loyalty and spreading the good word.

From the fourth interviewee, Mrs. Novri, who is 24 years old and works as an office employee, it is known that the first impression is clean and fragrant. She said, “At the beginning of my stay I immediately liked it, because the first time I entered it was clean and fragrant, the bathroom and spring bed were also clean.”
This statement shows that the success of the room attendant in creating overall cleanliness, from the main room to supporting facilities such as the bathroom, determines the initial impression of the guest.

Mrs. Novri also expressed her desire to stay again if there is a need in Medan, which shows that satisfaction with cleanliness is closely related to repeat visit intentions. Room attendants who are able to maintain cleanliness consistently from the beginning to the end of the stay will increase the perception of hotel professionalism. This positive experience involves not only the visual aspect, but also the aroma and physical comfort created by a clean room.

Ms. Tiara, a 25-year-old nail art entrepreneur, confirms that a clean and fragrant room is a key indicator in determining the quality of a hotel. She said,

“The room is clean, smells good, the bathroom is really good, because I make sure the bathroom is first.” The emphasis on clean bathrooms as the first indicator shows that guests

have high standards for the area, and a good room attendant should understand the different hygiene priorities for each guest. In addition to this, he also considers responsive or “really fast” receptionists and room service as a plus point in hotel service. However, the success of room attendants in maintaining the most sensitive parts such as the bathroom is the main factor that influences guests' decision to return. Ms. Tiara stated,

“If we staycation in this area, we will come back again,”

which indicates positive retention influenced by cleaning services.

Thus, the room attendant's job in ensuring the cleanliness of intimate areas such as bathrooms is one of the most crucial aspects.

Marcel, a 22-year-old university student, mentioned that he decided to stay because of a family recommendation and didn't regret it.

“From the moment I entered, it was good, the receptionist was good, the water heater had no problems, the room was spacious and clean, and the blankets were not dirty.”

His words show that room cleanliness, especially linen such as blankets, is a major concern for more selective young male guests. Marcel also mentioned the fast WiFi connection, but the cleanliness aspect remains the first assessment before enjoying other facilities.

“Next time I will come back to this hotel,” he said. This shows that good service from room attendants not only impacts physical comfort, but also creates trust in the quality of the hotel. Especially for young guests, the value of efficiency and neatness determines satisfaction.

The seventh interviewee, Mrs. Tekun who works as a tutor, gave a brief but concise testimony of her experience. She stated,
“During my stay at this hotel I felt comfortable, clean, the service was also good.”

This statement emphasizes that comfort cannot be separated from room cleanliness, which is directly the responsibility of the room attendant. The impression of comfort left by a room attendant can linger in a guest's memory even if only briefly mentioned. Thus, it is important for room attendants to not only perform technical tasks, but also ensure that the service feels personalized to each guest.

Mr. Alnan, a 28-year-old office worker, pays attention to the overall safety and cleanliness aspects.

“As long as I stay here, the cleanliness is very good, the employees are very friendly too, each corridor also has CCTV so it's more safe,” he said.

This statement shows that the role of the room attendant is not only to clean the room, but also to create a safe and comfortable environment as a whole. The friendly attitude of the housekeeping staff adds positive value to the service, while the presence of supporting technology such as CCTV provides an additional sense of security. Mr. Alnan also mentioned that he would most likely stay again, strengthening the link between service quality and guest loyalty. This suggests that the combination of a professional attitude and support systems makes guests feel cared for. Thus, the role of the room attendant becomes an integral part in the hotel's integrated service system.

Mr. Burhan, a 32-year-old office employee, highlighted the cleanliness and aesthetic appearance of the room as the main factors that affected his comfort. He expressed,

“The room is nice, the decoration is nice, the cleanliness is pretty good, the room smells nice, the bed is neat, and the bathroom is clean.”

This answer shows that elements directly handled by the room attendants such as the cleanliness of the linen, the layout, and the smell of the room play an important role in the guest experience. He even added,

“I was comfortable, I intend to stay at Hotel GCP again in the future,”

The visual arrangement and cleanliness that is consistently maintained shows that room attendants are not only in charge of cleaning but also creating an aesthetic of comfort. This shows that every detail done by the room attendant has a direct impact on the guest's judgment. The combination of visuals, aroma, and technical cleanliness creates a satisfying overall experience.

Finally, Mr. Rizky, a 35-year-old lecturer, appreciated the quick response and professionalism of the room attendants during his stay. He said,

“During my stay, the room attendant was responsive, friendly, the cleanliness was also very good, and comfortable.”

The use of the word “responsive” shows that two-way communication between guests and staff is highly valued by professional guests such as lecturers. Mr. Rizky also added,

“It is likely that I will come back again to bring my family,”

which shows high trust in the quality of hotel services. This confirms that a positive experience from the housekeeping side can improve the image of the hotel not only for individuals, but also for family groups. The decision to bring the family signifies confidence in the consistency of service quality. Thus, the role of room attendants is crucial in maintaining standards that not only satisfy but also build long-term reputation.

3.2 The Role of Room Cleaning Hygiene on Guest Satisfaction Level at Grand Central Premier Hotel

The cleanliness aspect of hotel rooms, especially with regard to overall hygiene or sanitation, is one of the main indicators of guest satisfaction during their stay. Based on the interview data that has been conducted, it was found that the majority of guests pay special attention to the feasibility and physical cleanliness of the room facilities, especially the bathroom, linen, and air ventilation. Aldi, one of the guests interviewed, said that the cleanliness of the room was very well maintained from the beginning of his arrival.

“The room is spacious and clean, from the start of check in until checkout it stays very clean,” he emphasized.

This shows that consistently maintained hygiene standards can shape guests' positive impressions of hotel service quality. This means that hygiene that is professionally managed by the room attendant team has a big influence in fostering a sense of comfort and security during the stay.

Ms. Dewi, an office employee staying at Grand Central Premier Hotel, underlined that the clean-room environment and well-maintained spot view have a positive psychological impact. She mentioned,

“Cleanliness and comfort are my main values in choosing a hotel; the cool and clean atmosphere makes me feel at home.”

Hygiene is not only about visual cleanliness, but also about air conditions, room odors, and sterile toiletries. When guests feel that the sleeping rooms and bathrooms are clean and hygienic, their trust in the hotel increases. There is no hesitation to use the facilities provided, even without feeling the need to bring additional personal items. In this case, the role of room cleaning staff as the frontline in maintaining cleanliness is absolutely necessary to maintain service quality.

Mrs. Elis, a kindergarten teacher who stayed for three days, expressed her satisfaction with the room sanitation. According to her,

“During my stay, the room was kept clean, the floor was not sticky, and there was no unpleasant odor.”

This statement shows that room cleanliness is not only done regularly, but also touches deep aspects such as the floor, corners of the room, and ventilation. A thoroughly clean hotel room provides a feeling of security, especially for guests staying more than one night. He also considers bathroom cleanliness as a determinant of comfort during a hotel stay. It is clear then that hygiene is not just a cleaning routine, but is part of the process of keeping guests healthy and calm.

Ms. Novri, who works as a private sector employee, said that when she first entered the room, she immediately felt comfortable due to the cleanliness and refreshing aroma.

“The smell of the room immediately made me feel confident, the bathroom was also clean, and there were no water stains on the mirror or floor,” she said.

Attention to small details like the cleanliness of mirrors and floors reflects that the room attendant is working on the whole, not just the surface. Good room cleaning gives the impression that the hotel is not careless when it comes to hygiene standards. Awareness of the importance of hygiene, especially in the post-pandemic era, has made guests more sensitive to sanitation. Hence, the commitment to maintain overall cleanliness is a plus point for this hotel.

Ms. Tiara, a nail art entrepreneur, stated that she always checks the condition of the bathroom before deciding to stay in a hotel.

“I make sure to clean the bathroom first, and it's really clean here, the towels are pure white, and the toilet doesn't smell,” she explained.

This suggests that perceptions of hotel room hygiene are strongly influenced by the condition of the bathroom and its amenities. Trust in the standard of cleanliness of towels and other sanitary facilities is a major consideration, especially for female guests. Ms. Tiara also revealed that the presence of soap and shampoo facilities in sealed conditions strengthened her confidence in hotel hygiene standards. This means that cleanliness is not just a matter of appearance, but also the sanitation distribution and control system managed by housekeeping. This also impacts on psychological comfort and a sense of security from the risk of infection or contamination.

Marcel, a student staying on a family recommendation, commented that he felt comfortable because the room was not only clean but also sterile. He said,

“The blanket had no stains, the bed was neat, even the room smelled fresh, not like a cheap hotel.”

Trust in the quality of the hotel is built on the experience of experiencing a truly clean and safe room. This shows that a high standard of cleaning service can be a key differentiator among other four-star hotels.

Mrs. Tekun, a private tutor, revealed that the cleanliness of the mattress and bed linen is her main concern.

“I'm allergic to dust, so if the sheets and bedcovers aren't changed, I can immediately tell,” she said. During her stay at the Grand Central Premier Hotel, she felt safe because she did not experience any allergy complaints, which indicates that the room attendants maintain the hygiene of the linen well. She also said that the room's trash cans were cleaned regularly, and there were no unpleasant odors in the room. This kind of comfort can only be achieved if cleaning standards are implemented in a disciplined and thorough manner. Thus, the involvement of the cleaning team in ensuring allergen-free areas is an important indicator in maintaining the satisfaction of sensitive customers.

Mr. Alnan, a private employee, shared that the hotel's cleaning system was professional. He said,

“The towels are neatly folded, there are no traces of use, the bathroom floor is dry, and the toiletries are organized.”

which shows the thoroughness of the housekeeping staff. Good organization and cleanliness not only create a neat atmosphere but also foster a sense of confidence that all facilities are sterile. He also noted that there were no soap stains on the sink or limescale in the toilet bowl, something that is often overlooked in other hotels. The overall experience made him confident to stay again in the future. This proves that hygiene is not just about superficial cleanliness, but also about details and consistency.

Mr. Burhan, with a background as an office worker, highlighted that the fragrance of the room and the freshness of the room were the main factors in his comfort.

“The bed is neat, dust-free, the bathroom is clean, and even the ventilation is good so the air doesn’t feel stuffy,” he said.

Good ventilation in hotel rooms is part of hygiene management as it reduces humidity and the risk of mold growth. He also emphasized the importance of daily linen and towel changes without needing to be requested. Therefore, comprehensive management of air, linen, and room cleanliness greatly contributes to the comfort he feels during his stay.

Mr. Rizky, a lecturer, expressed his satisfaction with the cleanliness of the room from both an academic and consumer perspective.

"I noticed that the bed was clean, there was no unpleasant smell from the air conditioner, and even the bathroom was very well maintained," he said.

He also felt that the room was not only clean but also provided a sense of calm because it looked sterile and well-organized. His sensitivity as a lecturer who often travels means he has high standards for hotel facilities. So, when he finds a hotel with a good hygiene system, he considers it a competitive advantage. He even plans to bring his family to stay at this hotel on his next visit because he feels it is worthy in terms of cleanliness.

All responses from sources indicate that they feel safe, comfortable, and confident to return due to the high standards of cleanliness. These high standards of cleanliness are inseparable from the strategic role of room attendants and housekeeping staff in consistently implementing cleaning procedures. The positive impression of room cleanliness is even the main reason they recommend the hotel to relatives and family. Therefore, it can be said that room cleaning hygiene is one of the vital indicators in fostering guest loyalty and enhancing the hotel's image. This aspect should not be overlooked in the operations of a star-rated hotel.

Empathy on the part of housekeeping staff is also considered to enhance service value in the eyes of guests. Through neat room arrangements and regularly controlled room aromas, guests can sense that staff understand their need for personal comfort, even without direct verbal interaction. For example, guests with dust allergies have noted that bedding is always changed meticulously and there are no dust particles under the bed, indicating that housekeeping staff follow extra procedures to ensure guest health. Although the guest did not specifically request this, these small details are still maintained, making the guest feel cared for and respected. Such service reflects the fact that staff implicitly understand guests' conditions and preferences without being told—the empathy dimension of service quality. Although not all guests explicitly state that they will return, this expression of satisfaction indicates a high level of psychological attention from the hotel toward individual needs.

In terms of reliability, guests reported that the cleanliness of their rooms upon check-in was similar to what they experienced upon check-out; this indicates consistency in the cleaning process and hygiene standards that are implemented consistently, not just at certain moments. Small differences, such as the consistent fresh scent from the first day to the last day of their stay, reinforce the belief that housekeeping operates at the same level of quality at all times. Guests and reviewers also noted that linens and amenities were always in good condition and ready for use without needing to be checked again, a sign that pre-arrival cleaning procedures are being carried out ideally. The reliability dimension of service quality plays a crucial role as it demonstrates that the hotel can be relied upon for room cleanliness. While some guests mentioned they would not return due to factors like price or location, they still praised room cleanliness as one of the hotel’s key strengths. This indicates that even when external factors are unfavorable, reliability in hygiene can still maintain the hotel’s reputation and positive image.

In most comments, guests stated that the freshness of the room was noticeable from the moment they opened the door. The light aromatherapy used in the rooms not only provided a relaxing atmosphere but also reinforced the impression that the rooms were truly clean and hygienic. The combination of visual cleanliness and pleasant aromas created a multisensory experience that enhanced the comfort of the stay. Guests feel that the room attendants pay attention to every small detail, including the room temperature and ventilation to prevent stuffiness. This aligns with the concept of quality service that considers not only basic functions but also emotional nuances and psychological comfort. The effect of this experience is an increase in guest loyalty to the hotel brand, even though they do not explicitly state that they will return.

Some guests noted that the hotel bathrooms were in excellent condition, with non-slip floors, clean fixtures, and sufficient lighting for personal use. There were no soap stains on the sinks or foggy mirrors, which are often problems in other star-rated hotels. This shows that the room attendants have high standards, even for parts of the room that are not always the main focus of guests. Maximum bathroom cleanliness not only creates comfort but also reinforces a sense of safety and trust that sanitation is maintained professionally. When guests do not have to complain about such minor issues, their time and energy can be better focused on enjoying their stay or activities outside. This reflects the success in creating seamless and uninterrupted service.

4. Conclusion

Based on interviews with 10 informants and analysis of 10 guest comments in each guest room at the Grand Central Premier Hotel, it can be concluded that the role of room attendants and the implementation of hygiene in room cleaning have a very significant contribution to guest satisfaction levels. All informants expressed satisfaction with room cleanliness, staff responsiveness, room comfort, and fast and friendly service. Even in comments stating they would not return, the reasons were not related to service or cleanliness but rather external factors. This means that room service and cleanliness have fully met guest expectations. This demonstrates that the hotel's housekeeping operational standards consistently address the needs and preferences of various guest segments. Therefore, efforts to maintain room hygiene quality and room attendant performance are well worth sustaining and even enhancing to preserve guest loyalty and the hotel's reputation.

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UMRAH REGISTRATION FLOWCHART TO IMPROVE SERVICE EFFICIENCY AT PT MAHER WISATA DUNIA TRAVEL AGENCY

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Abstract

Confusion about the next steps in the Umrah registration process at Maher Umrah is a common issue, particularly among elderly prospective pilgrims. Understanding the registration flow is crucial so that prospective pilgrims can successfully register to use Maher Umrah Travel's services. This study aims to analyse and design an Umrah registration flowchart to enhance service efficiency at PT Maher Wisata Dunia, a company specializing in Umrah pilgrimage travel services. In the registration process, efficiency and flow clarity significantly impact customer satisfaction and internal work effectiveness. This research uses a qualitative descriptive approach with observation, interviews, and documentation techniques. The results show several challenges in the current registration flow, such as an unstructured process and suboptimal utilization of digital systems. Therefore, a more systematic and efficient Umrah registration flowchart was designed, from the initial consultation stage to departure. The proposed flowchart visualizes the entire registration workflow from the initial inquiry to departure. Its implementation led to a 50% reduction in registration time and enhanced staff coordination. The study concludes that even a simple visual tool can significantly improve internal workflows and client satisfaction in the Umrah service sector.
Keywords: Registration; Flowchart; Service Efficiency

1. Introduction

In recent years, the Umrah travel industry in Indonesia has experienced a sharp surge, driven by post-pandemic enthusiasm and increased international mobility. According to Sofarul et al. (2025), the number of Indonesian Umrah pilgrims reached over 648,000 by April 2025. This surge demands operational excellence from Umrah travel agencies to meet high demand while maintaining service quality. However, many agencies, including PT Maher Wisata Dunia, still rely on traditional manual systems prone to inefficiencies, such as administrative repetition, information delays, and customer confusion especially among the elderly who struggle with unstructured verbal instructions (Ramadhan & Rukhviyanti, 2021)

Digitalization is the primary solution for optimizing administrative processes. Aulia,Z. (2025) emphasizes the importance of implementing system-based approaches such as SDLC to manage pilgrim data effectively. Although several studies have discussed digital systems or customer satisfaction (Tiani, 2022), few focus on visual process documentation such as flowcharts. This study aims to fill that gap by designing and evaluating a registration system based on a flowchart to improve service efficiency.

2. Methodology

This study adopted a qualitative case study approach based on the framework of Yin, (2014), which emphasizes contextual understanding of complex systems. Data were gathered through non-participant observation, semi-structured interviews with seven informants (staff and

elderly customers), and company documentation. Although the sample size is small, it aligns with qualitative research principles emphasizing depth over breadth. Thematic analysis was conducted through open, axial, and selective coding. Data triangulation and member checking were employed to ensure validity.

Data collection was conducted over three months using triangulation methods:

i. Observation: Non-participatory observation of the registration process to record direct behaviors, information flow, and staff-client interactions. Observations were made during the registration process to document workflows, staff interactions, and the time required for each stage. This was crucial for identifying service weaknesses and inefficiencies.
ii. Interviews: Semi-structured interviews were conducted with two administrative staff, one operations manager, one finance staff, and three pilgrims (including elderly ones) to explore operational challenges and user expectations. These interviews aimed to gain deeper insights into informants' experiences with obstacles, confusion, and suggestions for improvement. According to Solusi Jurnal, (2024), in-depth interviews provide contextual and narrative insights not accessible through observation alone.
iii. Documentation: Internal documents, SOP drafts (if available), and registration data were analyzed to assess existing procedures and system gaps.

Data were analyzed using thematic coding techniques (open, axial, and selective coding), forming the basis for constructing the registration flowchart. Chart validation refers to standard visual design principles such as clarity, linearity, decision points, and user focus (Setiawan, 2021). Data were analyzed thematically in three consecutive stages:

i. Open Coding: The initial process of identifying and breaking raw data into meaningful pieces. Researchers highlighted sentences or quotations relevant to the study objectives, such as registration obstacles or internal communication flows.
ii. Axial Coding: This stage connects categories found during open coding. Researchers identified patterns or relationships between categories, such as staff roles and service efficiency levels.
iii. Selective Coding: The final stage aims to unify all categories into main themes supporting the overall research narrative, such as the importance of visual documentation in manual systems.

To ensure result validity, source triangulation was conducted by comparing findings from observation, interviews, and documentation. Additional confirmation was done through member checking to verify the researcher’s interpretation accuracy. This ensures the research reflects an objective and trustworthy reality.

3. Result and Discussion

Based on observations and interviews at PT Maher Wisata Dunia, several key issues were found hindering registration service efficiency. These include a lack of workflow structure, overlapping staff duties, unawareness of procedures among prospective pilgrims, and the absence of documented standard operating procedures. Although the number of informants in this study is relatively small, it is justified by the qualitative and exploratory nature of the research. In qualitative case studies, the focus is not on generalizability through large samples, but on achieving depth and richness of understanding (Yin, 2014). The selected seven informants were directly involved in the Umrah registration process and provided detailed insights that were sufficient to address the research objectives

Before implementing the flowchart, service processes often experienced delays due to inconsistent workflows and decision-making based on individual staff habits. Elderly pilgrims

had difficulty understanding procedures as information was only delivered verbally. This led to repeated questions, document collection errors, and long waiting times.

In addition to internal efficiency improvement, implementing a flowchart also facilitates accountability. When workflows are visually documented, management can more easily identify bottlenecks and implement data-driven improvements. A study by Ali, R.; Syamsul, M.; Zainuddin, (2023) found that companies adopting visual process mapping experienced a 27% increase in operational efficiency compared to those using descriptive manual methods.

Prior to the implementation of the flowchart, the Umrah registration process at PT Maher Wisata Dunia took an average of 3 to 4 working days, depending on staff availability and document completeness. After the flowchart was introduced and used as a standard operating guide, the average registration time was reduced to 1 to 2 working days. This indicates a significant improvement in process efficiency, as summarized in the table below.

Table 1. Service stages before and after the flowchart

Service Stage	Before Flowchart	After Flowchart
Document Submission	1 day	< 1 day
Admin Verification	1-2 days	0,5 day
Payment Processing	0,5 – 1 day	0,5 day
Total Registration Duration	3-4 days	1-2 days

After implementing the flowchart, efficiency improved in several key areas:

i. Reduced service time: Registration, which previously took 3–4 days, can now be completed in 1–2 days.
ii. Improved customer satisfaction: Pilgrims felt more confident and less confused as all procedures were presented visually and were easy to understand.
iii. Effective internal coordination: Each staff member understood their responsibilities, avoiding task overlap.

Additionally, the flowchart serves as a training tool for new staff and a daily operational guide, which was previously unavailable in written form. Thus, the study underscores the importance of visual documentation as a functional communication medium to enhance service efficiency in manually operated Umrah travel agencies.

The flowchart illustrates the complete process from initial communication with prospective pilgrims to departure. Each stage includes responsible personnel, decision points, and required documents. The implementation of the flowchart improved staff communication and accelerated services. Internal evaluation showed faster service and reduced procedural complaints.

The Umrah registration flowchart developed in this study responds to the unstructured process found in the old system. This flowchart is systematically and comprehensively designed, starting from the initial contact with the admin to the final stage (pilgrims' return to Indonesia). This visualization represents both internal workflows and interactions between prospective pilgrims and the travel agency. To illustrate the improvement in the registration process, this study presents two comparative flowcharts: one representing the initial manual workflow and the other showing the revised structure after the flowchart implementation.

The initial process lacked clear role division and decision points, while the revised version introduced standardized steps with consistent symbols, as recommended in standard process mapping literature. These flowcharts are included in the Appendix for reference.

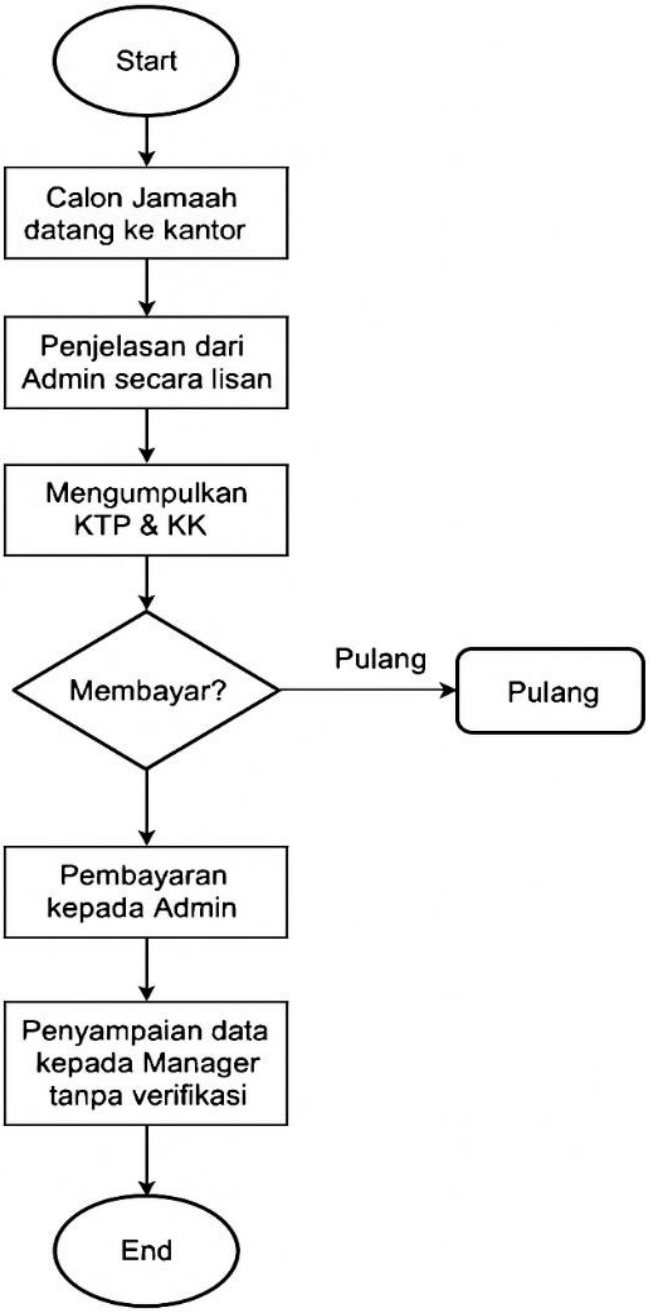

Fig. 1. Pre- Pre-Implementation Flowchart

Below is the flowchart design developed by the researcher to improve work efficiency in the Umrah registration process at PT Maher Wisata Dunia:

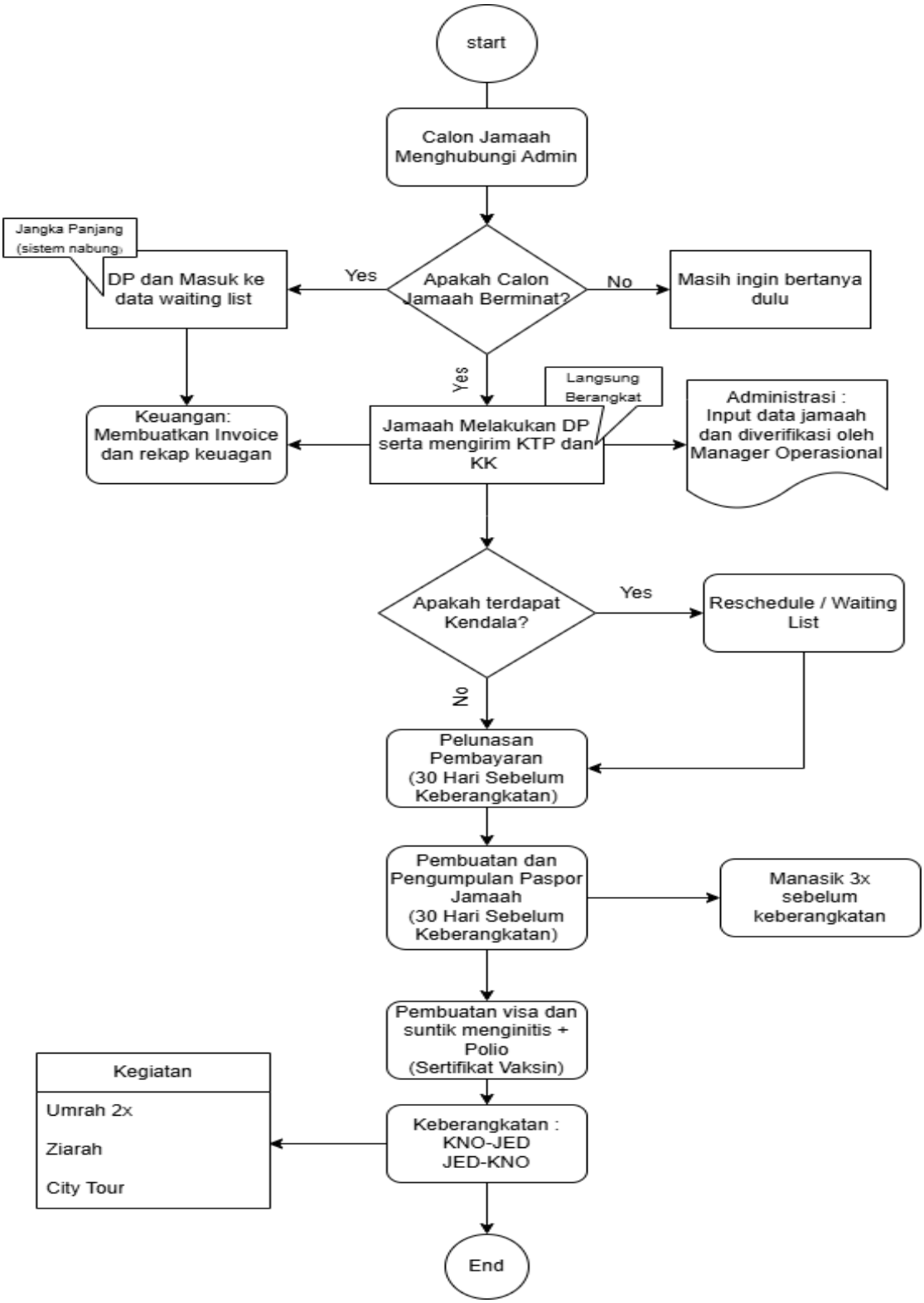

Fig. 2. Post- Implementation Flowchart

4. Conclusion

The implementation of a flowchart at PT Maher Wisata Dunia has shown significant results in improving service efficiency and pilgrim satisfaction. This visual documentation not only clarifies procedural stages for pilgrims but also systematizes internal task distribution in a way that is easy for all staff to follow.

Operationally, the agency experienced faster services, reduced administrative errors, and improved interaction quality between staff and clients. The structured process visualization provides a sense of security and transparency, especially for first-time pilgrims.

In an era of globalization and digital worship systems, a flowchart-based service system can serve as a new benchmark for Indonesian Umrah agencies to compete professionally with international agencies that have implemented smart hajj/umrah systems. Therefore, future development can be directed toward integrating AI-based technologies or chatbots to answer repetitive pilgrim questions automatically, as implemented by Umrah agencies in Malaysia and Turkey(Nasution, M. N., Lubis, A. R., & Rahmah, 2022).

This flowchart model has strong potential for broader adoption by other Umrah agencies, especially those still using manual systems without clear procedural documentation. Moreover, this flowchart could be enhanced through integration with web-based or mobile application systems, allowing pilgrims to track their registration status in real time.

Further studies are recommended to evaluate this model's effectiveness in different agency contexts and to assess how digital integration can enhance accountability, efficiency, and customer satisfaction quantitatively.

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PENILAIAN KANDUNGAN NUTRISI PRODUK BERTIH JAGUNG: PRODUK INOVASI TEMPATAN VS KOMERSIAL

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Abstrak

Bertih jagung (*popcorn*) merupakan snek popular yang digemari ramai kerana rasanya yang enak serta mudah didapati. Walau bagaimanapun, kandungan nutrisi produk bertih jagung berbeza-beza bergantung kepada kaedah pemprosesan, ramuan tambahan dan jenama. Oleh itu, kajian ini dijalankan bagi menilai dan membandingkan kandungan nutrisi tiga jenis produk bertih jagung yang berbeza di pasaran bagi mengenal pasti pilihan yang lebih baik daripada aspek pemakanan. Sampel pertama merupakan produk yang dihasilkan oleh pengkaji, berperisa rendang tok, dan dianalisis di makmal menggunakan kaedah saintifik iaitu AOAC 988.05 bagi protein, AOAC 954.02 bagi lemak, serta Kaedah *In-House* yang merujuk AOAC 920.40 bagi kandungan gula dan karbohidrat. Sampel kedua ialah bertih jagung berperisa karamel coklat dan sampel ketiga berperisa karamel. Kedua-dua sampel ini diperoleh daripada maklumat label nutrisi pada bungkusan produk komersial. Parameter yang dikaji meliputi kandungan tenaga (kcal), jumlah lemak, protein, karbohidrat dan gula, bagi setiap 100 gram produk. Hasil analisis menunjukkan sampel pertama mengandungi 480 kcal tenaga, 21.5 g lemak, 4.5 g protein, 61.5 g karbohidrat, dan 6.7 g gula. Sampel kedua mencatatkan nilai tenaga tertinggi iaitu 582 kcal dan kandungan gula yang tinggi iaitu 26.1 g, tetapi protein yang lebih rendah iaitu 3.1 g. Sampel ketiga pula mengandungi 482 kcal tenaga, 18.2 g lemak, 3.7 g protein, 76 g karbohidrat, dan gula tertinggi iaitu 69 g. Kesimpulannya, sampel pertama didapati mempunyai kandungan protein tertinggi dan jumlah gula yang paling rendah berbanding dua lagi produk. Produk ini menawarkan profil nutrisi yang lebih seimbang dan sihat, menjadikannya pilihan yang lebih baik dari aspek pemakanan.
Kata kunci: Bertih Jagung; Rendang Tok; Nutrisi.

1. Pengenalan

Bertih jagung atau *Popcorn* (Zea mays var. everta) merupakan snek berasaskan jagung yang mempunyai nilai komersial tinggi, dikenali kerana keupayaannya untuk meletup apabila dipanaskan serta menghasilkan serpihan (flake) yang besar dan mengembang (Gopinath et al., 2024). Sifatnya yang mudah diaplikasikan membolehkan ia dipelbagaikan dengan penambahan pelbagai perisa seperti mentega, keju, karamel, coklat dan juga perisa tempatan, menjadikannya lebih menarik dari segi citarasa dan pemasaran. (Nguyen et al., 2012).

Walaupun secara asasnya bertih jagung mempunyai potensi untuk menjadi pilihan snek yang sihat kerana rendah kalori dan mengandungi serat yang tinggi apabila disediakan tanpa bahan tambahan, namun hakikatnya kebanyakan produk bertih jagung yang dijual secara komersial telah diubah suai dengan penambahan bahan seperti gula, lemak dan garam. Penambahan ini bukan sahaja meningkatkan rasa dan daya tarikan produk, tetapi juga menyebabkan perubahan ketara terhadap nilai pemakanan asalnya (Ceylan & Karababa, 2004). Kesannya, produk yang pada asalnya sesuai untuk dijadikan snek sihat bertukar menjadi snek berkalori tinggi dan mengandungi kandungan nutrien yang kurang sihat, yang boleh memberi kesan negatif terhadap kesihatan pengguna sekiranya diambil secara berlebihan (Jeong et al., 2020).

Selain itu, kecenderungan pengguna terhadap produk sedia dimakan yang lebih mudah diperoleh di pasaran telah menyumbang kepada peningkatan permintaan terhadap snek segera, termasuk bertih jagung (Burri et al., 2008). Dalam konteks ini, isu berkaitan nilai pemakanan semakin mendapat perhatian, terutamanya apabila dikaitkan dengan masalah pemakanan seperti obesiti, hipertensi dan penyakit metabolik lain yang berkait rapat dengan pengambilan lemak, gula dan natrium secara berlebihan(Teoh, 2024). Namun begitu, sebahagian besar pengguna tidak memiliki akses kepada maklumat nutrisi yang lengkap dan terperinci tentang produk snek komersial yang terdapat di pasaran. Ketiadaan analisis perbandingan yang sahih dan menyeluruh menyukarkan pengguna untuk membuat pilihan yang lebih bijak dan sihat (Teoh, 2024).

Oleh yang demikian, kajian ini bertujuan untuk membandingkan profil pemakanan antara produk bertih jagung inovasi berperisa rendang tok yang dibangunkan oleh pengkaji dengan dua produk komersial yang berperisa karamel coklat dan karamel. Pemilihan rendang tok sebagai perisa inovatif adalah berasaskan rasional pemeliharaan dan pengkomersialan elemen warisan kulinari tempatan yang mempunyai potensi tinggi untuk menembusi pasaran niche makanan tradisional moden (Norashah Ibrahim, 2025). Rendang tok, yang berasal dari negeri Perak, merupakan masakan ikonik Malaysia yang kaya dengan rempah dan digemari ramai (Nurul Husna Mahmud, 2024). Justeru, penggabungannya dalam produk snek moden seperti popcorn bukan sahaja memperkenalkan dimensi baharu dalam inovasi makanan, tetapi turut menyumbang kepada nilai tambah komersial melalui penjenamaan unik berasaskan identiti tempatan.

Keperluan untuk menilai kandungan nutrisi pelbagai produk snek yang terdapat di pasaran adalah penting agar pengguna dapat membuat pilihan makanan yang lebih sihat dan bijak (Bhatnagar et al., 2024). Oleh itu kajian ini dijalankan bagi menentukan kandungan nutrisi bagi tiga jenis produk bertih jagung yang berbeza, merangkumi parameter tenaga (kcal), lemak, protein, karbohidrat, dan gula. Selain itu, kajian ini juga dijalankan bagi membuat perbandingan profil pemakanan antara bertih jagung inovasi berperisa rendang tok yang dibangunkan oleh pengkaji dengan dua produk komersial yang berperisa karamel coklat dan karamel. Seterusnya, kajian ini bertujuan untuk menilai kesesuaian pemakanan setiap produk bertih jagung yang dikaji berdasarkan komposisi nutrisinya dalam konteks amalan pemakanan sihat pengguna.

2. Metodologi

Analisis nutrisi standard ini dijalankan bagi menentukan kandungan kalori, lemak, karbohidrat dan protein dalam produk makanan yang telah dihasilkan. 100gm sampel telah diletakkan dalam bekas steril dan dihantar untuk proses analisis oleh syarikat Nano Lab Analytical Sdn Bhd Pulau Pinang iaitu sebuah syarikat yang menjalankan ujian makmal yang dikitiraf oleh *Standard Malaysia* dan Kementerian Kesihatan Malaysia. Bilangan sampel yang dihantar ke makmal adalah mencukupi berdasarkan keperluan ujian yang akan dijalankan (Kementerian Sains, Inovasi dan Teknologi & Jabatan Kimia Malaysia, 2021). Penentuan nilai kalori dilaksanakan berdasarkan kaedah yang digariskan dalam *Malaysian Dietary Guidelines*

(National Coordinating Committee on Food and Nutrition (NCCFN), 2021)seperti yang ditunjukkan dalam Jadual 1. Contoh pengiraan nilai kalori pula diperincikan dalam Jadual 1.

Jadual 1. Pengiraan kalori berdasarkan *Malaysian Dietary Guidelines*

Nutrient	Jumlah	Didarabkan dengan	Jumlah
Lemak	_____ g	9 kcal	= _____ kcal
Protein	_____ g	4 kcal	= _____ kcal
Karbohidrat	_____ g	4 kcal	= _____ kcal

Penentuan kandungan protein dalam sampel dijalankan menggunakan prosedur analisis berdasarkan kaedah AOAC 988.05 yang telah diiktiraf secara saintifik. Penentuan kandungan protein dalam sampel dijalankan menggunakan prosedur analisis berdasarkan kaedah AOAC 988.05 yang telah diiktiraf secara saintifik (Hakoda et al., 2009). Kaedah ini berasaskan prinsip Jean Kjeldahl, yang mengukur kepekatan nitrogen sebagai asas untuk pengiraan jumlah protein dalam sampel makanan(Aguirre, 2023). Melalui pendekatan analisis ini, sampel makanan ditimbang dengan teliti sebelum dimasukkan ke dalam kelalang pencernaan (*digestion flask*) untuk menjalani proses pencernaan kimia. Proses ini melibatkan pemanasan bersama asid sulfurik yang bertindak sebagai agen pengoksida, berfungsi melarutkan komponen makanan. Bagi mempercepatkan reaksi dan meningkatkan titik didih larutan, anhidrat natrium sulfat ditambah sebagai agen pelarut tambahan, manakala pemangkin seperti tembaga, selenium, titanium atau merkuri digunakan bagi mempercepatkan proses tindak balas kimia. Semasa pencernaan, nitrogen yang terkandung dalam bahan organik makanan ditukar menjadi bentuk ammonia, manakala karbon dioksida (CO_2) dan air (H_2O) terbentuk sebagai hasil sampingan. Ammonia yang dihasilkan tidak terbebas sebagai gas kerana dalam persekitaran berasid, ia hadir dalam bentuk ion ammonium (NH_4^+), yang kemudian akan berinteraksi dengan ion sulfat (SO_4^{2-}) dan kekal larut dalam larutan melalui tindak balas berikut.

$$N(food) \longrightarrow (NH_4)_2SO_4 \quad (1)$$

Setelah proses pencernaan selesai sepenuhnya, kelalang pencernaan akan disambungkan kepada kelalang penerima melalui tiub penyambung. Seterusnya, larutan dalam kelalang pencernaan dinetralkan kepada keadaan beralkali melalui penambahan natrium hidroksida (NaOH), yang berfungsi untuk menukarkan sebatian ammonium sulfat kepada gas ammonia (NH_3).

$$(NH_4)_2SO_4 + 2\ NaOH \longrightarrow 2NH_3 + 2H_2O + Na_2SO_4 \quad (2)$$

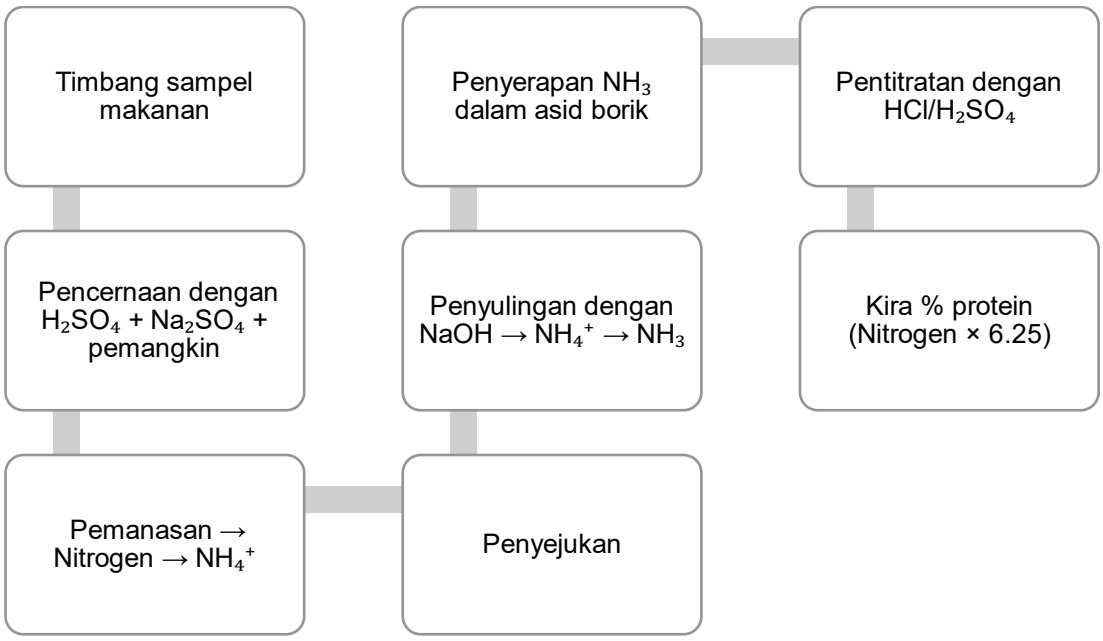
Gas ammonia yang terhasil kemudiannya dibebaskan daripada larutan dan dialirkan dari kelalang pencernaan ke kelalang penerima yang mengandungi lebihan asid borik. Kehadiran persekitaran berasid dalam kelalang penerima menyebabkan ammonia bertindak balas dan berubah menjadi ion ammonium (NH_4^+), manakala asid borik yang bertindak sebagai agen penjerap akan ditukar kepada bentuk ion borat melalui tindak balas tersebut.

$$NH_3 + H_3BO_3\ (\textit{boric acid}) \longrightarrow NH_4^+ + H_2BO_3^-\ (\textit{borate ion}) \quad (3)$$

Kuantiti nitrogen dalam sampel kemudiannya dianggarkan melalui proses titrasi terhadap sebatian ammonium borat yang terbentuk, menggunakan larutan asid sulfurik atau asid hidroklorik sebagai titran. Penunjuk kimia digunakan bagi mengenal pasti titik akhir titrasi, yang menandakan kesempurnaan reaksi asid-bes dalam sistem tersebut.

$$H_2BO_3^- + H^+ \longrightarrow H_3BO_3 \quad (4)$$

Ringkasan proses seperti dalam carta alir berikut:

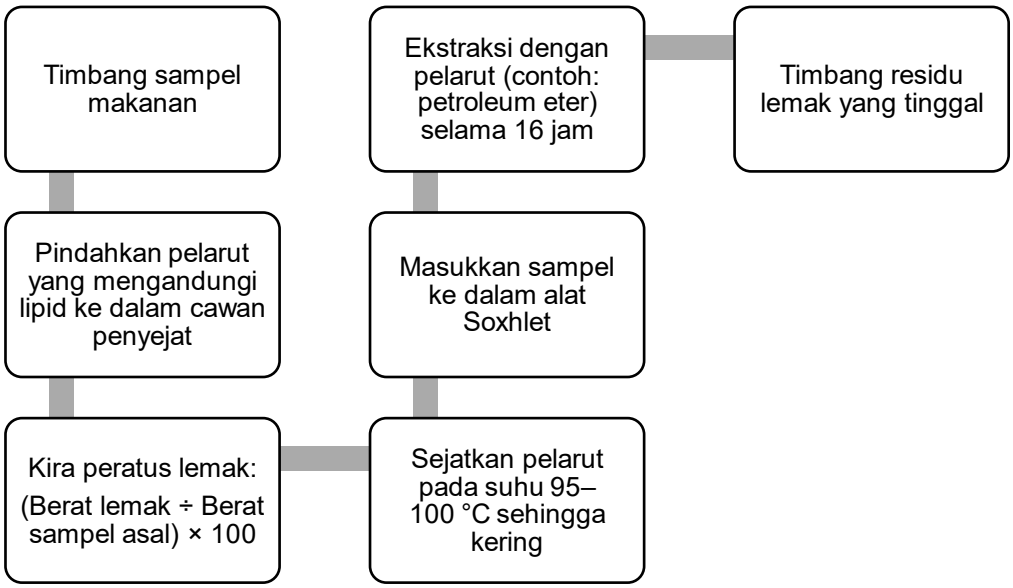


Rajah 1. Ringkasan proses penentuan kandungan protein

Penentuan kandungan lemak dalam sampel dijalankan menggunakan kaedah AOAC 954.02, yang merupakan prosedur pengekstrakan berasaskan pelarut bagi mengukur jumlah lemak dalam bahan tambahan makanan. Dalam kaedah ini, sampel produk diekstrak menggunakan alat *Soxhlet* selama tempoh 16 jam. Lipid yang diekstrak kemudiannya diuapkan hingga kering pada suhu antara 95 hingga 100 °C, sebelum residu yang tinggal ditimbang bagi menentukan jumlah kandungan lemak. Kandungan lemak dinyatakan dalam bentuk peratus berdasarkan berat kering sampel, dan dikira menggunakan formula berikut:

Peratus Lemak (%) = (Berat lemak yang diekstrak (g) ÷ Berat sampel asal (g)) × 100

Nilai yang diperoleh mewakili jumlah lemak kasar dalam sampel makanan dan digunakan untuk penilaian pemakanan serta perbandingan antara produk yang diuji (Keshun Liu, 2019). Ringkasan proses seperti dalam carta alir berikut:



Rajah 2. Ringkasan proses penentuan kandungan lemak.

Bagi tujuan perbandingan kandungan nutrisi, produk bertih jagung yang dibangunkan oleh penyelidik (Sampel A) telah dibandingkan dengan dua produk komersial yang tersedia di pasaran, iaitu Sampel B (Kakoshka Malaysia, 2025)dan Sampel C (Signature Market, 2024). Penilaian kandungan nutrisi bagi kedua-dua produk komersial ini dibuat berdasarkan maklumat pemakanan yang dinyatakan pada label pembungkusan masing-masing. Perbandingan ini dijalankan semata-mata untuk mengenal pasti nilai nutrien yang terkandung dalam ketiga-tiga produk tanpa melibatkan penilaian terhadap aspek kualiti produk. Selain itu, kaedah pembuatan dan proses pengilangan bagi produk pasaran tidak diambil kira dalam analisis ini.

3. Dapatan dan Perbincangan

Analisis perbandingan ini memberi tumpuan kepada enam parameter nutrisi utama, iaitu kandungan tenaga (kcal), lemak, protein, karbohidrat, gula dan natrium bagi setiap produk. Perbandingan dilakukan berdasarkan enam parameter utama, iaitu kandungan tenaga, lemak, protein, karbohidrat, gula, dan natrium. Keputusan yang diperoleh adalah berdasarkan berdasarkan satu siri pensampelan sahaja.

Jadual 2. Keputusan Perbandingan Kandungan Nutrisi Popcorn (Setiap 100g)

Parameter	Sampel A	Sampel B	Sampel C
Tenaga (kcal)	480	582	482
Lemak (g)	21.5	25.0	18.2
Protein (g)	4.5	3.1	3.7
Karbohidrat (g)	61.5	65.0	76.0

Daripada segi kandungan tenaga, Sampel B mencatatkan kalori paling tinggi (582 kcal) berbanding Sampel A (480 kcal) dan Sampel C (482 kcal). Nilai tenaga yang lebih tinggi ini mungkin disebabkan oleh penggunaan gula dan lemak tambahan, serta salutan karamel komersial yang padat kalori. Menurut kajian, dalam sistem salutan karamel yang kaya gula dan lipid secara signifikan meningkatkan ketumpatan tenaga dan tenaga per sajian berbanding formulasi yang lebih rendah gula (Mayhew et al., 2017). Prinsip asas pemakanan juga menjelaskan bahawa lemak menyediakan hampir 9 kcal/g, manakala karbohidrat dan protein hanya sekitar 4 kcal/g, menjadikan produk berlemak tinggi lebih padat tenaga dan berkalori tinggi per unit berat (Sengar & Sharma, 2014).

Daripada sudut kandungan lemak, Sampel B juga menunjukkan nilai tertinggi iaitu 25.0 g, diikuti oleh Sampel A (21.5 g) dan Sampel C (18.2 g). Dapatan ini secara tidak langsung menyokong dapatan kajian daripada (Mayhew et al., 2017) dan (Sengar & Sharma, 2014).Kandungan lemak yang tinggi, terutamanya jika berasal daripada lemak tepu, dikaitkan dengan peningkatan risiko penyakit kardiovaskular.(WHO, 2018). Oleh itu, Sampel C boleh dianggap lebih sesuai untuk pengguna yang mengawal pengambilan lemak harian, walaupun perlu diberi perhatian kepada parameter lain seperti gula.

Daripada segi protein, Sampel A mempunyai kandungan tertinggi iaitu 4.5 g, manakala Sampel B dan C masing-masing mencatatkan 3.1 g dan 3.7 g. Perbezaan ini berkemungkinan disumbangkan oleh penambahan bahan semula jadi seperti halia, lengkuas dan cili dalam formulasi perisa rendang tok. Rempah ini mengandungi sejumlah kecil protein secara semula jadi, dan apabila digunakan dalam kuantiti yang signifikan, terutamanya dalam bentuk pes pekat, ia boleh meningkatkan jumlah protein keseluruhan dalam produk (Aremu et al., 2011) (ALJOBAIR, 2022). Protein juga memainkan peranan penting dalam pembentukan otot, fungsi enzim dan memberikan rasa kenyang yang lebih lama (FOA, 2013).Justeru, nilai ini memberi kelebihan kepada Sampel A sebagai snek yang lebih mengenyangkan dan bernutrisi.

Dalam aspek karbohidrat dan gula, Sampel C mencatatkan nilai tertinggi dengan 76.0 g karbohidrat dan 69.0 g gula, berbanding Sampel A (61.5 g dan 6.7 g) dan Sampel B (65.0 g dan 26.1 g). Kandungan gula yang tinggi melebihi saranan *World Health Organization* (WHO) iaitu maksimum 10% daripada jumlah tenaga harian, boleh meningkatkan risiko obesiti, diabetes mellitus jenis 2, dan kerosakan gigi (WHO, 2015).Oleh itu, Sampel A jelas menampilkan profil gula yang lebih sihat dan menepati cadangan pemakanan semasa.

4. Kesimpulan

Kajian ini menunjukkan bahawa terdapat variasi ketara dalam profil nutrisi tiga sampel bertih jagung yang dikaji. Sampel A (inovasi oleh penyelidik) mencatatkan kandungan protein tertinggi (4.5 g) dan gula paling rendah (6.7 g), menjadikannya pilihan yang lebih sesuai bagi pengguna yang mementingkan pemakanan seimbang. Walaupun kandungan natriumnya tinggi (710 mg), ia masih boleh diterima jika diambil secara sederhana.Sebaliknya, Sampel B mencatatkan jumlah tenaga (582 kcal) dan lemak tertinggi (25.0 g), namun mempunyai protein paling rendah (3.1 g), menunjukkan kurang kesesuaian untuk diet seimbang. Sampel C pula mempunyai karbohidrat (76.0 g) dan gula (69.0 g) yang sangat tinggi, menjadikannya tidak sesuai untuk individu yang mengamalkan diet rendah gula atau menghadapi risiko penyakit metabolik.

Secara keseluruhannya, Sampel A merupakan snek yang lebih seimbang dari aspek tenaga, protein, lemak dan gula, berbanding dua produk komersial lain. Berdasarkan dapatan ini, pengguna disarankan untuk membuat pilihan makanan berasaskan maklumat nutrisi pada label dan memberi keutamaan kepada produk yang tinggi protein dan rendah gula serta natrium. Pengeluar makanan pula digalakkan membangunkan produk yang lebih sihat selaras dengan saranan Garis Panduan Diet Malaysia (MDG, 2020) dan cadangan WHO. Selain itu, kajian ini turut mencadangkan beberapa langkah praktikal kepada pihak berkepentingan. Bagi pengusaha kecil, formulasi snek yang lebih sihat seperti tinggi protein dan rendah gula boleh meningkatkan nilai pasaran produk. Pengajar TVET pula boleh menjadikan dapatan kajian ini sebagai modul latihan dalam bidang pemprosesan dan inovasi makanan. Dari segi pensijilan makanan, formulasi yang terkawal seperti dalam Sampel A berpotensi menyokong permohonan pensijilan HALAL, MESTI atau HACCP. Kajian ini juga mempunyai beberapa had, antaranya hanya melibatkan satu set sampel tanpa mengambil kira variasi antara pengeluaran, serta tidak merangkumi analisis mikronutrien atau sebatian bioaktif lain. Justeru, kajian lanjutan disarankan termasuk penilaian jangka hayat produk, ujian deria pengguna, serta melibatkan lebih banyak sampel dan jenama bagi memperoleh gambaran pasaran yang lebih menyeluruh. Kajian lanjutan juga boleh dijalankan dengan menilai aspek rasa, profil mikronutrien atau melibatkan lebih banyak sampel dari pelbagai jenama dan kategori snek bagi mendapatkan gambaran yang lebih menyeluruh tentang amalan pemakanan pengguna.

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PENGUJIAN TAHAP PENCEMARAN MIKROBIOLOGI DALAM PRODUK BERTIH JAGUNG INOVATIF BERPERISA RENDANG TOK

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Abstrak

Kajian ini dijalankan bagi menilai tahap kebersihan mikrobiologi dalam sampel produk inovasi bertih jagung berperisa rendang tok dengan menggunakan kaedah analisis pantas berasaskan sistem *Compact Dry*, yang merupakan medium kering sedia guna untuk pengesanan mikroorganisma. Lima parameter utama telah diuji*: Total Aerobic Plate Count*, *Total Yeast & Mold Count, Escherichia coli*, *Coliform*, dan *Salmonella*. Bagi ujian *Total Aerobic Plate Count*, kaedah *Compact Dry TC* (HC8771) telah digunakan untuk mengesan jumlah keseluruhan bakteria aerobik dalam sampel. Bagi ujian yis dan kulat, kaedah *Compact Dry* YMR (HS9801) digunakan, yang khusus untuk mengesan kedua-dua mikroorganisma tersebut dalam satu medium. Seterusnya, kehadiran *Escherichia Coli* dan bakteria *Coliform* diuji menggunakan kaedah *Compact Dry EC* (HS8781), yang membolehkan pengesanan serentak dua jenis bakteria ini melalui perubahan warna koloni. Manakala untuk pengesanan *Salmonella*, kaedah *Compact Dry* SL (HS9401) digunakan, yang membolehkan identifikasi bakteria patogen ini secara spesifik dan berkesan. Hasil analisis menunjukkan jumlah bakteria Aerobik adalah 2 × 10^2 cfu/g, manakala yis dan kulat tidak dapat dikesan (*nd <10 cfu/g). Selain itu, *Escherichia col*i, *Coliform*, dan *Salmonella* tidak dikesan. Penggunaan pelbagai kaedah *Compact Dry* dalam kajian ini terbukti berkesan dari segi ketepatan, kemudahan penggunaan, dan masa analisis yang cepat. Dapatan ini menunjukkan bahawa sampel makanan berada dalam tahap kebersihan mikrobiologi yang memuaskan, sejajar dengan keperluan keselamatan makanan industri.

Kata kunci: Analisis mikrobiologi, bertih jagung, rendang tok, produk inovatif, keselamatan makanan

1. Pengenalan

Keselamatan makanan adalah aspek yang amat penting dalam industri pemprosesan makanan, khususnya bagi produk makanan sedia dimakan yang berpotensi disalah anggap selamat. Makanan ringan seperti bertih jagung, walaupun mempunyai aktiviti air rendah, boleh dicemari oleh mikroorganisma seperti *Escherichia coli*, *Salmonella spp.*, yis dan kulat jika tiada kawalan yang ketat dalam pengendalian dan pembuatan(FAO dan WHO, 2022).

Selain itu, kajian juga membuktikan walaupun pemprosesan bertih jagung atau *popcorn* melalui proses suhu tinggi, pencemaran silang atau pengendalian yang tidak sempurna boleh menjejaskan kualiti mikrobiologi produk (Food Safety News, 2024). Selain itu, kajian oleh juga telah membuktikan bahawa meskipun pemindahan bakteria dari tangan ke bertih jagung adalah rendah, ia tetap boleh berlaku semasa proses pengendalian ke bertih jagung seterusnya boleh menyebabkan pencemaran mikrobiologi, terutama apabila makanan dikongsi atau dihidang tanpa amalan kebersihan tangan yang betul (Baker et al., 2015).

Bagi perusahaan kecil dan sederhana (PKS), akses kepada makmal mikrobiologi piawai masih terhad - kaedah konvensional seperti *pour plate* atau *spread plate* memerlukan masa, tenaga dan kos tinggi (Hannim et al., 2021) Dalam konteks ini, sistem *Compact Dry* menawarkan alternatif yang pantas dan praktikal dengan medium kering sedia guna yang

telah divalidasi dan diiktiraf oleh standard antarabangsa seperti ISO 16140 dan AOAC-RI (New et al., 2017).

Namun begitu, kajian terhadap keberkesanan sistem *Compact Dry* khususnya dalam aplikasi untuk produk inovasi seperti bertih jagung berperisa tempatan masih sangat terhad (Hosokawa et al., 2023). Mizuochi et., al (2016) dalam satu kajian pelebaran matriks telah membandingkan *Compact Dry TC* dengan kaedah ISO 4833 dan mendapati perbezaan purata log10 antara kedua-dua kaedah berada dalam lingkungan ≤ 0.5 log — menunjukkan *equivalence* statistik bagi sebahagian besar matriks yang diuji. Memandangkan produk seperti bertih jagung yang diperkaya dengan rempah tempatan (contohnya halia, lengkuas, cili) menghasilkan matriks makanan yang kompleks, persoalan utama yang timbul ialah sejauh manakah *Compact Dry* TC dapat memberikan ketepatan dan kebolehgunaan yang setanding dengan kaedah tradisional dalam mengesan mikroorganisma seperti *total aerobic count*, coliform, dan patogen. Tambahan pula, kekurangan data saintifik khusus bagi produk inovatif jenis ini mungkin menjejaskan tahap keyakinan pengeluar kecil yang berhasrat menggunakan teknologi mikrobiologi pantas.

Sehubungan itu, kajian ini dijalankan untuk menilai tahap kebersihan mikrobiologi dalam produk inovasi bertih jagung berperisa rendang tok menggunakan sistem *Compact Dry*, dengan menumpukan kepada lima parameter utama: *Total Aerobic Plate Count*, *yis dan kulat, Escherichia coli*, *Coliform*, dan *Salmonella spp.*

2. Metodologi

Dalam kajian ini, penilaian jumlah keseluruhan bakteria aerobik dilakukan menggunakan *Compact Dry Total Count* (TTC). Kaedah ini melibatkan inokulasi 1 mL sampel homogen ke atas plat TTC, diikuti dengan inkubasi pada suhu 35 ± 1 °C selama 48 jam. Kehadiran bakteria aerobik dikesan melalui pembentukan koloni berwarna merah hasil tindak balas dengan indikator tetrazolium. TTC telah disahkan setara dengan piawaian ISO 4833-1:2013 dan diiktiraf oleh NF-Validation di bawah protokol ISO 16140-2, menjadikannya sesuai untuk aplikasi rutin industri makanan (R-Biopharm, 2019)

Untuk mengesan kehadiran yis dan kulat, digunakan *Compact Dry Yeast* and *Mold Rapid* (YMR). Kaedah ini melibatkan penurunan 1 mL sampel ke atas medium YMR dan inkubasi pada suhu 25 ± 1 °C selama 48-72 jam. Koloni yis akan muncul sebagai bintik biru atau biru kehijauan, manakala koloni kulat membentuk struktur timbul berwarna terang atau kelabu. Kaedah YMR telah disahkan melalui *AOAC Research Institute* dan *MicroVal* dengan keberkesanan setara ISO 21527-1:2008 (Shingo Mizuochi et al., 2016).

Pengesanan *Escherichia coli* dan bakteria coliform dilakukan menggunakan *Compact Dry Escherichia coli* / *Coliform* (EC). Kaedah ini membolehkan pengesanan serentak dua kumpulan bakteria dengan inkubasi 1 mL sampel selama 24 ± 2 jam pada 37 ± 1 °C. Koloni *E. coli* dikenalpasti melalui pewarnaan biru akibat hidrolisis *X-Glucuronide*, manakala *Coliform* lain muncul merah atau merah jambu. *Compact Dry* EC telah dibuktikan sejajar dengan ISO 16649-2 dan ISO 4832, dengan ketepatan tinggi dalam pelbagai jenis sampel makanan (Shingo Mizuochi et al., 2016).

Bagi parameter patogen, kajian ini menggunakan *Compact Dry Salmonella* (SL) untuk mengesan kehadiran bakteria *Salmonella spp.* Medium SL membolehkan pengenalpastian *Salmonella* secara selektif melalui perubahan warna koloni, setelah sampel diinkubasi di bawah kondisi yang disarankan oleh pengeluar. Walaupun SL tidak memerlukan langkah pengayaan awal, penggunaannya tetap menepati prinsip ISO 6579 untuk pengesanan *Salmonella* dalam produk makanan (R-Biopharm, 2019). Kaedah *Compact Dry* yang diaplikasikan diringkaskan dalam jadual 1 seperti di bawah:

Jadual 1: Ringkasan Kaedah Analisis Mikrobiologi Menggunakan Sistem Compact Dry bagi Bertih Jagung Berperisa Rendang Tok

Kaedah & Singkatan	Parameter Ujian	Suhu Inkubasi	Tempoh Inkubasi	Ciri-ciri Koloni	Standard Rujukan
Compact Dry Total Count (TTC) HS8771	Jumlah bakteria aerobik	35 ± 1 °C	48 ± 3 jam	Koloni merah (indikator tetrazolium)	ISO 4833-1:2013 / NF-Validation / AOAC-PTM
Compact Dry Yeast and Mold Rapid (YMR) HS9801	Yis dan kulat	25 ± 1 °C	48-72 jam	Yis: biru; Kulat: struktur timbul & terang	ISO 21527-1:2008 / AOAC PTM 092002
Compact Dry Escherichia coli / Coliform (EC) HS8781	Escherichia coli dan koliform	37 ± 1 °C	24 ± 2 jam	*E. coli*: biru; Koliform: merah/pink	ISO 16649-2 & ISO 4832 / AOAC-PTM
Compact Dry Salmonella (SL) HS9401	Salmonella spp.	Mengikut protokol pengeluar	24-48 jam	Koloni khusus berubah warna (selektif)	ISO 6579 / MicroVal (jika tersedia)

Jadual 2: Keputusan Analisis Mikrobiologi Menggunakan Sistem *Compact Dry* bagi Bertih Jagung Berperisa Rendang Tok

Test Parameter	Unit	Analysis Result	Method
Total Aerobic Plate Count	cfu/g	< 10	Compact Dry TC HS8771
Total Yeast & Mount Count	cfu/g	< 10	Compact Dry YMR HS9801
Escherichia Coli	-	Not Detected	Compact DRY EC HS8781
Coliform	-	Not Detected	Compact DRY EC HS8781
Salmonella	-	Not Detected	Compact DRY SL HS9401

3. Dapatan dan Perbincangan

Keputusan makmal menunjukkan bahawa jumlah bakteria aerobik (*Total Aerobic Plate Count*, TC) dalam sampel adalah < 10 cfu/g, manakala yis dan kulat (*Yeast & Mold Rapid*, YMR) juga tidak dikesan (nd < 10 cfu/g). Selain itu, *Escherichia coli*, koliform, dan *Salmonella spp.* tidak dikesan (Not Detected) menggunakan kaedah *Compact Dry EC*. Nilai di bawah aras pengesanan (< 10 cfu/g) bagi TC dan YMR selaras dengan had menurut piawaian mikrobiologi untuk makanan sedia dimakan, yang biasanya menetapkan ACC < 10^2 cfu/g sebagai julat selamat (UKHSA 2024), (Centre for Food Safety Food and Environmental Hygiene Department, 2014).

Dapatan ini menunjukkan bahawa sampel memenuhi keperluan kebersihan mikrobiologi yang ketat, sejajar dengan garis panduan keselamatan makanan sedia dimakan yang diiktiraf di peringkat antarabangsa dan sekaligus menyokong profil keselamatan produk. Kaedah *Compact Dry* TC dan EC telah diuji secara berkali-kali dalam kajian validasi antarabangsa, menunjukkan koefisien korelasi tinggi ($r^2 \sim 0.99$) dengan kaedah rujukan ISO dan AOAC serta perbezaan purata kurang dari ±0.5 log for TC, memberikan keyakinan terhadap ketepatan dan kebolehpercayaan pendekatan ini (Keshun Liu, 2019). Dalam kajian pelanjutan matriks oleh (Mizuochi et al., 2016) dengan kaedah AOAC 966.24 serta piawaian ISO 4832 dan ISO 16649-2 bagi pengiraan E. coli dan koliform, perbandingan ini menghasilkan nilai korelasi r^2 > 0.97–0.99 dan perbezaan purata kurang daripada ±0.5 log10, sekali lagi menunjukkan

kesetaraan ketara dengan kaedah konvensional bagi pelbagai jenis matriks makanan Tambahan pula, had pengesanan *Compact Dry* (< 10 cfu/g) telah disahkan melalui ujian kelulusan seperti penyelidikan *Campden BRI* dan pensijilan *NF-Validation* (AFNOR) yang mengesahkan ketepatan untuk penggunaan produk sedia dimakan (AOAC Research Institute, 2019).

Oleh itu, hasil kajian ini menunjukkan bahawa produk inovasi bertih jagung berperisa rendang tok berada dalam kategori yang sangat memuaskan dari segi kebersihan mikrobiologi. Tiada kehadiran mikroorganisma patogen utama seperti Salmonella, E. coli, dan bakteria pencemar lain dikesan dalam sampel yang diuji, sekali gus membuktikan bahawa produk ini selamat untuk dimakan dan memenuhi piawaian keselamatan makanan yang ditetapkan. Penemuan ini bukan sahaja mengesahkan kualiti produk dari aspek keselamatan pengguna, malah turut menyokong keberkesanan penggunaan kaedah analisis pantas *Compact Dry* sebagai kaedah alternatif yang sesuai untuk ujian mikrobiologi makanan. Kaedah ini terbukti mampu memberikan keputusan yang boleh dipercayai dalam masa yang lebih singkat berbanding kaedah konvensional, tanpa menjejaskan ketepatan pengesanan mikroorganisma.

4. Kesimpulan

Kajian ini telah membuktikan bahawa produk inovasi bertih jagung berperisa rendang tok berada dalam tahap kebersihan mikrobiologi yang tinggi dan selamat untuk dimakan. Kesemua parameter yang diuji, termasuk jumlah bakteria aerobik, yis dan kulat, serta kehadiran *Escherichia coli*, *Coliform* dan *Salmonella spp.*, menunjukkan keputusan yang memuaskan, iaitu di bawah had pengesanan atau tidak dikesan sama sekali. Dapatan ini selaras dengan piawaian keselamatan makanan sedia dimakan seperti yang digariskan oleh agensi kesihatan antarabangsa seperti UKHSA dan WHO, yang menekankan ketiadaan patogen dan tahap mikroorganisma indikator yang rendah sebagai tanda makanan selamat. (UK HEALTH SECURITY AGENCY, 2024).Justeru, produk ini bukan sahaja mematuhi keperluan mikrobiologi semasa, malah membuktikan keberkesanan penggunaan kaedah analisis pantas seperti *Compact Dry* dalam memastikan kualiti dan keselamatan produk makanan inovatif.

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TOURISM OBJECT DEVELOPMENT STRATEGY TO ELEVATE TOURIST VISITS TO MUTIARA 88 BEACH, SERDANG BEDAGAI

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Abstract

This research discusses the development strategy of Pantai Mutiara 88 tourist attraction in Pantai Cermin Regency, focusing on infrastructure and the implementation of the Sapta Pesona concept. Pantai Mutiara 88 has a significant attraction for tourists, offering various facilities such as swimming, sunbathing, and beach recreation. This research aims to find out how good infrastructure can improve the tourist experience and attract more visitors. In addition, the implementation of Sapta Pesona, which includes elements of safe, orderly, clean, cool, beautiful, friendly, and memorable, is expected to create an environment that supports the growth of the tourism industry. This research uses a qualitative descriptive method. Data collection used observation, interviews and literature review methods as well as internal data obtained from the object of research. Data analysis used SWOT analysis. With a sustainable approach, this research also emphasises the importance of development that considers environmental, socio-cultural and economic aspects for the sustainability of tourism in the area. The result is conducting regular promotions and developing local communities to help increase tourist visits. Another inhibiting factor in this study is the poor and winding road access and having to pass through the village road to the Mutiara Beach 88 tourist attraction.
Keywords: Development Tourism; Sapta Pesona; Sustainable tourism.

1. Introduction

Traveling has become an alternative for individuals who feel fatigued by the repetitive routines of daily life, whether related to work or education. Everyone needs a moment to unwind and relieve the stress and burdens they carry. Tourism is one of the most common and effective ways to achieve this (Halawa et al., 2019). Visiting various tourist destinations such as mountains, beaches, or historical sites with family is an enjoyable activity that can make a person feel happier and more motivated. Traveling allows individuals to temporarily forget the heavy workload or academic responsibilities they face. In Indonesia, there are numerous tourist destinations that offer both natural beauty and comfort. One of the most popular options is the beach. Many people choose this type of destination because they enjoy the scenic views and the range of facilities available (Saragih et al., 2022). Tourism is the travel of an individual or a group of people from one place to another within a certain period, for the purpose of recreation and entertainment (Syaiful et al., 2023). Tourism activities occur when there is both a tourist destination and tourists, forming an operational tourism system that mainly consists of the demand side and the supply side (Simbolon, 2022). The demand side comprises individuals who wish to travel, while those undertaking the journey are referred to as tourists. The supply side includes components such as transportation, tourist attractions, services, and information or promotion, all of which constitute the products offered by the destination. Tourists are an inseparable part of the tourism industry. They vary widely—young and old, wealthy and less privileged, domestic and international—with differing expectations and motivations. The term "tourist" in Indonesian derives from the Sanskrit word *wisata*, meaning "journey," which aligns with the English term "travel." Therefore, the term *wisatawan* is essentially equivalent to "traveller," as it is common in Indonesian to use the suffix *-wan* to denote a person's role, profession, or status (Syaiful & Koswara, 2021). The beach as a tourist

attraction is an element of the beach that can be used as a place for recreational activities, that for tourism, the object has the potential to be utilized starting from passive activities (such as enjoying the scenery) to active (such as jogging) (Wibowo et al., 2023). The component of tourist attraction is the main capital that must be owned to improve and develop tourism quoting from Cooper *et al*. (1995) 4 (four) elements that must be owned by a tourist object, namely: attraction, accessibility, amenity, and ancillary. This object attracts tourists with its varied forms and atmosphere, so if it has a monotonous form and atmosphere without change, it is not necessarily a tourist object to inform**.** The tourist attraction will not necessarily be a tourist attraction if its form and atmosphere are monotonous without any variation, because a varied form and atmosphere are an attraction for tourists (Soplanit et al., 2019).

The tourist attraction Mutiara 88 Beach is in Kota Pari Village, Pantai Cermin District, Serdang Bedagai Regency Mutiara 88 Beach has the attraction and potential to increase regional income in Serdang Bedagai Regency. In the Mutiara 88 beach area, tourists can enjoy various facilities such as swimming, beach recreation, sunbathing and fishing. In addition, the Mutiara 88 Beach tourist attraction also offers a variety of villas for rent at different prices**.** Tourists either individuals or groups who travel from their place to another location for recreation, business or other purposes, usually lasting more than one night. According to the World Tourism Organization (UNWTO, 2021), a tourist is a person who travels to a place different from his/her place of residence for purposes not related to paid employment. Tourists can come from various backgrounds and have different motivations for traveling. Here are some types of tourists based on various criteria. Based on Travel Purpose:

- Recreational Travellers: Traveling to relax and enjoy their free time
- Business Travellers: Traveling for work or business purposes
- Educational Tourists: Traveling for learning or educational purposes, such as comparative studies or seminars.
- Based on Characteristics

Independent Travellers: Plan and organize their own trips without the help of a travel agent.
Therefore, to provide comfort to tourists, supportive and attractive infrastructures are needed. Infrastructure at a tourist destination includes natural and artificial resources as the main needs of tourists, such as roads, electricity, clean water, communication systems, bus stops, bridges, and so on. The readiness of a tourist destination to receive tourist visits is highly dependent on the development and provision of infrastructure that is adjusted to the characteristics of the location and conditions of the destination. Sustainable tourism development is a tourism concept that is expected by the community who understand the importance of tourism aspects (Hamzah, 2025). This concept emphasizes the development of tourism areas in a sustainable manner by considering three main aspects, namely the environment, socio-culture, and economy. Each type of infrastructure in these three aspects has its own indicators that reflect the characteristics of the infrastructure. For example, in economic infrastructure there are components such as bus stops, gazebos, security facilities, and so on. The same thing applies to social and environmental infrastructure, which is also explained in this study. Sustainable tourism development is a concept embraced by communities that recognize the importance of tourism (Fakdawer et al., 2023). This concept stresses the long-term development of tourist areas by balancing environmental, socio-cultural, and economic aspects. Each category of infrastructure namely economic, social, and environmental—has its own indicators that reflect its characteristics. For example, economic infrastructure may include bus stops, gazebos, and safety facilities, while social and environmental infrastructures have their own sets of facilities, as discussed in this study. Tourism infrastructure and the implementation of the Sapta Pesona concept are both regarded as essential factors in the strategic development of tourist destinations. From the researcher's point of view, adequate infrastructure encompasses more than just physical facilities such as restrooms, parking areas, or road access; it also reflects a destination's overall readiness to ensure comfort, safety, and convenience for visitors. Meanwhile, the implementation of Sapta

Pesona which consists of seven key elements: safety, order, cleanliness, coolness, beauty, hospitality, and memorable impressions is considered a holistic approach to create a meaningful and satisfying tourism experience. These two variables are seen as strongly interconnected and serve as the foundation pillars in achieving sustainable tourism. This perspective is particularly relevant given that many tourist destinations tend to prioritize attracting visitors without giving sufficient attention to sustaining visitor satisfaction and loyalty.

From a theoretical standpoint, tourism development should be based on the four key components proposed by Cooper et al. (1995): attraction, accessibility, amenity, and ancillary services. Infrastructure is included under the amenity component and plays a critical role in determining the level of comfort experienced by tourists. The indicators used to assess infrastructure include the availability of roads, sanitation facilities, places of worship, food vendors, and safety features. Simultaneously, the Sapta Pesona concept serves as a benchmark for evaluating the quality of the tourism experience, and its implementation requires active participation from both tourism managers and local communities, emphasizing the importance of providing support facilities that are aligned with environmental sustainability. (Widiati & Permatasari, 2022) highlights that service quality especially when supported by community-based training significantly influences visitor satisfaction and repeat visitation. Strengthening these two variables not only enhances a destination's competitiveness but also contributes positively to the local economy and raises public awareness of sustainable tourism practices.

Highlights the natural conditions, available facilities, and tourism potential of the destination, while also identifying various strengths, weaknesses, opportunities, and threats through a SWOT analysis (Safari et al., 2020). The results indicate that the strategic position of the tourist site falls within Quadrant I, suggesting a strong potential for development if improvements are made in infrastructure, promotion, and road accessibility. Several key issues were identified, including damaged footpaths, poorly maintained facilities, and limited promotional efforts, all of which have contributed to a decline in visitor numbers. The proposed development strategies include infrastructure enhancement, facility upgrades, the development of cultural attractions, and promotional efforts through various media channels as well as collaboration with the local community. Overall, the area possesses significant natural potential, but it requires comprehensive improvement and effective management to increase tourist visits and stimulate the local economy. The importance of effective management and strategic promotion plays a crucial role in enhancing the attractiveness of the tourist destination, thereby drawing more visitors and generating economic benefits for the local community. Tourism development strategies consist of a series of efforts aimed at increasing destination appeal, improving facilities, and strengthening promotional activities in order to attract a greater number of tourists and enhance the overall well-being of the surrounding community (Mistriani et al., 2020).

Pantai Mutiara 88, located in Kota Pari Village, Serdang Bedagai, is a tourist destination with significant natural potential. However, it continues to face several development challenges. Key issues identified include suboptimal infrastructure conditions, such as damaged roads, unsanitary restrooms, and a lack of waste disposal facilities. Moreover, the absence of official promotional efforts by the government has resulted in limited public awareness, with most exposure relying on personal social media and word-of-mouth. The services provided by the management team also lack professional training, and most operations are still community-based and self-funded. The insufficient implementation of the *Sapta Pesona* principles has further diminished the visitor experience, particularly in terms of cleanliness, comfort, and lasting impressions. These conditions have led to subpar visitor numbers and have not yet fostered strong tourist loyalty. Therefore, a comprehensive development strategy is required, utilizing a qualitative approach to explore solutions based on the direct perspectives of tourists, management, and the local community.

The importance of evaluating the carrying capacity and condition of a tourist destination through a SWOT analysis approach is strongly emphasized. This study reveals that the destination under review holds a strategically advantageous position for further development; however, it still faces several challenges, including damaged road infrastructure, suboptimal supporting facilities, and limited promotional activities. Therefore, the recommended strategies include improving infrastructure quality, developing local cultural potential, and expanding promotional efforts through collaboration with the surrounding community. These measures are considered effective in increasing tourist visits and generating a positive impact on the local economy (Lasdianti et al., 2022). One of the keys focuses in developing a tourist destination is the importance of implementing the Sapta Pesona concept thoroughly and consistently. Many tourism destinations tend to prioritize increasing visitor numbers by offering visual attractions or entertainment alone, without paying sufficient attention to the overall quality of the tourist experience. In fact, that quality should be maintained through the principles of Sapta Pesona, which include safety, orderliness, cleanliness, coolness, beauty, hospitality, and memorable impressions.

In the context of Pantai Mutiara 88, this research is particularly relevant, as the destination holds significant untapped potential that has yet to be optimized through a sustainable strategic approach. By employing a qualitative descriptive method, this study explores in depth how appropriate development strategies—based on the needs of tourists and local potential—can be implemented not only to attract new visitors but also to retain and enhance tourist satisfaction, thereby encouraging repeat visits and generating word-of-mouth promotion. This research is expected to make a meaningful contribution to tourism development that emphasizes service quality and visitor comfort. Furthermore, it aims to serve as a reference for other tourism managers, encouraging a shift from merely pursuing high visitor numbers to prioritizing the quality of sustainable tourism experiences.

2. Methodology

The researcher employed a qualitative descriptive method in this study. This approach was chosen because it is particularly suitable for providing a comprehensive and in-depth understanding of social phenomena, especially in the context of community-based tourism development strategies at Pantai Mutiara 88, Serdang Bedagai. It allows the researcher to gather empirical data based on the experiences and perceptions of tourism stakeholders, local communities, and other relevant parties. The research design does not aim to generalize the findings, but rather to explore and to understand the contextual dynamics that occur within the specific study area. Data collection was carried out directly in the field over a period of two months, from March to June 2025, using observation, in-depth interviews, and documentation as the primary methods. The research site is in Kota Pari Village, Pantai Cermin Subdistrict, Serdang Bedagai Regency, North Sumatra, where Pantai Mutiara 88 is located and has been developed as one of the region's leading tourist destinations**.** Respondents in this study include tourism object managers, village officials, local MSME players, and tourists. The selection of respondents was carried out through purposive sampling technique, which is one of the methods used selectively based on certain criteria for selecting respondents that are most used in qualitative research, especially when researchers want to explore certain issues from the perspective of individuals who are considered to have important information. In practice, there were 10 respondents interviewed, consisting of 3 tourism managers, 2 village government officials, 3 local community members, and 2 tourists who were visiting.

The interview method used Semi-structured interviews, which allowed the researcher to have flexibility in digging deeper into the answers given by respondents, while still referring to the main question guide that had been compiled previously. This in-depth interview allowed the researcher to explore information about the perceptions, experiences, obstacles, and expectations of the respondents towards the development of Mutiara Beach 88 as a tourist destination. Data analysis was conducted using the interactive analysis model by Miles and

Huberman, which consists of three main stages: data reduction, data display, and conclusion drawing/verification. The data reduction process involved selecting relevant information from interview and observation data, organizing it into thematic categories such as the potential for tourist attractions, development constraints, and forms of community participation. The data display stage was carried out in the form of narrative descriptions and direct quotes from respondents, supported by thematic tables. Meanwhile, conclusion drawing was conducted inductively, based on patterns that emerged from the analysed data. One of the analytical approaches used in this study is the SWOT analysis (Strengths, Weaknesses, Opportunities, and Threats).

3. Results and Discussion

Condition of Tourism Infrastructure at Pantai Mutiara 88. Field observations and in-depth interviews revealed that the tourism infrastructure at Pantai Mutiara 88 is still relatively underdeveloped. Several key issues were identified, including :

- Damaged road access leading to the beach, making it difficult for tourists, especially during the rainy season. Inadequate sanitation facilities, with toilets reported to be poorly maintained.
- Lack of waste management, evidenced by the insufficient number of trash bins along the tourist area. Despite these limitations, the location offers basic amenities such as gazebos, food stalls, and villas for rent, which serve as a foundation for future development. However, community-based management of the beach is still informal, and there has been no formal tourism development program or training provided by the local government.

1. Implementation of Sapta Pesona

   The application of Sapta Pesona (Seven Charms) safety, order, cleanliness, coolness, beauty, hospitality, and memorable experiences – has not yet been fully realized at Pantai Mutiara 88. From the interviews conducted:

   - Tourists appreciated the natural beauty of the beach but expressed concerns regarding cleanliness and comfort.
   - Security and order were not formally maintained, as there were no designated tourist security personnel.
   - The hospitality shown by local vendors and residents was a positive aspect, although most interactions were informal and untrained.
   - This gap in the application of Sapta Pesona contributes to the lack of consistent visitor satisfaction, affecting repeat visits and word-of-mouth promotion.

Meanwhile, this research is in Mutiara 88 Beach, Kota Pari Village, Serdang Bedagai Regency, North Sumatra, which is a local community-based destination and has not been widely exposed academically. The focus of this study is to identify factors that influence tourist visits, perceptions of services and facilities, management constraints, and development impacts. The facilities or infrastructure of a tourist destination play vital roles in encouraging tourist interest in visiting. This is because the availability of adequate infrastructure not only increases visitor comfort but is also a determining factor in the overall tourist experience. Training should be provided to improve the capacity and skills of local communities, especially tourism business actors such as shop managers, tour guides, and facility managers. Training materials include excellent service, small business management, digital marketing, and environmental conservation. With better knowledge and skills, communities can provide more professional services, attract more tourists, while maintain the sustainability of tourist destinations. Training for the surrounding community, business actors and management in supporting the quality of tourism services is very important. Meanwhile, branding needs to be done to form a unique identity for Pantai Mutiara 88. The management plans to create a special slogan and visual logo that describes the characteristics of Pantai Mutiara 88. Strong

branding helps create memories that stick in the minds of visitors and increases the interest in repeat visits. With consistent promotion and the right branding strategy, Pantai Mutiara 88 can be widely known as an attractive, valuable, and worthy destination to visit. In addition, promotion also supports community involvement in creative economic activities based on tourism, such as selling local products or opening guide services. With a good promotional strategy, a tourist attraction will be better known by the wider community. The success of marketing a tourist destination does not only depend on the quality of service but is also greatly determined by the effectiveness of the promotion carried out.

2. SWOT Analysis Findings

Based on the SWOT analysis conducted, the strategic position of Pantai Mutiara 88 falls into Quadrant I, indicating it has considerable potential for aggressive development strategies.

Strengths:

- Attractive natural scenery (white sand, calm waves, sunsets)
- Active participation of local communities in managing the site
- Affordable entry fees and accommodation

Weaknesses:

- Poor road and sanitation infrastructure
- Limited promotional efforts; reliant on social media and word of mouth
- Lack of tourism training for service providers

Opportunities:

- Support from local government for tourism village programs
- Growing interest in nature-based tourism post-pandemic
- Potential collaboration with private investors or travel agents

Threats:

- Environmental degradation and trash pollution
- Risk of natural disasters (e.g., coastal erosion)
- Competition from other, more popular beach destination

Promotion has a significant influence on consumer decisions in purchasing a product. When consumers are about to plan, promotion becomes one of the main considerations because it functions as a means of information that helps consumers recognize and assess a product. When associated with tourism, this shows that effective promotion can influence a person's decision to visit a tourist destination. Therefore, increasing targeted promotional activities is an important strategy in attracting tourists and increasing the number of visits. The urgency of collaboration between stakeholders in developing tourist destinations has also been proven in various studies. This finding confirms that the active involvement of all parties in a unified development vision greatly influences the success of a tourist destination. Therefore, the implementation of collaborative strategies at Pantai Mutiara 88 is expected to produce similar impacts, both in terms of economy, social, and environment. As a result, the economic development of local communities has increased, along with the increasing number of tourist visits and increasing tourism business activities. These are the strategies that will be carried out by the management of Pantai Mutiara 88 in the future. Through various steps that have been described previously, the management hopes that Pantai Mutiara 88 can grow and develop as a leading local tourist destination that not only attracts tourists but also provides real benefits to the surrounding community in a sustainable manner.

4. Conclusion

Based on the results of the Mutiara 88 Beach tourist attraction presented, the following conclusions can be drawn: the strategy for developing the Mutiara 88 Beach tourist destination from the results of interviews and observations conducted resulted in a strategy that has been

realized in the Mutiara 88 Beach tourism policy and program, including conducting regular promotions and developing local communities to help increase tourism visits to Mutiara 88 Beach. Problems in the development of Mutiara 88 Beach tourism include the lack of appropriate promotional strategies that make tourists yet to be familiar with the tourist attractions because the management lacks Official Promotion to promote the place so the target market cannot be reached optimally. Another inhibiting factor in this study is the road access which is still bad and winding and must pass through village roads to the Mutiara 88 Beach tourist attraction. From this study, researchers can provide a choice of strategies consisting of aspects of promotion and personal branding that are evenly distributed, aspects of Infrastructure Quality and Sapta Pesona facilities.

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THE INFLUENCE OF HEDONISM AND KNOWLEDGE ON TOURIST SATISFACTION AT MUSEUM FATAHILLAH JAKARTA

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Abstract

Museum Fatahillah Jakarta is one of the cultural and historical tourism destinations worth visiting. It houses many historical artifacts that serve as witnesses to the founding of the city of Jakarta. However, due to a lack of organization and management awareness regarding creating memorable tourism experiences, visitors often miss out on enjoyment and meaningful information, which are essential components when visiting a museum. This study aims to examine the influence of enjoyable experiences (hedonism) and knowledge on tourist satisfaction at Museum Fatahillah Jakarta. The research method used is a quantitative approach through surveys. Data collection was conducted using questionnaires with a Likert scale. Descriptive statistical analysis was employed to determine the effect of the independent variables—hedonism and knowledge—on the dependent variable, tourist satisfaction. The research population includes all tourists who have visited Museum Fatahillah Jakarta. The research was conducted from January to May 2025; therefore, the findings only reflect conditions during that period and do not consider long-term changes in tourism trends at the museum. The results show that both hedonism and knowledge have a positive influence on tourist satisfaction. This indicates that the more enjoyable and informative the visitor's experience, the higher their level of satisfaction. Among the two variables, hedonism has a more dominant influence on determining tourist satisfaction.
Keywords: Memorable Tourism Experience. Hedonism; Knowledge; Tourist Satisfaction.

1. Introduction

Tourism is one of the most important sources of income for a country. In Indonesia, tourism has great potential to drive national economic growth and can significantly contribute to future development. Tourism involves activities carried out by individuals or groups voluntarily and temporarily moving from one place to another to enjoy recreational activities and tourist attractions, without the intention of earning income at the destination, while receiving services provided by the tourism industry. Through tourism, countries especially local governments that manage tourist attractions can generate substantial revenue. Moreover, tourism is a commodity that is increasingly needed by individuals. Traveling can enhance creativity, relieve stress, provide entertainment, support shopping and business needs, and offer opportunities to learn about the cultural and historical values of different ethnic groups. As working hours decrease and income levels rise, leisure time increases, resulting in greater participation in tourism activities. Tourism also plays a role in broadening one’s perspective on life values.

Indonesia’s vast tourism potential is one of its key strengths in attracting domestic and international tourists, especially in large metropolitan areas such as Jakarta. Jakarta, the capital of Indonesia, is not only a center of government but also a densely populated urban hub with diverse activities. According to data from the Jakarta Central Statistics Agency (2022), the city has a population density of 16,084 people per square kilometer, with a total area of 664.01 km² and a population of 10.67 million people. Jakarta offers a variety of tourist attractions, including Ancol Dreamland, Taman Mini Indonesia Indah, Ragunan Zoo, the National Monument, Kota Tua (Old Town), and several museums. Most of these places

provide entertainment, while only a few—such as museums located in Kota Tua—offer education and historical insight. This highlights the need for the local government to give more attention to promoting and preserving historical tourist destinations like those in Kota Tua.

One of the most frequently visited historical sites in Kota Tua is the Fatahillah Museum. Built in 1712, it originally functioned as a city hall, known as the “Stadhuis” during the Dutch colonial period. The building served as the center of government and military command in Batavia (now Jakarta). The architectural design reflects neoclassical influences and symbolizes the socio-cultural, economic, and political conditions of its time. Although grand in appearance, the building's purpose was deeply rooted in colonial oppression, evident in its underground prison cells and courtyard used for public punishments and executions by the VOC (Dutch East India Company).

Today, the Museum Fatahillah has transformed into a historical site that tells the story of Jakarta’s past, particularly during the Batavia era. The museum continues to evolve in its function to educate and entertain visitors, presenting Jakarta’s long historical narrative in a more interactive and engaging format. The museum is equipped with various facilities such as exhibition rooms, an auditorium, a cafeteria, souvenir shops, and prayer rooms. The exhibitions are organized chronologically, presenting Jakarta’s historical timeline from 3500 BC to the 1950s on the first floor, and showcasing miniature collections and furniture from the old Batavia city hall on the second floor. However, visitor satisfaction at the museum is not solely determined by the facilities and services provided. It is also influenced by psychological and experiential aspects. In tourism, experiences are an essential factor that travelers seek, particularly those that create memorable tourism experiences (MTE). MTE refers to a positive and lasting impression of an experience that is remembered long after it has occurred. In the context of museums, two major components of MTE are hedonism and knowledge.

Hedonism refers to the pleasure and enjoyment that tourists feel during their visit. A pleasant visit—such as one with a welcoming environment, enjoyable exploration, engaging tour guides, or interactive technology—can lead to higher levels of satisfaction. On the other hand, a negative experience may lead to dissatisfaction. Meanwhile, knowledge gained from the visit plays a crucial role in creating a meaningful museum experience. Museums are expected to provide valuable insights and information to visitors. The more knowledge they gain, the higher their level of satisfaction.

Unfortunately, the lack of effective organization and awareness from the management regarding memorable tourism experiences often leads to visitors missing out on both enjoyable and educational experiences, two aspects that are essential for a meaningful and fulfilling museum visit.

2. Methodology

This research was conducted at Museum Fatahillah Jakarta, starting from January to May 2025.The type of data used in this study is quantitative data. According to Kuncoro (2021), quantitative data refers to data that can be directly measured and calculated, where the explanations and information are presented in numerical or statistical form. The data sources in this study consist of primary and secondary data.

Population is the group of individuals or objects that are of interest to the researcher and to whom the research findings will be generalized (Wicaksono, 2020). The target population in this study is tourists who have visited the Museum Fatahillah. This study employs the Cluster Sampling technique, a sampling method based on region, which is used when the area or subject of the study is vast, such as tourists from a country, province, district, or city. To determine which tourists will be selected as data sources, sampling is conducted based on predefined population locations (Sujarweni, 2020).

In multivariate analysis, the minimum sample size should be 10 times the number of variables. In this study, multivariate analysis is used through correlation or multiple regression, and the sample size is determined to be 20 times the number of variables. Since there are 3 variables (independent and dependent), the total number of respondents used is: 20 × 3 = 60 samples.

Validity and Reliability Testing

In this study, validity testing uses the Pearson correlation method by correlating the score of each questionnaire item with the total score. According to Hair et al. (2020), a good item-total correlation value (r-calculated) that indicates item validity should be above 0.50. However, in exploratory research, a value above 0.30 is still considered acceptable.

Reliability testing, according to Bahri (2020), is used to assess the consistency of measurement instruments, particularly those using questionnaires. The aim is to determine whether the measurements remain consistent if repeated. This aligns with Sugiyono (2021), who stated that the purpose of reliability testing is to determine how dependable an instrument is and whether it can produce consistent data. An instrument is considered reliable if the Cronbach's Alpha value is:

≥ 0.60 → acceptable reliability
≥ 0.70 → good reliability
≥ 0.80 → very reliable

2.2. Particular Partial Significance Test (t-test) and Simultaneous Significance Test (F-test)

The partial test (t-test) is conducted to determine the individual significance of each independent variable on the dependent variable (Sujarweni, 2020).

The simultaneous test (F-test) is used to assess the overall significance of the regression model. The significance is determined by observing the p-value (sig), where if the sig value is < 0.05, it indicates that the independent variables collectively have a significant influence on the dependent variable (Sujarweni, 2020).

3. Results and Discussion

3.1 Results

Reliability Analysis of the Hedonism Variable (X1)

Table 1. Reliability test results for hedonism variable

Case Processing Summary

		N	%
Cases	Valid	60	100,0
	Excluded	0	0,0
	Total	60	100,0

Reliability Statistics

Cronbach's Alpha	N of Items
0,913	15

Table 2. Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
X1.1	61,1567	41,256	0,647	0,913
X1.2	61,1897	42,416	0,633	0,917
X1.3	61,1864	40,178	0,717	0,918
X1.4	61,2965	41,697	0,689	0,919
X1.5	61,3865	42,806	0,627	0,924
X1.6	61,2186	42,424	0,702	0,923
X1.7	61,1198	40,861	0,788	0,916
X1.8	61,2327	41,513	0,810	0,915
X1.9	61,1378	41,269	0,664	0,914
X1.10	61,2667	41,857	0,813	0,934
X1.11	61,3590	42,024	0,722	0,932
X1.12	61,3874	42,786	0,799	0,915
X1.13	61,2356	41,763	0,642	0,916
X1.14	61,2984	41,674	0,775	0,918
X1.15	61,2574	41,238	0,762	0,913

The reliability test for the Hedonism variable (X1) showed an excellent result with a Cronbach's Alpha of 0.913. This value exceeds the commonly accepted threshold of 0.700 in social research, indicating a high level of internal consistency for all instruments used to measure this variable. With this level of reliability, the data obtained is considered stable and consistent in measuring the construct of Hedonism as a dimension contributing to tourist satisfaction. Furthermore, item analysis reveals that all items have high corrected item-total correlations, ranging from 0.5 to 0.8. This indicates that each item contributes significantly to the overall measurement of the Hedonism variable and reliably represents the construct. No item shows low correlation; thus, item removal is unnecessary to improve reliability.

In conclusion, the instrument used to measure tourist hedonism at Museum Fatahillah is highly reliable. Therefore, the data derived from the variable scores can be confidently used for further statistical analysis. This high consistency strengthens the internal validity of the developed scale and ensures that the Hedonism variable is accurately and consistently measured.

Reliability Analysis of the Knowledge Variable (X2)

Table 3. Reliability test results for the knowledge variable

		N	%
Cases	Valid	60	100,0
	Excluded[a]	0	0,0
	Total	60	100,0

Reliability Statistics

Cronbach's Alpha	N of Items
0,926	15

Table 4. Item-Total statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
X2.1	61,2568	44,516	0,668	0,926
X2.2	61,4278	43,628	0,827	0,925
X2.3	61,7863	42,878	0,797	0,924
X2.4	61,3667	43,757	0,753	0,923
X2.5	61,4667	43,292	0,684	0,926
X2.6	61,3563	43,747	0,808	0,967
X2.7	61,7816	43,816	0,730	0,947
X2.8	61,4000	44,317	0,834	0,925
X2.9	61,5000	41,776	0,705	0,923
X2.10	61,5667	43,978	0,690	0,935
X2.11	61,2764	43,982	0,727	0,932
X2.12	61,3782	44,102	0,857	0,933
X2.13	61,2758	43,757	0,854	0,923
X2.14	61,3749	44,944	0,748	0,934
X2.15	61,4603	44,033	0,663	0,926

The reliability analysis of the Knowledge variable (X2) yielded a Cronbach's Alpha value of 0.926, which is considered excellent. This demonstrates that all items within this scale are internally consistent and capable of accurately measuring the Knowledge construct. The value far exceeds the minimum threshold of 0.700, indicating a strong measurement consistency. Additionally, item-total correlations ranged between 0.638 and 0.748, which are categorized as very good. All items show a high level of influence on the total score of the variable, indicating their positive contributions to the reliability of the scale. The absence of low-impact items confirms that the instrument is free from irrelevant or ambiguous items, and the measurement results are statistically stable.

The high reliability level instills confidence that the measurement of the Knowledge variable in the museum context is consistent and accurate. This level of reliability is critical in increasing trust in the data obtained, particularly when testing the influence of the Knowledge variable on tourist satisfaction. The instrument's credibility is reinforced by the fact that all items meet the high standards of measurement reliability.

Reliability Analysis of the Tourist Satisfaction Variable (Y)

Table 5. Reliability Test Results for the Tourist Satisfaction

Case Processing Summary

		N	%
Cases	Valid	60	100,0
	Excluded[a]	0	0,0
	Total	60	100,0

Reliability Statistics

Cronbach's Alpha	N of Items
0,933	15

Table 6. Item-Total statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Y1.1	61,5782	39,541	0,758	0,933
Y1.2	61,8390	38,961	0,815	0,960
Y1.3	61,1000	38,990	0,783	0,960
Y1.4	61,1667	39,661	0,795	0,961
Y1.5	61,1333	38,671	0,826	0,960
Y1.6	61,3632	39,413	0,763	0,960
Y1.7	61,0667	39,060	0,836	0,960
Y1.8	61,2522	38,185	0,645	0,967
Y1.9	61,0333	40,171	0,849	0,962
Y1.10	61,0000	39,586	0,762	0,960
Y1.11	61,0333	39,275	0,851	0,959
Y1.12	61,2478	38,576	0,824	0,960
Y1.13	61,0333	40,516	0,691	0,963
Y1.14	60,6932	40,202	0,769	0,962
Y1.15	61,2653	40,723	0,773	0,933

The reliability test for the Tourist Satisfaction variable indicated Cronbach's Alpha of 0.933, reflecting a very high and stable internal consistency. Thus, the instrument used for measuring tourist satisfaction can consistently capture this concept across all items. The item-total correlations ranged from 0.645 to 0.849, demonstrating strong individual item relationships with the overall score. This confirms that all items collectively represent the dependent variable of tourist satisfaction effectively. No item indicated inconsistency, making the measurement statistically reliable.

This high reliability is crucial in this research context because it ensures that the data on tourist satisfaction accurately reflects their experience at Museum Fatahillah. With this level of reliability, further analysis of the influence of hedonism and knowledge on satisfaction becomes more valid and impactful for managerial and academic decision-making.

T-Test Analysis (Partial Significance Test)

Table 7. Partial Significance Test Results

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	7.366	5.708		1.290	.208
	HEDONISM	.597	.183	.573	3.262	.003
	KNOWLEDGE	.372	.175	.348	2.125	.049

a. Dependent Variable: Kepuasan Wisatawan

The t-test for regression coefficients was conducted to assess the significance of each predictor in explaining the variance of the dependent variable (Tourist Satisfaction). The t-value for Hedonism is 3.262 (p = 0.003), indicating a significant influence. Meanwhile, Knowledge has a t-value of 2.125 (p = 0.049), which is borderline significant.

These results suggest that Hedonism significantly influences Tourist Satisfaction, whereas the influence of Knowledge, although close, is less statistically robust. It can be concluded that hedonistic aspects play a more prominent role in enhancing tourist satisfaction than knowledge-related aspects.

F-Test Analysis (Simultaneous Significance Test)

Table 8. Simultaneous significance test results

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1076.491	2	538.246	53.170	<.002[b]
	Residual	263.185	26	10.123		
	Total	1339.676	29			

a. Dependent Variable: Kepuasan Wisatawan

b. Predictors: (Constant), Knowledge, Hedonism)

The F-test aims to evaluate whether the overall model, including Hedonism and Knowledge predictors, significantly explains the variance in the dependent variable. The F-value of 53.170 ($p < 0.002$) indicates that the regression model collectively explains the variance in tourist satisfaction significantly. The high F-value and low significance level suggest that the predictor variables collectively have a strong impact and differ significantly from zero. At least one of the predictors significantly affects Tourist Satisfaction, validating the regression model for further analysis.

This confirms that both variables jointly contribute to tourist satisfaction. Even though Hedonism shows stronger individual significance, both variables together suggest that improving knowledge and hedonistic experiences simultaneously can significantly enhance tourist satisfaction.

Coefficient of Determination (R2)

Table 9. Coefficient of Determination Results

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.712a	.506	.490	1.19447

The coefficient of determination (R2) assesses how much of the variance in the dependent variable is explained by the independent variables. The R2 value of 0.506 indicates that 50.6% of Tourist Satisfaction is explained by Hedonism and Knowledge, while the remaining 49.4% is influenced by other variables not included in the model.

Based on the data analysis results, variable X1, which measures the aspect of Hedonism, demonstrated excellent reliability with a Cronbach's Alpha value of 0.913. This value indicates a high level of internal consistency among all items in this variable. In other words, each item within the instrument consistently measures the aspect of Hedonism with minimal measurement error. This serves as a strong indicator that the instrument for variable X1 can be considered both valid and reliable for further analysis.

Moreover, the item-total correlation values range from 0.502 to 0.804, suggesting a strong relationship between each item and the overall variable score. Item validity values above 0.60 indicate that all items statistically meet the criteria for being valid indicators. This significance is further supported by a p-value of less than 0.05, which confirms a statistically significant relationship between the items and the Hedonism construct being measured. Therefore, it can be concluded that the items effectively represent the Hedonism aspect. It is also important to note that all items show statistical significance, reinforcing the conclusion that this construct can be consistently measured using the instrument. The psychometric strength of these items supports the recognition that variable X1 fulfills both statistical and methodological validity requirements.

Variable X2, which measures the aspect of Knowledge, also demonstrated excellent validity with a Cronbach's Alpha value of 0.926. This figure indicates a high level of internal consistency, meaning that all items within this variable consistently measure the relevant knowledge construct. An alpha value approaching 1 suggests that the instrument is highly stable and capable of producing consistent data across all respondents, making it suitable for further analysis. Furthermore, the item-total correlation values range from 0.502 to 0.850, all of which are statistically significant with p-values less than 0.05. These values indicate that each item makes a positive and significant contribution to the measurement of the Knowledge variable. Therefore, each indicator can be considered statistically valid and accurately reflects the aspect of knowledge being assessed.

The strong and significant validity confirms that the measurement instrument for variable X2 is highly representative, as each item effectively captures the knowledge dimension in a cohesive manner. This high reliability also ensures that the data obtained from this variable is both accurate and consistent, allowing for valid and reliable analysis of the impact of the knowledge variable on the dependent variable.

Variable Y, which measures Tourist Satisfaction, demonstrated very high reliability with a Cronbach's Alpha value of 0.933. This value indicates that all indicators used to measure this variable have strong internal consistency. Despite having a relatively large number of items (15 items), the reliability of the instrument remains unaffected, showing instead that the instrument is capable of comprehensively capturing the dimensions of Tourist Satisfaction. The item-total correlations range from 0.324 to 0.888, with all values showing statistically significant relationships at a p-value level of < 0.05. These figures indicate that each item individually has a strong connection to the main indicator of the variable, resulting in a statistically valid measurement. The strong association of these items with the Tourist Satisfaction construct reinforces the confidence that the instrument effectively represents the key aspects of visitor satisfaction at the Museum Fatahillah.

With these findings, researchers can obtain accurate and representative results regarding the level of tourist satisfaction, which is a crucial factor in assessing the success of museum management from the visitor's perspective. The maintained validity ensures that the research outcomes are accountable and can serve as a basis for evidence-based recommendations.

Based on the above analysis, it can be concluded that all variables—X1 (Hedonism), X2 (Knowledge), and Y (Tourist Satisfaction)—meet adequate validity criteria. Each variable demonstrates a high Cronbach's Alpha value, indicating a strong level of internal consistency. Furthermore, all items within each instrument show statistically significant validity in relation to the total variable score, with fairly strong coefficient values. These results suggest that the measurement instruments used are capable of accurately and consistently measuring the intended constructs.

4. Conclusion

i. Hedonism significantly influences tourist satisfaction at the Fatahillah Museum, with a Cronbach's Alpha value of 0.913 ($p \geq 0.5$). This indicates that enjoyable experiences and emotional aspects are key factors that enhance visitor satisfaction levels.
ii. Knowledge has a positive and significant impact on tourist satisfaction, with a Cronbach's Alpha value of 0.926 ($p \geq 0.5$). Increased information and educational value during visits help improve tourists' perception and satisfaction.
iii. Statistical analysis reveals that both variables, hedonism and knowledge, collectively contribute significantly to the variance in tourist satisfaction, as indicated by an R^2 value of 0.506. This means that approximately 50.6% of the variation in satisfaction levels can be explained by these two variables.

iv. The measurement instruments used in this study demonstrate high reliability and validity, ensuring that the analysis results are trustworthy and can be used as a basis for strategic decision-making in tourism destination management.

Suggestions

i. It is recommended that museum management enhance facilities and activities that can improve hedonistic experiences, such as comfortable interior design, interactive attractions, and an atmosphere that supports visitors' emotional comfort.
ii. The development of educational programs and more intensive information promotion is needed, both through digital and conventional media, to increase tourists' knowledge about the museum and its collections.
iii. It is advisable to provide tour guides who can deliver information in an engaging and informative manner, so that visitors' knowledge can improve and positively influence their satisfaction.
iv. Management should regularly evaluate the tourist experience and their satisfaction levels, and implement continuous improvements based on data and feedback in order to enhance service quality and the overall appeal of the museum.

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THE REVITALIZATION OF KEBUN BUNGA STADIUM AND SPORTS FACILITIES: MEDAN CITY COMMUNITY'S PERCEPTION OF ITS POTENTIAL AS A TOURIST DESTINATION

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Abstract

Public spaces play a vital role in urban life by supporting social interaction, cultural activities, recreation, and enhancing city aesthetics and well-being. Revitalization of public spaces is a key strategy to address urban decline and improve quality of life (Daffa et al., 2024). Kebun Bunga Stadium in Medan, established in 1915, has been revitalized into an Urban Community Park, offering a new image as a recreational and sports facility. This study aims to explore the perceptions of Medan residents toward the stadium's revitalization and assess its potential as a tourist attraction. Using a descriptive qualitative approach, data were collected through interviews and observation. The informants, selected via purposive sampling, consisted of 10–15 individuals associated with the stadium. Data were analyzed through collection, reduction, presentation, and conclusion stages. This study demonstrates that the revitalization has made significant contributions to the social, economic, and spatial aspect. The stadium has become a popular public space and promotes local economic empowerment (Adi et al., 2016). Despite challenges such as limited promotion, perceived high costs, and vandalism, the revitalization enhances residents' quality of life and strengthens Medan's image as a tourism destination. This study affirms earlier findings that active and accessible public spaces significantly influence community well-being and urban vibrancy (Akhyar, 2020). The research contributes theoretically to tourism and urban planning studies by emphasizing the role of sport tourism. and the importance of community perception in evaluating destination development (Alan, n.d.). Practically, it provides strategic recommendations for local governments in designing responsive and sustainable revitalization policies for public facilities

Keywords: Revitalization; Public Space; Kebun Bunga Stadium; Community Perception; Tourist Attraction.

1. Introduction

Public spaces play a central role in urban life as arenas for social interaction, cultural expression, and recreation, while significantly contributing to the well-being of residents and the aesthetic quality of the city. The global focus on urban renewal underscores the importance of public spaces in addressing urban decay and improving quality of life. Therefore, a deep understanding of the elements that shape high-quality urban spaces is crucial in these revitalization efforts. Successful urban spaces are characterized by livability, social vitality, and visitation frequency, contributing to economic prosperity, civic solidarity, local identity, and overall quality of life. Ecological factors, such as green spaces and access to water, have also been shown to significantly influence residents' happiness.

Medan has a rich history of sports development, highlighted by Kebun Bunga Stadium's existence since the early 20th century. This venue has long been a focal point for both athletic pursuits and social gatherings within the community, also serving as the home ground for PSMS Medan since 1973 (Aldi et al., 6737).

The current Kebun Bunga Stadium was officially built in 1953 in preparation for the 3rd National Sports Week (PON III) held in Medan. The event marked a major milestone for the city, driving sports infrastructure development and highlighting Medan's important role in national sports. Recently, the Medan City Government initiated a revitalization project, transforming the stadium into the Kebun Bunga Urban Community Park, envisioned as a new icon for sports and recreation. The revitalization includes an international-standard football field and other modern sports facilities (Redaksi et al., 2023).

Considering the potential economic and social impacts of this public space as a tourism attraction, it is essential to examine community perceptions state that "urban revitalization, also known as urban renewal or regeneration, aims to improve the economic, social, and physical conditions of deteriorating urban areas(Daffa et al., 2024) It seeks to create more dynamic and livable communities, attract investment, and enhance overall quality of life for residents." The success and sustainability of urban revitalization and tourism initiatives are strongly tied to how local communities perceive and respond to such developments. As hosts, local residents serve as ambassadors of their destination, and their views and experiences offer the most authentic and credible reflection of a place's uniqueness and appeal.

Community perceptions significantly influence the overall success of tourism projects. Positive public perception encourages greater levels of support and participation, whereas negative views can present obstacles. Therefore, community involvement plays a vital role in shaping favorable perceptions and ensuring the long-term success of tourism development. Community participation refers to the involvement of local residents in the development process of tourism destinations (Metro, 2355). When residents are actively involved, they are more likely to support tourism initiatives, feel a sense of ownership, and help ensure that the benefits are equitably shared.

Understanding how Medan residents perceive the revitalization of Kebun Bunga Stadium and its potential as a tourist attraction is essential for evaluating the success of the project and identifying areas for improvement. Positive community perception increases the likelihood of frequent use and word-of-mouth promotion of the space. Despite existing studies on public space revitalization and sports tourism, in-depth insights into how local communities view such transformations in Medan remain limited. This study seeks to fill that gap by specifically examining the perceptions of Medan residents regarding the revitalization of Kebun Bunga Stadium now Urban Community Park as a tourist attraction, and identifying the elements of revitalization that influence community perceptions, either positively or negatively.

This understanding is critical for creating successful urban spaces that also support sustainable tourism. The findings are expected to provide practical insights for local governments and stakeholders in designing more effective and community-responsive public space revitalization policies. Furthermore, the study aims to enrich academic discourse in the fields of urban revitalization, sports tourism, and the role of community perception in urban development particularly in developing countries like Indonesia. Despite existing studies on public space revitalization and sports tourism, no prior research has specifically explored the transformation of Kebun Bunga Stadium through the lens of local community perception as a tourism asset. This gap in the literature highlights the novelty of this study, which offers a unique local perspective on urban revitalization and tourism development in a mid-sized Indonesian city. By capturing how residents experience and interpret the stadium's transformation, this research provides fresh insights into the socio-spatial dynamics of public space use after revitalization. Accordingly, the researcher has chosen the title**: "**Revitalization of Kebun Bunga Stadium and Sports Facilities: Medan Community Perceptions of Its Potential as a Tourist Attraction."

2. Methodology

This study adopts a qualitative approach, focusing on an in-depth understanding of the perceptions of Medan residents regarding the revitalization of Kebun Bunga Stadium and its associated sports facilities, as well as its potential as a tourist attraction. The qualitative approach was chosen to explore individuals' views, opinions, and experiences directly dimensions that cannot be measured quantitatively. This research is descriptive in nature, aiming to analyze and present data as it is, without attempting to generalize findings to a larger population. Such an approach enables the researcher to gain a holistic and contextual insight into public perceptions, making the findings more comprehensive, natural, and grounded in real-life contexts.

The qualitative approach employed in this study is based on Creswell's (2016) framework, which emphasizes in-depth exploration of individuals' experiences and the meanings they assign to social phenomena. Furthermore, the data analysis technique follows the interactive model proposed by Miles and Huberman (1994), consisting of data collection, data reduction, data display, and conclusion drawing.

The data sources for this research are divided into two main categories: primary and secondary data. Primary data were obtained directly from first-hand sources or respondents and used to assess community perceptions of the revitalization of Kebun Bunga Stadium and its tourism potential (Medan, 4721). Meanwhile, secondary data were collected indirectly through intermediaries, including statistical records related to tourism and sports in Medan, official reports and documents on facility revitalization, local news articles, as well as content from social media and online discussion forums. (Nizar, 7782). The primary focus of data collection lies in external sources, particularly public perception, while internal data if available serve as supporting context for understanding the stadium's initial condition and the revitalization plan (Ramlee et al., 2020).

Data collection techniques were adjusted to suit the research environment in order to obtain accurate and relevant information. The main method used was field research, which included observation and interviews (Lahpan, 2024). Observations were conducted to assess the current physical condition of Kebun Bunga Stadium and its supporting facilities, including public activities and the use of the sports infrastructure. In-depth, semi-structured interviews were conducted with various relevant stakeholders such as nearby residents, facility users, community leaders, and stadium managers to explore their perceptions of the stadium and its potential as a tourism asset. In addition, library research was employed to gather relevant secondary sources, such as written documents and references that support the field data. The research population consists of Medan residents who have a connection to Kebun Bunga Stadium. The sampling method used was purposive sampling, which aimed to obtain meaningful insights from individuals most relevant to the topic. The criteria for selecting respondents included residing in Medan, being at least 17 years old, having interacted with Kebun Bunga Stadium, and being willing to participate as informants. A total of 10-15 informants were targeted, representing various backgrounds such as local residents, users of the sports facilities, small business operators, community leaders, and representatives from stadium management. Data analysis followed a descriptive qualitative approach, consisting of data collection, data reduction, data presentation, and conclusion drawing stages (Sushanti et al., 2021).

3. Results and Discussion

A. Revitalization of Kebun Bunga Stadium: Historical Narrative and Physical Transformation

Kebun Bunga Stadium is not merely a sports facility, but a symbol of urban identity that has been deeply embedded in the historical narrative of Medan's community since the early 20th

century. As early as 1915, the area formerly known as Parkstraat was recognized as a center for sports activities, marking the beginning of the city's long-standing athletic tradition (Nadiantika et al., 2022). Over time, Kebun Bunga Stadium witnessed the rapid development of sports in Medan, particularly football, as the legendary club PSMS Medan made it their home base starting in 1973 (Kwon et al., 2021).

However, the stadium's infrastructure and functionality gradually declined, especially during the period when it was managed by the Department of Sanitation and Parks (DKP), an agency lacking both orientation and expertise in sports facility management (Wibowo et al., 2023). This mismatch led to a deterioration in facility quality, eventually turning the stadium area into a hotspot for negative activities, including drug abuse. This context provided a compelling rationale for the comprehensive revitalization initiative launched by the Medan City Government in 2023.

The revitalization was implemented as a multi-year project with a total budget of approximately IDR 195 billion, funded through the Medan City Regional Budget for the 2023–2024 fiscal years (Wirajati et al., 3215). The transformation extended beyond physical renovations to a paradigm shift in the stadium's function, evolving into the "Urban Community Park Kebun Bunga" a multifunctional city park concept integrating modern sports facilities, green spaces, recreational areas, small business centers, and cultural performance venues (Muhammad, 5321).

New features such as the skate park, wall of sport fame, rock climbing court, the multifunctional FORI building, and the waterplay area were designed to accommodate the diverse needs of the community. With the capacity to host up to 1,500 visitors, the stadium has reemerged as an inclusive public space not only for athletes and sports communities, but also for families, students, artists, and tourists.

B. Timeline of the Revitalization Project and Changes in Management Structure

The journey of this revitalization project cannot be separated from the institutional dynamics that shaped the management of the facility. The initial turning point occurred on September 6, 2021, when the authority for managing the stadium was officially transferred from the Department of Sanitation and Parks (DKP) to the Department of Youth and Sports (DISPORA), a strategic decision by the Medan City Government aimed at strengthening the stadium's function in sports development and maximizing the potential for support from the Ministry of Youth and Sports (Arviyanda et al., 2023). DISPORA then initiated the technical planning phase by developing the Detail Engineering Design (DED) through a participatory approach, engaging the public via a design competition mechanism.

The project, which began in 2023, was inaugurated in early 2025, marking the reopening of Kebun Bunga Stadium as an Urban Community Park by Medan Mayor Bobby Nasution (Syafnidawaty, 2020). This planning phase was supported by inter-agency collaboration, particularly with the Office of Housing, Settlements, and Spatial Planning (PKP2R), which was responsible for the technical aspects of construction (N et al., n.d.). The collaboration serves as a model of cooperative and efficient governance, reflecting the integration of resources across local government agencies (OPD) in managing a regionally strategic development project.

C. Public Perception of the Revitalization

Interviews with 10 respondents from diverse age groups, occupations, and places of residence revealed that the stadium's revitalization has been positively received by the public. Respondents expressed appreciation for the improved cleanliness, safety, and comfort of the facilities, as well as the presence of disability-friendly access, which had previously been

unavailable. For instance, one respondent stated, “The condition is adequate, and the pedestrian and wheelchair-accessible areas are very safe” (Riski Agustika). This indicates that the stadium’s design now reflects the principles of universal design, making the facilities more inclusive for all segments of society. However, the public also noted several shortcomings, such as the limited number of toilet facilities, insufficient supervision of cleanliness, and the need for better parking arrangements. Another challenge raised was the lack of adequate socialization and promotion regarding the use of the facilities, which has resulted in suboptimal utilization of the stadium area by community groups who are still unfamiliar with it.

D. Economic and Social Impacts of the Revitalization

The revitalization of the stadium has generated tangible economic benefits. Local residents have begun opening businesses such as coffee stalls and snack kiosks around the park. The reopening of the stadium has led to a growth in revenue for surrounding MSMEs (Micro, Small, and Medium Enterprises), signalling the economic benefits of its revitalization. The Mayor has even encouraged local community involvement by facilitating licensing for micro-enterprises.

In addition to economic gains, the revitalization has also brought about significant positive social impacts. The stadium, once dark, neglected, and prone to illegal activities, has been transformed into a vibrant, well-lit, and secure public space. Equipped with CCTV and enhanced lighting, the area is now a safe environment where children, teenagers, and families can exercise or socialize freely.

This transformation aligns with the views of urban theorists like Jane Jacobs, who argued that vibrant and active public spaces are key to urban safety (Jacobs, 1961). The revitalization has not only reshaped physical infrastructure but has also influenced public behavior and the community’s culture regarding shared spaces.

E. Perceptions of DISPORA Management

According to a representative from the Department of Youth and Sports (DISPORA), public enthusiasm toward the stadium is notably high, particularly for the indoor tennis facilities, which are frequently fully booked and require a reservation system. However, the management also faces challenges, including minor incidents of vandalism and complaints regarding rental fees, which some residents perceive as too expensive.

DISPORA has established a fee structure based on Regional Regulation (Perda) No. 1 of 2024 and has made efforts to clarify that the collected retribution fees are allocated for facility maintenance. For instance, the football field is rented out to the public at a rate of Rp 700,000 for a two-hour session, with special membership rates also available. Meanwhile, access to the jogging track and children’s playground remains free of charge.

Revitalization as an Implementation of the Livable City Concept

The transformation of Kebun Bunga Stadium reflects the paradigm of a sustainable city, where public spaces are considered essential components of urban life. This idea aligns with the livable city concept articulated by Gehl (2010), which emphasizes that an ideal city must provide safe, comfortable, and enjoyable spaces for social interaction across all demographic groups.

By introducing green parks, jogging tracks, and a variety of sports facilities, the revitalization has succeeded in turning the stadium into one of the most favored urban spaces among residents both young and old. These findings are found that public green spaces significantly contribute to psychological well-being among urban populations.

A. Microeconomic Activation and MSME Empowerment

This study demonstrates that public space revitalization can serve as a catalyst for local economic growth. Many residents who were previously passive have now become active in launching new small businesses. This supports the theory proposed that the revitalization of urban parks can increase income and create new economic opportunities for surrounding communities.

The Medan City Government's policy of providing business incentives represents a tangible form of inclusive governance aimed at enhancing community welfare. This approach may serve as a best practice model worth replicating in other urban areas.

B. Revitalization and Social Transformation

The stadium area, once associated with insecurity and disorder, has now been transformed into a space that is safe, well-lit, and vibrant. This change has directly contributed to the reduction of youth delinquency and brawls. Consistent with the findings of [26] active public spaces can foster social cohesion and reduce the risk of conflict within the community.

C. Sport Tourism and Tourist Attraction Potential

The diversification of the stadium’s functions has positioned Kebun Bunga Stadium as a promising destination for sports tourism. Non-sporting events such as concerts and festivals are now regularly held at the site. This is consistent with Gibson et al. (2012), who define sport tourism as a tourism activity that revolves around competitive and recreational sports events.

D. Challenges and Sustainability Strategies

The main challenges identified include complaints about high user fees and incidents of vandalism. One long-term strategy that could be adopted is the implementation of differentiated pricing based on user segments and time of use. In addition, increasing public participation can be achieved through outreach programs, community education, and the formation of active user groups.

E. The Role of Academics and Research Limitations

DISPORA expects academic institutions to contribute to the promotion and development of the stadium. However, this research has certain limitations, as it relies solely on a qualitative approach with a relatively small number of respondents. Future longitudinal and quantitative studies will be crucial in assessing the long-term impacts of revitalization more comprehensively.

The involvement of academics is essential not only in terms of promotion, but also as independent evaluators and participatory facilitators to ensure the sustainability of the stadium’s management. This role encompasses conducting further research, mentoring small and medium enterprises (SMEs) around the stadium, and developing community-based educational programs. Although this study is limited by the number of informants and the temporal scope, efforts to ensure its validity were made through source triangulation, inter-researcher discussions, and reflective note-taking to maintain the credibility of the data.

This is supported by interview data from local respondents. For instance, one informant (Riski Agustika) stated that the facilities are now clean, comfortable, and inclusive, particularly for people with disabilities, reflecting improvements in the stadium’s universal design. Another respondent noted, “Now, the environment feels safer and more family-friendly, even at night,” emphasizing the social transformation brought by the revitalization. Small business operators

also expressed positive views, such as experiencing increased daily revenue since the reopening. These findings demonstrate that the revitalization has not only improved infrastructure but also significantly shaped community behavior, economic activities, and spatial usage. Therefore, the discussion in this study is rooted in empirical data and reflects the direct experiences of various stakeholders.

Fig. 1. The condition of Kebun Bunga Stadium before and after its revitalization

4. Conclusion

Based on the findings of the study titled "Revitalization of Kebun Bunga Stadium and Sports Facilities: Public Perception in Medan City Regarding Its Potential as a Tourist Attraction," it can be concluded that the revitalization initiative undertaken by the Medan City Government has had a tangible positive impact on public perception. The community has responded favorably to the transformation of the stadium into a multifunctional open space not only as a center for sports activities but also as a place for recreation and social interaction. This transformation aligns with the study's objective to explore public perceptions of the stadium's potential as a sports tourism attraction and supports the hypothesis that revitalization plays a significant role in enhancing that potential.

The theoretical implications of this research contribute to the fields of tourism management, urban planning, and public perception studies by emphasizing that the revitalization of public spaces should be understood as a holistic social process. On a practical level, the findings offer strategic input for local governments in designing revitalization policies for public facilities. The high level of community engagement and increased activity around the stadium demonstrate that public participation is a critical factor in the success of community-based infrastructure projects.

This study introduces a novel contribution by focusing on a revitalized public sports facility in a secondary city and interpreting its transformation through community perspectives, a focus that has been largely overlooked in previous urban tourism literature. Therefore, the findings offer a new framework for analyzing community-driven urban regeneration and may serve as a reference for similar studies in other regional contexts.

While this study acknowledges certain limitations such as the use of a qualitative approach with a limited number of informants, which restricts the generalizability of the results, as well as the relatively short time since the stadium's reopening, which prevents a comprehensive assessment of long-term impacts it nevertheless provides valuable insights. Issues such as vandalism and the public perception of high usage fees also present challenges. Despite these limitations. Thus, the revitalization of Kebun Bunga Stadium has proven to be a strategic catalyst that supports the growth of the local tourism sector, strengthens community-based social development, and enhances the identity and civic pride of Medan residents in a sustainable manner

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MENGKAJI TAHAP PENERIMAAN JACK FINGER PERISA LADA HITAM DAN PERISA KEJU DALAM KALANGAN PELAJAR LANGKAWI TOURISM ACADEMY@ KOLEJ KOMUNITI LANGKAWI MELALUI UJIAN RASA

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Abstrak

Kajian ini dijalankan untuk menilai tahap penerimaan responden terhadap produk makanan inovatif yang dikenali sebagai Jack Finger, iaitu snack yang diperbuat daripada biji buah nangka sebagai bahan utama. Responden bagi kajian ini adalah pelajar Langkawi Tourism Academy@Kolej Komuniti Langkawi. Instrumen kajian ini adalah soal selidik yang terdiri daripada dua jenis produk Jack Finger yang diberi nama Jack Finger dengan perisa lada hitam dan perisa keju. Responden yang dipilih secara rawak telah mengambil bahagian dalam ujian rasa dan melengkapkan borang soal selidik yang terdiri daripada dua bahagian: Bahagian A memberi tumpuan kepada demografi, manakala Bahagian B menilai tahap penerimaan terhadap produk. Analisis data telah dijalankan menggunakan Statistical Package for Social Science (SPSS) dengan membuat pengiraan peratusan dan skor min. Dapatan kajian menunjukkan penerimaan responden terhadap kedua-dua produk Jack Finger ini menunjukkan pada tahap yang memberangsangkan iaitu tahap penerimaan yang tinggi. Biarpun produk ini tidak pernah dipasarkan dan ia merupakan idea baharu, akan tetapi ianya sekaligus secara tidak langsung menunjukkan produk baru ini boleh diterima dipasaran dan mendapat sambutan.
Kata kunci: Nangka; Biji nangka; Jack finger.

1. Pengenalan

Nangka atau nama sainifiknya Artocarpus heterophyllus adalah tergolong di dalam keluarga Moraceae iaitu sejenis tanaman tropika. Nangka dipercayai dibawa masuk ke Malaysia dari India pada tahun 1877. Kawasan penanaman banyak tertumpu di kawasan tropika terutamanya di Indonesia, Thailand dan Filipina selain di Malaysia. Di Malaysia, negeri-negeri utama pengeluar Nangka adalah Johor, Kedah, Terengganu, Kelantan dan Pahang.

Terdapat 60 jenis dan lebih 1000 spesies pokok nangka dari keluarga ini di kawasan tropika. Pokok nangka adalah sejenis tumbuhan yang mengandungi getah, berwarna putih dan boleh mencapai ketinggian sehingga 20-meter serta mempunyai sistem akar tunjang. Anak pokok nangka mempunyai akar tunjang yang mudah cedera dan boleh menjejaskan pertumbuhan pokok tersebut.

Kebanyakan masyarakat kurang menggemari dan mengenali serta tidak tahu untuk memvariasikan produk berasakan nangka. Masyarakat kurang menggemari buah nangka kerana tidak tahu khasiat yang terkandung dalam buah nangka. Buah nangka dikatakan boleh mendatangkan angin dalam badan. Oleh itu, masyarakat lebih terdedah dengan buah-buahan luar negara yang diwarwarkan mempunyai lebih banyak khasiat dan mudah didapati di pasaran. Proses untuk mendapatkan isi buah nangka adalah rumit menyebabkan masyarakat kurang gemar untuk memakannya. Segelintir masyarakat kurang pengetahuan tentang khasiat dan tidak tahu memvariasikan produk berasaskan buah nangka menyebabkan ia kurang mendapat sambutan. Biji nangka juga sering dibuang. Kebanyakan masyarakat hanya tahu memakan isi nangka sahaja. Manakala bijinya dibuang begitu sahaja. Ramai yang tidak

tahu bahawa biji nangka boleh dimakan dan mempunyai pelbagai khasiat. (http://pertanianmjg.perak.gov.my, laman web Jabatan Pertanian Daerah Manjung, 8 Julai 2009)

Kajian ini bertujuan untuk menilai tahap penerimaan pelajar Langkawi Tourism Academy@Kolej Komuniti Langkawi terhadap Jack Finger perisa lada hitam dan perisa keju dengan menilai atribut deria dan visual utama seperti rasa, tekstur, bentuk dan warna. Setiap elemen ini memainkan peranan penting dalam mempengaruhi persepsi dan kepuasan pengguna.

Atribut deria (rasa, tekstur, bentuk dan warna) akan membantu menentukan sejauh mana produk ini menarik dari segi deria pengguna, Melalui analisis faktor-faktor ini, kajian ini bertujuan untuk memahami keutamaan pengguna dan menambah baik pembangunan produk selaras dengan kehendak mereka.

Nangka (Artocarpus heterophyus Lam.) adalah tumbuhan asli India dan Asia Tenggara, banyak ditemukan di hutan Malaysia dan negara ASEAN lainnya, serta diperdagangkan luas di pasar. Nangka dapat ditanam melalui biji, cantuman, atau kultur tisu. Buah nangka matang dapat dimakan mentah atau diolah menjadi beragam makanan seperti jem, jeli, acar, dodol, pengat, atau ditinkan. Nangka muda dapat dimasak gulai lemak, kari, kerabu, atau direbus sebagai ulam. Biji nangka juga memiliki khasiat obat, seperti direbus atau dihancurkan menjadi tepung untuk mengobati kelebihan hempedu, dan dipanggang sebagai tonik kelamin. Di Malaysia, nangka ditanam secara komersial dan di belakang rumah, terutama di Johor, Negeri Sembilan, Pahang, Kedah, dan Terengganu. Klon komersial yang direkomendasikan antara lain J 29, J 31 (N.S.I), dan J 32, yang diminati pasar karena ukurannya tidak terlalu besar, isi tebal, halus, manis (lebih dari 13% Brix), dan warna isi yang kuat. Pemanenan dilakukan 130-140 hari setelah putik atau 90-95 hari setelah dibalut, ditandai dengan tangkai berubah warna dari hijau tua menjadi kuning perang, serta duri yang lebih jarang, lebar, dan pendek. Nangka biasanya masak dalam 3-4 hari pada suhu kamar. Penyimpanan optimal pada suhu 11-13°C dengan kelembapan relatif 85-90%.

Beberapa jenis nangka di Malaysia adalah J 29, J 31, J 32, J 33, dan Mastura. Nangka J 29, berasal dari Sungai Chua, Selangor, berbuah besar (10 kg), bulat, kulit hijau kekuningan, duri kasar dan jarang, isi tebal, pejal, manis, kuning, bertekstur halus, jerami kurang. Nangka J 31 (N.S.I) berbuah besar (10 kg), panjang (45-55 cm), lurus, kulit hijau, getah banyak, duri rapat, isi kuning, manis, berbau kuat, dan jerami banyak. Nangka J 32, berbentuk bujur panjang, bahu melekuk, ujung bulat, isi kuning oranye, keras, pejal, kurang manis, sedikit berair, dan beraroma. Nangka J 33 cocok dimakan mentah. Nangka Mastura (Cj), kultivar baru dari USM 2000, adalah buah tropis dengan nilai komersial setara cempedak dan sukun, namun kurang mendapat perhatian.

Penyakit utama nangka adalah Mati Rosot (Branch Dieback/Bacterial Blight) yang disebabkan oleh Erwinia caratovora, menyerang dahan dan batang, menyebabkan daun menguning, gugur, dan akhirnya mati. Gejala lain meliputi getah putih kekuningan, kulit melunak, dan bau busuk. Pengendalian meliputi sanitasi ladang, pembuangan dan pembakaran bagian tanaman yang terinfeksi, serta sterilisasi alat pangkas dengan disinfektan (90% alkohol dan 10% natrium hidroksida).

Terdapat pelbagai khasiat dan zat yang terkandung di dalam buah dan biji nangka. Kandungan zat itu ialah Tenaga, Protein, Karbohidrat, Kalsium, Vitamin A, Vitamin B1, Vitamin C, Zat Besi, lemak, Fosfor dan Air.

Jadual 1. Kandungan Zat

KOMPONEN GIZI	BUAH NANGKA	BIJI NANGKA
Tenaga (kkal)	106	165/100g
Protein (g)	1.2	4.2/100g
Lemak (g)	0.3	0.1/100g
Fosfor (mg)	19	200/100g
Karbohidrat (g)	27.6	36.7/100g
Kalsium (mg)	20	33/100g
Air (g)	70	57.7/100g
Besi (mg)	0.9	1.0/100g
Vitamin A (SI)	330	0/100g
Vitamin B1 (mg)	0.07	0.20/100g
Vitamin C (mg)	7	10/100g

(Sumber: www.hubpages.com/hub/health-benefit_jack_fruiti, 2006-2010)

2. Metodologi Kajian

Kajian ini merupakan kajian yang bersifat diskriptif dan menggunakan kaedah ujian rasa dan ia melibatkan tempoh suatu masa tertentu sahaja. Instrumen soal selidik dipilih bagi mendapatkan data. Lokasi kajian hanya melibatkan adalah pelajar Langkawi Tourism Academy@Kolej Komuniti Langkawi. Instrumen soal selidik yang digunakan pengkaji melibatkan penggunaan skala hedonic.

Ujian Hedonic merupakan suatu komponen ujian efektif yang dijalankan bagi menentukan tahap kesukaan dan penerimaan pengguna terhadap sesuatu makanan (Aminah 2004). Skala hedonic adalah seperti berikut:

Jadual 2. Skala Hedonic

Skor					
	1. Sangat tidak suka	2.Tidak suka	2. Tidak pasti	3. Suka	4. Sangat Suka

Secara amnya, borang soal selidik yang akan diedarkan kepada responden iaitu pelajar Langkawi Tourism Academy@Kolej Komuniti Langkawi terdiri daripada dua bahagian iaitu Bahagian A dan Bahagian B. Bahagian A adalah maklumat demografi iaitu jantina dan bahagian B seperti jadual 3 berikut:

Jadual 3. Borang soal selidik

Skor	1. Sangat tidak suka	2.Tidak suka	2. Tidak pasti	3. Suka	4. Sangat Suka
Item	Kod A				
Rasa					
Tekstur					
Bentuk					
Warna					
Item	Kod B				
Rasa					
Tekstur					
Bentuk					
Warna					

Kedua-dua bahagian soalselidik dianalisis dengan kaedah analisis statistik secara deskriktif yang mana data dianalisis dalam bentuk frekuansi dan peratusan. Data juga dipersembahkan dalam bentuk sebutan skor min. Untuk memudahkan proses penganalisaan data, penyelidik telah menggunakan interpretasi skor min yang dikemukakan oleh Wiersma (1995) sebagai rujukan interpretasi skor min dalam jadual 4 di bawah:

Jadual 4. Teknik Analisis Data (Weirsma,1995)

SKOR MIN	INTERPRETASI	PENERIMAAN
1.00 - 2.49	Rendah	Rendah
2.50 - 3.49	Sederhana	Sederhana
3.50 - 5.00	Tinggi	Baik

Kajian ini menggunakan pendekatan kuantitatif iaitu melalui soal selidik. Saiz populasi pelajar yang terlibat dalam kajian adalah seramai 188 orang. Berdasarkan Jadual Krejcie & Morgan, saiz sampel yang disarankan ialah 127 orang.

3. Dapatan dan Perbincangan

Analisis yang dibuat adalah berdasarkan persoalan kajian bagi mencapai objektif kajian yang telah ditetapkan. Bagi maklumat demografi responden, analisis berbentuk penerangan secara terperinci iaitu dalam bentuk peratusan. Jadual 5 di bawah adalah berkaitan dengan maklumat demografi responden:

Jadual 5. Demografi responden

	Bilangan	Peratusan
Lelaki	47	37
Perempuan	80	63
Jumlah	127	100

Berdasarkan Jadual 6 di bawah, dapatan kajian menunjukkan bahawa tahap penerimaan Jack Finger berperisa lada hitam dalam kalangan pelajar Langkawi Tourism Academy@Kolej Komuniti Langkawi berada pada tahap yang tinggi, dengan skor min keseluruhan 4.43.
Skor tertinggi diperoleh pada aspek warna iaitu 4.63, menunjukkan bahawa penampilan visual produk memainkan peranan penting dalam menarik minat pengguna. Warna yang menarik dipercayai memberi persepsi positif terhadap kualiti dan kesegaran produk, sekaligus mempengaruhi kecenderungan untuk mencuba dan menerima makanan tersebut.
Aspek tekstur mencatatkan skor min 4.40, menandakan bahawa kelembutan, kerenyahan atau keseimbangan tekstur Jack Finger lada hitam sesuai dengan citarasa responden. Tekstur yang baik memberi pengalaman deria yang menyenangkan ketika memakannya.
Aspek rasa memperoleh skor min 4.37, menunjukkan bahawa gabungan perisa lada hitam dalam produk ini diterima dengan baik. Walaupun berada di bawah skor warna dan tekstur, rasa masih menjadi faktor utama yang menentukan penerimaan makanan.
Aspek bentuk mendapat skor min 4.33, iaitu yang paling rendah antara empat aspek, tetapi masih berada pada tahap tinggi. Ini menunjukkan bahawa bentuk produk tidak menjadi isu utama bagi responden, walaupun sedikit kurang mempengaruhi daya tarikan berbanding warna.

Secara keseluruhan, dapatan ini mengesahkan bahawa Jack Finger berperisa lada hitam mempunyai potensi tinggi untuk diterima di pasaran, terutamanya dalam kalangan pelajar yang menjadi sasaran kajian. Penambahbaikan boleh difokuskan pada aspek bentuk dan rasa untuk memastikan kesemua elemen berada pada tahap optimum, seterusnya meningkatkan kepuasan pengguna dan daya saing produk di pasaran.

Jadual 6. Skor min Jack Finger berperisa lada hitam

	N	Min	Tahap Penerimaan
Rasa	127	4.37	Tinggi
Tekstur	127	4.40	Tinggi
Bentuk	127	4.33	Tinggi
Warna	127	4.63	Tinggi
Min Keseluruhan		4.43	Tinggi

Berdasarkan Jadual 7 di bawah, tahap penerimaan Jack Finger berperisa keju dalam kalangan pelajar Langkawi Tourism Academy @ Kolej Komuniti Langkawi berada pada tahap tinggi dengan skor min keseluruhan 4.40. Dapatan ini menunjukkan bahawa produk berperisa keju ini mendapat sambutan positif dan diterima baik oleh responden.
Aspek warna mencatatkan skor min tertinggi iaitu 4.60, yang menggambarkan bahawa persembahan visual produk memainkan peranan besar dalam mempengaruhi persepsi pengguna. Warna keemasan atau tona yang menyerlah pada Jack Finger berperisa keju mungkin memberikan daya tarikan tambahan kerana ia sering dikaitkan dengan rasa lazat dan segar.

Aspek bentuk pula memperoleh skor min 4.43, menandakan bentuk produk yang konsisten, kemas dan mudah dimakan menjadi faktor yang menambah nilai penerimaan pengguna. Bentuk yang praktikal juga memudahkan penyediaan dan penyajian, terutamanya dalam konteks makanan ringan atau snek segera.

Bagi aspek rasa, skor min 4.33 menunjukkan bahawa perisa keju yang digunakan adalah digemari oleh kebanyakan responden. Walaupun berada pada tahap tinggi, skor ini sedikit lebih rendah berbanding warna dan bentuk, mungkin disebabkan variasi keutamaan rasa keju di kalangan pengguna atau tahap kemasinan yang berbeza dari jangkaan mereka.

Aspek tekstur mencatatkan skor min 4.27, iaitu yang terendah dalam penilaian ini walaupun masih berada pada tahap tinggi. Hal ini menunjukkan bahawa terdapat ruang untuk penambahbaikan dari segi kelembutan atau kerenyahan produk bagi meningkatkan lagi pengalaman sensori pengguna.

Secara keseluruhannya, dapatan ini membuktikan bahawa Jack Finger berperisa keju mempunyai potensi pasaran yang baik, khususnya di kalangan pelajar. Walaupun warna dan bentuk sudah berada pada tahap optimum, penambahbaikan pada aspek tekstur dan rasa boleh dipertimbangkan untuk meningkatkan lagi kepuasan pengguna dan memperkukuh daya saing produk di pasaran.

Jadual 7. Skor min Jack Finger berperisa keju

	N	Min	Tahap Penerimaan
Rasa	127	4.33	Tinggi
Tekstur	127	4.27	Tinggi
Bentuk	127	4.43	Tinggi
Warna	127	4.60	Tinggi
Min Keseluruhan		4.40	Tinggi

4. Kesimpulan

Merujuk tujuan kajian pengkaji iaitu melihat penerimaan Jack Finger berperisa lada hitam dan keju dikalangan pelajar Langkawi Tourism Academy@Kolej Komuniti Langkawi melalui ujian rasa didapati bahawa tahap penerimaannya adalah berada pada tahap tinggi iaitu mencatatkan min keseluruhan 4.43 untuk Jack Finger berperisa lada hitam dan 4.40 untuk Jack Finger berperisa keju.

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TENANK CAFÉ'S STRATEGY AS A CULINARY DESTINATION IN ATTRACTING DOMESTIC TOURISTS IN MEDAN

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Abstract

Tenank Café is one of the thematic culinary in Medan. It is actively engaged in the culinary sector, targeting millennial and Gen Z consumers through its tropical beach-themed concept and strong digital presence. However, despite its visual appeal and popularity on social media, the café faces challenges in sustaining customer loyalty and translating digital attention into consistent real-world visits. The core problem identified in this study is the mismatch between Tenank Café's strong online branding and its operational shortcomings, such as inconsistent food quality, uneven service, and underutilised promotional strategies. This study aims to analyse and formulate a new marketing strategy that integrates internal strengths and external opportunities while addressing existing weaknesses and threats. The research employs a descriptive qualitative approach using in-depth interviews, participatory observation, and content analysis of social media. The SWOT analysis is applied to identify strategic positioning and develop suitable marketing strategies. The findings show that Tenank Café has strong visual branding appeal, but operational gaps hinder sustainable performance. Thus, a strategic combination of Strength–Opportunity (SO), Weakness–Opportunity (WO), Strength–Threat (ST), and Weakness–Threat (WT) approaches is proposed. This study concludes that a SWOT-based experiential marketing strategy can support culinary MSMEs like Tenank Café in enhancing competitiveness, emotional customer engagement, and long-term growth in the dynamic urban tourism landscape.
Keywords: Marketing Strategy; Culinary Tourism; SWOT.

1. Introduction

The culinary sector in Indonesia has become more than just a consumption; it has become an integral part of experiential tourism, which is marked by cultural and symbolic significance. In the tourist ecosystem, culinary experiences transform the expression of local identity, educate people about gastronomy, and facilitate social intertourism. Culinary tourism is a medium of interconnection between local products, narrative culture, and personal experience, which makes it more popular, especially among millennials and Gen Z.

According to the Ministry of Tourism and Creative Economy report (2023), the culinary subsector contributes around 41.4% to the Gross Domestic Product (GDP), making it the subsector with the highest contribution among other sectors like fashion and crafts. This figure shows that the culinary sector can attract visitors. Thus, efforts to develop and manage potential tour culinary experiences are economical and can strengthen the image of local culture internationally.

Medan, a city in North Sumatra, Indonesia, is well known as one of the cities with culinary richness. Medan is a melting pot of various ethnicities, such as Batak, Chinese, Malay, Indian, and Javanese. This diversity gives birth to a complex and distinctive taste heritage. According to Utomo & Pulungan (2023), the Medan culinary sector should be lifted to become a national icon because its unique dishes come from various ethnic backgrounds. Therefore, Medan has a significant opportunity for city tour culinary branding.

The development of thematic cafés in Medan has become part of the dynamic urbanisation and digitalisation style. Cafés are not only places to eat and drink but have also become places for social interaction, lifestyle expression, and visual stage imaging on social media. Cafés with unique themes, interior concepts, and specific menus have become a preference for modern consumers.

One of the prominent cafés in Medan is Tenank Café, which targets millennials and Gen Z through its industrial-modern concept, aesthetic atmosphere, and promotional approach-based content. Although Tenank Café is active on social media and popular on weekends, it has not fully succeeded in building customer loyalty. The high and low customer visits during the weekdays show that the active promotional content on social media does not translate to physical visits in the real world. Therefore, comprehensive research is needed to study this phenomenon.

In an increasingly competitive culinary business, success is determined by a product's promotion strength or quality and its overall capabilities. A framework known as SWOT analysis can help companies to assess their strengths, weaknesses, opportunities, and threats. According to Suarna et al. (2025), SWOT analysis can help businesses understand internal and external conditions for designing adaptive and data-based strategies.

Unfortunately, the study of culinary marketing strategies in Indonesia still focuses on the 7P elements (product, price, place, promotion, people, process, physical evidence). However, these elements have not integrated SWOT as an evaluation framework for comprehensive strategic planning (Sinulingga et al., 2024). This has become a problem as the 7P approach is often normative and does not capture the unique context of each destination.

A study by Hasibuan (2022) that examines Free Kick Café in Padangsidimpuan proves that the SWOT approach can describe a competitive position in the culinary business. However, his study could not link the thematic café strategy with customers' experience, which is the differentiator in the experiential tourism context.

Andriyani and Mahardika (2023) used SWOT on the Umbul Manten destinations tour to evaluate the company's effectiveness in communication marketing. The SWOT approach is an effective marketing tool. However, it does not address customers' narrative and emotional engagement in tourism, which is a long-term determinant of success in the hospitality and culinary industry.

Safeyah et al. (2024) also showed SWOT potential as a tool in building sustainable innovation in a village tour. However, the implementation of SWOT focuses on the rural area and has not yet touched the complexity of urban market dynamics, like urban café, which has a cycle trend, lifestyle, and fast-changing customer expectations.

Rohmatur and Setiawan's (2021) Villa Study strengthens the importance of cultural perspectives in understanding the café's function as a new social room. Hanging out at No Again Café was considered part of social rituals and identity symbols. Therefore, a marketing strategy that only focuses on informative and functional will be left behind if it is not customised with emotional and symbolic dimensions expected in today's consumers.

The Last Supper (2024), in his research about the culinary tour in Luwu, and Mujanah (2022), in the study of a marketing strategy for village tours, state that the strategy models used in the sector tend to be generic and not contextual. They emphasise that a proper and contextual SWOT analysis should be used to develop a strategy based on local superiority, especially in response to the needs of travellers in an increasingly domestically diverse environment.

From the various studies mentioned, there are still theoretical and practical gaps in using SWOT analysis as a main approach to designing marketing strategies for thematic cafés in urban areas, especially those operating in tourists' culinary landscapes such as Medan. In fact, mapping strategic SWOT can clarify a business's position in the competition cycle and open room to develop a more comprehensive, adaptive, and contextual strategy.

Based on said gap, this qualitative research will determine how Tenank Café positions itself strategically in the Medan culinary landscape, manages strengths and opportunities, and responds to weaknesses and challenges. The research will look from the perspectives of owners, managers, and customers.

The primary purpose of this study is to compile a strategic marketing portrait for Tenank Café using the SWOT approach rooted in operational reality and customer experiences. This study is expected to enrich marketing literature in the culinary sector. The results can become a strategic reference for UMKM culinary to design effective marketing strategies for thematic cafés in big cities.

2. Methodology

This study used a qualitative descriptive approach to study the marketing strategy of Tenank Café in depth as a culinary destination in Medan. This approach was chosen because it can capture social dynamics, customer perception, and construction, meaning it cannot be explained quantitatively (Sandelowski, 2000). The main objective was to understand business strategy based on customers' experience in the context of urban culinary through a rich empirical data narrative. A qualitative approach is very precise in exploring the "why" and "how" questions, as well as in understanding perspective (Creswell & Creswell, 2017).

The types of data used included primary and secondary data. Primary data is obtained through in-depth interviews with Tenank Café managers and customers. Interviews were conducted through Google Forms to learn about the strengths, weaknesses, opportunities, threats, and the experience of visiting the café. In addition, participatory and non-participatory observations were conducted directly in the on-site café to observe customers' interactions, service flow, and overall café atmosphere. Besides that, documentation data and social media content from Tenank Café were analysed as source visual information and promotions that reflect brand positioning and digital communication strategies. This analysis covers Instagram, TikTok, and customer reviews on online platforms as an indicator of public perception of the café.

Data analysis follows the Miles, Huberman, and Saldaña (2014) model, which includes three main stages: data reduction, data presentation, and withdrawal and verification conclusion. The collected data were then mapped in a four-element SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis according to the approach proposed by Gurl (2017). Every SWOT category was developed through triangulation between interviews, observations, and documentation to ensure validity and consistency of findings.

Within this framework, SWOT is used not only as a tool for classification but also as a thematic approach for formulating a strategy based on reality, operational experience, and consumer experience (Ridder, 2014). The primary analysis identifies narratives emerging from internal and external factors. These narratives are then formulated in a SWOT matrix to develop adaptive and business-based marketing strategies for customer experience.

3. Results and Discussion

This study was conducted at Tenank Café, Ngumban Branch Surbakti, Medan Selayang District, Medan. This is the second branch of the Tenank Café network, which stands out with a tropical beach theme in the middle of the city. The aesthetic uniqueness and relaxing interior

design make Tenank Café popular among young generations, especially millennials and Gen Z. However, popularity on social media has not yet fully converted customers into loyal customers sustainably.

The result was obtained from interviews with managers and customers, participatory and non-participatory field observation, and analysis of social media content and visual documentation. The data obtained was then classified into SWOT elements to identify the strategic position of Tenank Café.

The results of the data analysis were then classified into the SWOT (Strengths, Weaknesses, Opportunities, Threats) framework as follows:

Table 1. SWOT Analysis of Tenank Cafe

No.	Aspect	Key Factors
1	Strengths	Unique visual concept themed beach tropical Aesthetic and Instagrammable interior design Traditional menu with modern presentation Active social media activity
2	Weaknesses	1. The consistency of food taste is not stable 2. Service staff are not evenly distributed 3. Location is hidden 4. Menu promotion is not yet comprehensive
3	Opportunities	1. Travel trends, thematic culinary is increasing 2. Active young customers on social media 3. Potential collaboration with the community and influencers
4	Threats	1. The competition among thematic cafes in Medan is very high 2. Change trend style life fast consumer 3. Sensitivity to review digital negative

Table 1 shows the SWOT analysis result of Tenank Café, which includes aspects of Strengths, Weaknesses, Opportunities, and Threats. In terms of strength, Tenank Café has a superior visual concept of the tropical beach, an aesthetic and Instagrammable interior, a modern presentation of traditional menus, and activity on social media. However, weaknesses include inconsistent food taste, uneven service staff, a hidden location, and unpublished menu promotions. From opportunities, there are trends in culinary tourism that continue increasing, young consumers who are active on social media, and potential collaboration with local communities and influencers. While threats come from tight competition in café themes in Medan, changes in the trend style of customers and heightened sensitivity to negative reviews on social media are also a concern. Therefore, this analysis is important to develop adaptive and competitive marketing strategies.

The results of the SWOT mapping are then used to develop a strategy based on a combination of internal and external factors, as shown in the following SWOT matrix:

Table 2. Tenank *Cafe SWOT Strategy Matrix*

	Opportunities	Threats
Strengths	SO: Leverage visual power and a unique atmosphere for the collaborative campaign with local influencers.	ST: Strengthening the identity brand to differentiate from competitors and prevent switching behaviour
Weaknesses	WO: Increase menu promotion through social media and train staff based on digital feedback	WT: Prepare service SOPs, periodic quality evaluation on products, and improvements of facilities

The Strengths-Opportunities (SO) strategy emphasises using visual branding and a unique atmosphere to reach more visitors through collaboration with local influencers and the creation of content narrative promotion. The Weakness-Opportunities (WO) strategy encourages repairing internal weaknesses, especially service and menu promotion, by utilising digital opportunities. The Strength-Threats (ST) strategy anticipates competitors' threats by strengthening the brand's uniqueness and differentiation. Finally, the Weakness-Threats (WT) strategy simultaneously reduces weaknesses and threats through improving system operation and quality of service.

The research result is in harmony with the framework theory of marketing destinations proposed by Cooper (2008), who emphasises the importance of four main elements in building a Pull Power destination: attractions, accessibility, facilities, and services. In the context of Tenank Café, the attraction aspect, in the form of a thematic beach tropical, has become the main selling point of customers' interest. Aesthetic interior design and a comfortable atmosphere create a memorable social activity experience, such as hanging out and taking selfies. However, accessibility is still challenging as Tenank Café is located in a narrow alley off the main road. This can lower the possibility of visitors spontaneously and become a barrier for first-time visitors. Based on observation and customer responses, facilities like a prayer room and a toilet are inadequate.

From a marketing perspective, this study found that the ideas put forward by Pine and Gilmore (2011) and Schmitt (1999), which stated that a product or service in the hospitality industry is not solely based on its functionality but on its capabilities to create sensation, emotion, and social involvement, were strengthened.

Tenank Café has fulfilled part of the significant indicator through its visual atmosphere, narrative theme, and social interaction between customers. However, the elements of taste and service are inconsistent, which can be challenging for the café.

This study aligns with findings by Hasibuan (2022), which emphasises SWOT effectiveness in designing a marketing strategy for culinary UMKM. However, this research offers solutions by integrating the emotional dimension and the perceptual customer into the SWOT framework, making it more in accordance with the context café thematic in urban areas. In addition, this study also complements research by Sinulingga et al. (2024) and Villa Rohmatur & Setiawan (2021), emphasising the importance of the social and cultural approach in understanding the dynamics of modern culinary.

Thus, it can be concluded that Tenank Café's strategy is still fragmentary and not yet fully integrated into a systematic and experiential marketing framework. Strong visual branding must have consistent quality products and services to build long-term customer loyalty. In addition, the community's involvement and narrative authenticity need to be reinforced to create an emotional connection between the café and its customers.

This study contributes to tourism strategy development through culinary adaptive thematics for dynamic urban consumers. It also shows that the fusion between SWOT and experience customer becomes an effective approach to developing marketing strategies in the digital and post-pandemic era.

4. Conclusion

This study concludes that Tenank Café's success as a culinary tourism destination is greatly influenced by its ability to create a distinctive and relevant experience for urban consumers with a lifestyle. The themed concept of beach tropical, aesthetic interior design, and active digital promotions have proven to be strengths in capturing customers' attention, especially

the young generation. However, the weaknesses in service, the quality of food taste, and the promotion show that operational and managerial aspects still need strengthening.

Through the SWOT approach analysis (Gurl, 2017), alternative strategies are formulated to optimise strengths and opportunities (SO strategy), taking advantage of opportunities to improve weaknesses (WO strategy), protect strengths from potential threats (ST strategy), and reduce the impact of weaknesses on external challenges (WT strategy). This finding also emphasises the relevance of marketing models of destination (Cooper, 2008) and experiential marketing theory (Pine & Gilmore, 2011) in local business culinary.

This main study's contribution lies in integrating the SWOT framework with the approach of rare customer experience into a strategic combination in the culinary UMKM study. Research results are expected to become a reference for future businesses developing a strategy based on context and customer perception, as well as developing sustainable and competitive urban culinary.

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THE EFFECT OF FRONT OFFICE SERVICE QUALITY AND LOCATION ON CUSTOMER SATISFACTION AT HERMES PALACE HOTEL MEDAN

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Abstract

This study aims to measure the effect of front office service quality and location on customer satisfaction at the Hermes Palace Hotel Medan. The approach used is a quantitative method with multiple linear regression analysis techniques. Data were collected through questionnaires distributed to 88 respondents, which were determined using the Slovin formula, and validity tests were carried out on 50 respondents. Data analysis was carried out using SPSS version 25 software. The study's results showed that front office service quality and hotel location significantly influenced customer satisfaction. These findings indicate that improving the front office's service quality and optimally utilising strategic locations can significantly increase guest satisfaction. Therefore, the management of the Hermes Palace Hotel Medan needs to continue to improve the professionalism of service in the front office and maximise the advantages of the hotel location as a competitive added value in the hotel industry.
Keywords: Front Office; Location; Guest Satisfaction.

1. Introduction

In the era of globalisation and increasingly competitive hotel industry competition, the hospitality sector has a strategic role in supporting the growth of tourism and the regional economy. Hotels as accommodation service providers must provide quality services and strategic locations to meet customers' ever-growing expectations. Excellent service and easily accessible locations are important indicators in creating customer satisfaction and forming long-term loyalty. Especially in the hotel world, the front office department is the main face of the hotel, reflecting the image and professionalism of the institution in the eyes of guests from the first time they arrive until the check-out process takes place.

Previous studies have highlighted that service quality significantly affects customer satisfaction, especially in the front office. However, there is still a gap between expectations and reality in the field, one of which is related to customer complaints about less-than-optimal front office services, as reflected in negative reviews on various digital platforms. On the other hand, the hotel's strategic location is also often not maximised as a competitive advantage, even though it has great potential to attract consumers from various segments.

Hotel Hermes Palace Medan, a four-star hotel in the heart of Medan, is a relevant case study that needs further study. With complete facilities, superior geographical position, and broad market segmentation, this hotel is ideal for studying the relationship between front office service quality and location to customer satisfaction.

Hermes Palace Hotel Medan is a company that provides services such as accommodation, event or meeting rooms, food or beverages, and other services. Hermes Palace Hotel Medan was founded by Hermes Thamrin on October 7, 2010, and is located at Jl. Pemuda No. 22, Medan 20151, North Sumatra. Initially a three-star hotel, then on September 22, 2020 it was inaugurated as a four-star hotel through notarial deed No. 13 before Notary Fibriani

Magdalena Hasibuan, SH This hotel has 106 rooms with various types such as Standard Twin Bed, Superior, Deluxe, Junior Suite, and Suite, all of which are equipped with cable TV, Safe Deposit Box, refrigerator, shower, tea, coffee, mineral water, and Wi-Fi. Additional facilities include meeting rooms such as Maimun Ballroom, Mezzanine, Deli 1–3, and Sirocco Rooftop. Its strategic location makes this hotel close to various Medan city destinations such as Tjong A Fie Mansion, Maimun Palace, Al Mashun Grand Mosque, Medan Train Station, Sun Plaza, and Merdeka Walk.

Fig. 1. Hermes Palace Hotel Medan Logo Image

With the vision of the hotel"To be the best 4-star hotel in Medan," and the mission "To provide the best service in Medan, with the highest room rates and occupancy rates, achieving the highest profit/value from the assets of Hermes Palace Hotel Medan." The organisational structure of Hermes Palace Hotel Medan is designed to support smooth, professional and integrated operations between departments.

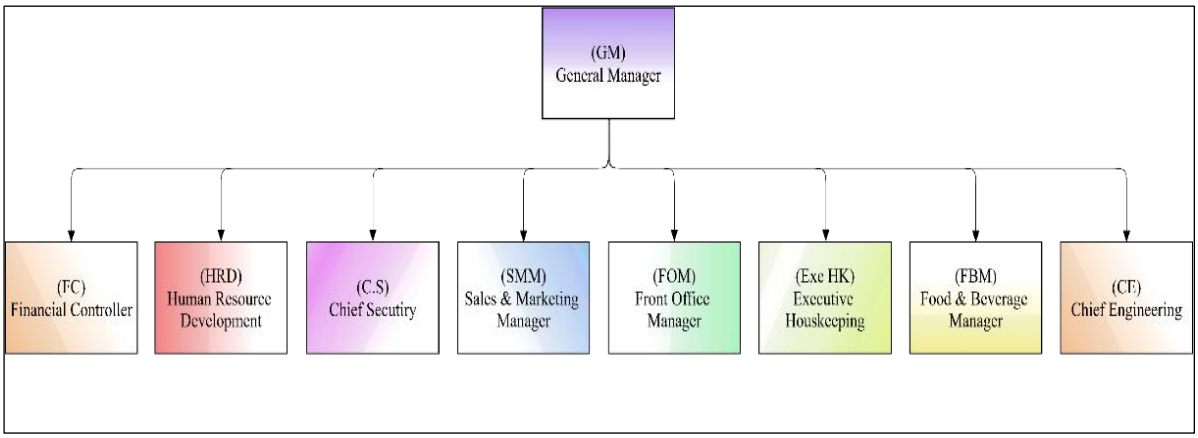


Fig. 2. Organisational structure image of Hermes Palace Hotel Medan

Therefore, this research is important to provide academic and practical contributions and fill the gap in the limited literature regarding the synergy between front office services and location on customer satisfaction in the local hospitality context.

2. Methodology

This quantitative study uses multiple linear regression analysis to obtain the resulting influence model and analyse the influence of front office service quality and location on customer satisfaction at the Hermes Palace Hotel Medan. The type of data used is primary data, namely, data obtained directly from respondents through the distribution of structured questionnaires. The study was conducted at the Hermes Palace Hotel Medan at Jl. Pemuda No.22, Medan, North Sumatra, during April and May 2025.

The population in this study were all guests or customers who had used the services and facilities of the Hermes Palace Medan Hotel. The sample was determined using the Slovin formula to obtain a representative sample size with a tolerance level of 10%. Based on these calculations, a sample size of 88 respondents was obtained. In addition, the validity and reliability test of the instrument was carried out first on 50 respondents as an initial stage to ensure that the measurement instrument can be used validly and consistently.

Data were collected through the distribution of closed questionnaires compiled based on research variable indicators. The questionnaire consisted of three parts that measured: (1) front office service quality, (2) hotel location, and (3) customer satisfaction. The measurement scale used was a five-point Likert scale, ranging from "strongly disagree" to "strongly agree". This research instrument was developed to measure three main variables, namely:

Independent variable 1 (X_1): Front Office Service Quality, which consists of five dimensions: reliability, responsiveness, assurance, empathy, and tangible evidence.

Independent variable 2 (X_2): Location, which includes accessibility indicators, proximity to activity centres, security, and the surrounding environment.

Dependent variable (Y): Customer Satisfaction, measured based on conformity to expectations, stay experience, intention to return, and recommendations to others.

The data obtained from the questionnaire were analysed using descriptive and quantitative analysis methods. Descriptive analysis was used to describe respondents' characteristics and the distribution of answers. In contrast, quantitative analysis was conducted using multiple linear regression analysis to test the relationship between variables. The data was processed using the Statistical Package for the Social Sciences (SPSS) version 25 software.

3. Results and Discussion

This study was conducted to determine the effect of front office service quality and location on customer satisfaction at the Hermes Palace Hotel Medan. Data was collected by distributing questionnaires to 88 respondents who stayed and used the hotel's front office services.

3.1 Respondent Characteristics

The majority of respondents in this study were male (63.6%) and female respondents (36.4%). The largest age range was dominated by workers aged 31-35, with 32 respondents (36.4%), and respondents aged <20 were only six, accounting for 6.8% of their contribution. Respondents came from various regions, with a dominance of guests from outside the province of 44 people, followed by North Sumatra Province, except for Medan City and abroad, with 14 respondents each and finally from Medan City with 16 respondents.

Fig. 3. According to Gender

Table 1. Respondent characteristics by age

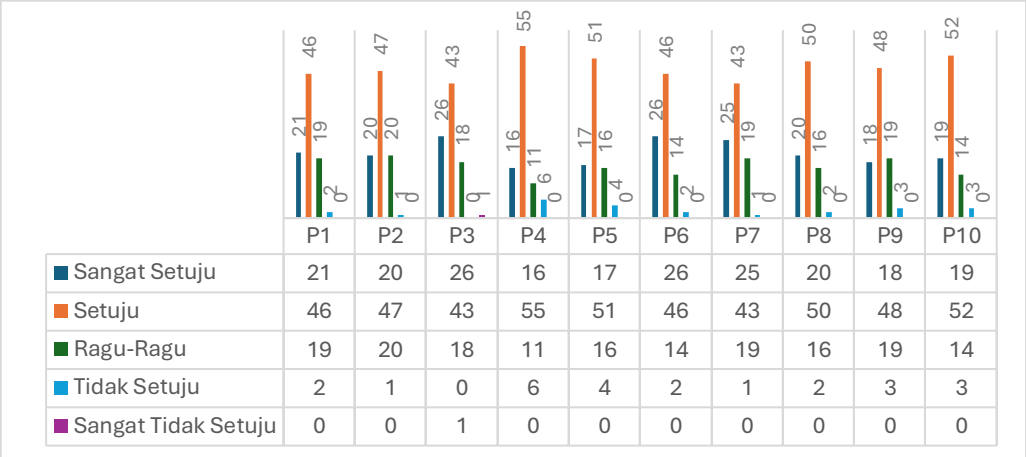
No	Age	Number of Respondents
1.	<20 Years	6
2.	20-25 Years	13
3.	26-30 Years	11
4.	31-35 Years	32
5.	>35 Years	26
	TOTAL	88

Table 2. Respondent characteristics based on domicile of origin

No	Domicile of Origin	Amount
1	Medan City	16
2	North Sumatra Province (Except Medan City)	14
3	Outside North Sumatra Province	44
4	Overseas	14
	TOTAL	88

1.2 Respondents' Perceptions of Front Office Service Quality

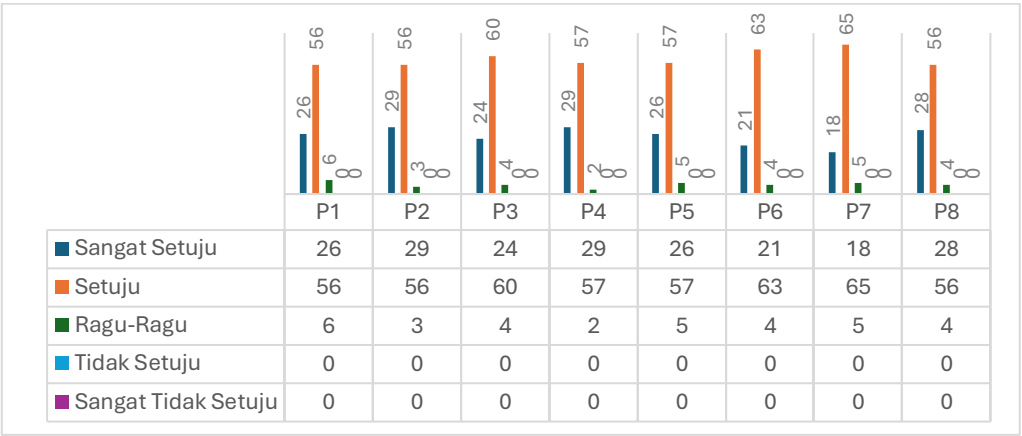
Overall, most respondents gave a positive assessment of the front office service, with the dominance in the "Agree" category, especially in P4, which reached 55 respondents. The "Strongly Agree" category was also quite high, especially in P6 and P7, with 26 and 25 respondents respectively, indicating high confidence in the quality of service. Meanwhile, respondents who chose "Undecided" were relatively few, and the "Disagree" and "Strongly Disagree" categories almost did not appear, indicating a very low level of rejection. These findings reinforce that customer perceptions of front office service are positive and consistent, especially regarding staff alertness, cleanliness, and sense of security, contributing significantly to customer satisfaction at the Hermes Palace Medan Hotel.



	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10
Sangat Setuju	21	20	26	16	17	26	25	20	18	19
Setuju	46	47	43	55	51	46	43	50	48	52
Ragu-Ragu	19	20	18	11	16	14	19	16	19	14
Tidak Setuju	2	1	0	6	4	2	1	2	3	3
Sangat Tidak Setuju	0	0	1	0	0	0	0	0	0	0

Fig. 4. Survey results on the front office service variable

3.3 Respondents' Perception of Hotel Location

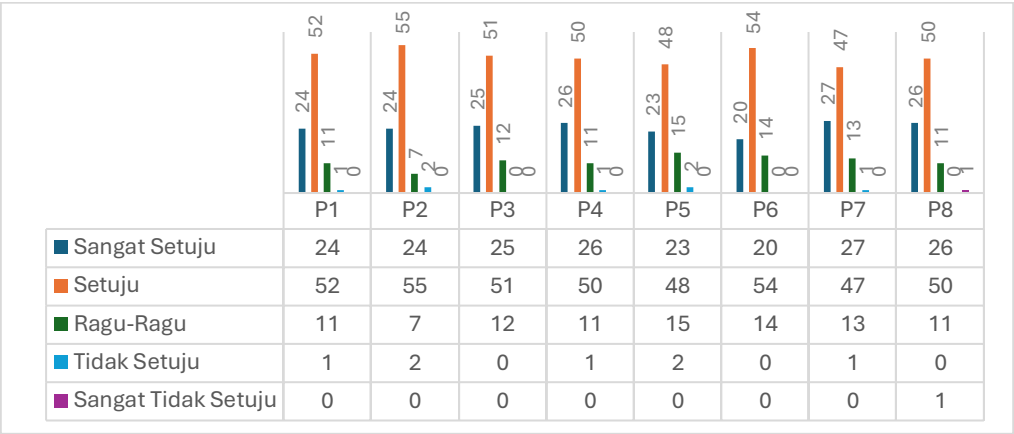


	P1	P2	P3	P4	P5	P6	P7	P8
Sangat Setuju	26	29	24	29	26	21	18	28
Setuju	56	56	60	57	57	63	65	56
Ragu-Ragu	6	3	4	2	5	4	5	4
Tidak Setuju	0	0	0	0	0	0	0	0
Sangat Tidak Setuju	0	0	0	0	0	0	0	0

Fig. 5. Survey results on hotel location variable

This figure shows the respondents' responses to eight statements related to the location of the Hermes Palace Medan Hotel. The majority of respondents chose the "Agree" category, with the highest number at P7 (65 respondents), followed by P6 (63) and P3 (60), indicating that the hotel's location is considered very strategic and supports guest mobility. The "Strongly Agree" category is also quite high, especially at P2, P4, and P8 (each around 28–29 respondents), indicating that location is considered the hotel's main advantage. The "Undecided" category only appeared in a small number, and no respondents chose "Disagree" or "Strongly Disagree", reflecting a high level of trust and satisfaction. Overall, this graph confirms that hotel location is a dominant factor that contributes significantly to customer satisfaction.

3.4 Respondents' Perception of Customer Satisfaction



	P1	P2	P3	P4	P5	P6	P7	P8
Sangat Setuju	24	24	25	26	23	20	27	26
Setuju	52	55	51	50	48	54	47	50
Ragu-Ragu	11	7	12	11	15	14	13	11
Tidak Setuju	1	2	0	1	2	0	1	0
Sangat Tidak Setuju	0	0	0	0	0	0	0	1

Fig. 6. Survey results on customer satisfaction variable

This figure shows the respondents' responses to eight statements that measure customer satisfaction at the Hermes Palace Hotel Medan. The results show the dominance of "Agree" answers on all items, with the highest number of 55 respondents (P2). The "Strongly Agree" category is also quite high, especially in P7 and P8 (27 and 26 respondents respectively), indicating a very good level of satisfaction. Meanwhile, the "Undecided" category is in the range of 7–15 respondents, and "Disagree" and "Strongly Disagree" only appear in very small numbers (0–2 respondents), indicating minimal dissatisfaction.
Overall, this graph shows that the majority of customers were satisfied with the service and experience during their stay, which reflects the hotel's success in meeting customer expectations.

3.5 Validity and Reliability Test

A validity test is conducted to measure the extent to which the statement items in the questionnaire can represent the indicators of each variable. Three main variables, Front Office Service Quality (10 statements), Location (8 statements), and Customer Satisfaction (8 statements), were tested, for a total of 26 statements.

Testing was conducted using SPSS version 25 on 50 respondents from the main sample. The basis for determining validity is the Pearson correlation value of 0.279 compared to the r table ($n = 50$, $\alpha = 0.05$). An item is declared valid if r count ≥ r table.

The test results show that all statements are valid:

- Front Office Services: All indicators (Tangibles, Empathy, Reliability, Responsiveness, Assurance) have a calculated r value ≥ 0.28, indicating that all statements can be used to measure this variable accurately.

- Location: All indicators (Accessibility, Proximity to activity centres, Security, Surrounding environment) have a strong and valid correlation.

- Customer satisfaction: Indicators such as Conformity to Expectations, Stay Experience, Intention to Return, and Recommendation also showed high validity, with the highest r value reaching 0.72.

Reliability Statistics

Cronbach's Alpha	N of Items
.918	26

Fig. 7. Reliability test results

Thus, all items in the questionnaire are suitable for further analysis because they meet the statistical validity requirements.

The results of data processing using SPSS obtained a Cronbach's Alpha value of 0.918. This value is included in the very reliable category (excellent reliability) because it is above 0.90. Thus, all statement items in this research instrument are declared feasible and consistent for use in collecting research data.

3.6 Regression Analysis Results

Multiple linear regression models are used to analyse the influence of independent variables on dependent variables. The regression equation obtained is:

Table 3. Table coefficients

Model		Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	-.262	.345		-.760	.449
	Pelayanan Front Office	.536	.059	.597	9.038	.000
	Lokasi	.529	.093	.377	5.705	.000

a. Dependent Variable: Kepuasan Pelanggan

$$Y = -0{,}262 + 0{,}536X^1 + 0{,}529X^2 \quad (1)$$

The results of the model test show that the Adjusted R^2 value is 0.715, which means that 71.5% of the variation in customer satisfaction can be explained by service quality and location. The remaining 28.5% is influenced by other variables outside the model, such as price, promotion, other facilities, and customer psychological conditions.

Table 4. Model summary

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.849a	.722	.715	.27483

a. Predictors: (Constant), Location, Front Office Service

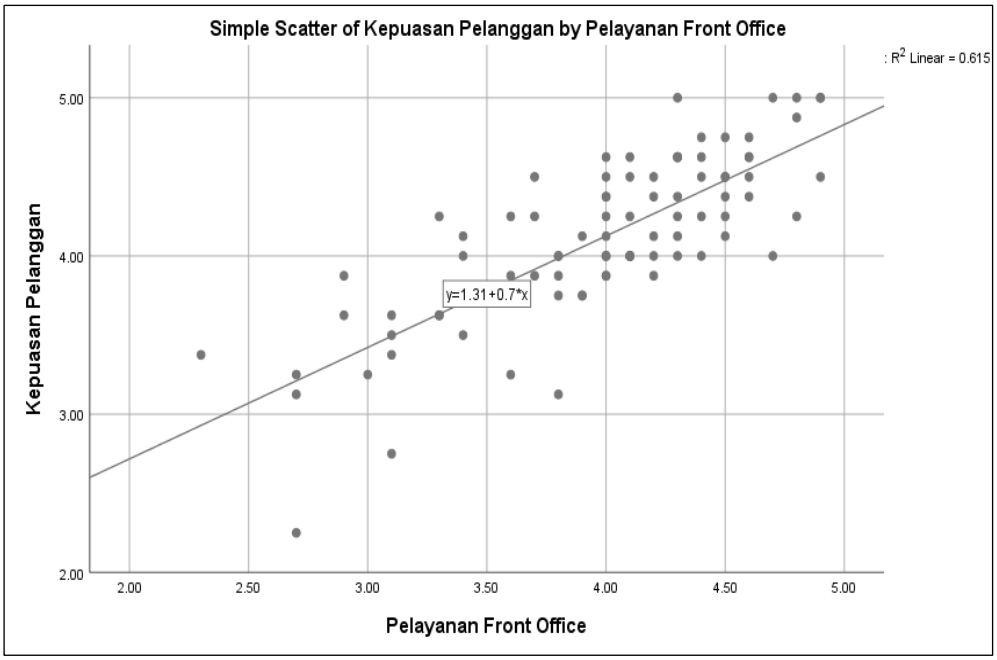


Fig. 8. Scatterplots of the influence of front office variable

The scatterplots show the influence of front office service variables on customer satisfaction, and the R^2 value of 0.615 was obtained.

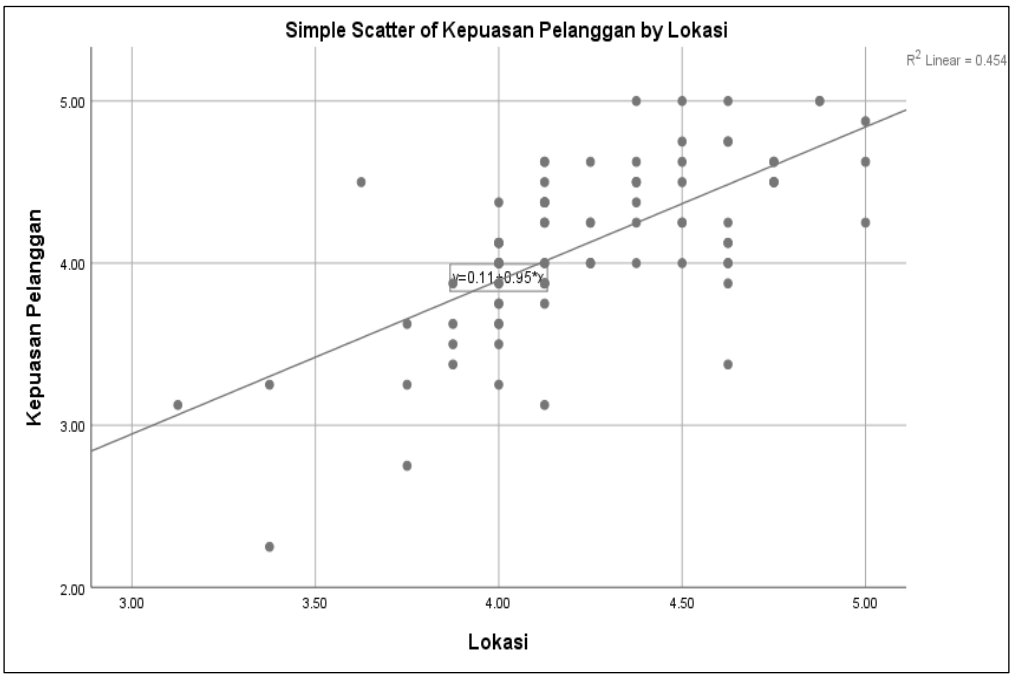


Fig. 8. Scatterplots of the influence of location variable

Scatterplot graph of the influence of the Location variable on customer satisfaction. It obtained an R^2 value of 0.454. Each point obtained is close to the linear equation line of the model created from linear regression analysis. Therefore, each variable is very close to the best value of the formed function.

Simultaneous Test (F Test)

The F test shows a calculated F value of 110.153 with a significance of 0.000 < 0.05, so it is concluded that the quality of front office service and location together have a significant effect on customer satisfaction.

Table 5. Anova table

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	16,640	2	8,320	110.153	.000b
	Residual	6,420	85	.076		
	Total	23,060	87			

a. Dependent Variable: Customer Satisfaction

b. Predictors: (Constant), Location, Front Office Service

Partial Test (t-Test)

- The front office service quality variable has a t-value of 9.038 and a significance of 0.000, so it significantly affects customer satisfaction.
- The location variable has a t-value of 5.705 and a significance of 0.000, which also shows a significant influence on customer satisfaction.

Table 5. Coefficients table

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	-.262	.345		-.760	.449
	Pelayanan Front Office	.536	.059	.597	9.038	.000
	Lokasi	.529	.093	.377	5.705	.000

Thus, both independent variables are proven to significantly influence customer satisfaction, both partially and simultaneously. However, the service quality variable has a more dominant influence, with a contribution of 53.6%, compared to location's 52.9%.

The proof of the hypothesis in this study was carried out through partial tests (t-test) and simultaneous tests (F-test). The results of the partial Test showed that the service quality variable significantly influences customer satisfaction, with a significance value of 0.000 <0.05 and a calculated t value of 9.038. This proves that the first hypothesis (H_1) is accepted. Furthermore, the location variable is also proven to significantly affect customer satisfaction, with a significance value of 0.000 < 0.05 and a calculated t of 5.705, so the second hypothesis (H_2) is also accepted. Meanwhile, the results of the simultaneous test show that service quality and location together have a significant effect on customer satisfaction, which is indicated by a significance value of 0.000 and a calculated F of 110.153. Thus, the third hypothesis (H_3) is also accepted. Overall, these results indicate that both partially and simultaneously, service quality and location significantly influence customer satisfaction at the Hermes Palace Hotel Medan. This study proves that improving the quality of service at the front office is the main focus of improving customer satisfaction at the Hermes Palace Medan Hotel. Although the hotel's location is already strategic, the service provided directly by the staff in the main determinant of customer impressions and satisfaction.

4. Conclusion

This study was conducted to answer the main question regarding how much front office service quality and location influence customer satisfaction at the Hermes Palace Hotel

Medan. Based on the results of data analysis, front office service quality has a significant influence of 53.6%, while location has a partial influence of 52.9% on customer satisfaction. Simultaneously, these two variables contribute 72.22%, meaning that service and location dominate customer satisfaction. The remaining 27.78% is influenced by other variables outside the scope of this study, such as price, quality of facilities, and brand perception. This study gained a new understanding that the dimensions of front office service—such as tangibility, empathy, responsiveness, assurance, and reliability—play an important role in shaping positive customer experiences. In addition, a strategic and safe hotel location is a major consideration for guests in assessing the overall quality of service. This study also confirms that excellent service and convenient location are key to building customer loyalty. This study contributes to the literature on hospitality management, particularly in the context of starred hotels in urban areas such as Medan, by empirically demonstrating that front office and location aspects significantly influence customer satisfaction. This new knowledge is expected to be the basis for developing a more integrated and customer experience-oriented service strategy. Suggestions:

1. For Hermes Palace Hotel Medan Management:
    a. Improve the quality of front office services through regular training that focuses on improving officers' communication, responsiveness, and empathy.
    b. Pay attention to aspects of accessibility, cleanliness, and security of the hotel's surroundings to maintain the location's image as the main added value.
2. For Further Researchers

Expanding the scope of the research by including additional variables such as price, promotion, quality of facilities, and brand perception would obtain a more comprehensive picture of the factors that influence customer satisfaction. Thus, this conclusion answers the problem formulation and provides a direction for further research development and future hotel management practices.

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THE EFFECT OF BREAKFAST MENU VARIETY AND MENU QUALITY ON GUEST SATISFACTION AT LABERSA TOBA HOTEL & CONVENTION CENTRE

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Abstract

This study aims to determine the effect of breakfast menu variety and menu quality on guest satisfaction at Labersa Toba Hotel & Convention Centre.Initial observations and guest comments indicated complaints regarding a lack of menu variety and inconsistent food taste, which can affect guest loyalty.The research method used is a quantitative approach with a causal relationship. The study population consisted of guests who stayed more than one night at the hotel, with a sample of 100 respondents selected using a purposive sampling technique. Data was collected through a questionnaire structured with a Likert scale to measure guest perceptions of menu variety, menu quality, and guest satisfaction. To test the hypothesis and analyze the collected data, multiple linear regression analysis was employed.The results show that breakfast menu variety and menu quality, both individually and collectively, have a significant and positive effect on guest satisfaction. The coefficient of determination test revealed that these two variables account for 77% of guest satisfaction, while the remaining 23% is influenced by other factors not examined in this study. These findings confirm that providing a diverse, high-quality breakfast is a critical strategy for enhancing the guest experience and satisfaction.
Keywords: Breakfast menu variety; Menu quality; Guest satisfaction.

1. Introduction

Hotel is an accommodation chosen by many guests for business and travel. . Hotels as accommodation service providers, not only offer a place to stay, but also provide experience and comfort for guests. In the hospitality industry, guest satisfaction is an important indicator that determines the success of the service. One of the main aspects that contributes to the guest experience is the variety of breakfast menus provided by the hotel. Conversely, menu variations that are interesting and in accordance with guest expectations can increase satisfaction, even encouraging guests to make repeat visits. Amid increasingly competitive hotel markets, providing a varied and quality breakfast menu has become a necessity that cannot be ignored. The breakfast menu is no longer just a complement, but has become part of the strategy to create a memorable experience for guests. Labersa Toba Hotel & Convention Centre, a four-star hotel located in the strategic area of Lake Toba, is one of the main accommodation destinations for tourists and business people. With various excellent facilities such as ballrooms, meeting rooms, restaurants, sky 8 to waterpark facilities, this hotel has become an icon in Toba Regency. However, as with other hotels, the challenge of maintaining consistent service quality remains a major concern, especially in terms of serving a variety of breakfast menus. Food and Beverage Service is one of the main departments in hotel operations that is responsible for providing food and beverage services to guests. The product produced by the food and beverage organization if comprises food and beverages and attributes such as taste, color, aroma and price, etc. (Destira, 2023). The two main aspects that determine the quality of breakfast service are menu variety and the quality of the menu itself. Menu variety refers to the diversity of types of food and beverages provided, both in terms of taste, type of ingredients, local and international presentation, as well as the hotel's ability to present a menu that can be accepted by various types of guests with different cultural

backgrounds. Satisfaction is a person's feeling of pleasure or disappointment that arises from comparing the perceived performance of a product or service against their expectations. If performance fails to meet expectations, customers will be dissatisfied. If the performance matches expectations, the customer will be satisfied (Resti, 2022). In addition, if performance exceeds expectations, customers will be very satisfied or happy. Menu quality includes such things as taste, appearance, cleanliness, freshness of ingredients, and serving techniques. Good quality food will increase appetite and create a pleasant dining experience (Nakatani, 2021). In the world of hospitality, food quality is an important benchmark for the credibility of the hotel as a whole, especially for star hotels that prioritize high service standards. Initial observations and guest reviews through guest comments indicate that one of the most common complaints is the lack of menu variety and inconsistency in food taste. This phenomenon is important to investigate because guest satisfaction is closely related to their likelihood to return (repeat guest) and recommend the hotel to others. Consumer satisfaction is the feeling of consumers after comparing what they receive with what they expect If a customer is satisfied with the value provided by a product or service, it is likely that the customer will be a customer for a long time. Emphasizing that the hospitality industry not only sells products but also experiences provided by hoteliers. Adjustments in menu strategy, especially in terms of rotation, is an important step to improve the guest's dining experience. Adjustments to the breakfast buffet menu rotation are expected to overcome the problem of boredom conveyed by customers and improve satisfaction levels (M. D. Pratiwi, 2024). Based on the background and description described above, researchers are interested in proposing the following hypothesis:
H0: Variable X1 (Breakfast Menu Variety) and Variable X2 (Menu Quality) together have no effect on Variable Y (Guest Satisfaction)
h1: Variable X1 (Breakfast Menu Variety) and Variable X2 (Menu Quality) together have an effect on Variable Y (Guest Satisfaction).

2. Methodology

The type of research used is a quantitative method with a causal approach to analyze data collected from 100 respondents. The respondents were guests who stayed more than one night and had experienced breakfast services at the hotel. A questionnaire with a Likert Scale was used to measure guest perceptions, and the results were analyzed using multiple linear regression. Respondents in this study were determined using purposive sampling technique. Purposive sampling is a sampling technique with certain considerations, usually based on the specific characteristics possessed by the population in accordance with the research needs. The characteristics of the respondents in this study are guests who stay more than one night who have enjoyed breakfast who are aged starting from 20 years with 100 respondents involved in this study. This study uses quantitative methods in the form of causal relationships with survey methods. The data collection instrument is a questionnaire arranged according to a Likert scale with the preparation in the form of positive sentences related to the three variables, namely menu quality (X1), menu variety (X2), guest satisfaction (Y). respondent characteristics in the form of age, occupation, and gender. Respondents were asked to fill in the proposed statement according to the circumstances experienced. Alternative answer responses include: Strongly Disagree (STS), Disagree (ST), Disagree (KS), Agree (S), Strongly Agree (SS) with a score range of 1-5. The test in this study used Pearson Correlation , namely by calculating the correlation between the values obtained from the statements with the help of SPSS 23 for windows software.

3. Results and Discussion

Research conducted on guests who enjoy a variety of breakfast menus amounted to 100 respondents. Characteristics of respondents based on gender, age, occupation, and level of visit.

Table 3.1 Based On Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	63	63.0	63.0	63.0
	Female	37	37.0	37.0	100.0
	Total	100	100.0	100.0	

Source: Output SPSS 23,2025

Table 3.2 Based On Age

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	20-30 Years	68	68.0	68.0	68.0
	31-40 Years	20	20.0	20.0	88.0
	41–50 Years	10	10.0	10.0	98.0
	> 50 Years	2	2.0	2.0	100.0
	Total	100	100.0	100.0	

Source: Output SPSS 23,2025

Table 3.3 Based On Occupation

		Frequency	Percent	Valid Percent	Cumulative Percent
Valic	PNS	31	31.0	31.0	31.0
	Employees	25	25.0	25.0	56.0
	Private Officers	26	26.0	26.0	82.0
	Students	18	18.0	18.0	100.0
	Total	100	100.0	100.0	

Source: Output SPSS 23,2025

Table 3.4 Based On Level Visit

		Frequency	Percent	Valid Percent	Cumulative Percent
Valic	1 Times	18	18.0	18.0	18.0
	2 Times	25	25.0	25.0	43.0
	> 2 Times	57	57.0	57.0	100.0
	Total	100	100.0	100.0	

Source: Output SPSS 23,2025

Multiple Linear Regression Test

1. Multiple Linear Test Results t Test

Table 3.5 Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	1.940	1.132		1.714	.090
	Breakfast Menu Variety	.516	.103	.510	4.997	.000
	Quality Menu	.394	.102	.394	3.862	.000

a. Dependent Variable: Guest Satisfaction.

Based on the Coefficients Table above, it can be obtained that the significant value of the two Variables Sig. (0.000) < 0.05 So it can be concluded that Variable X1 (Breakfast Menu Variety) and Variable X2 (Menu Quality) together have a significant effect on Variable Y (Guest Satisfaction).

$Y = \alpha + \beta1X1 + \beta2X2 + e$

$Y = (1,940) + 0.516X1 + 0.394X2 + e$

From the multiple linear regression equation above, it can be explained as follows:
1. The constant value (a) has a positive value of 1.940. The positive sign means that it shows a unidirectional influence between the independent variable and the dependent variable. This shows that if all independent variables including Breakfast Menu Variety (X1), Menu Quality (X2) are 0 percent or have not changed, then the value of tax aggressiveness is 1.940.
2. The regression coefficient value for the Breakfast Menu Variation variable (X1) is 0.516. This value indicates a positive influence (unidirectional) between the Breakfast Menu Variation variable and Guest Satisfaction. This means that if the Breakfast Menu Variation variable increases by 1%, then the Guest Satisfaction variable will increase by 0.516. Assuming that other variables remain constant.
2. The regression coefficient value for the Menu Quality variable (X2) has a positive value (unidirectional) of 0.394. This shows that if the Menu Quality increases by 1%, then Guest Satisfaction will increase by 0.394 assuming other independent variables are held constant. The positive sign means that it shows a unidirectional influence between the independent variable and the dependent variable.

2. F Test

Table 3.6 ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	578.540	2	289.270	162.332	.000[b]
	Residual	172.850	97	1.782		
	Total	751.390	99			

a. Dependent Variable: Guest Satisfaction
b. Predictors: (Constant), Menu Quality, Breakfast Menu Variety.

Based on the ANOVA Table above, it can be obtained that the Sig value (0.000) < 0.05 Then H0 is rejected then H1 is accepted, so Variable X1 (Breakfast Menu Variety and Variable X2 (Menu Quality) together affect Variable Y (Guest Satisfaction).

3. Test Results of the Coefficient of Determination (Adjusted R Square)

Table 3.7 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.877[a]	.770	.765	1.33490

a. Predictors: (Constant), Menu Quality, Breakfast Menu Variety

Based on the results of the Determination Coefficient Test above, the value of the Coefficient of Determination is 0.77 0 which means that the influence of the Breakfast Menu Variation and Menu Quality Variables has an effect of 77% on Guest Satisfaction at Labersa Toba Hotel & Convention Centre, while the remaining 23% is influenced by other variables that are not included in this study.

The results of this study indicate that together, breakfast menu variety and menu quality have a significant effect on guest satisfaction at Labersa Toba Hotel & Convention Centre. This finding is in line with and strengthens the conclusions of several previous studies such as research by) (M. D. Pratiwi, 2024) also highlighted the importance of menu variety to overcome

guest boredom and increase satisfaction. The current study provides quantitative evidence supporting these ideas, by showing a significant positive effect of menu variety on guest satisfaction. Then strengthening this theoretical concept refers to the definition of satisfaction from Resti (2022) which states that satisfaction arises from the comparison between expectations and performance received. The results of this study empirically prove that a varied and high-quality menu is a performance that can meet or even exceed guests' expectations, thereby increasing their satisfaction. And to emphasize the importance of quality in accordance with (Nakatani, 2021) statement that good quality food creates a pleasant dining experience, this study found that menu quality has a positive and significant influence on guest satisfaction.

Compared to the previous research referred to, this research has several advantages and strengths that stand out, namely this research not only states the existence of influence, but also measures it quantitatively through multiple linear regression analysis. This results in a mathematical model (regression equation Y = 1.940 + 0.516X1 + 0.394X2 + e) that specifically measures the amount of influence of each variable. Then, this research model has a very good ability to explain the guest satisfaction variable. The coefficient of determination (R) value of 0.770 indicates that the breakfast menu variety and menu quality together are able to explain 77% of guest satisfaction, while the remaining 23% is influenced by other factors. This high explanatory power is the main advantage of the study. This study was conducted in a very specific location, namely Labersa Toba Hotel & Convention Centre, a four-star hotel in a strategic tourist destination. This makes the results not only academically relevant but also very applicable and can be the basis for direct decision making for hotel management. Based on the phenomenon and initial observations of guest complaints regarding the lack of menu variety and inconsistent flavors. This shows that this research is designed to answer real problems in the field and the findings of this research provide clear and actionable recommendations, such as designing a dynamic menu rotation system and adding local and international menu variations.

4. Conclusion

Breakfast menu variety and menu quality together are proven to have a significant and positive influence on guest satisfaction at Labersa Toba Hotel & Convention Centre. The results of quantitative analysis show that these two factors are able to explain 77% of total guest satisfaction, indicating their very important role in creating a satisfying stay experience. Specifically, any increase in menu variety and menu quality will have a positive impact on guest satisfaction levels. This finding confirms that providing a diverse and high-quality breakfast menu is not just a complement, but a crucial strategic element to meet guest expectations and drive customer loyalty in the competitive hospitality industry. The main limitation in this study is the relatively small number of respondents, namely 100 guests. Although it has met the requirements for statistical analysis, the relatively small sample size may limit the generalization of the research results to a wider and more diverse guest population. This could potentially reduce the overall representativeness of the data, so the findings may not fully reflect the perceptions of all hotel guests. Based on the findings and limitations, this study provides several practical recommendations that can be followed up both by hotel management and for further research. It is recommended that the hotel design a more dynamic menu rotation system to overcome guest boredom. In addition, it is recommended to evaluate the completeness of the menu categories presented and actively add new menu variations that include local and international flavors to meet the diverse tastes of guests. For future researchers, it is recommended to expand the number of sample respondents to get more representative and comprehensive results.

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THE IMPACT OF BRIDGE DAMAGE ON TOURIST INTEREST IN CADIKA PARK, MEDAN

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Abstract

This study analyzes the impact of the October 2024 bridge collapse at Taman Cadika Medan t on tourists' interest in returning to visit. The research uses a quantitative approach with purposive sampling, in which samples are selected based on criteria relevant to the research objectives. Data collection was conducted through a questionnaire distributed to 40 respondents who met the criteria. Analysis was performed using a simple linear regression technique. The results of the study indicate that the bridge damage incident significantly affected visitors' interest in visiting Taman Cadika Medan. The incident influenced 28% of visitation interest, with other factors explaining the remainder, as indicated by the R-Square value. \Both the F-test and t-test each showed significant results with significance values. The t-test results showed a significance value smaller than 0.05, i.e., <0.001. These results indicate that the bridge- damage incident has a significant influence on tourists' interest in visiting.

Keywords: Bridge Incident; Tourist Interest; Taman Cadika Medan.

1. Introduction

One of the most popular nature and recreational attractions in Medan is Medan's Cadika Park. It is known as a family recreation spot because it has an artificial lake, walking paths, and wooden bridges connecting several areas of the park. However, on October 13, 2024, tone of the park's bridges collapsed due to overcapacity. The bridge, which was design to accommodate a maximum of 20 e, was crowded with approximately 50 to 80 people. According to Acting Medan Secretary Topan Ginting, only 20 people can cross the bridge at a time. However, reports indicated that approximately 50 to 80 people crossed the bridge simultaneously (A. R. Sapta and M. Hanri, 2023).The research shows that each type of disaster has a different effect on the tourism industry, with some disasters having a significant impact on long-term declines in tourist numbers. The findings suggest that events that negatively impact the tourism sector may influence tourists' decisions not to revisit the place. The two main variables that are the subject of this study are the bridge damage incident as the independent variable and tourist interest as the dependent variable. This incident has the potential to create a negative perception of the safety of Cadika Park, which may affect tourists' decision to visit again. Therefore, it is important for this study to find out how much impact this incident has on tourist behavior and find ways to improve the park's tourist image. Research (E. I. Yuslistyari, 2022) shows that after the tsunami disaster in Anyer Beach Banten, there was a decrease in tourist visits due to increased risk perceptions of the destination. However, after appropriate recovery efforts were made, tourist interest increased again. This study (Susyanti, 2024) examines how road conditions affect tourists' desire to visit Balekambang Beach, Malang Regency. The findings show that if the roads are in good condition, tourist interest in visiting increases, but if the roads are damaged, interest may decline. Similarly, research by (T. S. Rachman, 2021) examined how the development of transportation infrastructure affects tourists' desire to return to South Lampung Regency. They found that improvements in infrastructure, such as toll roads and executive docks, contributed

significantly to increase itourist number.This shows that an effective recovery strategy can help restore tconfidence in affected destinations
Various factors, such as the attractiveness of the destination, accessibility, facilities, and information received by potential visitors, influence this interest. Research by (A. Yandi, 2023) found that the image of the destination, tourist attractions, and facilities influence interest in visiting. The results of the study (M. T. Ngajow, 2021) also show that tourist attraction and images of tourist attractions have a positive and significant effect on visitors' desire to visit Bukit Kasih Kanonang. In another study (R. Muhammamd and K. Jon, 2023), this study investigated the influence of attraction, accessibility, and amenities on visitor interest in the Sarasah Tanggo tourist destination in Lima Puluh Kota Regency. It was found that all three variables had an influence.
Based on initial observations, visitor numbers at Cadika Park declined after the incident. i. Some previously frequent visitors expressed concerns about the safety of the park's infrastructure. Social media and local news also showed a negative response from the community, including criticism of the park management for not anticipating the overcapacity of the bridge.Research (M. Nur Ali Darajat, 2021) explains that a positive destination image can reduce the negative impact of perceived risk on visits. In the context of Cadika Park, if the management can immediately repair the bridge and improve safety standards, and socialize these steps to the community, then tourist interest in returning to visit may increase. Theoretically, this research can help understand the relationship between tourist infrastructure events and tourist behavior, especially in the context of urban tourist destinations. This research can enhance knowledge about tourism, risk management, and post-incident destination recovery strategies. Practically, the findings of this research will help the Cadika Park management and Medan City government in developing post-incident tourism recovery policies. The results of this study can assist in making decisions about infrastructure improvements, higher safety standards, and communication strategies to regain tourists' trust.

2. Methodology

The study was conducted from March to May at Cadika Park, Jalan Karya Wisata, Pangkalan Masyhur, Medan Johor Sub-district, Medan City, North Sumatra. The type of data used by the author in this study is divided into two categories, namely:Primary data is data collected independently by individuals or groups for relevant studies through interviews or observations (I. Amelia, 2016).Primary data are collected directly through interviews or observations (I. Amelia, 2016). In this study, primary data comprised questionnaires distributed to visitors to Cadika Park before and after the bridge collapse and direct interviews to assess the impact of infrastructure damage on visit interest. The author also conducted field observations of the condition of tourism infrastructure at the research location. Secondary data is data that is not directly provided from the object under study, but can be obtained through literature and literacy studies. Secondary data in this study are important records of cadika park managers and reports on the number of visitors who came before and after the bridge collapse. The author uses data from various sources to complete this thesis, such as: Internal data, data that the author obtained from Taman Cadika, the object of research, through distributing questionnaires to visitors to Taman Cadika during the study.External data, data collected by the authors from outside sources, such as journals, books, the internet, and several reliable sources that provide the information the authors need for their research.

Before distributing questionnaires directly or indirectly to respondents, the author must determine the population to be sampled. Population is a general area consisting of objects or subjects that have certain qualities and characteristics that have been determined by researchers to be studied and then drawn to reach conclusions (Sugiyono and I. A. Noeraini, 2019). Every visitor to Taman Cadika, both before and after the bridge collapse, is counted as a population in this study. The number and characteristics of the population comprise the sample. (Sugiyono and I. A. Noeraini, 2019). The authors in this study used a purposive sampling technique, which means that they selected samples based on considerations or

standards relevant to the research objectives. Based on these considerations, the authors set 30-40 respondents as the research sample. This number is considered sufficient to describe and analyze validly and how tourists' perceptions see the incidence of bridge damage in Taman Cadika Medan. The author used a descriptive quantitative analysis approach in this study.

The purpose of this data collection is to determine the perception and influence of the bridge damage incident on visitor interest in Cadika Park. In addition, the author used simple linear regression analysis to determine whether there is a relationship between the impact of the bridge damage incident on visitation interest from both variables X and Y. The author conducted this test using the help of SPSS26 (Statistical Program for Social Science) to determine the significance of the relationship between variables. validity and reliability test methods are also used in research where according to (Sugiyono, 2017) in the journal, a high level of instrument validity indicates a low level of instrument validity (Suhendra & Yakobus, 2021).The Pearson Product Moment correlation method was used to test the validity of the study. The calculated r value and r table were compared at the 5% significance level (α = 0.05). The calculated r value is considered valid if the value is greater than r table. And Reliability was tested using Alpha Cronbach and SPSS. Reliability decision-making criteria are as follows:> 0.60 = Reliable < 0.60 = Unreliable.The questionnaire is considered to have good reliability if the Cronbach's Alpha value of each variable is greater than 0.60.

2. Results and Discussion

3.1. Results of Validity and Reliability Test of variable X

Table 1. X validity test results in SPSS

Correlations

		X.1	X.2	X.3	X.4	X.5	X.6	X.7	X.8	X.9	X.10	Total_X
X.1	Pearson Correlation	1	.689**	.491**	.618**	.537**	.750**	.539**	.369*	.529**	.626**	.859**
	Sig. (2-tailed)		.000	.001	.000	.000	.000	.000	.019	.000	.000	.000
	N	40	40	40	40	40	40	40	40	40	40	40
X.2	Pearson Correlation	.689**	1	.494**	.586**	.568**	.602**	.574**	.359*	.408**	.614**	.825**
	Sig. (2-tailed)	.000		.001	.000	.000	.000	.000	.023	.009	.000	.000
	N	40	40	40	40	40	40	40	40	40	40	40
X.3	Pearson Correlation	.491**	.494**	1	.489**	.461**	.562**	.377*	.413**	.476**	.519**	.723**
	Sig. (2-tailed)	.001	.001		.001	.003	.000	.017	.008	.002	.001	.000
	N	40	40	40	40	40	40	40	40	40	40	40
X.4	Pearson Correlation	.618**	.586**	.489**	1	.337*	.435**	.421**	.094	.245	.447**	.653**
	Sig. (2-tailed)	.000	.000	.001		.033	.005	.007	.562	.128	.004	.000
	N	40	40	40	40	40	40	40	40	40	40	40
X.5	Pearson Correlation	.537**	.568**	.461**	.337*	1	.537**	.470**	.375*	.368*	.516**	.716**
	Sig. (2-tailed)	.000	.000	.003	.033		.000	.002	.017	.019	.001	.000

	N	40	40	40	40	40	40	40	40	40	40	40
X.6	Pearson Correlation	.750**	.602**	.562**	.435**	.553**	1	.329*	.407**	.422**	.619**	.787**
	Sig. (2-tailed)	.000	.000	.000	.005	.000		.038	.009	.007	.000	.000
	N	40	40	40	40	40	40	40	40	40	40	40
X.7	Pearson Correlation	.539**	.574**	.377*	.421**	.470**	.329*	1	.367*	.323*	.493**	.694**
	Sig. (2-tailed)	.000	.000	.017	.007	.002	.038		.020	.042	.001	.000
	N	40	40	40	40	40	40	40	40	40	40	40
X.8	Pearson Correlation	.369*	.359*	.413**	.094	.375*	.407**	.367*	1	.350*	.284	.553**
	Sig. (2-tailed)	.019	.023	.008	.562	.017	.009	.020		.027	.076	.000
	N	40	40	40	40	40	40	40	40	40	40	40
X.9	Pearson Correlation	.529**	.408**	.476**	.245	.368*	.422**	.323*	.350*	1	.444**	.624**
	Sig. (2-tailed)	.000	.009	.002	.128	.019	.007	.042	.027		.004	.000
	N	40	40	40	40	40	40	40	40	40	40	40
X.10	Pearson Correlation	.626**	.614**	.519**	.447**	.519**	.619**	.493**	.284	.444**	1	.768**
	Sig. (2-tailed)	.000	.000	.001	.004	.001	.000	.001	.076	.004		.000
	N	40	40	40	40	40	40	40	40	40	40	40
Total_X	Pearson Correlation	.859**	.825**	.723**	.653**	.716**	.787**	.694**	.553**	.624**	.768**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	
	N	40	40	40	40	40	40	40	40	40	40	40

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

The results of the validity test conducted on the ten statement items of the variable impact of the bridge damage incident show that the Pearson correlation value ranges between 0.553 and 0.859 with a significance value <0.001. All correlation values are greater than r table (0.312). Therefore, it can be concluded that all statement items are valid.

Reliability Statistics

Cronbach's Alpha	N of Items
.897	10

Fig. 2. X reliability test results in SPSS

Based on the results of the reliability test conducted on the ten statements of the variable impact of bridge damage incidents using Cronbach's Alpha technique, a value of 0.897 was obtained, above the minimum limit of 0.60, which indicates that the research instrument is highly reliable and has good internal consistency in measuring respondents' perceptions of the variable.

3.2. Validity and reliability test results of variable y

Correlations

		Y.1	Y.2	Y.3	Y.4	Y.5	Y.6	Y.7	Y.8	Y.9	Y.10	Total_Y
Y.1	Pearson Correlation	1	.432**	.524**	.661**	.340*	-.023	.524**	.433**	.302	.637**	.743**
	Sig. (2-tailed)		.005	.001	.000	.032	.890	.001	.005	.058	.000	.000
	N	40	40	40	40	40	40	40	40	40	40	40
Y.2	Pearson Correlation	.432**	1	.438**	.377*	.157	.134	.337*	.483**	.692**	.441**	.668**
	Sig. (2-tailed)	.005		.005	.016	.334	.409	.034	.002	.000	.004	.000
	N	40	40	40	40	40	40	40	40	40	40	40
Y.3	Pearson Correlation	.524**	.438**	1	.645**	.058	.370*	.542**	.402*	.292	.575**	.727**
	Sig. (2-tailed)	.001	.005		.000	.721	.019	.000	.010	.068	.000	.000
	N	40	40	40	40	40	40	40	40	40	40	40
Y.4	Pearson Correlation	.661**	.377*	.645**	1	.316*	.151	.590**	.542**	.392*	.690**	.838**
	Sig. (2-tailed)	.000	.016	.000		.047	.351	.000	.000	.012	.000	.000
	N	40	40	40	40	40	40	40	40	40	40	40
Y.5	Pearson Correlation	.340*	.157	.058	.316*	1	.155	.060	.273	.273	.275	.464**
	Sig. (2-tailed)	.032	.334	.721	.047		.341	.710	.088	.088	.086	.003
	N	40	40	40	40	40	40	40	40	40	40	40
Y.6	Pearson Correlation	-.023	.134	.370*	.151	.155	1	-.057	.353*	.236	.065	.362*
	Sig. (2-tailed)	.890	.409	.019	.351	.341		.727	.026	.143	.692	.022
	N	40	40	40	40	40	40	40	40	40	40	40
Y.7	Pearson Correlation	.524**	.337*	.542**	.590**	.060	-.057	1	.118	.161	.611**	.575**
	Sig. (2-tailed)	.001	.034	.000	.000	.710	.727		.470	.320	.000	.000
	N	40	40	40	40	40	40	40	40	40	40	40
Y.8	Pearson Correlation	.433**	.483**	.402*	.542**	.273	.353*	.118	1	.673**	.405**	.732**
	Sig. (2-tailed)	.005	.002	.010	.000	.088	.026	.470		.000	.010	.000
	N	40	40	40	40	40	40	40	40	40	40	40
Y.9	Pearson Correlation	.302	.692**	.292	.392*	.273	.236	.161	.673**	1	.240	.655**
	Sig. (2-tailed)	.058	.000	.068	.012	.088	.143	.320	.000		.136	.000
	N	40	40	40	40	40	40	40	40	40	40	40
Y.10	Pearson Correlation	.637**	.441**	.575**	.690**	.275	.065	.611**	.405**	.240	1	.757**
	Sig. (2-tailed)	.000	.004	.000	.000	.086	.692	.000	.010	.136		.000
	N	40	40	40	40	40	40	40	40	40	40	40

Total_Y	Pearson Correlation	.743**	.668**	.727**	.838**	.464**	.362*	.575**	.732**	.655**	.757**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.003	.022	.000	.000	.000	.000	
	N	40	40	40	40	40	40	40	40	40	40	40

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Fig. 3. Y validity test results in SPSS

According to the results of the validity test conducted on the ten statement items of the tourist visit interest variable, the Pearson correlation value ranges between 0.362 and 0.838. All these values are greater than r table (0.312). The significance level is 0.05. Therefore, all statement items are declared valid.

Reliability Statistics

Cronbach's Alpha	N of Items
.850	10

Fig. 4. Y reliability test results in SPSS

Based on the results of the reliability test conducted on ten statement items on the tourist visit interest variable, the instrument obtained a Cronbach's Alpha value of 0.850, which is in the very high category, indicating that the instrument has excellent internal consistency. Therefore, each detail of the statement is declared reliable and suitable for use as a measuring instrument in this study.

3.3. Simple Linear Regression Test Results

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.530[a]	.280	.262	3.999

a. Predictors: (Constant), Dampak Insiden rusaknya Jembatan

Fig. 5. Modal summary

Based on the output results of the Model Summary, a coefficient of determination (R Square) of 0.28 was found. This indicates that 28.0% of the variation in tourist visitation interest to Medan's Cadika Park can be attributed to the variable impact of the bridge damage incident, while the remaining 72.0% can be attributed to other variables not included in the model. The strong and unidirectional relationship between the two variables is indicated by the correlation coefficient (R) value of 0.530. With a standard error of estimation of 3.999, the model can be used to make predictions with a fairly good level of accuracy.

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	236.827	1	236.827	14.812	.000[b]
	Residual	607.573	38	15.989		
	Total	844.400	39			

a. Dependent Variable: Minat Kunjugan Wisatawan

b. Predictors: (Constant), Dampak Insiden rusaknya Jembatan

Fig. 6. Anova

There is an F value of 14.812 with a significance level of p = <0.001 based on the results of the F test (ANOVA), which indicates that the regression model is significant. Since the significance value is smaller than 0.05, it can be concluded that the regression model is significant and indicates that the variable impact of bridge damage incidents significantly affects visitors' interest in Medan's Cadika Park.

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	22.186	4.723		4.698	<.001
	Dampak Insiden rusaknya Jembatan	.449	.117	.530	3.849	<.001

a. Dependent Variable: Minat Kunjugan Wisatawan

Fig. 7. Coefficients

The calculated t value is 3.849, with a significance level of p < 0.001, which is smaller than 0.05, according to the t-test results displayed in the Coefficient table. Thus, it can be concluded that the variable Impact of the Bridge Damage Incident (X) has a significant influence on interest in tourist visits (Y).

3.4. Hypothesis testing

The t and F test results show that the bridge damage incident in Medan's Cadika Park significantly affected visitors' interest. This suggests that the way visitors perceive the incident affects their desire to return to the park. This study aimed to determine whether the bridge damage incident at Medan's Cadika Park actually affected visitors' interest. A strong relationship between the two variables was found, and their impact was also statistically significant, based on the results of simple linear regression analysis. This means that the greater the impact perceived by tourists d, the lower their interest in returning to the park.The authors point out that this study does not stand alone. The results of this study support (Yuni, 2024) research, which found that tourists' perceptions of risk strongly influence their desire to return. Her research reached a similar conclusion, namely that certain events that impact comfort and safety can decrease visitation interest, even if they are conducted in different places. According to additional research by (Rahmafitria, 2024), who investigated the Ir. H. Djuanda Grand Forest Park area, damage or the physical condition of tourist attractions can cause visitors to feel uncomfortable and change their perception of the place. The damaged bridge in Cadika Park is one type of infrastructure damage that can have a psychological impact on visitors. Beyond that, the findings of this case are also related to (Kartini, 2022) research, which points out that bad news or events about a tourist spot can affect people's perceptions of the place. When tourists hear or know that there is an incident or damage in a place, they are less inclined to visit it.

In terms of results, the authors found similarities with previous studies, namely that tourists' perceptions of risk or infrastructure damage can affect their decision to visit and both use a quantitative approach and focus on visitor perceptions as the unit of analysis.However, this study has differences from previous studies, such as those conducted by Rahmafitria and Yuni, looking at general physical damage or the consequences of disasters, but this study focuses on bridge damage in one city park, namely Cadika Park Medan. While some other studies concentrated on risk perception or overall destination image, this study emphasized the change in visitation interest before and after the bridge damage incident.The results of this study corroborate the argument that the condition of a tourist site's physical infrastructure has a significant influence on tourists' psychological state when they decide to visit. If a place feels less safe, tourists will be less interested in going. This research highlights that it is not only the

presence of facilities that matters, but also their condition and feasibility that have an impact on tourists' decisions. The findings therefore broaden insights into how even a single incident can affect public perception at large, even when a destination has good recreational potential.

4. Conclusion

As shown by the results of the data analysis and explanations conducted in the previous chapter, it can be concluded that the bridge damage incident in Medan's Cadika Park affects tourists' interest. The results of the simple linear regression analysis show this. The coefficient of determination (R2) of 0.280 indicates that a 28% of the variance in tourists' interest in visiting is explained by their perception of the incident's impact. The remaining 72% is influenced by additional components not addressed in this study. The t-test results show a significance value smaller than 0.05, which is <0.001. This indicates that the factors influencing the bridge damage incident partially affect tourist interest. In addition, the F-test results show that the overall regression model is significant, with significance values also less than <0.001.
Previous research has also shown that tourists' perceptions of the physical condition and comfort of a place strongly influence their decision to return for a visit. In the context of Medan's Cadika Park, the damage to the bridge led to inconvenient access and poor perceptions of the maintenance and safety of the tourist site.Thus, it can be concluded that damaged infrastructure, even if it is only one part, such as a bridge, can have a major impact on tourist interest. This suggests that sustainable and damage-responsive management of public facilities is critical to maintaining tourist attraction, especially in the city's public environment.

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THE IMPACT OF TOURISM DEVELOPMENT IN CAMP RUMAH TANGGAL SILALAHI ON SOCIAL AND ECONOMIC RESULTS: A STUDY OF PUBLIC PERCEPTION

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Abstract

This study aims to explore community perceptions regarding the economic, social, and participatory impacts of tourism development in Camp Rumah Tanggal Silalahi, Dairi Regency, North Sumatra. A descriptive qualitative method was employed, using in-depth interviews with nine local residents selected through purposive sampling. The findings indicate that the community perceives tourism development as having a positive impact, particularly in terms of increased income and expanded employment opportunities. Socially, tourism is seen to strengthen interpersonal interactions without displacing existing cultural values. Residents also feel adequately involved in various stages of tourism development, although there remains a shared expectation for greater support from the government, especially in terms of infrastructure provision and sustainable environmental management. These findings emphasize that positive community perceptions can serve as a crucial foundation for realizing inclusive and sustainable tourism, as long as effective collaboration between communities, tourism managers, and government institutions is maintained.
Keywords: Tourism development; Community perception; Economic impact; Social involvement.

1. Introduction

Tourism plays a vital role in driving regional development and enhancing local economies, particularly in areas with cultural and natural attractions. One such destination is Camp Rumah Tanggal Silalahi in Silahisabungan District, North Sumatra. Known for its scenic views of Lake Toba and the richness of Batak culture, the area is experiencing growth as a tourist destination. However, while tourism can offer economic benefits such as income generation and job creation, it may also bring social challenges and cultural shifts. Several studies (Dinata et al., 2024),(Sudiarta et al., 2021) have shown that tourism often leads to both economic growth and social tensions. Importantly, the sustainability of tourism development largely depends on the perceptions and involvement of the local community (Wijayanto & Susilawati, 2023). Tourism development encompasses the improvement of infrastructure, services, and community capacity to support tourism. According to (Satrio Wibowo & Arviana Belia, 2023), community participation at every stage of development—from planning to implementation and evaluation—is crucial for ensuring sustainability. In areas with strong cultural and environmental assets, like Papua and other rural destinations, strategies must include government support, infrastructure development, and digital promotion tools (Ismail, 2020; Aziz, 2022). The economic impact of tourism includes income growth, job creation, and a shift from traditional livelihoods to service-based activities, as highlighted by Oktaviani and Yuliani (2023). Meanwhile, the social impact includes strengthened community cohesion and cultural pride, although risks such as social conflict may arise if development is not inclusive (Rohani & Yitno, 2020; Fahlevi et al., 2024). Furthermore, perception plays a critical role in tourism

development. As (Kurniasari, 2021) and (Khan et al., 2020) emphasize, communities are more likely to support tourism if they experience direct benefits. Negative perceptions may result in resistance and weaken the potential for long-term development. Despite the growing popularity of Camp Rumah Tanggal Silalahi, academic research exploring community perceptions of tourism impacts remains limited. This raises important questions: How does the community perceive the economic and social impacts of tourism development in the area, and to what extent are they involved in the development process? In response, this study aims to:

Examine the community's perceptions of the economic impacts of tourism development at Camp Rumah Tanggal Silalahi

Examine the community's perceptions of the social impacts of tourism development at Camp Rumah Tanggal Silalahi

Analyze the extent of community involvement in tourism development at Camp Rumah Tanggal Silalahi

Fig. 1. *Camp Rumah Tanggal Silalahi*

2. Methodology

This study employed a qualitative approach with a descriptive analysis method to illustrate the community's perceptions regarding the economic and social impacts, as well as their involvement in tourism development at Camp Rumah Tanggal Silalahi, located in Silahisabungan District, Dairi Regency.

Data Sources and Sampling Technique

The study used both primary and secondary data:

Primary data were collected through in-depth interview with nine informants selected using a purposive sampling technique. This technique involved deliberately selecting participants based on specific criteria, such as active involvement in tourism activities and length of residence in the research area

Secondary data were obtained from relevant literature, including academic journals and previous research studies.

Data Collection Technique

In-depth Interviews were conducted to obtain detailed insights into the socio-economic impacts of tourism and the extent of community participation in tourism development.

Observation – observation were conducted to complement interview findings by directly observing community interactions, tourism activities, and observable changes in the area.

Data Analysis Technique

The data were analyzed using descriptive analysis, which involved systematically organizing, classifying, and interpreting the data to produce an accurate representation of the phenomena observed in the field.

3. Results and Discussion

The findings of this study reveal that the community around Camp Rumah Tanggal Silalahi generally perceives the development of tourism in their area positively. Through in-depth interviews and direct observations, several important aspects emerged, particularly concerning the economic and social impacts, as well as the level of community involvement in tourism-related activities. From an economic perspective, all nine informants expressed that the presence of tourism has improved their livelihoods. Many of them experienced increased income and new sources of revenue that were previously unavailable. Individuals who once depended solely on farming or fishing have now opened food stalls, offered parking services, or rented out camping equipment for tourists. This economic shift is consistent with the findings of (Sudiarta et al., 2021), who noted that the growth of tourism often encourages communities to move from traditional sectors into service-oriented roles that are more profitable and sustainable. One of the respondents even stated that tourism helped them fulfill daily needs, something that was more difficult before visitors started coming regularly. These testimonies support previous research by (Oktaviani & Yuliani, 2023), which emphasized that the increased flow of tourists often leads to tangible improvements in household income and economic resilience at the community level. The social impact of tourism in the area was also seen as largely positive. According to most participants, social cohesion has strengthened as a result of shared responsibilities, such as maintaining the cleanliness of the tourist area and working together to improve facilities. Community members described themselves as becoming more open and confident in interacting with visitors from different regions and cultural backgrounds. At the same time, they remained committed to preserving their Batak cultural identity, which was often displayed proudly to tourists during traditional events and performances. Nevertheless, the study also uncovered a few minor social tensions, including small-scale disagreements between community members and tourists or among local stakeholders over resource use. Although these incidents did not escalate into major conflicts, they highlight the need for proper coordination and inclusive planning to ensure that tourism remains a unifying force rather than a divisive one. These findings resonate with the study by (Rohani & Yitno, 2020), which emphasized that community-based tourism can strengthen social harmony when local people are actively involved in both the design and management of tourism initiatives. Regarding community involvement, the majority of informants acknowledged that they were included in discussions and collaborative activities such as village meetings and shared maintenance efforts. However, they also noted that their participation often stopped at the implementation level, with strategic decisions still largely dominated by local authorities or tourism managers. This situation reveals a need for deeper and more meaningful engagement, particularly in long-term planning and policy-making. As pointed out by (Kemalasari & Sugiri, 2023), community support is essential for sustainable tourism development, and such support can be sustained only when locals are treated not merely as participants, but as partners. In addition to these benefits and perceptions, some key challenges were identified. Several informants expressed concern over inadequate government involvement, particularly in improving infrastructure such as road access and waste management systems. Many believed that the development of tourism would be more successful and sustainable if the local government played a more proactive role beyond ceremonial appearances or brief visits. In sum, the research findings highlight the positive economic and social transformations experienced by the local community due to tourism. However, they also underline the importance of strengthening community participation and government responsiveness to address the challenges that may hinder the long-term success of tourism in Camp Rumah Tanggal Silalahi.

Table 1. Summary of Community Perception on Tourism Development at Camp Rumah Tanggal Silalahi

Aspect	Positive Perception	Negative perception
Economic Impact	Increased income for households; emergence of new small businesses; growth in tourism-related services (e.g., homestays, food stalls)	Rising cost of living; income benefits concentrated in certain groups
Social Impact	Strengthened community pride in Batak culture; improved social interaction between locals and visitors	Potential land disputes; risk of cultural commodification
Community Involvement	there is a sense of involvement in tourism activities, especially in terms of daily operations and participation.	Limited involvement in formal planning; decision-making

4. Conclusion

This study aimed to explore the perceptions of local communities regarding the economic and social impacts of tourism development, as well as their level of involvement, in Camp Rumah Tanggal Silalahi. Based on interviews with nine informants and field observations, the findings reveal that tourism is largely perceived as a positive force in the area. Economically, the presence of tourism has contributed significantly to improving the livelihoods of local residents. Increased income, job creation, and the emergence of small-scale entrepreneurial activities were frequently mentioned as direct benefits. Many community members who previously relied on agriculture or traditional occupations have adapted to the growing tourism industry by offering services such as food stalls, accommodation, and other tourism-related activities. Socially, the development of tourism appears to have strengthened community interaction and solidarity. Informants described an increase in collaboration, particularly in collective efforts to maintain the tourism area and preserve local culture. Although minor frictions occasionally occurred—either between residents and tourists or among stakeholders—they were generally addressed through community dialogue, and no major social conflicts were reported. Community involvement was also a key theme in this study. Most informants expressed a sense of inclusion in tourism-related activities, especially in terms of operational and day-to-day participation. However, some emphasized that their role in strategic planning and decision-making remains limited, suggesting a need for more equitable and meaningful engagement. Despite these positive perceptions, several challenges remain. These include limited infrastructure, inadequate waste management, and insufficient government support. Addressing these issues will require stronger collaboration between local communities, tourism managers, and public authorities to ensure the sustainability and inclusivity of tourism development in the area. In conclusion, the success of tourism in Camp Rumah Tanggal Silalahi lies not only in its natural and cultural attractions but also in the active participation and support of its local community. Future efforts should focus on strengthening this collaboration and ensuring that the benefits of tourism are shared equitably and sustainably.

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EMPLOYEE PERCEPTION OF THE RELATIONSHIP BETWEEN KITCHEN AREA HYGIENE AND SANITATION AND SERVICE QUALITY AT HOTEL SANTIKA PREMIERE DYANDRA MEDAN

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Abstract

The objective of this study was to determine employee perceptions of the relationship between kitchen area hygiene and sanitation and the quality of service at Hotel Santika Premiere Dyandra Medan. The method used in this research is qualitative, employing observation and interview techniques. The respondents consisted of 27 kitchen employees, with a sample of 6 individuals involved in food handling and management representatives, including the F&B Manager, CDP Kitchen, kitchen staff, Bartender, Waiter, and HRD. The results showed that the implementation of personal hygiene and workplace cleanliness among the kitchen employees at Hotel Santika Premiere Dyandra Medan is already at a good standard. They have implemented preventive measures and maintained behaviors that could prevent food contamination. Training, socialization, and Standard Operating Procedures (SOPs) implemented by the management significantly influence service quality in the F&B department. Hotel Santika Premiere Dyandra Medan has established adequate guidelines and Standard Operating Procedures for conducting service and food processing operations, leading to a positive image for the hotel and receiving satisfaction feedback from guests.
Keywords: Employee Perception; Kitchen Area Hygiene and Sanitation; Service Quality.

1. Introduction

The tourism and hospitality industry is a vital sector in both the global and national economies. As tourist expectations rise, service quality becomes a determining factor in a hotel's success. One of the crucial components that support a hotel's image and guest satisfaction is its Food & Beverage (F&B) service. The quality of F&B service is not only measured by the taste of the food or the friendliness of the staff but is rooted in a foundation often unseen by guests: hygiene and sanitation in the kitchen area (Walczak, 2020).

The cleanliness of food processing areas is a fundamental public health issue. Food handlers play a central role in the food safety chain, as unhygienic practices can be a source of contamination and lead to foodborne illnesses (Ansari-Lari et al., 2020). Therefore, the perception of employees, especially kitchen staff, regarding the importance of hygiene and sanitation is highly relevant. This perception shapes their daily attitudes and behaviors, which ultimately have a direct impact on product safety and the quality of service received by guests (Atmoko, 2021).

Hotel Santika Premiere Dyandra Medan, as a leading player in the hospitality industry, places special emphasis on this aspect. However, to ensure that high standards are sustainably maintained, it is important to understand how employees perceive, internalize, and apply hygiene and sanitation practices in their daily operations. This study aims to explore in-depth the perceptions of F&B employees regarding hygiene practices, the relationship between the implementation of cleanliness standards and service quality, and the role of management in supporting these practices.

Based on this background, the research problems are formulated as follows:

1. How do F&B employees perceive hygiene practices in their work area?
2. According to employees, what is the relationship between the implementation of hygiene and sanitation and the quality of F&B service?
3. According to employees, what is the role of management in supporting sustainable hygiene and sanitation practices?

Employee Perception**:** Perception is the process by which individuals organize and interpret their sensory impressions to give meaning to their environment (Kotler & Armstrong, 2021). In this context, employee perception of hygiene and sanitation will influence their attitudes and behaviors in maintaining cleanliness in the work environment.

Hygiene and Sanitation**:** Hygiene is the effort to prevent disease by focusing on the health of the individual and their environment, such as hand washing and maintaining clean clothing (Yulianto et al., 2020). Sanitation, on the other hand, focuses more on supervising physical environmental factors that can affect human health, such as building cleanliness, waste management, and the provision of clean water (Chandra, 2022). Both are key pillars in ensuring food safety.

Service Quality**:** Service is a series of activities that occur in the interaction between a customer and a service provider (Gronroos & Tjiptono, 2023). In the F&B industry, service quality encompasses various dimensions, from product quality (food and beverages) and physical environment quality (cleanliness and atmosphere) to interaction quality (friendliness and speed of service). Food safety, guaranteed through good hygiene and sanitation, is an absolute prerequisite for service quality itself.

2. Methodology

This study uses a descriptive qualitative approach to provide a systematic and in-depth description of the phenomenon under investigation.

a. Location and Time: The research was conducted at Hotel Santika Premiere Dyandra Medan from April to June 2025.
b. Data Source: The data used were primary data obtained directly from the source, namely the employees of Hotel Santika Premiere Dyandra Medan.
c. Data Collection Methods: Data were collected through three methods:

    1. Observation: Direct observation of hygiene and sanitation practices in the kitchen and F&B areas.
    2. Interviews: In-depth interviews with kitchen staff, waiters/waitresses, bartenders, the F&B manager, and an HRD representative to explore their perceptions and experiences.
    3. Documentation: Collection of data from related documents such as company SOPs.

d. Data Analysis Method: Data analysis was carried out through several stages according to the qualitative analysis model, namely data reduction (selecting and summarizing relevant data), data presentation (organizing data in narrative and tabular form), and conclusion drawing (interpreting findings to answer the research questions).

3. Results and Discussion

A. Employee Perception of Hygiene and Sanitation Practices

In general, F&B employees at Hotel Santika Premiere Dyandra Medan have a positive

perception and high awareness of the importance of hygiene and sanitation. Interview results show that 100% of respondents are aware of contamination sources and understand the importance of preventive measures such as hand washing, wearing clean work attire, and using personal protective equipment (PPE). They also demonstrated an understanding of behaviors to avoid, such as smoking in food processing areas or tasting food unhygienically.
Factors such as education level and management-provided training were found to be positively correlated with the level of hygiene knowledge. However, the main challenge identified is the gap between knowledge and practice. Although employees know what should be done, work pressure, time constraints, or habits sometimes prevent ideal practices from being consistently applied. This confirms that knowledge alone is not enough; strong supervision and a robust work culture are needed to ensure sustainable implementation.

B. The Relationship between Hygiene and Sanitation and Service Quality

Employees understand that there is a very close and inseparable relationship between hygiene/sanitation and service quality. This relationship is manifested in several aspects:

1. Product Safety and Quality: Employees are aware that good cleanliness practices are the primary guarantee for producing safe and high-quality food. Food that is free from bacterial contamination is the foundation of customer satisfaction.
2. Customer Trust and Satisfaction: Visible aspects of cleanliness (tangibles) such as the cleanliness of the dining area, the tidiness of employee uniforms, and transparency (e.g., through an open kitchen concept) are recognized as strong signals that build customer trust. Customers who trust the cleanliness of a place will feel more satisfied and are more likely to return.
3. Employee Productivity and Comfort: A clean, safe, and organized work environment (non-slippery floors, good ventilation, adequate facilities) directly enhances employee comfort and productivity. Comfortable employees can work more efficiently, which in turn improves the speed and quality of service provided to guests.

C. The Role of Management in Supporting Hygiene and Sanitation Practices

The management of Hotel Santika Premiere Dyandra Medan plays a central role in shaping the culture of hygiene and sanitation. This role is realized through several effective strategies:

1. Training and Socialization: Management regularly conducts training to increase employee knowledge and awareness.
2. Provision of Clear SOPs: The existence of clear and documented Standard Operating Procedures (SOPs) provides concrete guidance for employees in carrying out their tasks according to cleanliness standards.
3. Consistent Supervision: Internal audits, daily supervision by superiors, and routine checks (e.g., on ingredient expiration dates) serve as effective control tools to ensure compliance.
4. Resource Provision: Management ensures the availability of adequate facilities, such as PPE, handwashing stations complete with soap, and covered trash bins.
5. Building a Food Safety Culture: The above efforts collectively create a culture where food safety and cleanliness become a shared responsibility and an integral part of the work ethic.

4. Conclusion

1. The perception of kitchen employees at Hotel Santika Premiere Dyandra Medan regarding hygiene and sanitation is generally good, supported by adequate knowledge. However, the main challenge lies in the gap between knowledge and practice in the field, which is influenced by operational factors.
2. There is a strong and positive relationship between the implementation of hygiene/sanitation and the quality of service. Good cleanliness practices not only ensure

product safety but also build customer trust and increase employee productivity.
3. Management plays a crucial role in supporting sustainable hygiene practices through training, provision of SOPs, consistent supervision, and the creation of a strong food safety culture.

Suggestions

1. For Management: It is necessary to develop training programs that focus more on practical behavioral change to bridge the gap between knowledge and practice. Scenario-based and simulation training could be more effective than theoretical methods.
2. For Employees: It is necessary to continuously improve personal discipline in applying hygiene standards despite work pressure, and to proactively provide feedback to management regarding constraints faced in the field.
3. For Future Researchers: Future research could use a quantitative approach to statistically measure the relationships between variables or conduct a comparative study between several hotels to obtain a broader picture.

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ANALYSIS OF THE INFLUENCE OF COMMUNICATION AND TRAINING ON EMPLOYEE PERFORMANCE AT RESTO RUCCI + RESTAURANT

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Abstract

This study aims to analyze the influence of communication and training on employee performance at Resto Rucci +, a restaurant in Medan, Indonesia. The research employed a quantitative approach with data collected through structured questionnaires distributed to all 37 employees. The data were processed using multiple linear regression analysis with SPSS software. The findings revealed that communication has a positive and significant effect on employee performance, while training has a positive but not statistically significant effect when tested individually. However, simultaneously, communication and training have a significant impact on performance, contributing to 60.3% of the variation. These results emphasize the importance of effective communication and relevant training in enhancing employee performance in the hospitality sector.
Keywords: Communication; Training; Employee Performance.

1. Introduction

Effective workplace communication plays a vital role in enhancing productivity, reducing errors, and strengthening relationships between superiors and subordinates. In the context of a restaurant like Rucci+, clear and open communication helps employees understand organizational goals, operational policies, and customer expectations. Studies by Daviki and Wijaya (2024) and by Hen, Widyani, and Saraswati (2020) have confirmed that effective communication positively and significantly influences employee performance. Conversely, poor communication can lead to confusion, service errors, and tension among team members, which in turn negatively impacts performance. Therefore, effective communication is a foundational element for building a harmonious and productive work environment.

Training also plays a crucial role in enhancing employee performance. Through training, employees gain new skills, deepen their knowledge, and sharpen existing competencies, enabling them to provide better and more professional service. In the restaurant sector, training covers not only technical skills—such as cooking, food service, and customer interaction—but also interpersonal and managerial skills. Adriyanto and Subakti (2018), as well as Widhyanti et al. (2020), found that training, motivation, and competence significantly impact employee performance. Well-trained employees are better equipped to handle workplace challenges and demands, ultimately improving service quality and customer satisfaction.

At Rucci + Restaurant, communication breakdowns between kitchen staff and servers often result in delays in food service, leading to less optimal customer experiences. For instance, a lack of clarity between chefs and waitstaff has caused delays in delivering orders, resulting in customer dissatisfaction and harming the restaurant's reputation. This illustrates the need for clear and effective communication among all team members to ensure smooth operations and positive customer experiences.

This research was conducted to determine whether communication and training, individually and jointly, have a significant influence on employee performance at Resto Rucci +. The research questions are:

1. Does communication significantly affect employee performance?
2. Does training significantly affect employee performance?
3. Do communication and training simultaneously influence employee performance?

The results of this study are expected to contribute both theoretically and practically to managerial decision-making and future academic research.

Communication in organizations refers to the process of exchanging information that influences understanding, coordination, and interpersonal relationships. Effective communication improves task clarity, collaboration, and morale.
According to Ruliana and Lestari, several indicators characterize effective organizational communication:

1. Effective Coordination – Facilitates the flow and exchange of information between departments to minimize miscommunication and enhance synergy.
2. Task Clarity – Clearly and accurately conveyed information helps each employee understand their role and responsibilities.
3. Strong Employee Relationships – Open and two-way communication fosters trust and positive interpersonal relationships among colleagues.
4. Performance Improvement – High communication effectiveness supports efficient and productive task completion (Ruliana & Lestari, 2021)

Training is a structured process of skill and knowledge development aimed at improving employee capabilities. Well-designed training programs have been shown to enhance employee productivity and service quality.

Indicators of effective training include:

1. Relevance of Material to Job Requirements – Training should be directly applicable to the tasks and challenges faced by employees, especially in areas like service speed, cleanliness standards, and customer handling.
2. Competence Improvement – Effective training results in increased employee knowledge, skills, or attitudes.
3. Active Participation – Training should engage employees actively through practical sessions and discussions, not just theory.
4. Evaluation and Feedback – Post-training evaluation and feedback help assess effectiveness and guide further development.
5. Workplace Application – Employees should be able to apply what they've learned directly in the workplace, indicating successful transfer of training (Hardjana, 2021).

Employee performance refers to measurable outcomes of work, including speed, accuracy, initiative, teamwork, and responsibility. Previous studies have indicated that both communication and training positively affect employee performance. This study builds upon that theoretical framework to explore such relationships at Resto Rucci+. In the restaurant context, employee performance can be evaluated based on speed, service quality, and customer satisfaction (Pranogyo et al., 2022). The following are relevant indicators of performance in the hospitality industry:

1. Work Speed – The ability to complete tasks quickly and efficiently reduces customer wait times and improves service flow.

2. Service Quality – Includes accuracy in fulfilling orders, friendliness, and the ability to meet customer needs effectively.
3. Customer Satisfaction – Reflected through feedback and guest impressions, customer satisfaction measures how well employees fulfill or exceed customer expectations (Pranogyo et al., 2022).

2. Methodology

This study uses a quantitative approach with primary data obtained from structured questionnaires. The population includes all 37 employees of Resto Rucci+, with a total sampling technique (census method) applied.

The questionnaire utilized a Likert scale (1 to 5) to measure perceptions of communication, training, and performance. Data validity and reliability were tested using SPSS, and the hypotheses were analyzed using:

- Multiple Linear Regression
- Partial t-test
- Simultaneous F-test
- Coefficient of Determination (R^2)

3. Results and Discussion

Reliability and Validity

All items were confirmed to be valid and reliable (Cronbach's Alpha > 0.7), indicating the consistency and accuracy of the measurement instruments.

Table 1. Validity test

		KOMUNIKASI	PELATIHAN	KINERJA
KOMUNIKASI	Pearson Correlation	1	.764**	.690**
	Sig. (2-tailed)		0	0
	N	100	100	100
PELATIHAN	Pearson Correlation	.764**	1	.715**
	Sig. (2-tailed)	0		0
	N	100	100	100
KINERJA	Pearson Correlation	.690**	.715**	1
	Sig. (2-tailed)	0	0	
	N	100	100	100

Table 2. Reliability test

Item-Total Statistics

	Scale Mean If Item Deleted	Scale Variance If Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha If Item Deleted
Komunikasi	67.5352	29.767	.911	.882	.852
Pelatihan	63.9859	28.357	.882	.868	.869
Kinerja	64.1690	29.200	.771	.603	.963

Classical Assumption Test

The results of the normality test for this study are normally distributed, as the data are scattered around the diagonal line and follow its direction, as shown in the figure below.

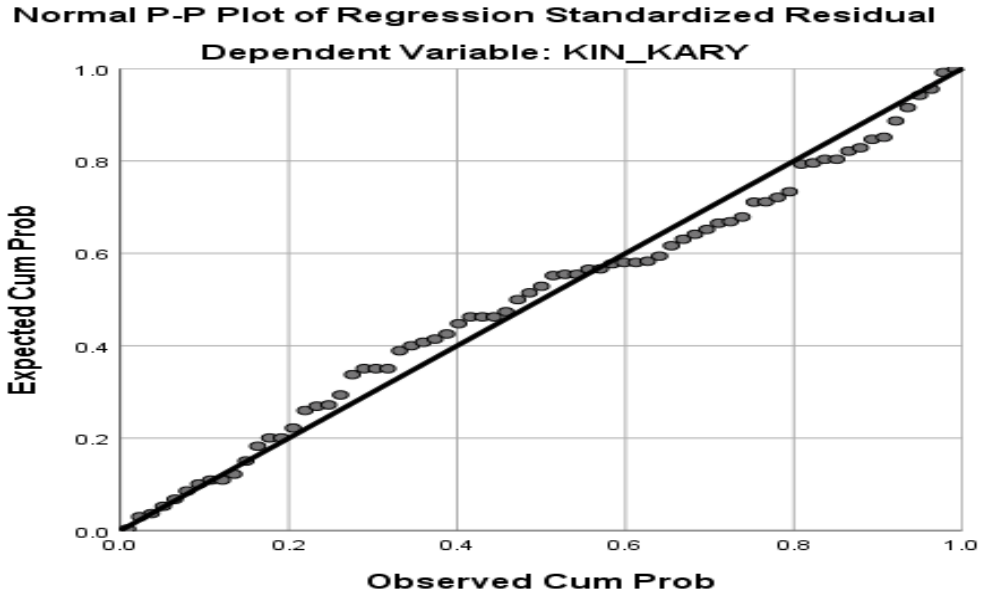

Fig.1. Normality test

The multicollinearity test aims to examine whether there is any correlation among the independent variables in the regression model. One of the methods to diagnose multicollinearity is by analyzing the tolerance values and their inverse, the Variance Inflation Factor (VIF). In this study, no correlation was found among the independent variables, as the tolerance values are greater than 0.10 and the VIF values are less than 10.000. Therefore, the requirements for the multicollinearity test have been fulfilled.

Table 3. Multicollinearity test

Coefficients[a]

Model		Unstandardized B	Coefficents Std. Error	Standardized Coefficients Beta	t	Sig.	Zero-order	Correlations Partial	Part	Collinearity Tollerance	Statistic VIF
1	(constant)	6.530	2.746		2.378	.020					
	KOMUNIKASI	.695	.237	.615	2.938	.000	.774	.336	.225	.133	7.497
	PELATIHAN	.180	.221	.170	.814	.418	.743	.098	.062	.133	7.497

a.Dependent Variable : KINERJA

Heteroscedasticity testing is conducted to determine whether the disturbance (error) variable has a constant variance or not. To detect the presence or absence of heteroscedasticity, a scatterplot is observed between the predicted values of the dependent variable and the residuals. The basis of the analysis is as follows:

a. If there is a certain pattern, such as points forming a regular shape (wavy, widening, then narrowing), this indicates the presence of heteroscedasticity.
b. If there is no clear pattern and the points are randomly scattered above and below the value of 0 on the Y-axis, then heteroscedasticity is not present.

From the figure below, it can be seen that there is no heteroscedasticity, as there is no clear pattern and the points are scattered above and below the value of 0 on the Y-axis. Therefore, it can be concluded that the heteroscedasticity test has been fulfilled.

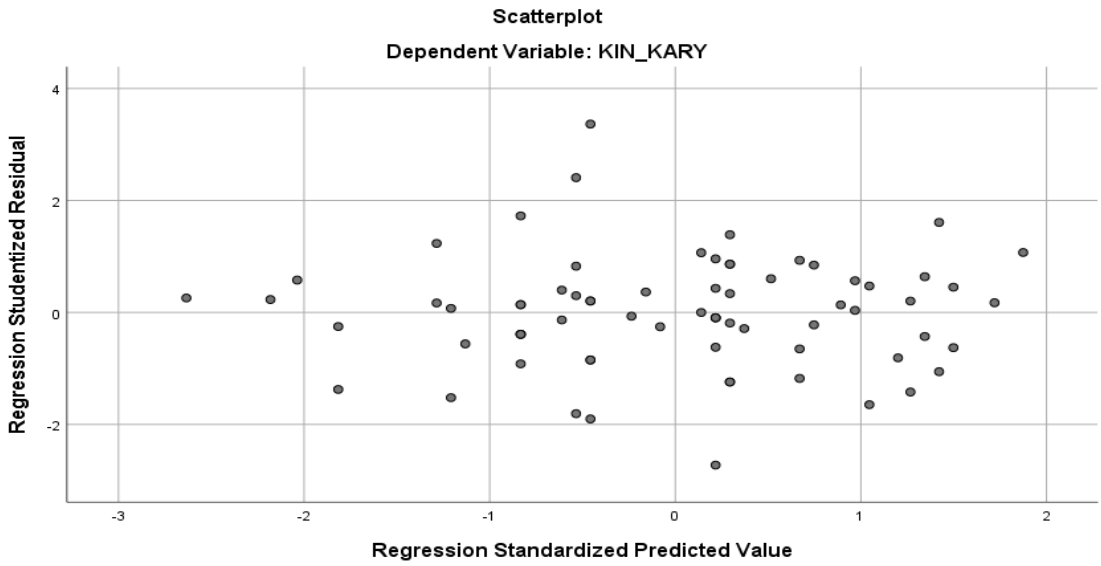

Fig. 2. Heteroscedasticity test

Regression Analysis Results

- Communication (X1) has a positive and significant effect on employee performance (p-value < 0.05).
- Training (X2) has a positive but not significant effect when analyzed separately (p-value > 0.05).
- The F-test shows that communication and training jointly have a significant effect on performance (p-value < 0.05).

Table 4. Multiple Linear Regression Analysis (Coefficients[a])

Coefficients[a]

Model		Unstandardized B	Coefficents Std. Error	Standardized Coefficients Beta	t	Sig.	Zero-order	Correlations Partial	Part	Collinearity Tollerance	Statistic VIF
1	(constant)	6.530	2.746		2.378	.020					
	KOMUNIKASI	.695	.237	.615	2.938	.000	.774	.336	.225	.133	7.497
	PELATIHAN	.180	.221	.170	.814	.418	.743	.098	.062	.133	7.497

a.Dependent Variable : KINERJA

The regression model is:
Y=6.530+0.695X1+0.180X2Y = 6.530 + 0.695X_1 + 0.180X_2Y=6.530+ 0.695X1+ 0.180X2

Interpretation:

- Constant (6.530): Baseline performance when both communication and training are zero.
- X_1 (Communication): A 1-unit increase in communication leads to a 0.695 increase in performance.
- X_2 (Training): A 1-unit increase in training leads to a 0.180 increase in performance.

Hypothesis Testing

Partial t-Test

- Communication (X_1): t = 2.938 > t-table = 2.000; Significant (p < 0.05) → H1 accepted.
- Training (X_2): t = 0.814 < t-table = 2.000; Not Significant (p = 0.418 > 0.05) → H2 rejected

Simultaneous F-Test

The F-test is conducted to determine whether the variables Communication and Training simultaneously have a positive effect on Employee Performance. Table 4.12 shows that the Sig. F value for the Communication and Training variables is 0.000, where the calculated F value (F count) is 51.540, which is greater than the F table value of 3.13. Based on this data, it can be concluded that the variables Communication and Training simultaneously have a positive effect on Employee Performance.

Table 5. Simultaneous F-test (ANOVA[a])

Model	Sum of Squares	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	379.32	2	189.66	51.54	0.00[b]
	Residual	250.23	35	3.68		
	Total	629.549	37			

a. Dependent Variable: Kinerja
b. Predictors; (Constant), Komunikasi, Pelatihan

- F-value = 51.540 > F-table = 3.13, with p = 0.000 → H3 accepted.
- Communication and training jointly have a significant effect on performance.

Coefficient of Determination (R^2)

- R^2 = 0.603, indicating that 60.30% of the variance in employee performance is explained by communication and training.
- This suggests a strong level of influence, with the remaining 39.70% attributable to other variables not included in the model.

The R^2 value is 0.603, meaning that 60.3% of the variation in employee performance is explained by communication and training, while the remaining 39.7% is attributed to other factors such as internal and external factors or Organisation Behaviour.

Discussion

The findings in this study relate to the alignment of the research results with existing theories, expert opinions, and previous studies, as well as behavioral patterns that should be adopted to address the identified issues. The following is a discussion based on the analysis of the research findings:

The Effects of Communication on Employee performance

Based on the hypothesis testing analysis, it is found that the t-count value is 2.938 > t-table 2.000 and the significance value (Sig.) is 0.000 < 0.05. Therefore, it can be concluded that H0 is rejected and H1 is accepted, meaning that the communication variable partially has a positive and significant effect on the performance of employees at Rucci + Restaurant. The results also show that communication has a positive and significant influence on improving employee performance. This means that every effort made by the company to enhance communication at Rucci + Restaurant has the potential to improve performance by a coefficient of 00.695. The relationship between communication and employee performance shows a positive correlation with a value of 0.774. This correlation value falls into the category of a strong relationship. Communication contributes (coefficient of determination) 77.40% to the improvement of employee performance.

The Effect of Training on Employee Performance

Based on the hypothesis testing analysis, it is found that the t-count value is 0.814 < t-table 2.000 and the significance value (Sig.) is 0.418 > 0.05. Therefore, it can be concluded that H0 is accepted and H1 is rejected, meaning that the training variable partially has a positive but not significant effect on employee performance at Rucci + Restaurant. Training has a regression coefficient of 0.180 with a significance level of 0.418. These results support the research hypothesis stating that there is a positive effect of training on employee performance0at0Rucci+. Although the effect of training on employee performance is not yet optimal, the relationship between training and employee performance shows a positive correlation with a value of 0.743. This correlation value falls into the category of a strong relationship.

4. Conclusion

Conclusion

1. Communication has a significant positive effect on employee performance.
2. Training has a positive but not significant partial effect.
3. Communication and training jointly have a significant effect on performance.

Recommendations

Based on the analysis of the research results, the following suggestions are proposed:

1. Communication is already very good, but it should be further improved by fostering effective communication and maintaining good relationships among Rucci + employees.
2. Training is essential for enhancing employee competence so they can uphold the company's service standards effectively, ultimately leading to customer satisfaction and encouraging repeat visits to Rucci + Restaurant.
3. Rucci + Restaurant management is encouraged to explore other variables beyond communication and training that could further improve employee performance.

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THE INFLUENCE OF TOURISM FACILITIES AND PROMOTION ON TOURIST INTEREST IN VISITING BAH DAMANIK, SIMALUNGUN REGION, NORTH SUMATERA, INDONESIA

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Abstract

This study aims to determine the effect of tourism facilities and promotion on tourist interest in visiting the Bah Damanik Bath. This study uses a quantitative approach through the distribution of questionnaires to collect data from representative respondents. The results showed that complete and well-maintained tourist facilities, such as adequate parking areas, clean toilets, attractive tourist spots, and the comfort of the place are the main attractions for tourists to visit. Furthermore, effective promotion through social media and cooperation with travel agents also play an important role in attracting tourists, especially from outside the region. In addition, creating a positive experience for tourists helps increase their interest in visiting. Based on this, it is recommended that the management of Bah Damanik Bath continue to improve existing facilities, and strengthen promotions, in order to attract more tourists.
Keywords: Tourist Facilities; Promotion; Service Quality.

1. Introduction

Tourism is one of the strategic sectors in both regional and national economic development. In addition, to increase local original income (PAD), tourism also contributes to job creation, the expansion of community business networks, and the promotion of a local potential to a wider audience. The current era of globalization depends not only on its natural beauty, but also on the ability of its management to provide a comprehensive, engaging, and memorable travel experience for tourists.

One of the natural tourist destinations with great development potential is Bah Damanik Bath, located in Simalungun Regency, North Sumatra Province. This area is known for its beautiful natural scenery, clear water, and cool and refreshing air. However, this potential has not yet been matched by a consistent increase in tourist visits. This indicates that there are challenges that need to be observed, especially the attractiveness, comfort, and quality of services provided by tour managers.

Several factors are believed to affect tourists' interest in visiting, including the availability and completeness of tourist facilities, as well as the effectiveness of destination promotion. Tourist facilities such as parking areas, public toilets, relaxation places, information centers, and attractive photo spots can increase tourists' comfort and satisfaction. In addition, effective promotions through social media, digital platforms, and cooperation with travel agents also plays an important role in expanding the reach of the tourism market. Therefore, it is important to conduct an in-depth study of how these two aspects affect the interest of tourists in visiting Bah Damanik Bath. This research not only aims to examine the relationship between these variables, but is also expected to provide constructive input for destination managers and related parties in developing targeted and sustainable tourism development strategies. With

proper management, it is hoped that Bah Damanik Bath can become a leading destination capable of competing in the midst of the rapid growth of the tourism sector.

According to Saputra and Maulana (2025), well-maintained tourist facilities play an important role in creating positive experiences for tourists, so that they can increase their chances of making repeat visits or recommending destinations to others. When facilities are available and easily accessible, travellers feel more satisfied and motivated to come back.

Tourism promotion is a communication activity that aims to introduce the attraction of a destination and influence the perception and interest of potential tourists. In the digital era, promotion is not only carried out conventionally through billboards or brochures, but also through digital platforms such as social media, tourism websites, and influencers. Hutasoit et al (2024) in their research at Mayang Nature Recreational Park, Pekanbaru, revealed that promotions carried out actively through social media such as *Instagram* and *Tik Tok* have a big impact on attracting the attention of tourists, especially from the younger generation. Visual and interactive content has proven to be more effective in building a destination image.

Tourist interest refers to an individual's interest or desire to visit a tourist attraction which is influenced by various factors such as perception, motivation, information, and previous experiences. According to Putri (2024), interest is part of the consumer decision-making process which goes through the stages of Attention, Interest, Desire, and Action, known as the AIDA model.

Several previous studies have shown that tourism and promotional facilities have a significant influence on tourist interest in visiting. Research by Andriansyah et al. (2024) at Gedambaan Beach, Kotabaru, states that facilities and promotions simultaneously have a positive effect on people's interest in visiting, with a contribution of 40.8%. Similar findings were also conveyed by Kusnaidi & Senin (2024) who researched the tourist attraction of the Tirta Lebak Hot Springs, where facilities and promotions were proven to have a strong relationship with visitor satisfaction. Meanwhile, research by Dahmiri & Bhayangkari (2022) at Muaro Jambi Temple concluded that visual promotion and tourist facilities have a partial significant influence on tourist interest in visiting. These three studies reinforce the assumption that the availability of proper facilities and promotional strategies is an important factor in increasing interest in visiting tourist destinations.

Tourism facilities play an important role in shaping visitor satisfaction and interest. A study by Chiu et al, (2019) shows that comfortable and well-maintained facilities influence the image of a destination and tourists' intention to revisit. Effective promotion can expand market reach and build a positive destination image. Research by Wang et al (2020) emphasizes that the use of interactive digital media increases the engagement of potential tourists, while Kim & Park (2021) found that authentic promotional messages increase tourist trust and loyalty.

Visitor interest is influenced by perceptions of quality, previous experiences, and information exposure. According to Li & Katsumata (2022), visitor interest grows when the destination's image is positive and the information received is consistent. Based on the background described, the main problem in this study is that the number of tourist visits to Bah Damanik Bath is still not optimal, despite the destination's great natural potential. This is allegedly caused by several factors, including the quality and availability of tourism facilities that have not been maximized and promotional strategies that have not effectively reached the target market. Therefore, this research is focused on answering the question of how much influence tourism facilities and promotions have on tourists' interest in visiting. This study also seeks to determine whether these two variables simultaneously have a significant influence on tourists' decisions in choosing Bah Damanik Bath as a travel destination.

2. Methodology

Data Types and Sources

This study uses a quantitative approach with a survey method through the distribution of questionnaires to visitors who have travelled to Bah Damanik Bath. This approach was chosen because it is able to provide measurable and objective data on the influence of tourism facilities and promotional efforts on tourists' interest in visiting. The data in this study consists of two types, namely primary data and secondary data. Primary data was obtained directly from respondents through a closed questionnaire based on a Likert scale, while secondary data was obtained from various sources such as official documents, observation results, and relevant literature. In addition, based on its nature, the data used is quantitative as it is processed in numerical form and analyzed using statistical techniques.

Population and Sample

The population in this study consists of all visitors who have visited Bah Damenik Bath tourist attraction, totalling 60 individuals. This population was chosen because they are directly involved as users of the facility and a recipient of promotional information from the tour manager, so it was considered relevant to assess the interest in visiting. From this population, the researchers used the Slovin formula to determine the number of samples with a margin of error of 5%. Based on this calculation, a sample of 48 respondents was obtained. The sampling technique employed was an accidental sampling method, which involves selecting respondents by chance, namely visitors who were met directly at the location and were willing to complete the questionnaire. This technique was chosen for its practicality and in accordance with field conditions, where not all visitors can be reached within a limited time available.

Data Collection Techniques

The data collection technique in this study involved a survey method using a closed questionnaire based on a Likert scale. The questionnaire contained statements representing each research variable, namely tourist facilities, promotions, and tourist visit interests. Respondents were asked to rate each statement on a five-point scale, ranging from strongly disagree to strongly agree. In addition, data collection is also complemented by direct observation in the field and documentation to support the validity of the results. The use of questionnaires was chosen because it was considered effective in collecting large amounts of data in a relatively short period.

Data Analysis Techniques

The data analysis technique used in this study is quantitative analysis with the assistance of SPSS software version 27. The analysis begins with validity and reliability tests to ensure that the research instrument is trustworthy and consistent. Furthermore, multiple linear regression analysis was carried out to determine the partial and simultaneous influence between free variables (facilities and promotions) on bound variables (tourist interest in visits). In addition, a t-test was also conducted to test the influence of each variable partially, and an F test to see the influence simultaneously. The determination coefficient (R^2) test was used to determine how much the independent variable contributed to the dependent variable in this research model.

3. Results and Discussion

History of Research Objects

Bah Damanik Bath is one of the natural tourist attractions located in Sidamanik District, Simalungun Regency, North Sumatra. This place is known for its water clarity, natural

atmosphere, and cool air. Since becoming known to the wider community in the 1980s, Bah Damanik Bath has become a favourite tourist destination, especially for local tourists who like a calm and natural atmosphere. Although the management remains traditional, its main attraction still survives because of the natural beauty and cultural values inherent in the area. The uniqueness of this place also lies in the existence of mountain springs which are believed to bring blessings and health. Over time, this area began to be looked at as a subject of study in the fields of local tourism and culture, especially in the context of community-based tourism development and environmental sustainability.

Vision and Mission of Research Objects

The vision of this tourist attraction is to develop Bah Damanik Bath into a sustainable, educational, and environmentally friendly local culture-based natural tourism destination to support nature conservation and empowerment of the local community. Its mission is to enhance and expand tourist facilities at Bah Damanik Bath to increase the number of visitors.

Respondent Characteristics

A total of 48 respondents were selected as the sample for this study, obtained through the calculation of the Slovin formula from a total population of 60 visitors. Respondents are tourists who have visited Bah Damanik Bath and are willing to participate in filling out the questionnaire. The questionnaire included a series of statements related to facilities, promotions and interest in visiting. The results were then analyzed descriptively to illustrate the trends of respondents' data.

Table 1. Respondent Demographics

Characteristics		Frequency	Percent
Gender	Man	22	45,8
	Woman	26	54,2
	Amount	48	100
Pekerjaan	Pelajar / Mahasiswa	20	41,7
	Karyawan	12	25,0
	PNS	6	12,5
	Wiraswasta	10	20,8
	Amount	48	100

Source: Data processed (2025)

The characteristics of the respondents in this study varied in terms of gender and occupation. Based on the data analysis, the majority of respondents were women with a percentage of 54.2%, while men were 45.8%. This indicates that women's participation in tourism activities and in filling out questionnaires is quite dominant. In terms of employment, most respondents are from students, making up 41.7%, followed by employees at 25%, self-employed individuals at 20.8%, and Civil Servants (PNS) at 12.5%. This data illustrates that Bah Damanik Bath tourist attraction is particularly popular among young people and students, and has its own attraction for people from various professional backgrounds. The diversity of respondents' backgrounds provides a broader perspective in assessing the influence of facilities and promotions on tourists' interest in visiting.

Summary of Respondents' Answers

For the tourist facilities variable, the researcher used 5 statements that were distributed to the respondents. Based on their responses, the following data was obtained:

Table 2. Replication of Respondents' Answers to Tourism Facilities (X1)

	Respondents' answers

No	Statement	SS		S		N		TS		STS		Amount
		F	%	F	%	F	%	F	%	F	%	
1.	Public facilities such as toilets, bathrooms, and dining areas are well available.	11	23%	26	54 %	11	23 %	0	0 %	0	0 %	48
2.	The environment around the bathing area is well maintained.	9	19%	25	52 %	13	27 %	1	0 %	0	0 %	48
3.	The tourist facilities of Bah Damanik Bath are well maintained and undamaged.	13	27%	26	54 %	9	19 %	0	2 %	0	0 %	48
4.	Access to the location of BathBah Damanik is easy to reach.	10	21%	26	54 %	12	25 %	0	0 %	0	0 %	48
5.	The tourist area of Bah Damanik Bath is safe for visitors, including children and the elderly.	12	25%	21	44 %	15	31 %	0	0 %	0	0 %	48
	Average		23%		52 %		25 %		0 %		0 %	100 %

Source: Primary data processed 2025

The results in Table 2 show that the tourist facilities at Bah Damanik Bath are quite good, with 48% of respondents, who answered an average of 23% agreed, and those who answered an average of 52% agreed. Tourist facilities at Bah Damanik Bath are quite adequate. This shows that most visitors consider the existing facilities support a comfortable travel experience. However, 25% of respondents choose a neutral response, indicating that there is still room for improvement in the quality and completeness of the facilities, such as clean public toilets, adequate garbage cans, and more comfortable and representative rest areas. Therefore, the management is expected to continue to evaluate and develop the available facilities to enhance visitor comfort and satisfaction on an ongoing basis.

Table 3. Replication of Respondents' Answers to Promotion (X2)

No	Statement	Respondents' answers SS		S		N		TS		STS		Amount
		F	%	F	%	F	%	F	%	F	%	
1.	I found out about Bah Damanik Bath through social media or the internet.	13	27%	22	46 %	13	27 %	0	0 %	0	0 %	48
2.	I often hear and see information about the Bah Damanik Bath in various media.	19	40%	23	48 %	6	13 %	0	0 %	0	0 %	48
3.	Promotional information for Bah Damanik Bath is in accordance with the actual conditions at the tourist location.	22	46%	25	52 %	1	2%	0	0 %	0	0 %	48
4.	The promotional content of the Bah Damanik Bath attracted my attention to visit.	18	38%	25	52 %	5	10 %	0	0 %	0	0 %	48
5.	Promotional content explains its main appeal clearly and is packaged in an attractive and	20	42%	27	56 %	1	2%	0	0 %	0	0 %	48

creative way and different from other places.						
Average	38%	51 %	11 %	0 %	0 %	100 %

Source: Primary data processed 2025

The results in Table 3 show that the promotion carried out at Bah Damanik Bath, with an average of 51% answered agreed, and those who answered on average strongly agreed with 38% to the statement that the tourism promotion of Bah Damanik Bath has been done well. This shows that the majority of visitors consider the promotional efforts by the management to be quite effective in attracting tourists to visit. Meanwhile, 11% of respondents answered neutrally indicating that efforts are still needed to improve promotional strategies, both in terms of reach, the media used, and the quality of information delivered. By optimizing promotional activities in a more targeted and creative manner, it is hoped that public awareness can increase and lead to a rise in the number of tourist visits at the Bah Damanik Bath.

Table 4. Replication of Respondents' Answers Interested in Visiting Tourists (Y)

No	Statement	Respondents' answers SS		S		N		TS		STS		Amount
		F	%	F	%	F	%	F	%	F	%	
1.	I am interested in the natural tourism offered by the Bah Damanik Bath.	13	27%	29	46 %	6	27 %	0	0 %	0	0 %	48
2.	I am willing to recommend Bah Damanik Bath to friends and others.	9	19%	30	48 %	8	13 %	1	0 %	0	0 %	48
3.	I want to visit Bah Damanik Bath again in the future.	10	21%	27	52 %	9	2%	2	0 %	0	0 %	48
4.	I have a desire to visit Bah Damanik Bath in the near future.	14	29%	28	52 %	6	10 %	0	0 %	0	0 %	48
5.	I felt curious to see the beauty of the natural tourism of the Bah Damanik Bath.	19	40%	24	50 %	5	10 %	0	0 %	0	0 %	48
	Average		27%		58 %		14 %		1 %		0 %	100%

Source: Primary data processed 2025

The results in Table 4 show that tourists' interest in visiting Bah Damanik Bath, with an average of 58% of respondents agreeing, and 27% of respondents who answered the average who said they strongly agreed. This indicates that the level of interest in tourists visiting Bah Damanik Bath is relatively high. Furthermore, it has a positive response that can be a special attraction in the eyes of tourists, both in terms of natural beauty, atmosphere, and experiences offered. Meanwhile, those who stated neutrality with an average of 14% of respondents, and those who stated that they did not agree with an average of 1% of respondents expressed interest in visiting the Bah Damanik Bath. Respondents who are neutral point to opportunities to better convince tourists through increased promotions and facilities, while the number who disagree is very small. This data indicates that Bah Damanik Bath has good potential in attracting tourists, so management needs to maintain and improve the quality of services and tourist attractions to maintain and increase visitor numbers.

Validity Test

The validity test was carried out to find out whether the questionnaire instrument used in this study could measure what should be measured. The validity test was performed using *the*

Pearson Product Moment correlation, by calculating the correlation between the score of each statement item and the total score of each variable. In this study, there are three variables, namely:

Table 5. Validity Test of Tourist Facilities (X1)

Variable	Item Questionnaire	r count	r table	Information
Tourism Facilities (X1)	X1	0,550	0,2845	Valid
	X2	0,717	0,2845	Valid
	X3	0,760	0,2845	Valid
	X4	0,543	0,2845	Valid
	X5	0,798	0,2845	Valid

Source: SPSS data processing results 27, 2025

Table 6. Promotional Validity Test Results (X2)

Variable	Item Questionnaire	r count	R table	Information
Promotions (X2)	X1	0,407	0,2845	Valid
	X2	0,715	0,2845	Valid
	X3	0,685	0,2845	Valid
	X4	0,701	0,2845	Valid
	X5	0,707	0,2845	Valid

Source: SPSS data processing results 27, 2025

Table 7. Results of the Validity Test of Tourist Interest (Y)

Variable	Item Questionnaire	r count	R table	Information
Tourist Attraction (Y)	X1	0,693	0,2845	Valid
	X2	0,821	0,2845	Valid
	X3	0,833	0,2845	Valid
	X4	0,671	0,2845	Valid
	X5	0,548	0,2845	Valid

SPSS data processing results 27, 2025

The results of the above validity test allow an evaluation of the correlation strength of each statement item. To determine the significance of this relationship, the correlation value of each item is calculated compared to the value of the table. With the number of respondents (n) as many as 48, the degree of freedom (df) was calculated using the formula n-2, which is 48-2=46. Referring to the table r with a real level of 5% (0.05), a rateable value of 0.2845 was obtained. Based on the table of test results that have been presented, overall all items for the variables of tourist facilities (X1), promotions (X2), and tourist interest (Y), show a calculation value greater than the value of the table with a significant value below 0.05.

This shows that each statement in the research instrument has sufficient correlation strength to the total value of each variable, so that it can be declared valid. Each statement in the questionnaire is suitable for use as a research instrument because it is proven to have a significant and strong correlation to the total value of its variables and the data collected reflects the actual conditions in the field.

Reliability Test

The reliability test is used to find out to which extent the research instrument (questionnaire) is reliable or consistent if measured again under similar conditions. An instrument is said to be reliable if it provides consistent and stable results over time. In this study, reliability was measured using Cronbach's Alpha coefficient, with a minimum limit of ≥ 0.60 as a condition for the instrument to be considered reliable. Based on the results of the reliability test conducted, the following Cronbach's Alpha values are obtained:

Table 8. Reliability Test

Variable	Cronbach's Alpha	Condition	Reliability Levels
Tourist Facilities	0,825	>0,60	Reliable
Promotion	0,617		Reliable
Interest in Visiting Tourists	0,763		Reliable

SPSS data processing results 27, 2025

The three values of Cronbach's Alpha of each variable greater than 0.60, so it can be concluded that all items in the variables X1, X2, and Y are declared reliable. This means that the instruments used in this study are reliable and consistent in measuring each variable.

Multiple Linear Regression Test

Table 9. Multiple Linear Regression Test

Model	Unstandardized Coefficients		Unstandardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1. (Constant)	3.424	3.099		1.105	.275
Tourist Facilities	.369	.091	.463	4.073	.000
Promotion	.452	.136	.377	3.316	.002

a. Dependent Variable: Visiting Interest

Based on the test results in table 4.9 above, the following linear regression equations are obtained:

$$Y = 3.424 + 0.369X1 + 0.452X2 \quad (1)$$

In the multiple linear regression model, a constant value of interest in visiting is obtained of 3,424, indicating that the variable of tourist facilities and promotions has a value of 0, then the interest in visiting tourists is 3,424. The regression coefficient of tourist facilities is 0.369 where every one unit increase in tourist facilities will increase interest in visiting by 0.369, while the regression coefficient of promotion of 0.452 shows that an increase in one promotion unit will increase interest in visiting by 0.452. The significance value for tourist facilities is 0.000 and for promotions is 0.002, both of which are smaller than 0.05. Thus, it can be concluded that tourism and promotional facilities have a positive and significant effect on the interest of tourists visiting the Bah Damanik Bath.

Hypothesis Test (T Test)

Table 10. T Test (Partial) Coefficients[a]

Model	Unstandardized Coefficients		Unstandardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1.(Constant)	3.424	3.099		1.105	.275
Tourist Facilities	.369	.091	.463	4.073	.000
Promotion	.452	.136	.377	3.316	.002

a. Dependent Variable: Interest in Visiting

Based on the results of Table 10 above, it can be seen that:

1. The calculated value for the variable of tourist facilities is 4.073 and the significant value is 0.000 < alpha 0.05, so the variable of tourist facilities has a partial significant effect on the interest in visiting.

2. The calculation value for the promotional variable is 3,316 and the significant value is 0.002 < alpha 0.05, so the promotional variable also has a partial significant effect on the interest in visiting.
3. A Sig value of 0.275 is not significant, indicating that if the tourist and promotional facilities are worth 0.

The results of this study are in line with several previous studies that stated that the quality of complete and comfortable facilities can increase the attractiveness of tourist visits (sari, 2021). However, this study is different from the previous research in terms of the number and types of variables observed. Thus, it can be concluded that the improvement of tourist facilities and promotions respectively will increase the interest of tourist visits in a real and significant way.

F Test (Simultaneous)

The F test was used to test whether the independent variables (Tourism facilities and promotions) together had a significant effect on the dependent variables (Interest in visiting).

Table 11. Simultaneous Test Results (F Test) ANOVA

Model	Sum of Square	Df	Mean Square	F	Sig.
1.Regresion	118.786	2	59.393	17.365	<,001[b]
Residual	157.336	46	3.420		
Total	276.122	48			

a.Dependent variable: Visiting Interest
b.Predictors: (Constant), Promotions, Tourism Facilities

Based on Table 11 above, it can be seen that the Fcal value is 17,365 with a significance value of <0.001 which is smaller than alpha 0.05. So, the decision taken H0 is accepted H1, thus simultaneously the variables of tourist facilities have a significant effect on the interest of tourists to visit.

Coefficient Determination Test

Table 4.12 Determination Coefficient Test Results (R2) Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.656[a]	.430	.405	1.84942

a. Predictors: (Constant), Promotions, Tourism Facilities

The Coefficient of Determination (R2) is used to measure how far the model's ability to explain variations in dependent variables (Ghozali, 2018). From the results of multiple linear regression analysis in table 4.10, the *value of R Square* (R2) was obtained as 0.430. This shows that 43.0% of variations or changes in interest in visiting can be explained by the variables of tourism facilities and promotions together. Meanwhile, it can be explained by the variables of Tourism and Promotion Facilities together. Meanwhile, the R2 value is 57% which (100% - 43.0% = 57%) is influenced by variable factors outside the study, such as ticket prices, weather, and so on.

Discussion

1. The Influence of Tourist Facilities on Tourists' Interest in Visiting

The results of the study show that tourist facilities have a significant influence on the interest of tourists visiting Bah Damanik Bath. Adequate, clean, and comfortable facilities are one of the determining factors in tourists' decisions in choosing tourist destinations. This is in

accordance with the opinion of Sintyawati (2024) who stated that complete facilities will increase the comfort and satisfaction of visitors, thereby encouraging them to return or recommend to others.

2. The Effect of Promotion on Tourist Interest

In addition, promotion has also been proven to have a significant impact. Promotional strategies carried out through social media, the internet, and information presented in an attractive manner are effective in building a positive image of tourist destinations. Promotions that are in accordance with real conditions in the field increase tourists' confidence, thereby boosting their interest in visiting. These findings support the research of Hutasoit et al. (2024) which emphasizes the importance of digital promotion in attracting tourists' attention, especially in the current technological era.

3. The Influence of Tourism Facilities and Promotion on Tourist Interest in Visiting

When analyzed simultaneously, tourism and promotional facilities are able to make a strong contribution to increasing interest in visits. This can be seen from the response of the majority of visitors who expressed interest in visiting again, were willing to recommend to others, and felt satisfied with the experience obtained. These findings prove that the combination of improving the quality of facilities and the right promotional strategy can be the main key in developing the attractiveness of tourist destinations.
Overall, the results of this study show that the management of Bah Damanik Bath needs to continue innovating by improving facilities and strengthening more creative and informative promotional activities. Thus, these destinations can sustain the interest of returning tourists and attracting new tourists on a continuous basis.

4. Comparison with National and Global Tourism Trends

In a global context, the tourism sector has experienced significant growth, especially after the COVID-19 pandemic. According to the UNWTO report (2024), international tourist arrivals in 2023 have recovered to 88% of pre-pandemic levels. Nature-based tourism, local culture, and authentic experiences are increasingly popular among global travellers, especially among millennials and Gen Z. This aligns with trends in Indonesia, where the Ministry of Tourism and Creative Economy aims to increase visitor numbers to local destinations offering natural, cultural, and local experiences (Kemenparekraf, 2025). Destinations such as touristic villages and natural hot springs like Bah Damanik are concrete examples of this trend. However, to compete in the modern tourism market, destinations like Bah Damanik Hot Springs need to adopt more aggressive digital promotion strategies, including social media optimization, collaborations with travel vloggers, and leveraging digital reviews (TripAdvisor, Google Maps). In terms of facilities, many top destinations in Indonesia—such as Puncak B29 in Lumajang or Bukit Lawang in Langkat—have invested in basic facilities and aesthetic photo spots to increase visitor interest and length of stay. Thus, the findings of this study not only reflect local phenomena but also indicate that Bah Damanik Hot Spring has significant potential if it can align itself with the direction of national and global tourism development. Emphasizing facility comfort and digitalizing promotions are key to the success of future tourism destination development.

4. Conclusion

This study shows that tourism facilities and promotion have a significant effect on tourists' interest in visiting, both partially and simultaneously. Clean, complete, and easily accessible facilities increase the comfort and attractiveness of a destination, while creative, consistent, and authentic promotion strengthens the image and encourages the decision to visit. The combination of the two produces a greater synergistic effect on increasing visits.

Based on the data analysis and discussions conducted, it can be concluded that:

1. Tourist facilities have a significant effect on the interest of visitors. Adequate facilities such as clean toilets, parking lots, attractive photo spots, and environmental comfort have been proven to increase the interest of visitors to come to Bah Damanik Bath. Most respondents agreed that the facilities at Bah Damanik Bath were sufficient to support the comfort of traveling.
2. Promotions have a significant influence on tourist visits. Promotions carried out through social media, attractive visual content, and positive testimonials have proven to be effective in attracting the attention of potential visitors.
3. Simultaneously, tourism facilities and promotions have a significant effect on the interest of tourist visits, that the combination of providing good facilities and the right promising strategy can increase the number of tourists visits more optimally.

Research Limitations

This study is limited to one location, Pemandian Bah Damanik, with a limited number of respondents. The variables studied only include facilities and promotion, so other factors such as service quality, price, and destination image have not been considered.

Recommendations for Further Research

Future research is recommended to involve more diverse destinations and larger samples, as well as adding other variables for a more comprehensive analysis. The use of mixed methods is also recommended to gain a deeper understanding of tourist behavior and motivations.

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THE EFFECT OF SERVICE QUALITY AND BREAKFAST MENU VARIATION ON GUEST SATISFACTION AT ARYADUTA BALI HOTEL

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Abstract

This study aimed to explore how service quality and the variety of breakfast menus influence guest satisfaction at the Aryaduta Bali Hotel. The research took place directly at the hotel, focusing on guests who stayed and had breakfast during the study period. The sampling method used was probability sampling with a random sampling technique, ensuring that every guest had an equal chance of being selected. A total of 100 guests participated as respondents. The study examined two independent variables: service quality and breakfast menu variety and one dependent variable, namely guest satisfaction. Data were collected through questionnaires using a 5-point Likert scale, ranging from strongly disagree to strongly agree. To analyze the data, multiple linear regression was used. Hypothesis testing was carried out through both t-tests (to examine partial effects) and F-tests (to examine simultaneous effects), with all data processing conducted using SPSS version 26. The findings revealed a coefficient of determination (R^2) of 0.799, indicating that 79.9% of the variation in guest satisfaction could be explained by service quality and breakfast menu variety. The remaining 20.1% was influenced by other factors not included in this study. Individually, both service quality and breakfast menu variety were found to have a positive and significant impact on guest satisfaction. When considered together, these two variables also had a strong and positive effect on overall guest satisfaction at Aryaduta Bali Hotel.
Keywords: Service Quality; Breakfast Menu Variety; Guest Satisfaction.

1. Introduction

With the growing number of domestic and international tourists, Bali's hospitality sector has experienced significant expansion. To meet rising guest expectations, hotels strive to deliver the highest quality service. One of the most effective ways to measure a hotel's success is by assessing whether guests are satisfied, willing to return, and likely to recommend the hotel to others (Suprina et al., 2022). As a star-rated hotel in Kuta, Hotel Aryaduta Bali faces the challenge of maintaining guest satisfaction. Despite offering numerous facilities and services, the hotel continues to receive complaints regarding service quality and breakfast menu options. This indicates the need for an evaluation of factors influencing guest satisfaction at Hotel Aryaduta Bali.

Initial observations revealed several concerns from guests, including unresponsive service from hotel staff, particularly in handling special requests, as well as complaints about a limited and less diverse breakfast menu that did not cater to international guests' preferences. These issues highlight potential shortcomings in service quality and menu variety, both of which can significantly affect guest satisfaction.

Service quality is one of the key elements shaping a guest's overall experience. The way hotel staff interact with and attend to guests can strongly influence their perception of the stay. Friendly, prompt, and professional service enhances guest satisfaction, while poor service often leads to complaints and dissatisfaction.

Breakfast is another essential service provided by hotels. The variety of breakfast options offered can significantly affect guest satisfaction, especially for long-stay guests. A monotonous breakfast menu can lead to boredom and reduced satisfaction, whereas a varied menu tailored to guests' tastes enhances satisfaction and creates a more enjoyable experience.

Previous studies consistently demonstrate a strong correlation between service quality, menu variety, and guest satisfaction. For example, Cahyadi (2022) found that service quality significantly impacted guest satisfaction at The Haven Bali Seminyak, with empathy and assurance being the most influential factors. Similarly, Simanjuntak and Asnur (2023) reported that breakfast menu variations contributed 57.1% to guest satisfaction at the Grand Basko Hotel Padang. Suyoga (2022) emphasized the importance of both food and service quality, noting that each had a significant effect on guest satisfaction and showed a strong combined influence at the Fontana Hotel Bali. Supporting these findings, Fredirikus (2021) concluded that both menu variety and service quality significantly influenced guest satisfaction at the Victory Kefamenanu Hotel, with menu variety being the most dominant factor. More recently, Dwiantari et al. (2025) confirmed that both service quality and menu variety play crucial roles in shaping customer satisfaction, reinforcing their importance in the hospitality industry.

2. Methodology

This research was carried out at the Aryaduta Bali Hotel in June 2024. The study made use of both primary and secondary data. The data collection process involved several methods, including documentation from the hotel, questionnaires filled out by respondents, direct field observations, and literature reviews using academic sources such as journals, theses, and books. The study population totaled 19,854 individuals, and the sample size of 100 respondents was determined using the Slovin formula. To analyze the data, the study applied a quantitative descriptive approach, followed by multiple linear regression analysis.

3. Results and Discussion

Validity Test

The validity test was conducted to assess how accurately the research instrument measured what it was intended to measure. An instrument is considered valid if the calculated r-value is equal to or greater than 0.195. The validity results for each research variable are presented as follows:

Table 4.1. Validity of Service Quality Variable Instrument (X1)

Instrument	Validity Value		Description
	rhitung	Rtable	
Quality Service 1	0.671	0.195	valid
Quality Service 2	0.698		valid
Quality Service 3	0.827		valid
Quality Service 4	0.675		valid
Quality Service 5	0.626		valid
Quality Service 6	0.819		valid
Quality Service 7	0.742		valid
Quality Service 8	0.855		valid

Based on Table 4.1, it can be seen that each item in the service quality variable has an r-value equal to or greater than 0.195. This indicates that all the statement items used to measure the service quality variable are valid.

Table 4.2. Validity of the Breakfast Menu Variation Variable Instrument (X2)

Instrument	Validity Value		Description
	rhitung	Rtable	
Breakfast Menu Variations 1	0.724	0.195	valid
Breakfast Menu Variations 2	0.790		valid
Breakfast Menu Variations 3	0.767		valid
Breakfast Menu Variations 4	0.795		valid
Breakfast Menu Variations 5	0.771		valid
Breakfast Menu Variations 6	0.850		valid
Breakfast Menu Variations 7	0.702		valid
Breakfast Menu Variations 8	0.756		valid
Breakfast Menu Variations 9	0.826		valid

Referring to Table 4.2, the results show that each item in the breakfast menu variations variable has a calculated r-value of 0.195 or higher. Therefore, it can be concluded that all the statements used to measure this variable are valid.

Table 4.3. Validity of Guest Satisfaction Variable Instrument (Y)

Instrument	Validity Value		Description
	rhitung	Rtable	
Guest Satisfaction 1	0.702	0.195	valid
Guest Satisfaction 2	0.874		valid
Guest Satisfaction 3	0.819		valid
Guest Satisfaction 4	0.754		valid
Guest Satisfaction 5	0.688		valid
Guest Satisfaction 6	0.832		valid
Guest Satisfaction 7	0.854		valid
Guest Satisfaction 8	0.802		valid

Based on Table 4.3, each item in the guest satisfaction variable (Y) shows a calculated r-value of 0.195 or higher. This indicates that all the statement items used to measure guest satisfaction are valid.

Reliability Test

Reliability testing was conducted to ensure that the instrument used in this study is consistent, stable, and dependable when applied repeatedly over time. An instrument is considered reliable if it produces a Cronbach's Alpha value of 0.60 or higher. The results of the reliability test are presented as follows:

Table 4.4. Reliability Results

No	Variables	Cronbach's Alpha	Decision
1	Service Quality (X1)	0.873	Reliable
2	Breakfast Menu Variations(X2)	0.912	Reliable
3	Guest Satisfaction(Y)	0.905	Reliable

The results of the reliability test show that the Cronbach's Alpha values for all variables are above 0.60. This indicates that the questionnaire used in this study is reliable and can be trusted to consistently measure the intended variables.

Partial Test (T-Test)

The partial test is used to examine how each independent variable individually influences the dependent variable. This test is carried out using the t-test by comparing the significance (Sig.) value with the alpha level of 0.05, as well as comparing the calculated t-value with the t-table value. The decision-making criteria are as follows:

Table 4.5. Partial Test Results Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	4.644	1,384		3.357	.001
	Quality of Service	.390	.066	.412	5,870	.000
	Breakfast Menu Variations	.432	.056	.539	7,670	.000

a. Dependent Variable: Satisfaction Visitor

The t-value for the service quality variable is 5.870, which is greater than the t-table value of 1.984, and the significance value is 0.000, which is less than the alpha level of 0.05. This means that H_0 is rejected and H_1 is accepted, indicating that service quality has a positive and significant effect on guest satisfaction when tested partially. The t-value for the breakfast menu variation variable is 7.670, which also exceeds the t-table value of 1.984, with a significance value of 0.000. Since this is below the 0.05 threshold, H_0 is rejected and H_1 is accepted, showing that breakfast menu variation also has a positive and significant impact on guest satisfaction.

Simultaneous Test (F Test)

Simultaneous testing is used to determine the combined effect of multiple independent variables on a single dependent variable. This test helps assess whether the independent variables, when considered together, have a significant influence. The decision-making criteria are based on the comparison of the significance value and the predefined alpha level.

Table 4.6 Simultaneous Test Results ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2076.789	2	1038.394	193,328	.000b
	Residual	521,001	97	5.371		
	Total	2597.790	99			

a. Dependent Variable: Guest Satisfaction

b. Predictors: (Constant), Breakfast Menu Variety, Service Quality

Based on the table above, it can be seen that the value Fcount 193.328 ≥ from the Ftable value of 3.09 and a significant value of 0.000≤from alpha 0.05. Then H0 is rejected H3 is accepted, thus simultaneously service quality and breakfast menu variety have a positive and significant effect on guest satisfaction at Hotel Aryaduta Bali.

Multiple Linear Regression Analysis

This test was carried out to examine how service quality and breakfast menu variations influence guest satisfaction at the Aryaduta Bali Hotel. The table below presents the results of the multiple linear regression analysis for each of the variables studied:

Table 4.7Multiple Linear Regression Results Coefficientsa

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	4.644	1,384		3.357	.001
	Quality of Service	.390	.066	.412	5,870	.000
	Breakfast Menu Variations	.432	.056	.539	7,670	.000

a. Dependent Variable: Satisfaction Visitor

Based on the test results above, the following multiple linear regression equation is obtained:

$$Y=4.644+0.390X1+0.432X2 \quad (1)$$

In the multiple linear regression model, the constant value for guest satisfaction was found to be 4.644. This means that if both independent variables service quality and breakfast menu variety are assumed to be zero, the baseline value of guest satisfaction would still be 4.644. The regression coefficients for both independent variables are positive, indicating that improvements in service quality and the variety of the breakfast menu contribute positively to increasing guest satisfaction at the Aryaduta Bali Hotel.

Coefficient of Determination

The coefficient of determination (R^2) is used to measure how well the model explains the variation in the dependent variable. Its value ranges from 0 to 1, where a value closer to 1 indicates that the independent variables have a stronger influence on the dependent variable. The results of the R^2 analysis are shown in the table below.

Table 4.8. Determination Coefficient Results Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.894[a]	.799	.795	2.318

a. Predictors: (Constant), Breakfast Menu Variety, Service Quality

b. Dependent Variable: Guest Satisfaction

The coefficient of determination (R^2) value obtained was 0.799, or 79.9%. This means that service quality and breakfast menu variety together explain 79.9% of the variation in guest satisfaction at the Aryaduta Bali Hotel. The remaining 20.1% is influenced by other factors not covered in this study, such as hotel facilities, pricing, and other possible variables.

The growing influx of tourists to Bali has placed Hotel Aryaduta Bali in an increasingly competitive environment. Guest satisfaction is not only an indicator of service success but also a key determinant of loyalty and the hotel's image. Two critical factors that often receive attention are service quality and breakfast menu variety. In a global context these two elements have been proven to play an essential role in shaping a satisfying stay experience.

International studies show that service quality has a significant impact on guest satisfaction and loyalty. Breakfast at a hotel is not merely a basic need but is regarded as a "signature experience" that influences guests' decisions to return. Research by Wijaya (2025) found that breakfast variety affects a hotel's competitive perception, especially in attracting international guests with diverse preferences. A global survey by Leite-Pereira et al. (2023) revealed that

European travellers prioritize a wide selection of bread and fresh products, while Asian guests expect rice options and hot dishes.

When compared to international hotel benchmarks, five-star hotels in Europe and Asia have adopted a “localized-global menu” strategy, which combines international options with local dishes to meet global guest expectations (Abdullah et al., 2023). This approach not only enhances satisfaction but also creates an authentic experience. Hotel Aryaduta Bali needs to review its breakfast menu policy and strengthen its service standards to align with global practices. Theoretically, this study reinforces the SERVQUAL model, which states that dimensions of service quality should be integrated with product offerings (in this case, menu variety) to achieve optimal guest satisfaction.

4. Conclusion

Based on the results of testing and data analysis related to service quality and breakfast menu variety in relation to guest satisfaction at the Aryaduta Bali Hotel, it can be concluded that both factors have a meaningful impact. The first hypothesis test confirms this, as shown by the coefficient of determination (R^2) value of 79.9%, indicating that service quality and breakfast menu variety together explain a significant portion of the variation in guest satisfaction. The second hypothesis test, which examined the variables simultaneously, shows that the F-count value of 193.328 is greater than the F-table value of 3.09, with a significance level of 0.000 well below the 0.05 threshold indicating a strong joint influence. Individually, the t-value for service quality is 5.870 (greater than the t-table value of 1.984), with a significance value of 0.000. Likewise, the breakfast menu variation variable has a t-value of 7.670 and a significance value of 0.000, both meeting the criteria for significance. These results clearly demonstrate that both service quality and the variety of breakfast menus have a positive and significant effect on guest satisfaction at the Aryaduta Bali Hotel.

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DESIGN OF WEB-BASED STUDENT ABSENCE SYSTEM TO IMPROVE ATTENDANCE EFFECTIVENESS AT SMP IT NURUL ILMI MEDAN ESTATE

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Abstract

The problem raised in this study is the low effectiveness of recording student attendance at SMP IT Nurul Ilmi Medan Estate due to the use of a paper-based manual system. This results in delays in data recapitulation, the risk of data loss, and inaccuracy in recording. To overcome these problems, this study aims to design a web-based student attendance system that can be used in real time, accurately, and integrated for use by teachers and administrative staff. This study uses the Research and Development (R&D) method with the Waterfall model. Data collection was carried out through observation, interviews, and documentation studies. This system was developed using the PHP programming language with the Laravel and Bootstrap frameworks as interfaces. The test results showed an increase in the efficiency of recording time and an increase in data accuracy by 60%. This system also supports multi-role login features, automatic notifications to parents, and print report features. This study shows that the web-based attendance system is effective in increasing the efficiency and accuracy of student attendance management.
Keywords: Attendance system; Web-based; Attendance effectiveness.

1. Introduction

The development of information technology (IT) continues to transform various sectors, including education. One critical aspect affected by this advancement is the student attendance recording system. SMP IT Nurul Ilmi Medan Estate still utilizes a manual, paper-based system to record attendance, resulting in delays in recap reports, data loss, inaccuracies, and limited access for stakeholders. Research by Aizah and Santoso (2024) and Januartika et al. (2023) has shown that digital attendance systems, particularly web-based ones, can improve operational efficiency by up to 78% compared to manual methods. These systems not only accelerate attendance recording but also enhance accuracy in monitoring and reporting. Additionally, Jabar (2024) found that digital attendance systems increase user accountability and provide timely feedback to relevant parties.

Although the technology is available, SMP IT Nurul Ilmi has not yet implemented a digital attendance model. The gap between administrative needs and the tools used highlights a lack of system integration and real-time capabilities. To address this issue, this study proposes the design of a web-based student attendance system tailored to the school's operational needs and technological capacity. To support system design and ensure effective implementation, this study adopts the Software Development Life Cycle (SDLC) framework, specifically the Waterfall model, which emphasizes sequential stages, including requirement analysis, system design, implementation, testing, and deployment (Justan & Aziz, 2024; Yam, 2024). This structured approach provides a strong theoretical foundation for system development.

Therefore, this study aims to design a web-based attendance system that is accurate, integrated, user-friendly, and accessible in real-time to teachers, administrative staff, and parents. The system is expected to improve attendance effectiveness and serve as a model for other educational institutions seeking to digitize their administrative functions.

2. Methodology

This study employs a software engineering design approach to develop a student attendance system tailored to the operational needs of SMP IT Nurul Ilmi. The research process begins with the identification of system needs, followed by analysis, design, and implementation of the system prototype. The research was conducted directly at SMP IT Nurul Ilmi Medan Estate, located in Medan, North Sumatra. To obtain accurate and relevant data, several data collection techniques were used, namely: direct observation of the production process and recording that occurs in the field, structured interviews with management and operators to obtain detailed information about system needs, and literature studies to understand the theory and basic principles in designing web-based information systems.

This research employs the Research and Development (R&D) method, combined with the Software Development Life Cycle (SDLC) framework using the Waterfall model. The stages involved include: (1) requirements analysis; (2) system design; (3) implementation; (4) testing; and (5) deployment. This model was chosen to ensure a systematic development process with clear outputs at each stage (Justan & Aziz, 2024). The research was conducted at SMP IT Nurul Ilmi Medan Estate. Data collection was conducted through direct observation of the school's attendance process, structured interviews with teachers and administrative staff, and a review of relevant documents. A literature review was also conducted to examine the implementation of similar systems (Ganesha, 2022; Hardani et al., 2020).

For system modelling, tools such as flowcharts, Data Flow Diagrams (DFDs), and Entity-Relationship Diagrams (ERDs) were used to visualize data processes and database design. The system was developed using PHP (Laravel framework), MySQL as the database, and Bootstrap for the user interface. These tools were selected because they are open-source and compatible with educational environments. System design is done with tools such as:

Flowcharts are used to describe the overall flow of the attendance recording process.

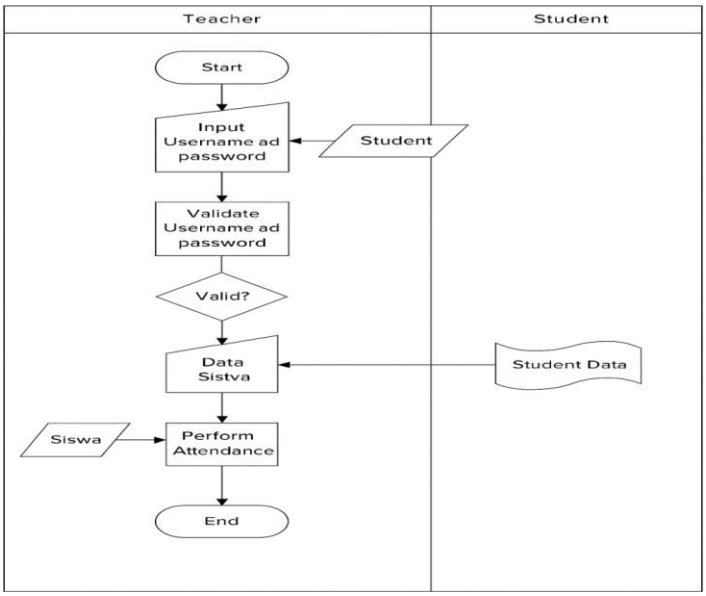

Fig. 1. System flowchart

Data Flow Diagrams (DFD) are used to depict the flow of data between processes and entities in a system.

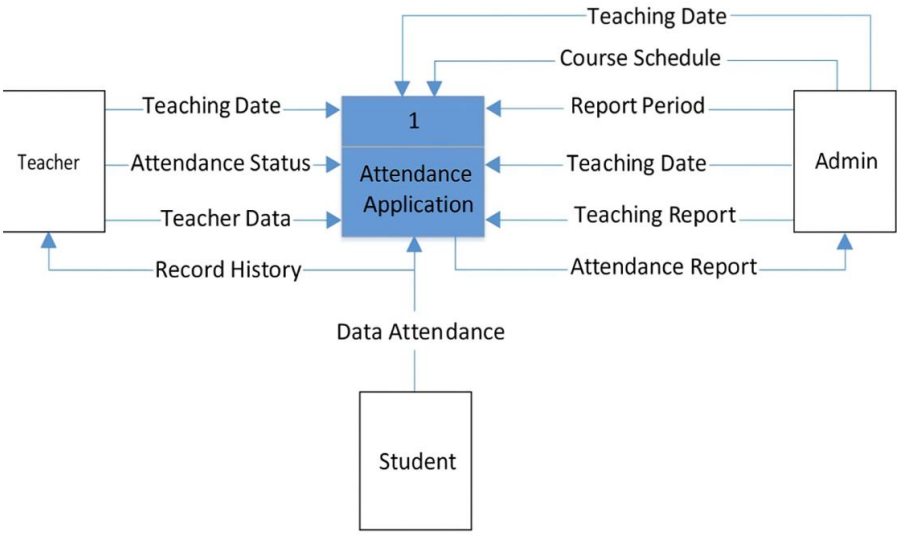

Fig. 2. Data Flow Diagram (DFD)

An Entity-Relationship Diagram (ERD) is used to design a relational database structure that stores production data, raw materials, and other information systematically.

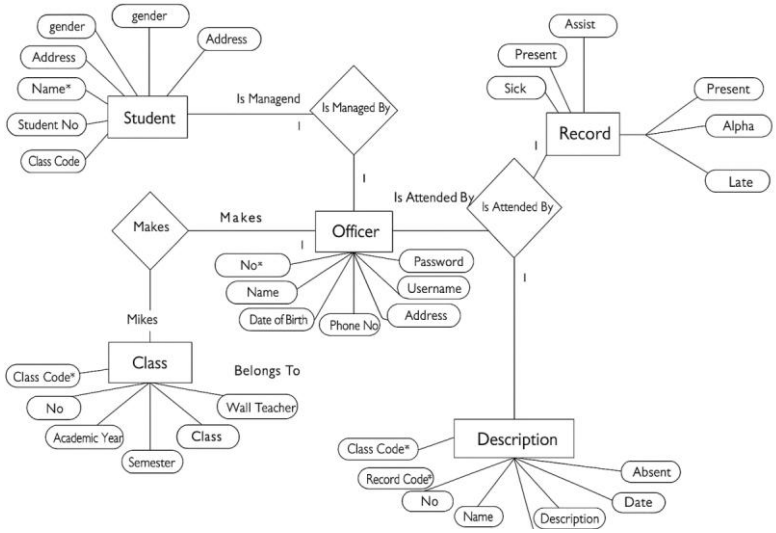

Fig. 3. Entity Relationship Diagram (ERD)

System development is done using:

1. HTML to build the structure of the interface page.
2. PHP is a backend programming language that handles system logic and processes.
3. MySQL as a database management system is used to store and manage all data in the system.

3. Results and Discussion

Some of the key features of this system include:

1. Automatic attendance input with the status options Present, Permission, Sick, or Alpha.
2. Daily and monthly recap, which can be downloaded in print format.
3. Absence notification to parents directly through the system.
4. Multi-role login, namely Admin, Teacher, and Homeroom Teacher, to differentiate user access rights.

Through a system trial on one study group, an increase in attendance recording efficiency of up to 60% was achieved compared to the manual method. Teachers no longer need to copy attendance data to a recap book or report separately to administrative staff. The system automatically calculates the number of attendances, displays late statistics, and allows attendance reports to be printed periodically.

Overall, the implementation of a web-based attendance system at SMP IT Nurul Ilmi Medan Estate has significantly increased the effectiveness of student attendance management. This system is not only an administrative tool but also serves as a strategic instrument to foster a culture of discipline, enhance school-parent communication, and lay the groundwork for the integration of a broader educational information system in the future. Testing was carried out using a questionnaire distributed to respondents consisting of students, teachers, and school operators. The purpose of this test is to measure the effectiveness of system attendance information towards increasing attendance and ease of managing attendance data.

Number of respondents:

Students: 50 people
Teachers: 20 people
Operator/admin: 5 people

Rating scale method:

A 5-point Likert scale is used, namely:

a. 5 = Strongly Agree
b. 4 = Agree
c. 3 = Neutral
d. 2 = Disagree
e. 1 = Strongly Disagree

Here are some indicators used in the questionnaire:

Table 1. Questionnaire indicators

No	Indicator
1	The system makes it easier to record attendance
2	The system increases student/teacher awareness to attend
3	The attendance process becomes faster and more efficient
4	Attendance information is easily accessible by relevant parties
5	Attendance data is more accurate than manual systems
6	The system helps teachers/admins in attendance recapitulation
7	The system rarely experiences disruptions or errors

The following is an example of the results of processing average data based on respondent answers:

Table 2. Average user satisfaction scores

Indicator	Average Grade (Students)	Average Value (Teacher)	Average Value (Admin)
1	04.06	04.07	05.00
2	04.03	04.05	04.08
3	04.05	04.06	04.09

Indicator	Average Grade (Students)	Average Value (Teacher)	Average Value (Admin)
4	04.02	04.03	04.07
5	04.04	04.06	04.08
6	04.03	04.07	05.00
7	04.01	04.04	04.06

Based on the results above, it was found that the average value of all indicators was above 4.0, indicating a high level of satisfaction and effectiveness among system users.

1. Highest indicators: Ease of recapitulation of absences and recording of attendance (value close to 5).
2. Lowest indicator: System stability (there are still reports of minor glitches, although the score remains high above 4.0).

The system interface is designed with a user-centred design approach. Each page, such as dashboard, Student Data, Teacher Data, Class Data, and Attendance Report, is designed to be easy to use even for non-technical users. Neutral colours and intuitive layout support easy navigation.

The Dashboard page functions as the main page of the web-based attendance system, which is designed to display a summary of important information in real-time to users. This form functions as an initial control and monitoring centre and presents data in an easy-to-understand visual form.

Fig.7. Dashboard form view

The Student Data page functions to manage all information related to students. This form serves as the central hub for inputting and managing student data used in the attendance process and reporting.

Fig. 8. Student data form display

The Teacher Page displays and manages all teaching staff in the school. This form functions as a data centre that stores teacher identities, roles, and access to the system, including attendance and teaching activities.

Fig. 9. Teacher data form display

The Class Data page is used to display, add, change, and delete class data at school.

Fig. 10. Class data form view

The Form page is used to present student attendance in a structured and informative manner. This form enables users, including administrators, homeroom teachers, and teachers, to view, print, and export daily, weekly, or monthly attendance reports using various available filters.

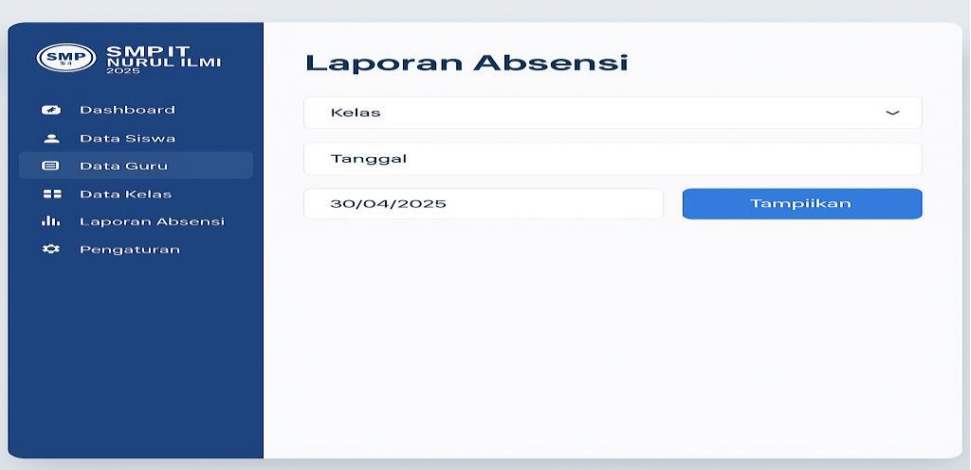

Fig. 11. Attendance report form display

The settings page is used to manage the general configuration of the system, both technically and administratively. This menu can generally only be accessed by users with special access rights, such as admin.

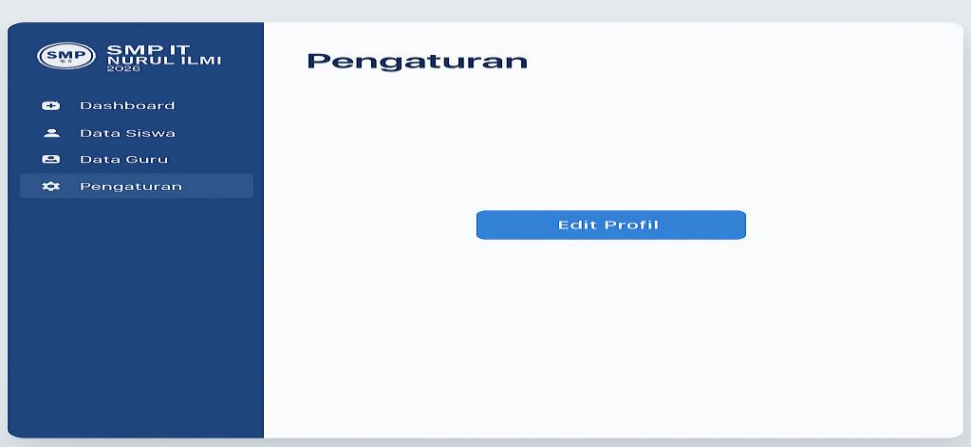

Fig. 12. Settings form view

The main problem faced by SMP IT Nurul Ilmi Medan Estate before the system development was the low effectiveness in the process of recording student attendance. The attendance system, which still relies on a manual paper-based method, presents various obstacles, including delays in data recapitulation, the risk of losing archives, and inaccuracies in daily recording. This has a direct impact on decreasing the efficiency of learning time, the lack of parental involvement in monitoring children's attendance, and the limitations of the school in conducting comprehensive student attendance evaluations. The development of a web-based attendance system is designed to address these issues through an automated and digitized data approach. This system employs a client-server architecture that enables teachers and homeroom teachers to record attendance in real-time, providing direct access to administration and parents.

4. Conclusion

This research shows that the implementation of a web-based student attendance system at SMP IT Nurul Ilmi Medan Estate has successfully increased the efficiency, accuracy, and speed of student attendance recording. The system was designed to replace the manual method currently used and has been proven to reduce recording time by up to 60%. Key system features include real-time attendance recording, daily and monthly attendance recaps,

multi-level access for administrators, teachers, and homeroom teachers, as well as an automatic notification system for parents regarding student absences.

The design process employed a waterfall model approach, encompassing needs analysis, system design using Laravel and Bootstrap, and data modelling using DFDs and ERDs tailored to the school's needs. System trials, conducted through observations and questionnaires in one class, demonstrated the system's success in meeting the school's need for fast and accurate attendance recording. The average user satisfaction rating was above 4.0 on a five-point Likert scale, indicating that the system was well-received and effective in strengthening communication between the school, students, and parents.

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TRANSFORMASI DIGITAL DALAM PENGURUSAN CUTI: SATU KAJIAN TERHADAP KEBERKESANAN SISTEM CUTI PINTAR

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Abstrak

Kajian ini dijalankan bagi menilai keberkesanan pelaksanaan PCOM *eLeave Application* dalam mempertingkatkan kecekapan pengurusan cuti di PCOM, yang merupakan sebuah syarikat teknologi tempatan yang memberi tumpuan kepada pembangunan dan penyediaan penyelesaian sistem komunikasi, terutamanya dalam bidang gentian optik, penyelesaian jalur lebar dan rangkaian infrastruktur. Amalan sedia ada iaitu proses permohonan cuti pekerja adalah secara manual sepenuhnya dan secara langsung memberikan kesukaran kepada pengurusan bagi tujuan pemantauan dan rekod. Fokus utama kajian adalah untuk meneliti sejauh mana sistem ini mampu menggantikan kaedah pengurusan cuti secara manual yang lazimnya memerlukan masa yang panjang, tenaga kerja yang tinggi serta berisiko terhadap kesilapan manusia. Objektif kajian ini merangkumi tiga aspek utama iaitu mengkaji keberkesanan sistem dalam meningkatkan kecekapan pengurusan cuti, analisis terhadap keupayaan sistem dalam aspek penggunaan masa dan tenaga, dan menambah baik pengurusan cuti dengan penggunaan sistem yang lebih sistematik dan berkesan. Kaedah kajian yang digunakan adalah kuantitatif melalui pengedaran soal selidik kepada kakitangan organisasi yang terlibat secara langsung dalam penggunaan sistem tersebut. Dapatan kajian menunjukkan bahawa sistem ini berjaya meningkatkan pengurusan cuti melalui pemprosesan permohonan yang lebih pantas dan efisien, rekod cuti yang tersusun, serta pengurangan beban kerja staf dalam pengendalian permohonan cuti. Kajian ini mencadangkan agar menambah baik paparan antara muka agar lebih interaktif, menyediakan panduan pengguna yang jelas terutamanya untuk staf baharu, serta memperkenalkan fungsi tambahan seperti notifikasi masa nyata dan penjejakan status permohonan secara langsung.
Kata kunci: Digital; E-cuti; Keberkesanan.

1. Pengenalan

Dalam era digital masa kini, penggunaan sistem automasi dalam pengurusan sumber manusia menjadi satu keperluan penting bagi meningkatkan kecekapan operasi sesebuah organisasi. Sistem digital bukan sahaja membantu mempercepat proses kerja, malah meningkatkan ketepatan dan kebolehkesanan dalam pengurusan data serta pengambilan keputusan (Lim & Hashim, 2020; Rahman, Zainuddin, & Omar, 2021). Di PCOM, sebuah syarikat teknologi tempatan yang terlibat dalam pembangunan sistem komunikasi seperti fiber optik, penyelesaian jalur lebar dan infrastruktur rangkaian, proses pengurusan cuti masih dijalankan secara manual. Amalan ini bukan sahaja memakan masa, malah menyukarkan pemantauan dan penyimpanan rekod cuti pekerja. Justeru, kajian ini dijalankan bagi menilai keberkesanan pelaksanaan Sistem Cuti Pintar (*Smart Leave System*) dalam menggantikan sistem manual yang sedia ada. Penekanan diberikan kepada aspek peningkatan kecekapan, pengurangan masa serta tenaga kerja, dan penambahbaikan proses pengurusan cuti secara sistematik dan automatik. Kajian ini juga bertujuan menyokong inisiatif pendigitalan organisasi dengan memanfaatkan teknologi dalam urusan harian pengurusan sumber manusia (Nawi & Ahmad, 2022; Kamarudin & Saad, 2019).

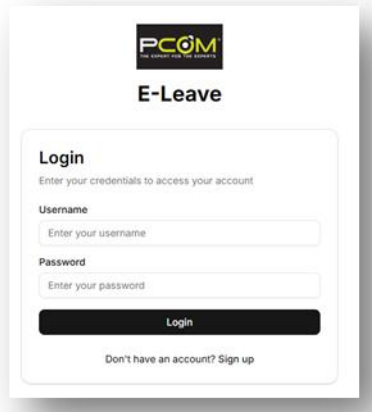
2. Metodologi

Kajian ini menggunakan pendekatan kuantitatif sebagai kaedah utama, dengan pengumpulan data dilakukan melalui pengedaran soal selidik berstruktur kepada kakitangan PCOM yang menggunakan Sistem Cuti Pintar. Soal selidik ini direka bentuk berdasarkan skala Likert lima mata, yang membolehkan responden menyatakan tahap persetujuan mereka terhadap kenyataan-kenyataan berkaitan keberkesanan sistem, kemudahan penggunaan, ketepatan rekod, serta impaknya terhadap beban kerja dan kecekapan organisasi. Pemilihan responden dibuat melibatkan pengurusan, pihak sumber manusia dan pekerja itu sendiri.

Dalam kajian ini, data yang dikumpulkan adalah melalui soal selidik yang telah diedarkan. Soal selidik yang dibangunkan mengandungi empat elemen utama merangkumi maklumat demografi, analisis keberkesanan, maklum balas antara muka dan kepuasan pelanggan. Soal selidik yang dibangunkan juga mengandungi soalan terbuka bagi mendapatkan maklum balas langsung responden berkaitan perbandingan sistem tradisional dengan sistem yang dibangunkan, kekuatan utama sistem yang dibangunkan, kelemahan dan cabaran yang dihadapi dalam penggunaan sistem dan cadangan penambahbaikan.

Selain pendekatan kuantitatif, pendekatan kualitatif melalui temu bual separa berstruktur turut dicadangkan sebagai kaedah sokongan untuk mendapatkan maklum balas secara mendalam daripada pihak pengurusan dan penyelia jabatan yang terlibat secara langsung dalam proses kelulusan cuti. Temubual ini bertujuan untuk mengenal pasti cabaran pelaksanaan sistem, serta cadangan penambahbaikan berdasarkan pengalaman sebenar pengguna. Gabungan kedua-dua pendekatan ini diharap dapat memberikan gambaran yang lebih menyeluruh terhadap keberkesanan pelaksanaan Sistem Cuti Pintar di PCOM.

Sistem ini juga boleh terus diakses secara atas talian melalui pautan https://pcom-e-leave.vercel.app/. Ianya perlu diakses melalui nama pengguna dan kata laluan yang telah ditetapkan. Berikut merupakan paparan antara muka sistem yang telah dibangunkan (Rajah 1).



Rajah 1. Paparan antara muka PCOM

3. Dapatan dan Perbincangan

Berdasarkan hasil dapatan soal selidik yang dijalankan, didapati bahawa majoriti responden bersetuju bahawa sistem yang dibangunkan ini telah berjaya meningkatkan kecekapan pengurusan cuti di PCOM. Responden menyatakan bahawa sistem ini memudahkan proses permohonan dan kelulusan cuti, memberikan akses cepat kepada maklumat baki cuti, serta mengurangkan keperluan dokumentasi manual yang sebelum ini membebankan. Selain itu, antara muka yang mesra pengguna dan kemudahan penjanaan laporan juga turut membantu pihak pengurusan dalam membuat keputusan dengan lebih efisien. Secara keseluruhan, dapatan ini menunjukkan bahawa objektif untuk menilai keberkesanan sistem dalam mempertingkat pengurusan cuti telah dicapai dengan baik. Penemuan ini sejajar dengan

kajian oleh Rahman et al. (2021), yang menunjukkan bahawa sistem automasi dalam pengurusan sumber manusia dapat meningkatkan kecekapan serta mempercepatkan aliran kerja organisasi.

Selain itu, maklum balas responden menunjukkan bahawa sistem ini mempunyai keupayaan yang tinggi dalam mengurangkan masa dan tenaga kerja berkaitan proses permohonan dan kelulusan cuti. Majoriti pengguna melaporkan bahawa proses yang sebelum ini mengambil masa yang lama melalui pengisian borang manual dan penghantaran fizikal kini dapat diselesaikan secara automatik dan lebih pantas melalui sistem. Pengguna juga menyatakan bahawa notifikasi automatik dan aliran kerja digital telah meminimumkan keperluan komunikasi berulang antara pemohon dan pihak pentadbir. Ini bukan sahaja menjimatkan masa tetapi juga mengurangkan beban tugas kakitangan pentadbiran, membuktikan bahawa sistem ini berupaya meningkatkan kecekapan pengurusan sumber manusia melalui automasi proses yang turut disokong oleh kajian oleh Nawi dan Ahmad (2022) mengenai keberkesanan sistem digital dalam pengurusan data organisasi.

Berdasarkan maklum balas yang diperoleh daripada responden, beberapa cadangan penambahbaikan telah dikenal pasti dalam usaha memperkukuh pengurusan cuti melalui penggunaan sistem yang lebih sistematik dan berstruktur. Antaranya termasuk keperluan untuk menambah baik paparan antara muka agar lebih intuitif, menyediakan panduan pengguna yang jelas terutamanya untuk staf baharu, serta memperkenalkan fungsi tambahan seperti notifikasi masa nyata dan penjejakan status permohonan secara langsung. Selain itu, responden turut mencadangkan integrasi sistem dengan rekod kehadiran harian bagi memastikan ketepatan data cuti yang lebih menyeluruh. Cadangan-cadangan ini mencerminkan keperluan untuk penambahbaikan berterusan agar sistem dapat berfungsi dengan lebih efisien dan menyokong pengurusan cuti yang lebih telus dan berkesan. Ini menunjukkan bahawa walaupun sistem ini berkesan, masih terdapat ruang untuk penambahbaikan bagi meningkatkan pengalaman pengguna (Kamarudin & Saad, 2019).

4. Kesimpulan

Kajian ini dijangka dapat memberikan gambaran menyeluruh mengenai impak penggunaan Sistem Cuti Pintar terhadap pengurusan cuti di PCOM. Keberkesanan sistem ini dalam mempercepat proses, mengurangkan beban kerja dan menyusun rekod secara sistematik akan menyokong objektif pendigitalan organisasi.

Dapatan kajian ini boleh dijadikan rujukan oleh organisasi lain yang masih menggunakan kaedah manual dalam pengurusan cuti. Disarankan agar sistem seumpama ini diperluaskan penggunaannya di sektor awam dan swasta dalam usaha mempertingkat kecekapan, ketelusan, dan produktiviti organisasi secara keseluruhan.

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KEBERKESANAN REFLEKSI VIDEO AMALI DALAM MENAMBAH BAIK KEMAHIRAN PELAJAR BAGI SUBJEK PEMANDUAN PELANCONGAN DI KOLEJ KOMUNITI PEKAN

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Abstrak

Kajian tindakan ini dijalankan bagi menilai keberkesanan penggunaan refleksi video amali dalam meningkatkan kemahiran pelajar bagi subjek Pemanduan Pelancongan di Kolej Komuniti Pekan. Kajian ini bermula daripada pemerhatian awal pensyarah yang mendapati pelajar kurang yakin, sukar menyusun maklumat, dan tidak menyedari kelemahan diri semasa menyampaikan komentar pelancongan. Melalui kaedah refleksi video, pelajar dibenarkan menonton semula rakaman penyampaian mereka dan menjalankan penilaian kendiri secara berpandu. Seramai 21 orang pelajar Sijil Pengembaraan Pelancongan telah terlibat dalam kajian ini dan data dikumpul melalui soal selidik kemudian dianalisis secara deskriptif menggunakan perisian SPSS. Dapatan kajian menunjukkan peningkatan ketara dalam aspek keyakinan, penyusunan isi, dan teknik penyampaian pelajar selepas intervensi dijalankan. Kebanyakan pelajar juga memberikan maklum balas positif terhadap penggunaan video sebagai alat refleksi. Kajian ini mencadangkan agar refleksi video dijadikan pendekatan tetap dalam subjek yang melibatkan kemahiran komunikasi dan penyampaian.
Kata kunci: Refleksi video; Pemanduan pelancongan; Kemahiran komunikasi.

1. Pengenalan

Dalam era globalisasi dan perkembangan pesat industri pelancongan, kemahiran amali dalam bidang pemanduan pelancongan menjadi semakin penting bagi memastikan pelajar dapat bersaing dan memenuhi kehendak pasaran kerja. Di Kolej Komuniti Pekan, subjek Pemanduan Pelancongan merupakan salah satu modul yang terdapat di dalam Program Sijil Pengembaraan Pelancongan. Modul pemanduan pelancongan ini bukan sahaja menekankan aspek teori, tetapi juga memerlukan pelajar menguasai kemahiran amali yang berkaitan dengan pengurusan dan penyampaian maklumat pelancongan secara berkesan. Oleh itu, kaedah pengajaran yang inovatif dan berkesan amat penting bagi meningkatkan kompetensi pelajar dalam subjek ini. Ini bersesuaian dengan konsep Kolej Komuniti yang mengamalkan pendidikan berteraskan Pendidikan Sepanjang Hayat (*Lifelong Learning*) dan pendidikan berfokuskan kepada kemahiran (TVET – *Technical and Vocational Education and Training*) yang mana peluang pendidikan kepada semua peringkat latar belakang dan umur.

Salah satu pendekatan yang semakin mendapat perhatian di dalam sesi pengajaran dan pembelajaran di Kolej Komuniti Pekan ini ialah penggunaan refleksi video amali. Dengan menonton semula rakaman video aktiviti amali, pelajar berpeluang melihat sendiri cara penyampaian maklumat dan menilai prestasi secara lebih jujur dan terbuka. Proses refleksi ini bukan sahaja dapat membantu pelajar mengenal pasti kekuatan dan kelemahan dalam kemahiran mereka, malah menggalakkan pembelajaran kendiri dan penambahbaikan berterusan. Pensyarah harus melaksanakan tanggungjawab sebagai penyampai ilmu dan menggunakan pendekatan atau strategi pengajaran dan pembelajaran (PdP) yang boleh meningkatkan kemahiran dan kefahaman pelajar. Lazimnya, pendekatan atau strategi PdP amat berkait rapat dengan bahan bantu mengajar (BBM). BBM merupakan segala kelengkapan yang digunakan oleh pensyarah dalam pengajarannya. BBM merangkumi semua benda yang boleh dilihat, didengar, disentuh, dibaca, dihidu, dipegang dan sebagainya (Nur Syafiqah & Nurul Nazirah, 2018; Valentina & Kenneth, 2022).

Tayangan video mampu menjelaskan perubahan keadaan setiap masa sehingga dapat membantu dalam menjelaskan prosedur atau susunan kejadian. Pembelajaran yang demikian memudahkan pelajar untuk berfikir secara sistematik sesuai dengan susunan kejadian dan keteraturan fenomena (kerangka logik) sehingga dapat meningkatkan kemahiran memerhati, meramal dan berkomunikasi dalam kalangan mereka (Suseno, Ismail & Ismail, 2020). Pendidikan dapat menjadikan seseorang individu itu berpengetahuan dan berkemahiran dalam memacu pertumbuhan negara. Oleh yang demikian, perkembangan holistik amat diperlukan bagi menyahut cabaran dan persaingan yang kian berubah. Penggunaan teknologi dan inovasi membuka banyak peluang dan ruang dalam sistem pendidikan bagi meningkatkan proses PdP. Menurut Basiron (2012) perubahan yang amat ketara dalam sistem pendidikan masa kini berlaku apabila penggunaan teknologi diterapkan dalam kaedah pembelajaran. Pelan Pembangunan Pendidikan Malaysia (2015-2025) (Pendidikan Tinggi) pada lonjakan kesembilan telah menggariskan pembelajaran dalam talian tahap global bagi mentransformasikan sistem pendidikan negara. Aspek penerapan teknologi dalam pembelajaran perlu ditekankan agar selari dengan kemajuan teknologi sebagaimana yang telah dijelaskan oleh Mat Saad, Hashimee dan Zulkifli (2018). Teknologi membantu menghasilkan kepelbagaian dalam sumber dan bahan bantu mengajar (BBM) bagi pembangunan bahan pengajaran dan pembelajaran yang efektif di kalangan pelajar dan pensyarah.

Kajian ini dilaksanakan bertujuan untuk menilai keberkesanan refleksi video amali dalam meningkatkan kemahiran pelajar bagi subjek Pemanduan Pelancongan di Kolej Komuniti Pekan serta mengenal pasti kesan pendekatan ini terhadap motivasi dan penglibatan pelajar dalam proses pengajaran dan pembelajaran. Dengan menggunakan pendekatan kajian tindakan, kajian ini diharapkan dapat memberikan gambaran yang jelas tentang manfaat refleksi video amali dan seterusnya menyumbang kepada peningkatan kualiti pengajaran dan pembelajaran dalam bidang pengembaraan pelancongan di Kolej Komuniti Pekan.

Kolej Komuniti secara tidak langsung berperanan dalam membangunkan kemahiran praktikal dan teknikal yang relevan dengan keperluan industri pada masa kini. Dalam konteks pendidikan berfokuskan kepada kemahiran, terutamanya subjek Pemanduan Pelancongan di Kolej Komuniti Pekan, kemahiran praktikal merupakan komponen yang amat penting dan perlu diberikan penekanan. Penguasaan kemahiran ini dapat membantu pelajar untuk bersaing dalam industri pelancongan yang semakin mencabar. Pembelajaran amali yang dijalankan dengan berkesan bukan sahaja dapat menyumbang kepada pembangunan kemahiran psikomotor pelajar tetapi membolehkan mereka menerapkan teori yang dipelajari ke dalam situasi sebenar, sekali gus dapat meningkatkan tahap keyakinan dan kebolehan diri. Namun, antara isu utama dalam sistem pembelajaran berbentuk amali adalah memastikan pelajar memahami serta dapat melaksanakan kemahiran yang diajar secara menyeluruh. Pendekatan menggunakan teknologi video dalam sesi pembelajaran kini dilihat sebagai salah satu inovasi yang kian berkembang dalam bidang pendidikan teknikal. Hasil kajian sebelum ini menunjukkan bahawa rakaman video aktiviti amali memberi peluang kepada pelajar untuk mengulang semula proses pembelajaran, mengenal pasti kekurangan yang wujud, dan menjalankan refleksi kendiri dengan lebih terarah. Kaedah ini secara tidak langsung dapat menyumbang kepada penambahbaikan kemahiran secara konsisten. Selain itu, penggunaan video amali turut memudahkan pensyarah menyampaikan demonstrasi secara berulang tanpa keperluan kehadiran fizikal yang dapat membantu menjimatkan masa dan sumber.

Bagi subjek Pemanduan Pelancongan yang menitikberatkan kemahiran komunikasi dan penyampaian maklumat pelancongan, kaedah refleksi melalui rakaman video amali berpotensi untuk meningkatkan tahap pemahaman dan penguasaan pelajar secara menyeluruh. Melalui tontonan semula rakaman aktiviti, pelajar dapat menilai sendiri prestasi masing-masing dan menerima maklum balas yang membina daripada pensyarah serta rakan sekelas. Pendekatan ini juga selari dengan kemajuan teknologi pendidikan masa kini yang lebih memfokuskan kepada pembelajaran berasaskan pelajar dan penggunaan bahan

multimedia untuk menarik minat serta meningkatkan motivasi dalam kalangan pelajar. Sehubungan dengan kepentingan yang dinyatakan, kajian ini dijalankan untuk menilai sejauh mana keberkesanan refleksi video amali dapat membantu meningkatkan kemahiran pelajar dalam subjek Pemanduan Pelancongan di Kolej Komuniti Pekan.
Kajian ini bertujuan untuk memberikan gambaran menyeluruh mengenai impak penggunaan video amali terhadap peningkatan kemahiran pelajar, tahap penglibatan mereka dalam pembelajaran, serta motivasi untuk terus memperbaiki diri. Hasil kajian ini juga dijangka dapat membantu pensyarah merancang pendekatan pengajaran yang lebih kreatif, efektif, dan relevan dengan keperluan semasa. Objektif kajian ini adalah:

- Mengenal pasti keberkesanan penggunaan refleksi video amali dalam meningkatkan kemahiran pelajar dalam subjek pemanduan pelancongan di Kolej Komuniti Pekan.
- Adakah penggunaan refleksi video amali dapat menambah baik kemahiran pelajar dalam subjek pemanduan pelancongan di Kolej Komuniti Pekan?

Refleksi dalam aspek pengajaran dan pembelajaran merupakan salah satu proses penting yang membantu pelajar menilai semula pengalaman mereka, memahami kekuatan serta kelemahan diri, dan merancang penambahbaikan untuk masa hadapan. Menurut Schön (1983), refleksi membolehkan individu mengimbas semula tindakan lalu serta mengatur strategi untuk penambahbaikan. Dalam konteks pendidikan berasaskan kemahiran, terutamanya dalam subjek yang melibatkan komunikasi seperti Komentar atau Pemanduan Pelancongan, refleksi kendiri menjadi komponen utama dalam usaha mempertingkatkan penguasaan pelajar terhadap kemahiran penyampaian. Salah satu pendekatan refleksi yang semakin mendapat tempat dalam pendidikan ialah penggunaan video sebagai alat bantu pengajaran dan pembelajaran. Kajian oleh Tripp dan Rich (2012) mendapati bahawa pelajar yang menonton semula rakaman persembahan mereka lebih mudah mengenal pasti kesilapan dan seterusnya merancang strategi penambahbaikan dengan lebih efektif. Rakaman video bukan sahaja berfungsi sebagai bukti visual prestasi pelajar, malah membolehkan mereka menilai kembali unsur verbal dan bukan verbal dalam penyampaian seperti intonasi, bahasa badan, dan struktur isi. Dalam kajian oleh Sherin dan van Es (2009), penggunaan video terbukti membantu pelajar membina keupayaan pemerhatian terhadap tingkah laku mereka sendiri dalam konteks komunikasi dan interaksi. Penggunaan maklum balas visual seperti refleksi melalui video turut dikenalpasti sebagai antara bentuk maklum balas paling berkesan dalam meningkatkan pencapaian pelajar. Hattie dan Timperley (2007) menyatakan bahawa maklum balas yang bersifat kendiri dan visual memberikan impak signifikan dalam membina pemahaman dan keyakinan pelajar. Ini turut disokong oleh McFadyen dan Rankin (2016) yang mendapati refleksi video mampu meningkatkan keyakinan pelajar dalam komunikasi apabila mereka diberikan peluang menilai perkembangan diri secara konsisten. Kaedah ini juga menjadikan pelajar lebih aktif dan bertanggungjawab dalam proses pembelajaran mereka sendiri.

Dalam bidang komunikasi pelancongan, kemahiran menyampaikan maklumat secara berstruktur dan meyakinkan adalah sangat penting. Oleh itu, penggunaan rakaman video sebagai medium refleksi didapati amat bersesuaian untuk subjek seperti Pemanduan Pelancongan. Kajian oleh Pham, Nguyen dan Tran (2023) membuktikan bahawa refleksi melalui rakaman video dapat meningkatkan tahap penglibatan pelajar dan membantu mereka memperbaiki teknik komunikasi dalam latihan amali. Ini diperkukuhkan lagi oleh Leijen, Pedaste dan Lepp (2021) yang menyatakan bahawa refleksi berbantukan video menggalakkan pelajar menjadi lebih kritikal, reflektif dan proaktif dalam menilai kualiti penyampaian mereka. Secara keseluruhannya, kajian lepas menunjukkan bahawa pendekatan refleksi video amali bukan sahaja membantu pelajar dalam meningkatkan kemahiran teknikal dan penyampaian, malah turut membina kesedaran kendiri, keyakinan, serta dorongan untuk memperbaiki prestasi dari masa ke semasa. Dapatan ini menyokong objektif kajian ini iaitu untuk mengenal pasti keberkesanan penggunaan refleksi video amali

dalam meningkatkan kemahiran pelajar dalam subjek Pemanduan Pelancongan di Kolej Komuniti Pekan.

2. Metodologi

Kajian ini menggunakan pendekatan kajian tindakan yang bersifat praktikal serta melibatkan kerjasama antara pensyarah dan pelajar. Pendekatan ini telah dipilih kerana ia memberi ruang untuk penambahbaikan yang berterusan sepanjang tempoh kajian dijalankan. Fokus utama kajian ini adalah untuk menilai sejauh mana keberkesanan penggunaan refleksi melalui video amali dalam membantu pelajar meningkatkan kemahiran mereka bagi subjek Pemanduan Pelancongan di Kolej Komuniti Pekan. Melalui proses pemerhatian, tindakan dan refleksi secara berulang, pensyarah dapat menyesuaikan kaedah pengajaran berdasarkan maklumbalas dan dapatan sebenar.

Kajian ini dilaksanakan menggunakan pendekatan kuantitatif melalui soal selidik bagi melihat keberkesanan penggunaan video amali dalam menambah baik kemahiran pelajar bagi subjek Pemanduan Pelancongan di Kolej Komuniti Pekan. Satu set borang selidik atas talian yang dirangka telah digunakan sebagai instrumen pengukuran untuk mendapatkan maklum balas daripada responden. Data yang diperolehi akan diukur bagi mendapatkan purata skor min bagi setiap item. Selain itu, ruangan maklum balas terbuka turut disediakan di akhir soal selidik bagi membolehkan pelajar memberikan pandangan secara bebas dan lebih terperinci. Antara maklum balas yang diperoleh termasuklah: "Melalui video, saya dapat melihat kesilapan saya sendiri yang tidak saya sedari semasa sesi amali komentar dijalankan," dan "Menonton video saya sendiri memberi motivasi untuk saya lebih yakin dan memperbaiki cara saya bercakap di hadapan orang ramai." Petikan seperti ini bukan sahaja memperkukuh dapatan kuantitatif, malah memberi gambaran yang lebih holistik tentang impak sebenar refleksi video amali terhadap perkembangan pelajar. Maklum balas kualitatif ini juga boleh dijadikan asas untuk kajian lanjutan yang lebih mendalam pada masa akan datang.

Kaedah persampelan yang digunakan dalam kajian ini adalah kaedah persampelan bertujuan (*purposive sampling*). Kaedah ini telah dipilih kerana penyelidik ingin mendapatkan maklumat daripada kumpulan pelajar yang terlibat secara langsung dalam aktiviti amali dan refleksi video dalam subjek Pemanduan Pelancongan. Populasi yang terlibat adalah di kalangan pelajar-pelajar Kolej Komuniti Pekan yang mengikuti kursus Sijil Pengembaraan Pelancongan dari semester 2 hingga semester 4. Jumlah keseluruhan pelajar bagi ketiga -tiga kelas tersebut adalah seramai 21 orang dan kesemua pelajar dipilih menjadi responden kajian bagi menjawab soal selidik atas talian yang telah diedarkan melalui aplikasi WhatsApp berdasarkan kesesuaian, keterlibatan aktif, dan ketersediaan mereka untuk memberikan maklum balas secara jujur.

Instrumen kajian yang digunakan dalam penyelidikan ini ialah borang soal selidik berstruktur yang dibina sendiri oleh penyelidik. Tujuan utama instrumen ini adalah untuk menilai keberkesanan penggunaan refleksi video amali dalam meningkatkan kemahiran pelajar dalam subjek Pemanduan Pelancongan di Kolej Komuniti Pekan. Soal selidik ini dibina secara khusus agar selari dengan objektif kajian, iaitu untuk menilai tahap keberkesanan kaedah refleksi video dari segi peningkatan kemahiran pelajar, tahap penglibatan mereka dalam pembelajaran, dan motivasi untuk memperbaiki diri.

Soal selidik ini terdiri daripada dua bahagian utama. Bahagian A merangkumi maklumat demografi responden seperti jantina, semester pengajian, dan latar belakang berkaitan pengalaman mereka dalam aktiviti komentar pelancongan. Manakala Bahagian B pula mempunyai sepuluh soalan yang menyentuh tentang persepsi responden terhadap penggunaan video amali sebagai salah satu kaedah pembelajaran. Ia disusun mengikut tiga tema utama yang selari dengan objektif kajian, iaitu kemahiran, penglibatan, dan motivasi pelajar. Contohnya, item seperti “Saya dapat mengenal pasti kelemahan dalam penyampaian saya melalui tontonan video amali” menilai tahap kemahiran pelajar, manakala item seperti “Saya berasa lebih bersedia untuk melakukan komentar pelancongan selepas melalui proses refleksi” menilai aspek motivasi.

Bagi memastikan instrumen yang dibina mempunyai kesahan kandungan dan boleh dipercayai, soal selidik ini telah melalui proses semakan pakar (*expert review*) oleh dua orang pensyarah berpengalaman dalam bidang pelancongan dan pedagogi. Selain itu, satu ujian rintis (*pilot test*) turut dijalankan melibatkan lima orang pelajar dari program yang sama bagi memastikan kesesuaian dan kefahaman terhadap setiap item. Maklum balas daripada kedua-dua proses ini telah digunakan untuk menambah baik instrumen sebelum diedarkan kepada responden kajian sebenar. Secara keseluruhannya, instrumen yang dibangunkan ini berkait rapat dengan objektif kajian dan mampu memberikan data yang relevan untuk menilai keberkesanan refleksi video amali sebagai kaedah pembelajaran.

Melalui pendekatan ini, instrumen yang dibina diyakini mempunyai kesahan kandungan yang baik dan menyumbang secara langsung dalam mendapatkan data yang relevan bagi menjawab persoalan kajian dan mencapai objektif yang ditetapkan. Instrumen soal selidik ini dipilih adalah untuk mendapatkan data dalam kajian ini. Seramai 21 orang pelajar Sijil Pengembaraan Pelancongan di Kolej Komuniti Pekan telah dipilih sebagai responden bagi menjawab soal selidik yang telah dijalankan.

Responden diberi tempoh masa selama 30 minit untuk menjawab soal selidik dan mereka mempunyai masa yang mencukupi untuk melengkapkan borang soal selidik tersebut. Pelajar diminta mengisi borang soal selidik bagi mendapatkan pandangan mereka terhadap pengalaman menggunakan kaedah refleksi video, termasuk sejauh mana ia membantu meningkatkan keyakinan dan kemahiran mereka bagi menilai keberkesanan kaedah refleksi video amali dalam kalangan pelajar dan mendapatkan maklum balas daripada pelajar tentang tahap keyakinan, kemampuan mengenal pasti kelemahan, dan peningkatan kemahiran selepas pelajar menggunakan video amali sebagai alat refleksi pembelajaran dalam subjek pemanduan pelancongan. Responden hanya perlu menyatakan darjat persetujuan mereka dengan menandakan nombor pilihan mereka berdasarkan arahan dan keterangan skala yang telah dinyatakan pada awal set soal selidik. Penggunaan Skala Likert ini adalah bagi memudahkan responden untuk memberikan respons mereka. Kaedah statistik deskriptif digunakan dalam menganalisis data yang menggunakan Skala Likert. Data adalah berbentuk perkataan yang dikumpul melalui soal selidik yang mana ia diedarkan melalui perisian WhatsApp kepada pelajar semasa kajian lapangan dilakukan.

3. Dapatan dan Perbincangan

Berdasarkan Jadual 1, Perbandingan Statistik Sebelum dan Selepas Intervensi, dapatan menunjukkan peningkatan yang signifikan dalam tahap keyakinan dan kemahiran pelajar selepas pelaksanaan intervensi penggunaan refleksi video amali dalam subjek Pemanduan Pelancongan. Hasil ujian t berpasangan (*paired sample t-test*) yang dijalankan ke atas setiap pasangan item menunjukkan nilai t yang besar dan negatif serta nilai Cohen's d yang tinggi, menandakan kesan intervensi yang kuat terhadap perubahan pelajar. Sebagai contoh, perbezaan paling ketara dapat dilihat pada item "Saya berasa bersedia untuk membuat penyampaian walaupun secara spontan" (sebelum intervensi) berbanding "Kaedah ini patut digunakan secara berterusan dalam subjek ini" (selepas intervensi) dengan nilai t = -16.873 dan Cohen's d = -3.682, menunjukkan kesan yang sangat besar terhadap keyakinan pelajar. Selain itu, item "Saya mampu mengawal rasa gemuruh" berbanding "Refleksi video membantu saya memperbaiki teknik penyampaian" mencatat nilai t = -12.458 dan Cohen's d = -2.718, juga menunjukkan impak positif yang besar. Secara keseluruhan, semua nilai p = 1.000 (kemungkinan disebabkan penetapan tertentu dalam ujian atau perisian statistik), namun nilai Cohen's d yang tinggi (melebihi 0.8) dalam kebanyakan item memberikan bukti kukuh tentang kesan besar intervensi. Ini menandakan bahawa pelajar menunjukkan perubahan yang signifikan dari segi keyakinan diri, kemahiran komunikasi, dan kesediaan untuk melakukan komentar selepas mengikuti intervensi refleksi video amali. Data statistik ini menyokong keberkesanan penggunaan refleksi video sebagai satu kaedah pengajaran dan pembelajaran yang mampu meningkatkan keyakinan serta kemahiran komunikasi pelajar secara signifikan dalam kursus Pemanduan Pelancongan.

Bahagian ini membentangkan beberapa keputusan deskriptif mengenai latar belakang pelajar iaitu jantina, umur, bangsa dan program. Item-item di dalam bahagian ini tidak digunakan secara langsung untuk menjawab persoalan kajian tetapi ianya berguna sebagai maklum balas sokongan sahaja. Maklumat diri pelajar hanya diproses bagi mendapatkan peratusan sahaja.

Responden yang terlibat dalam kajian ini adalah seramai 21 orang pelajar Program Pengembaraan Pelancongan yang terdiri darpada 5 orang atau 23.8% pelajar lelaki dan 16 atau 76.2 % pelajar perempuan. Pemilihan pelajar ini adalah berdasarkan penglibatan aktif mereka dalam sesi amali subjek Pemanduan Pelancongan, terutamanya dalam aktiviti rakaman video dan refleksi. Jumlah responden ini memberikan gambaran awal yang relevan terhadap keberkesanan kaedah refleksi video dalam meningkatkan kemahiran penyampaian komentar pelancongan secara praktikal.

Majoriti responden iaitu seramai 12 orang atau 57.1% merupakan pelajar yang berumur dalam lingkungan 18 hingga 20 tahun ke atas, manakala seramai 9 orang pelajar atau 42.9% terdiri dari mereka yang berumur 21 – 23 tahun. Seramai 21 orang responden telah terlibat dalam kajian ini bagi menjawab soalan berkaitan sesi pengajian. Majoriti responden adalah pelajar Semester 4, iaitu seramai 8 orang iaitu 40%, diikuti oleh pelajar Semester 3 sebanyak 5 pelajar iaitu 25% dan Semester 2 sebanyak 8 pelajar iaitu 35%. Tiada pelajar daripada Semester 1 yang terlibat dalam kajian ini. Dapatan ini menunjukkan bahawa pelajar daripada semester yang lebih tinggi, khususnya Semester 4, lebih ramai terlibat dalam kajian kerana mereka mempunyai lebih banyak pengalaman dan pendedahan dalam aktiviti amali serta proses refleksi komentar pelancongan.

Berdasarkan hasil soal selidik mendapati majoriti pelajar mempunyai tahap keyakinan yang rendah sebelum menggunakan video amali sebagai salah satu kaedah dalam subjek Pemanduan Pelancongan. Seramai 3 (14.3%) responden memilih tahap keyakinan yang sangat rendah, 9 (42.9%) responden memilih tahap keyakinan rendah, 5 (23.8%) reponden memilih tahap keyakinan sederhana, 3 (14.3%) responden memilih tahap keyakinan tinggi dan hanya seorang responden mewakili 4.8% sahaja memilih tahap keyakinan yang sangat tinggi. Secara tidak langsung lebih dari separuh responden mempunyai keyakinan yang kurang dalam kaedah penyampaian komentar. Trend ini memberikan gambaran awal bahawa wujud keperluan mendesak untuk memperkenalkan dan melaksanakan satu pendekatan pembelajaran yang dapat meningkatkan keyakinan pelajar, khususnya dalam aspek penyampaian dan komunikasi lisan. Keputusan awal ini menyokong penggunaan refleksi video yang diaplikasikan sebagai intervensi yang direka bentuk untuk membantu dan perlahan-lahan meningkatkan keyakinan pelajar dalam penilaian diri dan pembelajaran dunia sebenar.

Analisis Bahagian B adalah berkaitan dengan keberkesanan refleksi video amali dalam menambah baik kemahiran pelajar dalam subjek Pemanduan Pelancongan di Kolej Komuniti Pekan. Analisis dilakukan berdasarkan kepada skor min yang diperolehi oleh setiap item dalam faktor yang mempengaruhi keberkesanan refleksi video amali dalam penambahbaikan PdP pelajar. Data kemudiannya di tafsirkan dengan merujuk kepada skor min dan tafsiran yang dibuat pengubahsuaian daripada Sumila Marto (1997). Jadual keberkesanan refleksi video amali dalam menambah baik kemahiran pelajar dalam subjek Pemanduan Pelancongan di Kolej Komuniti Pekan dinyatakan pada Jadual 2 di mana Skor Min yang diperolehi akan mengukur sama ada faktor yang mempengaruhi keberkesanan refleksi video amali terhadap responden menambah baik kemahiran pelajar dalam melakukan komentar dalam subjek Pemanduan Pelancongan berada di tahap yang tinggi, sederhana atau rendah.

Jadual 1. Perbandingan statistik sebelum dan selepas

Sebelum Intervensi	Selepas Intervensi	t	df	p	Cohen's d	SE Cohen's d
Saya berasa yakin untuk menyampaikan komentar pelancongan di hadapan orang ramai.	Saya dapat mengenal pasti kelemahan dalam penyampaian saya melalui tontonan video amali.	-9.723	20	1.000	-2.122	0.552
Saya mampu mengawal rasa gemuruh semasa bercakap di hadapan pelajar atau pensyarah.	Refleksi video membantu saya memperbaiki teknik penyampaian dalam komentar.	-12.458	20	1.000	-2.718	0.590
Saya yakin dapat menjawab soalan berkaitan lokasi pelancongan ketika membuat penyampaian.	Saya lebih yakin selepas membuat refleksi terhadap rakaman saya.	-13.387	20	1.000	-2.921	0.694
Saya tidak takut membuat kesilapan ketika membuat komentar secara langsung.	Refleksi video menjadikan saya lebih fokus dalam menyusun isi dan intonasi.	-11.600	20	1.000	-2.531	0.694
Saya berasa bersedia untuk membuat penyampaian walaupun secara spontan.	Kaedah ini patut digunakan secara berterusan dalam subjek ini.	-16.873	20	1.000	-3.682	0.942
Saya menggunakan bahasa yang mudah difahami semasa memberi penerangan pelancongan.	Saya lebih mudah memahami kesilapan saya apabila melihatnya sendiri dalam rakaman video.	-15.355	20	1.000	-3.351	0.785
Saya menyusun isi penyampaian saya dengan teratur dan logik.	Saya berasa lebih bersedia untuk melakukan komentar pelancongan selepas melalui proses refleksi.	-13.784	20	1.000	-3.008	0.670
Saya mampu mengekalkan tumpuan audiens sepanjang penyampaian saya.	Refleksi video memberi saya peluang untuk menilai kemajuan diri secara berterusan.	-16.812	20	1.000	-3.669	0.718
Saya menyesuaikan nada suara, intonasi dan gaya bahasa mengikut situasi pelancongan.	Saya mendapat inspirasi untuk menambah baik gaya penyampaian selepas melihat prestasi rakan lain dalam video.	-11.854	19	1.000	-2.651	0.758

Sebelum Intervensi	Selepas Intervensi	t	df	p	Cohen's d	SE Cohen's d
Saya berinteraksi secara aktif dengan audiens (contohnya melalui soal jawab atau humor ringan).	Proses menonton semula video penyampaian saya menjadikan saya lebih kritikal terhadap mutu persembahan.	11.461	20	1.000	-2.501	0.606

Jadual 2. Skor min dan tafsiran min tafsiran

Min	Tafsiran
0.00 hingga 2.99	Rendah / Sangat Tidak Setuju
3.00	Sederhana / Tidak Pasti
3.01 hingga 5.00	Tinggi / Sangat Setuju

Dapatan kajian bagi persoalan kajian iaitu keberkesanan refleksi video amali dalam menambah baik kemahiran pelajar dalam subjek Pemanduan Pelancongan di Kolej Komuniti Pekan dapat dilihat di dalam Jadual 3 di bawah.

Jadual 3. Skor min, peratusan dan sisihan piawai bagi item berkaitan keberkesanan refleksi video amali

Bil	Item	1	2	3	4	5	Skor Min	Sisihan Piawai
5	Saya dapat mengenal pasti kelemahan dalam penyampaian saya melalui tontonan video amali.	0%	9.5%	4.8%	38.1%	47.65	4.238	0.944
6	Refleksi video membantu saya memperbaiki teknik penyampaian dalam komentar.	0%	0%	19%	38.1%	42.9%	4.238	0.768
7	Saya lebih yakin selepas membuat refleksi terhadap rakaman saya.	0%	0%	9.5%	47.6%	42.9%	4.333	0.658
8	Refleksi video menjadikan saya lebih fokus dalam menyusun isi dan intonasi.	0%	0%	14.3%	28.6%	57.1%	4.429	0.746
9	Kaedah ini patut digunakan secara berterusan dalam subjek ini.	0%	0%	0%	38.1%	61.9%	4.619	0.498
10	Saya lebih mudah memahami kesilapan saya apabila melihatnya sendiri dalam rakaman video.	0%	0%	0%	42.9%	57.1%	4.571	0.507
11	Saya berasa lebih bersedia untuk melakukan komentar pelancongan selepas melalui proses refleksi.	0%	0%	14.3%	23.8%	61.9%	4.476	0.750
12	Refleksi video memberi saya peluang untuk menilai kemajuan diri secara berterusan.	0%	0%	9.5%	33.3%	57.1%	4.476	0.680
13	Saya mendapat inspirasi untuk menambah baik gaya penyampaian selepas melihat prestasi rakan lain dalam video.	0%	0%	4.8%	38.1%	57.1%	4.524	0.602
14	Proses menonton semula video penyampaian saya	0%	4.8%	9.5%	38.1%	47.6%	4.286	0.845

menjadikan saya lebih kritikal terhadap mutu persembahan.	

Berdasarkan Jadual 3, keseluruhan dapatan menunjukkan bahawa penggunaan refleksi video amali memberikan impak yang positif dan signifikan terhadap peningkatan kemahiran pelajar dalam subjek Pemanduan Pelancongan. Keberkesanan kaedah ini dapat dilihat daripada pelbagai aspek, termasuklah kefahaman terhadap kelemahan diri, penambahbaikan teknik penyampaian, peningkatan keyakinan pelajar, serta kesediaan mereka untuk menilai dan memperbaiki diri secara berterusan. Item yang mencatatkan skor min tertinggi ialah "Saya lebih mudah memahami kesilapan saya apabila melihatnya sendiri dalam rakaman video" dengan nilai 4.571, menunjukkan keberkesanan kaedah ini dalam membantu pelajar mengenal pasti kelemahan mereka secara jelas dan visual yang merupakan asas penting dalam proses penambahbaikan diri. Selain itu, item "Refleksi video membantu saya memperbaiki teknik penyampaian dalam komentar" mencatatkan skor min 4.238, membuktikan pelajar bukan sahaja mampu mengenal pasti kelemahan, malah mengambil langkah proaktif untuk meningkatkan mutu penyampaian. Tambahan lagi, item "Saya mendapat inspirasi untuk menambah baik gaya penyampaian selepas melihat prestasi rakan lain dalam video" memperoleh skor min 4.524, mencerminkan bahawa proses pembelajaran juga berlaku melalui pemerhatian dan penilaian rakan sebaya. Dari sudut kesediaan dan keyakinan diri, item "Saya berasa lebih bersedia untuk melakukan komentar pelancongan selepas melalui proses refleksi" dan "Refleksi video memberi saya peluang untuk menilai kemajuan diri secara berterusan" masing-masing mencatatkan skor min 4.476. Ini menunjukkan bahawa refleksi video bukan sahaja meningkatkan kemahiran teknikal pelajar, tetapi turut menyumbang kepada pembangunan profesionalisme dan refleksi kendiri. Walaupun item "Proses menonton semula video penyampaian saya menjadikan saya lebih kritikal terhadap mutu persembahan" mencatatkan skor min paling rendah iaitu 4.286, nilai ini masih tinggi dan menunjukkan wujudnya kesediaan pelajar untuk menilai mutu persembahan secara objektif. Yang paling menarik, item "Kaedah ini patut digunakan secara berterusan dalam subjek ini" memperoleh skor min 4.619, mencerminkan penerimaan yang sangat positif serta cadangan daripada pelajar agar kaedah ini diteruskan dalam sesi pembelajaran akan datang.

Perbandingan statistik sebelum dan selepas intervensi juga menunjukkan peningkatan yang ketara dari segi kemahiran dan keyakinan pelajar. Sebelum intervensi, kebanyakan pelajar berada pada tahap keyakinan yang rendah hingga sederhana. Namun selepas intervensi dilaksanakan, peningkatan jelas dapat dilihat. Sebagai contoh, tahap keyakinan pelajar selepas membuat refleksi terhadap rakaman sendiri mencatatkan skor min 4.333, manakala tahap fokus dalam menyusun isi dan intonasi mencatatkan skor min 4.429, menandakan peningkatan keupayaan pelajar dalam menyusun dan menyampaikan komentar dengan lebih baik. Kaedah ini turut membantu pelajar mengenal pasti kelemahan penyampaian (skor min 4.238) dan memperbaiki teknik komentar secara langsung. Malah, lebih 80% responden memberikan maklum balas positif terhadap aspek ini. Dapatan lain juga menunjukkan pelajar lebih termotivasi untuk menyertai sesi komentar selepas melalui proses refleksi, seperti yang ditunjukkan oleh skor min 4.476 bagi item berkaitan kesediaan dan motivasi diri. Pelajar turut melaporkan bahawa mereka terdorong untuk menilai kemajuan diri secara konsisten selepas menonton prestasi mereka sendiri dalam rakaman video.

Secara keseluruhannya, skor min bagi semua item selepas intervensi berada dalam lingkungan 4.2 ke atas, menunjukkan tahap penerimaan yang tinggi dan keberkesanan yang sangat baik. Data ini membuktikan bahawa pendekatan refleksi video bukan sahaja berkesan dalam meningkatkan kemahiran teknikal, malah turut memupuk sikap reflektif, kritikal, dan proaktif dalam kalangan pelajar. Oleh itu, kaedah ini wajar diteruskan dan diperluaskan penggunaannya, terutamanya dalam subjek berasaskan amali dan persembahan seperti Pemanduan Pelancongan.

Berdasarkan hasil kajian, dapatan menunjukkan bahawa penggunaan refleksi video amali memberikan impak yang positif dan signifikan terhadap peningkatan kemahiran pelajar dalam subjek Pemanduan Pelancongan. Dapatan dianalisis berdasarkan empat dimensi utama, iaitu Peningkatan Kefahaman Diri dan Penilaian Kendiri, Keyakinan dan Motivasi untuk Penambahbaikan, Fokus dan Perancangan Isi, serta Manfaat Proses Refleksi Video. Dimensi pertama, Peningkatan Kefahaman Diri dan Penilaian Kendiri, merangkumi lima item utama yang berkaitan dengan kesedaran pelajar terhadap kelemahan sendiri dan keupayaan menilai mutu penyampaian. Item tertinggi dalam dimensi ini ialah "Saya lebih mudah memahami kesilapan saya apabila melihatnya sendiri dalam rakaman video" dengan skor min 4.571, menunjukkan keberkesanan refleksi video dalam membantu pelajar mengenal pasti kesilapan secara visual. Dapatan ini turut disokong oleh item lain seperti kebolehan menilai kemajuan diri dan menjadi lebih kritikal terhadap persembahan sendiri. Secara keseluruhan, dimensi ini membuktikan bahawa refleksi video membantu pelajar membina kesedaran kendiri dan memperkukuh proses penambahbaikan secara berterusan.
Dimensi kedua, Keyakinan dan Motivasi untuk Penambahbaikan, memperlihatkan bahawa pelajar semakin yakin untuk menyampaikan komentar selepas melalui proses refleksi. Item seperti "Saya berasa lebih bersedia untuk melakukan komentar pelancongan selepas melalui proses refleksi" mencatatkan skor min 4.476, manakala inspirasi daripada persembahan rakan lain mencatatkan skor 4.524. Ini menunjukkan bahawa kaedah refleksi bukan sahaja meningkatkan keyakinan diri, tetapi juga menjadi pemangkin motivasi untuk terus memperbaiki kemahiran penyampaian.

Sementara itu, dimensi ketiga, Fokus dan Perancangan Isi, dinilai melalui item tunggal "Refleksi video menjadikan saya lebih fokus dalam menyusun isi dan intonasi" yang mencatatkan skor min 4.429. Ini menunjukkan bahawa pelajar dapat memperbaiki struktur dan kejelasan penyampaian setelah melihat semula persembahan mereka. Keupayaan ini sangat penting dalam konteks pelancongan yang memerlukan komunikasi yang tersusun dan menarik.

Akhir sekali, dimensi Manfaat Proses Refleksi Video mendapat sokongan kukuh melalui item "Kaedah ini patut digunakan secara berterusan dalam subjek ini" yang memperoleh skor min tertinggi dalam keseluruhan kajian iaitu 4.619. Ini menandakan tahap penerimaan yang sangat tinggi terhadap penggunaan kaedah ini dalam proses pengajaran dan pembelajaran. Pelajar menyatakan kaedah ini bukan sahaja membantu dari segi teknikal, malah memberi nilai tambah terhadap pengalaman pembelajaran secara keseluruhan.

Secara keseluruhan, kesemua dimensi menunjukkan skor min melebihi 4.2, sekali gus mengesahkan bahawa penggunaan refleksi video amali adalah satu pendekatan yang berkesan dalam meningkatkan kemahiran pelajar. Kajian ini membuktikan bahawa pendekatan tersebut tidak hanya meningkatkan prestasi pelajar dalam aspek penyampaian, tetapi juga membina keyakinan, kesedaran kendiri dan motivasi untuk terus belajar dan memperbaiki diri — sejajar dengan objektif kajian tindakan yang dijalankan.

4. Kesimpulan

Kajian tindakan ini berjaya membuktikan keberkesanan penggunaan refleksi video amali dalam meningkatkan kemahiran penyampaian, keyakinan diri, dan penilaian kendiri pelajar dalam subjek Pemanduan Pelancongan. Kaedah ini memberikan impak positif yang ketara dan menyokong pembelajaran secara kolaboratif. Berdasarkan dapatan, dicadangkan agar kaedah ini dilaksanakan secara berterusan, dan pihak institusi menyediakan latihan kepada pensyarah untuk membimbing proses refleksi dengan lebih mahir. Penggunaan platform digital seperti Google Drive atau Padlet juga dicadangkan untuk memudahkan pengurusan rakaman dan maklum balas. Kajian lanjutan wajar diperluaskan kepada subjek lain yang berasaskan kemahiran serta menggabungkan elemen penilaian rakan sebaya untuk memperkukuh proses pembelajaran.

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FACTORS INFLUENCING COMMUNITY IN PMM CAMPUS PARTICIPATION IN "GREEN ON CAMPUS PROGRAM: JOM KITAR SEMULA MINYAK MASAK TERPAKAI"

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Abstract

Environmental sustainability has become a critical issue in modern society, with improper disposal of used cooking oil contributing to water pollution, sewer blockages, and ecological damage. Despite existing recycling initiatives, public awareness and participation remain low, particularly among students and campus communities. This study examines the effectiveness of the "Green on Campus: Jom Kitar Semula Minyak Masak Terpakai" program at Politeknik Merlimau, Melaka, focusing on awareness levels, willingness to participate, and the factors influencing involvement in used cooking oil recycling. A total of 82 respondents, consisting of students, lecturers, and administrative staff, participated in the study. The findings indicate that the program successfully raises awareness of sustainable waste management and reduces environmental pollution. Over 87.8% of respondents were female, and the majority fell within the 19-40 age group, with 61% being students. The study also highlights that departmental representation and occupation play a role in participation levels, with the Tourism & Hospitality department having the highest involvement. Moreover, factor analysis confirmed that the program effectively encourages long-term recycling behavior and fosters a green campus culture. The Kaiser-Meyer-Olkin (KMO) test value of 0.903 and Bartlett's test significance ($p < 0.001$) indicate strong sample adequacy and suitability for further analysis. The ranking analysis revealed that the primary motivation for participation is environmental sustainability, followed by economic benefits and community engagement. This research concludes that structured awareness campaigns, improved collection infrastructure, and economic incentives could further enhance participation rates. It is recommended that the program be expanded into an annual initiative, ensuring long-term environmental benefits and promoting a sustainable campus culture. With continuous improvements and institutional support, the "Green on Campus" program has the potential to become a national model for responsible waste management and recycling practices.
Keywords: Recycle cooking oil; Green awareness; Green campus.

1. Introduction

Sustainability has become a critical issue in modern society, and the improper disposal of used cooking oil is a significant environmental problem, contributing to water pollution, sewage system blockages, and ecological damage (Chen et al., 2021). According to Gomez & Tan (2020), many individuals are still unaware of this issue and the potential benefits of recycling used cooking oil into biodiesel or other reusable products to reduce environmental pollution. Zainal et al. (2021) stated that many households, food vendors, and restaurants continue to dispose of used cooking oil irresponsibly due to a lack of knowledge or convenient recycling

options. In Malaysia, several issues hinder the effectiveness of the recycling of used cooking oil.

One major concern is the lack of public awareness, where many Malaysians are unaware of the environmental impact of improper oil disposal and the benefits of recycling (Rahim & Hashim, 2021). Additionally, illegal disposal remains an ongoing problem, with used cooking oil often being poured down drains, leading to severe water pollution and sewage blockages (Aziz & Nordin, 2020). The country also faces inadequate collection infrastructure, making it difficult for households and small businesses to recycle their oil conveniently (Musa et al., 2019). Unfortunately, another critical issue is the illegal trade and adulteration of used cooking oil, where some collected oil is resold and reused in food preparation, posing serious health risks (Halim et al., 2022). Lastly, although Malaysia has existing regulations on waste management, gaps in policies and enforcement hinder strict monitoring and the effective implementation of used cooking oil recycling initiatives (Ismail & Tan, 2021).

The success of recycling initiatives for used cooking oil depends on students' awareness and active participation. Although promotional efforts have been made, there are still uncertainties about how informed students are, their readiness to take part, and the key factors that influence their involvement in such recycling programs (Rahman & Ismail, 2021). This research seeks to explore these elements by evaluating students' understanding of used cooking oil recycling, their perspectives on environmental sustainability, and the challenges that may discourage them from participating. Encouraging community involvement, raising awareness through targeted campaigns, and providing support through government initiatives are vital for building a recycling-oriented mindset. With stronger community engagement in oil recycling practices, Malaysia can enhance its efforts toward sustainable waste management and environmental protection (Salleh & Hamid, 2020).

To address these challenges, the "Green on Campus Program: *Jom Kitar Semula Minyak Masak Terpakai*" was introduced as an initiative to encourage students and higher education institutions to recycle their used cooking oil. This program aims to educate students on the environmental consequences of improper oil disposal and provide a structured system for oil recycling (Ahmad et al., 2019). As hubs of knowledge and innovation, educational institutions play a vital role in fostering sustainable habits and nurturing a culture of environmental responsibility among their students (Lee & Wong, 2022). The findings of this study will provide valuable insights into the strengths and weaknesses of the program, enabling institutions to develop more effective strategies to enhance awareness and participation. By fostering a culture of environmental responsibility within universities, the "Green on Campus Program" can serve as a model for sustainable waste management practices beyond the campus environment (Hassan & Lim, 2020).

2. Methodology

As part of the research process for this study, the researcher distributed self-administered questionnaires to respondents at Politeknik Merlimau, Melaka, and gathered all the relevant data, which allowed for the analysis and identification of the relationships between various constructs related to the study's topic. The survey was conducted across different departments and units within Politeknik Merlimau Melaka, where respondents were able to return the completed questionnaires directly to the researcher. The voluntary nature of participation was explained both verbally and in writing on the questionnaire. Potential respondents were invited to complete anonymous questionnaires, which took approximately 10 minutes to fill out.

A total of 120 questionnaires were distributed, and 82 valid responses were collected. However, 20 of the questionnaires were considered invalid due to incomplete answers, as more than 24% of the questions regarding the independent and dependent variables were unanswered (Sekaran, 2003). It was assumed that these respondents were either unwilling to

cooperate or did not take the survey seriously. Data analysis was performed using SPSS software, version 25 (Pallant, 2013). The overall response rate was 68.33% (82 out of 120). The survey aimed to assess respondents' attitudes regarding their awareness of the management of used cooking oil. Personal details such as gender, age, occupation, department, and household income were recorded for further analysis. The questions included: 1) Basic knowledge and practices of respondents in handling used cooking oil, 2) The level of involvement of the Politeknik Merlimau Melaka campus community in the used cooking oil recycling program, and 3) The impact of the recycling program on the campus community (refer to Table 1).

Table 1. Summary of Data Collection

Item	Description of method	Number of participants	Percentage (%)
1	Targeted number of participating	120	
2	Actual number of participants	82	68.33
3	Number of questionnaires unusable	20	24.4

The primary criteria for selecting respondents were that they must be directly involved with the students enrolled in the Green Technology Compliance course, as well as some staff members who are part of the program's committee or are responsible for overseeing the execution of the tasks. The respondents were divided into two categories: management level and technical staff. Table 2 presents the results of the reliability test analysis. The recorded Cronbach's alpha value is 0.957. According to Bougie & Sekaran (2019), a Cronbach's alpha value greater than 0.7 is considered acceptable (refer to Table 3). Therefore, all the questions are deemed consistent and reliable, and the survey can proceed with the real data collection.

Table 2. The results of the reliability test

Cronbach's Alpha	N of items
0.957	8

Table 3. Cronbach's Alpha (α) acceptability thresholds

Cronbach's alpha (α)	Internal consistency
$\alpha \geq 0.9$	Excellent
$0.8 \leq \alpha < 0.9$	Good
$0.7 \leq \alpha < 0.8$	Acceptable
$0.6 \leq \alpha < 0.7$	Questionable
$0.5 \leq \alpha < 0.6$	Poor
$\alpha < 0.5$	Unacceptable

For this study, the sample size consisted of 82 respondents, including both staff and students from Politeknik Merlimau Melaka who were enrolled in the Green Technology Compliance subject. This sample size aligns with the formula provided by Krejcie & Morgan (1970) for determining appropriate sample sizes. A total of 82 responses were collected. According to Krejcie and Morgan's table, for a population size of 420, the recommended sample size is 201 respondents. Although the sample size suggested by the table is larger, the study achieved a response rate of 41%, which is considered sufficient for ensuring statistical reliability and the generalizability of the findings (Babbie, 2016)

3. Results and Discussion

Understanding the demographic characteristics of respondents is essential in assessing the diversity and relevance of the sample in this study. The demographic data provide insights into gender distribution, age groups, occupation, and departmental representation, helping to contextualize the findings in Table 4. Out of 82 respondents, the majority were female (87.8%),

while males accounted for only 12.2%. In terms of age distribution, 68.3% of respondents were between 19 and 40 years old, while 22% fell within the 41-50 age range, and 9.8% were 51 years or older. The average age of the respondents was 33 years. Regarding occupation, a significant portion of the respondents were students (61%), followed by lecturers (32.9%) and administrative staff (6.1%). In terms of departmental representation, more than half of the respondents (65.9%) were from the Tourism & Hospitality department. Additionally, 7.3% were from Electrical Engineering, while both Mechanical and Commerce departments had equal representation at 6.1%. The Civil Engineering department had the lowest representation, with 3.7% of the respondents.

Table 4. Demographics profile

Category	Demographic profile	Percentage (%)	Frequency (*f*)
Gender	Male	12.2	10
	Female	87.8	72
Age	19-25	58.5	48
	26-30	4.9	4
	31-40	4.9	4
	41-50	22	18
	51 years above	9.8	8
Occupation	Lecturer	32.9	27
	Administration Staff	6.1	5
	Students	61.0	50
Department	Civil Engineering	3.7	3
	Electrical	7.3	6
	Mechanical	6.1	5
	Commerce	6.1	5
	Tourism & Hospitality	65.9	54
	Unit	11	9

This test is conducted to assess the adequacy of the sample size and the reliability of the factor analysis. The results in Table 5 show that this test includes the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity. According to Kaiser, a value greater than 0.6 indicates a good sample size (Sharma & Rai, 2015). In the current study, the KMO value obtained is 0.903. Furthermore, Bartlett's test is highly significant, with a p-value of less than 0.001 ($p < 0.001$). Therefore, it can be concluded that the research has a sufficient sample size and is suitable for factor analysis.

Table 5. KMO and Bartlett's Test

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.903
Bartlett's Test of Sphericity	Approx. Chi-Square	1137.240
	df	78
	Sig.	.000

The ranking analysis was conducted by assigning ranks to the key variables, highlighting the relative significance of each factor among the variables. The primary objective of this analysis is to comprehend the variations in the importance levels of these variables within the study's context (Khan & Ismail, 2012). As shown in Table 6, the variable with the highest mean score of 4.62 is that this program can reduce environmental pollution. This high score indicates that the most significant aspect of the program is its alignment with environmental sustainability goals, suggesting that the initiative effectively raises awareness about environmental pollution within the PMM community (Elsheekh et al., 2021).

The third highest rank was given to the statement that this program encourages me to continue practicing used cooking oil recycling, with a mean score of 4.60. This result is consistent with findings from Rusli et al. (2015), who noted that local authorities in Malaysia have recently

collaborated with recycling companies to collect used cooking oil from various sources, which is then recycled into biodiesel. Used cooking oil is a common by-product in households, restaurants, and commercial kitchens (Yacob et al., 2015; Kabir, 2014). The lowest mean score of 4.44 was for this program, which has the potential to generate passive income. This result aligns with Azme et al. (2023), who found that community-based recycling initiatives not only raise awareness about used cooking oil but also provide an opportunity to generate income by producing soap from recycled oil, thereby benefiting the local economy.

Additionally, all the factors recorded mean scores higher than 1, which signifies that each factor contributes positively to the awareness of the "Green Program" on campus, particularly the “Jom Kitar Semula Minyak Masak Terpakai” initiative at PMM. This suggests that the program is successful in fostering a positive attitude towards recycling and environmental sustainability within the PMM community.

Table 6. The factors with the score

Item Statistics	N	Mean	Std. Deviation	Rank
1. This program can reduce environmental pollution.	82	4.62	.678	1
2. This program helps reduce the problem of clogged tanks/sinks.	82	4.62	.580	2
3. This program encourages me to continue practicing used cooking oil recycling.	82	4.60	.606	3
4. This program can raise awareness about the importance of effective used cooking oil waste management.	82	4.57	.609	5
5. This program can save repair costs due to negligence in handling used cooking oil.	82	4.55	.669	6
6. This program encourages innovation, invention, and resource reuse involving used cooking oil.	82	4.59	.565	4
7. This program can attract the interest of industries/stakeholders to collaborate with PMM.	82	4.50	.689	7
8. This program can generate passive income.	82	4.44	.611	8

4. Conclusion

In conclusion, this study aims to identify the main challenges in the collection and recycling program of used cooking oil at Politeknik Merlimau. The findings confirm that the "Green on Campus: Jom Kitar Semula Minyak Masak Terpakai" program plays a crucial role in reducing environmental pollution and increasing campus awareness of sustainable practices. Through this initiative, students and staff are more exposed to the importance of responsible waste management, encouraging them to adopt a sustainable lifestyle in the long term. Additionally, this program not only helps mitigate water pollution caused by improper disposal of used cooking oil but also serves as an educational platform that raises awareness among campus residents about the negative impacts of waste oil on the environment. With a structured collection system and strong community support, this initiative has the potential to become an effective model for creating a sustainable green campus. Therefore, to ensure the continuity and effectiveness of this program, it is recommended that it be implemented in phases or established as an annual activity. With continuous support and improvements, such as introducing economic incentives for participants and expanding awareness campaigns, this program has the potential to make a more significant impact on the local community. Furthermore, it can strengthen the recycling culture among the younger generation, making them more responsible toward environmental preservation and contributing to sustainable development goals at both the institutional and national levels.

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LITERASI PENGKOMPUTERAN HIJAU: PERSPEKTIF PENSYARAH JABATAN TEKNOLOGI MAKLUMAT DAN KOMUNIKASI, POLITEKNIK MUADZAM SHAH

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Abstrak

Pelaksanaan kampus hijau semakin mendapat perhatian di politeknik dan kolej komuniti (PolyCC). Ini terbukti dengan adanya dokumen tindakan Blueprint Smartgreen PolyCC 2021-2026 yang merangka beberapa pelaksanaan amalan hijau di institusi termasuklah aspek penekanan kualiti kehidupan dan budaya kerja. Pengkomputeran hijau merupakan satu inisiatif lestari penggunaan teknologi dan peralatan komputer bagi mengurangkan kesan negatif terhadap alam sekitar. Kajian ini bertujuan untuk menilai tahap literasi pengkomputeran hijau dalam kalangan pensyarah Jabatan Teknologi Maklumat dan Komunikasi (JTMK) di Politeknik Muadzam Shah (PMS). Kajian akan meneliti terhadap pemahaman dan amalan pensyarah serta mengkaji hubungan signifikan kedua-dua aspek tersebut. Responden kajian adalah kesemua pensyarah JTMK merangkumi dua program iaitu program Diploma Teknologi Maklumat (*Software and Development*) dan Diploma Teknologi Maklumat (*Networking System*) iaitu seramai daripada 40 orang pensyarah. Instrumen kajian adalah melalui borang soal selidik. Perisian aplikasi SPSS Statistics v25.0 telah digunakan untuk menganalisis data dan dinyatakan secara deskriptif mengunakan kaedah kekerapan, peratusan dan min. Hasil kajian dijangka memberikan gambaran mengenai tahap kesedaran serta keberkesanan amalan pengkomputeran hijau dalam kalangan pensyarah JTMK. Dapatan ini dapat membantu merangka pendekatan yang lebih berkesan bagi meningkatkan kesedaran melaksanakan amalan lestari menggunakan teknologi. Kajian ini juga diharapkan dapat menyumbang kepada pembangunan dasar yang menyokong inisiatif hijau di PolyCC.
Kata Kunci: Pengkomputeran hijau; Pensyarah; Politeknik.

1. Pengenalan

Tidak dapat dinafikan pada masa kini, dunia sering dilanda dengan pencemaran alam sekitar dan perubahan iklim yang semakin membimbangkan. Jika tidak diurus dengan baik kelestarian alam ini, maka kesan pembalikan melalui pencemaran tersebut boleh menjadi satu wabak kepada manusia (Duong & Pensini, 2023). Di Malaysia, permasalahan ini telah memberi kesan negatif kepada alam sekitar, keamanan dan kemakmuran sejagat (Puteh et al., 2024). Banyak faktor yang mendorong kepada punca masalah tersebut termasuklah pembangunan pesat di bandar, penerokaan tanpa kawalan di luar bandar dan penggunaan sumber alam tidak terurus.

Sebagai contoh pencemaran alam sekitar, menurut Laporan Greenpeace Malaysia 2024 negara ini menghadapi krisis pencemaran plastik yang serius dengan kadar kitar semula hanya sekitar 33% pada tahun 2023, jauh daripada sasaran 40% menjelang 2025. Kebocoran dan kebakaran paip gas di Putra Heights, Selangor yang menyebabkan kecederaan serta kemusnahan harta benda, walaupun tiada pencemaran toksik dikesan, insiden ini menimbulkan persoalan mengenai keselamatan infrastruktur dan kesan jangka panjang terhadap alam sekitar. Bagi bencana dan perubahan iklim pula, Malaysia pernah mengalami gelombang haba yang teruk pada awal 2024 dengan amaran tahap dua dikeluarkan di beberapa negeri yang melibatkan kes penyakit berkaitan haba. Beberapa kejadian tanah runtuh di kawasan Cameron Highlands, Puchong, dan Genting Highlands akibat hujan lebat

yang luar biasa serta musibah banjir besar melanda di 10 negeri yang juga dikaitkan dengan peningkatan kejadian cuaca ekstrem akibat perubahan iklim di Malaysia.
Agenda 2030 untuk Pembangunan Mampan merupakan pelan tindakan global telah diluluskan dan diterima pakai oleh Pertubuhan Bangsa-Bangsa Bersatu (PBB) yang bertujuan untuk mengakhiri kemiskinan, melindungi alam sekitar, dan memastikan kesejahteraan untuk semua menjelang tahun 2030. Sebanyak 17 Matlamat Pembangunan Mampan dan 169 sasaran yang saling berkait terkandung di dalam agenda ini.

Usaha PolyCC sebagai salah satu institusi peneraju TVET negara yang telah menghasilkan Blueprint SmartGreen PolyCC 2021-2026 (BSGPC) wajar dipuji kerana blueprint ini bertujuan memperkasa budaya hijau dan melestarikan PolyCC melalui tujuh bidang tumpuan utama, termasuk pengurusan kampus hijau, pemupukan komuniti hijau dan penyelidikan hijau (Razak & Halili 2023). Ia juga selaras dengan usaha untuk menyokong Agenda 2030 Pembangunan Mampan (SDG) dan meningkatkan kedudukan institusi dalam penarafan UI GreenMetric World University Ranking.

Institusi Pengajian Tinggi (IPT) perlu dilihat sebagai pemangkin dan platform utama dalam menerapkan nilai-nilai kesedaran, pengetahuan dan kemahiran bagi mengekalkan kesejahteraan dan pembangunan mampan. Ini kerana sistem pengajian tinggi dibentuk bagi melahirkan generasi yang mampu untuk berdaya saing dari segi keupayaan yang dinamik dan mampu untuk meramalkan cabaran masa hadapan serta bertindak secara berkesan seiring dengan pembangunan global (Azmi & Radzuan, 2021). Menurut Abdullah et al., (2022), adalah sangat penting bagi menghasilkan graduan yang berpengetahuan dan kompeten dalam bidang pengajian serta mampu untuk menggunakan pengetahuan dan amalan. Untuk tujuan itu, IPT seharusnya menjadi gedung ilmu yang berupaya menghasilkan graduan yang berpengetahuan dan berkemahiran agar kepakaran mereka dapat menyumbang kepada pengurusan dan kepimpinan mampan selain turut berperanan dalam mengetengahkan sikap dan komunikasi yang berkesan supaya mampu membangun secara holistik (Aziz et al., 2024). Bagi keperluan melahirkan generasi dan sumber pekerja hijau di masa hadapan, IPT perlu bersedia dalam menangani cabaran IR 4.0 yang bukan memberi fokus terhadap perkembangan teknologi semata-mata malah memberi tumpuan kepada pembinaan karektor pelajar (Mustafa, 2024). Terdapat lapan ciri sumber pekerja hijau yang perlu ada dalam seseorang warga organisasi iaitu kejat, tangkas, konsisten, fleksibel, sihat tubuh badan, waras, seimbang, dan produktif. Oleh itu, strategi-strategi pengurusan sumber manusia hijau perlu dilaksanakan secara sistematik dan efisien untuk menjana dan mengekalkan sumber manusia hijau (Makhbul et al., 2018). Semua pensyarah JTMK Politeknik Muadzam Shah perlu melihat perkara ini dengan lebih serius dan seharusnya menjadi pelopor dan contoh terbaik dalam aspek pengkomputeran hijau kepada warga Politeknik Muadzam Shah. Antara amalan terbaik ke arah usaha ini adalah dengan perlaksanaan program Digital Innovation & Creativity Exhibition (DICE 2025) pada 23 April 2025 anjuran JTMK yang merupakan program penghasilan dan pembentangan projek akhir pelajar bertemakan teknologi hijau. Jalinan kerjasama turut dibuat bersama Perbadanan Pengurusan Sisa Pepejal dan Pembersihan Awam (SWCorp) Cawangan Muadzam Shah salah satu usaha yang sangat baik sebagai pendekatan dalam memberi pendidikan kepentingan kitar semula, menjaga keindahan dan kebersihan alam sekitar.

Kamarudin et al., (2022) telah menggariskan empat laluan yang memberi kesan terhadap alam sekitar melalui pengkomputeran seperti mengurangkan penggunaan tenaga, mengitarkan semula komponen komputer, merekabentuk komponen atau peranti yang mesra alam dan menghasilkan komponen elektronik yang memberi kesan minima kepada alam sekitar. Usaha-usaha membudayakan amalan pengkomputeran hijau di JTMK PMS seperti mengurangkan penggunaan tenaga elektrik, menjalankan aktiviti kitar semula serta mengurangkan pencetakkan kertas telah dilaksanakan di tempat kerja. Malah turut diperluaskan perlaksanaannya kepada pelajar supaya mereka mampu menjadi generasi pekerja hijau di masa hadapan. Namun, menjadi persoalan sekarang samada pemahaman

dan amalan pembudayaan ini hanya dilaksanakan oleh segelintir pensyarah atau mendapat kerjasama daripada keseluruhan warga JTMK. Komitmen daripada semua pihak sangat diperlukan bagi membuktikan warga JTMK betul-betul mampu melaksanakan pengkomputeran hijau iaitu menggunakan komputer dan teknologi maklumat secara efisien yang mesra alam untuk mengurangkan kesan negatif terhadap alam sekitar di Politeknik Muadzam Shah. Objektif kajian ini adalah bertujuan untuk:

i) Mengenalpasti tahap literasi pengkomputeran hijau dalam kalangan pensyarah JTMK
ii) Mengenalpasti tahap pelaksanaan amalan pengkomputeran hijau dalam kalangan pensyarah JTMK
iii) Mengenalpasti hubungan signifikan antara tahap literasi dan pelaksanaan amalan pengkomputeran hijau dalam kalangan pensyarah JTMK

2. Metodologi

Kajian ini adalah kajian deskriptif berbentuk kuantitatif manakala pendekatan yang digunakan adalah secara tinjauan dengan menggunakan borang soal selidik sebagai instrumen kajian. Penyelidik mengedarkan sendiri borang soal selidik kepada pensyarah mengikut program bagi menjelaskan tujuan dan kepentingan kajian. Edaran borang soal selidik turut disediakan dalam bentuk *google form* bagi memudahkan pensyarah untuk memberi maklumbalas. Penggunaan borang soal selidik diyakini mampu memberikan maklumbalas yang tepat kerana hasil sampel tidak dipengaruhi oleh penyelidik (Ali et al., 2022). Perisian aplikasi SPSS Statistics v25.0 telah digunakan untuk menganalisis data dan dinyatakan secara deskriptif mengunakan kaedah kekerapan, peratusan dan min. Secara keseluruhan terdapat seramai 297 orang pensyarah di Politeknik Muadzam Shah yang merangkumi 7 jabatan akademik. Namun populasi kajian ini tertumpu kepada pensyarah Jabatan Teknologi Maklumat dan Komunikasi sahaja iaitu seramai 40 orang pensyarah. Kajian ini telah mendapat responden seramai 40 orang maka berpandukan kajian Kriecjie dan Morgan (1970), sampel kajian ini adalah mencukupi bagi tujuan penulisan kajian.

Jadual 1. Skala Likert

Sangat tidak setuju (STS)	1
Tidak setuju (TS)	2
Tidak pasti (TP)	3
Setuju (S)	4
Sangat setuju (SS)	5

Interpretasi skor min dalam kajian ini ditentukan melalui jadual penentuan tahap skor min oleh Landell (1977) seperti pada Jadual 2.

Jadual 2. Tahap kecenderungan skor min

Skor Min	Tahap
1.00 – 2.33	Rendah
2.34 – 3.66	Sederhana
3.67 – 5.00	Tinggi

Kajian kuantitatif yang berbentuk tinjauan ini mengumpulkan data berdasarkan kepada borang soal selidik yang diedarkan dan dijawab oleh responden. Kertas soal selidik yang digunakan mengandungi beberapa bahagian seperti berikut:

a) Bahagian A - Demografi responden
b) Bahagian B - Tahap literasi berkaitan pengkomputeran hijau di kalangan pensyarah JTMK, PMS
c) Bahagian C - Amalan pengkomputeran hijau di kalangan pensyarah JTMK, PMS

Bahagian A adalah bertujuan untuk mendapatkan maklumat diri berkaitan dengan jantina, umur, peringkat akademik, program pengajian dan pengalaman mengajar responden. Bahagian B dan C masing-masing mengandungi 5 soalan yang secara keseluruhannya berjumlah 15 soalan.

Jadual 3. Taburan item dalam borang soal selidik kajian

Bahagian	Pembolehubah kajian yang ingin dikenalpasti	No Item	Jumlah Item
A	Demografi responden	1-5	5
B	Tahap literasi berkaitan pengkomputeran hijau di kalangan pensyarah JTMK, PMS	6-10	5
C	Amalan pengkomputeran hijau di kalangan pensyarah JTMK, PMS	11-15	5
	Jumlah Soalan		15

Rusli et al., (2021) menyatakan kajian berbentuk deskriptif mampu memberi gambaran atau maklumat mengenai sesuatu keadaan pada satu masa tertentu di samping dapat membantu perancangan di masa akan datang. Oleh itu, ia sangat sesuai digunakan di dalam kajian ini kerana dapatan kajian ini merupakan maklumat keadaan yang sedang berlaku dan boleh digunakan untuk menyelesaikan masalah yang berkaitan pada masa akan datang.

3. Dapatan dan Perbincangan

Perkara		Bilangan	Peratus (%)
Jantina	Lelaki	15	(35.0)
	Perempuan	25	(65.0)
Umur	30 - 34 tahun	1	(2.5)
	35 - 39 tahun	6	(15.0)
	40 - 44 tahun	21	(52.5)
	45 - 49 tahun	12	(30.0)
	50 tahun ke atas	0	(0.0)
Peringkat Pendidikan Akademik	Ijazah Sarjana Muda	22	(55.0)
	Sarjana	17	(42.5)
	PHD	0	(0.0)
Program Pengajian	Track - Software & Development (SAD)	22	(55.0)
	Track - Networking System (NS)	18	(45.0)
Pengalaman Mengajar	0 hingga 5 tahun	2	(5.0)
	6 hingga 10 tahun	2	(5.0)
	11 hingga 15 tahun	13	(32.5)
	16 hingga 20 tahun	18	(45.0)
	21 tahun ke atas	5	(12.5)

Rajah 1. Demografi responden

Rajah 1 menunjukkan demografi responden kajian yang merangkumi item jantina, umur, peringkat pendidikan akademik, program pengajian dan pengalaman mengajar. Berdasarkan jadual, majoriti responden adalah terdiri daripada pensyarah perempuan iaitu seramai 25 orang (65%) manakala pensyarah lelaki seramai 15 orang (35%). Jumlah responden mengikut umur pula, majoriti adalah dalam lingkungan 40-44 tahun iaitu seramai 21 orang (52.5%), 12 orang berusia 45-49 tahun (30.0%), 6 orang berusia 35-39 tahun (15.0%) dan 1 orang berusia 30-34 tahun (2.5%). Dapatan kajian turut menunjukkan sejumlah 22 orang pensyarah mempunyai pendidikan Ijazah Sarjana Muda (55.0%) dan 17 orang mempunyai peringkat pendidikan akademik Sarjana (42.5%). Seramai 22 orang pensyarah terdiri daripada Program

Software & Development (SAD) (55.0%) manakala selebihnya seramai 18 orang terdiri daripada Program Networking System (NS) (45.0%). Seterusnya bagi item pengalaman mengajar, seramai 18 orang pensyarah JTMK telah berkhidmat dalam tempoh 16-20 tahun (45.0%), 13 orang dalam tempoh 11-15 tahun (32.5%), 5 orang dalam tempoh 21 tahun ke atas (12.5%) serta masing-masing 2 orang bagi tempoh 0-5 tahun dan 6-10 tahun (10%). Rajah 2 menunjukkan tahap literasi berkaitan pengkomputeran hijau di kalangan pensyarah bagi Program Software & Development (SAD) dan Rajah 3 pula terdiri daripada pensyarah bagi Program Networking System (NS). Rata-rata pensyarah didapati mampu untuk memahami, menilai serta mengamalkan prinsip-prinsip teknologi yang mesra alam dalam penggunaan komputer dan ICT di JTMK. Keupayaan dan sikap bertanggungjawab setiap pensyarah amat memainkan peranan penting dalam pembentukan budaya kerja yang sihat di jabatan seterusnya mampu membentuk jati diri pelajar dengan mencontohi sikap tenaga pengajar samada di dalam mahupun di luar bilik kuliah. Perbandingan kedua-dua jadual tersebut menunjukkan item 5 bagi Program Software & Development memberi nilai skor min terendah 3.8182 berbanding nilai skor min 4.1667 bagi Program Networking System. Manakala item 1 daripada Program Software & Development memberi nilai skor min tertinggi 4.7273 berbanding nilai skor min 4.3333 bagi Program Networking System. Nilai skor min bagi item 2, item 3 dan item 4 bagi kedua-dua jadual memberikan nilai skor min melebihi 4.200 ke atas. Jumlah nilai skor min bagi Rajah 2 adalah sebanyak 4.45 manakala jumlah nilai skor min bagi Rajah 3 adalah sebanyak 4.34. Jumlah skor min yang tinggi ini menunjukkan pensyarah JTMK mempunyai tahap kefahaman dan pengetahuan yang sangat baik berkaitan pengkomputeran hijau di jabatan.

TAHAP LITERASI BERKAITAN PENGKOMPUTERAN HIJAU DI KALANGAN PENSYARAH					
Item	**Pernyataan**	**N**	**Mean**	**Std. Deviation**	**Total Mean**
1	Saya tahu teknologi pengkomputeran hijau adalah seperti penggunaan peranti secara efektif dan pengkomputeran awan	22	4.7273	0.5505	4.45
2	Saya tahu penggunaan pengkomputeran hijau mampu mengurangkan bil elektrik di jabatan	22	4.6364	0.5811	
3	Saya bersetuju pengkomputeran hijau boleh membantu mengurangkan penggunaan sumber tenaga fosil dan mengurangkan kesan terhadap alam	22	4.6364	0.4924	
4	Saya bersetuju penggunaan pengkomputeran hijau mampu membuatkan diri berasa selamat dan mudah dipercayai	22	4.4091	0.7341	
5	Saya memperoleh maklumat yang mencukupi tentang promosi pengkomputeran hijau di jabatan	22	3.8182	1.0065	

Rajah 2. Tahap literasi berkaitan pengkomputeran hijau di kalangan pensyarah bagi Program Software & Development (SAD), JTMK

TAHAP LITERASI BERKAITAN PENGKOMPUTERAN HIJAU DI KALANGAN PENSYARAH					
Item	**Pernyataan**	**N**	**Mean**	**Std. Deviation**	**Total Mean**
1	Saya tahu teknologi pengkomputeran hijau adalah seperti penggunaan peranti secara efektif dan pengkomputeran awan	18	4.3333	0.8402	4.34
2	Saya tahu penggunaan pengkomputeran hijau mampu mengurangkan bil elektrik di jabatan	18	4.4444	0.7838	
3	Saya bersetuju pengkomputeran hijau boleh membantu mengurangkan penggunaan sumber tenaga fosil dan mengurangkan kesan terhadap alam sekitar	18	4.5000	0.6183	
4	Saya bersetuju penggunaan pengkomputeran hijau mampu membuatkan diri berasa selamat dan mudah dipercayai	18	4.2778	0.7519	
5	Saya memperoleh maklumat yang mencukupi tentang promosi pengkomputeran hijau di jabatan	18	4.1667	1.1504	

Rajah 3. Tahap literasi berkaitan pengkomputeran hijau di kalangan pensyarah bagi Program Networking System (NS), JTMK

Rajah 4 menunjukkan tahap literasi keseluruhan pensyarah JTMK berkaitan pengkomputeran hijau. Pada item 5, didapati sebanyak 30% responden yang terdiri daripada seorang responden memberikan penilaian sangat tidak setuju, 3 responden memberikan penilaian

tidak setuju dan seramai 8 responden adalah tidak pasti terhadap keberkesanan promosi pengkomputeran hijau di jabatan. Item ini secara keseluruhannya memberikan nilai skor min terendah iaitu 3.9750. Item 3 berkaitan pensyarah bersetuju terhadap pengkomputeran hijau boleh membantu mengurangkan sumber tenaga fosil dan mengurangkan kesan terhadap alam sekitar memberi nilai skor min tertinggi iaitu 4.5750.

Item	Pernyataan	STS	TS	TP	S	SS	Mean	Std. Deviation
TAHAP LITERASI BERKAITAN PENGKOMPUTERAN HIJAU DI KALANGAN PENSYARAH								
1	Saya tahu teknologi pengkomputeran hijau adalah seperti penggunaan peranti secara efektif dan pengkomputeran awan	0 (0.0)	1 (2.5)	2 (5.0)	11 (27.5)	26 (65.0)	4.5500	0.7143
2	Saya tahu penggunaan pengkomputeran hijau mampu mengurangkan bil elektrik di jabatan	0 (0.0)	1 (2.5)	1 (2.5)	13 (32.5)	25 (62.5)	4.5500	0.6775
3	Saya bersetuju pengkomputeran hijau boleh membantu mengurangkan penggunaan sumber tenaga fosil dan mengurangkan kesan terhadap alam sekitar	0 (0.0)	0 (0.0)	1 (2.5)	15 (37.5)	24 (60.0)	4.5750	0.5495
4	Saya bersetuju penggunaan pengkomputeran hijau mampu membuatkan diri berasa selamat dan mudah dipercayai	0 (0.0)	0 (0.0)	6 (15.0)	14 (35.0)	20 (50.0)	4.3500	0.7355
5	Saya memperoleh maklumat yang mencukupi tentang promosi pengkomputeran hijau di jabatan	1 (2.5)	3 (7.5)	8 (20.0)	12 (30.0)	16 (40.0)	3.9750	1.0739

Rajah 4. Tahap literasi berkaitan pengkomputeran hijau di kalangan pensyarah JTMK

AMALAN PENGKOMPUTERAN HIJAU DI KALANGAN PENSYARAH					
Item	Pernyataan	N	Mean	Std. Deviation	Total Mean
1	Saya bersedia untuk membeli peralatan ICT yang telah dikitar semula untuk kegunaan persendirian	22	3.7727	0.8691	4.51
2	Saya bersedia untuk menutup (shutdown) peranti ICT atau komputer apabila tidak menggunakannya	22	4.7727	0.4289	
3	Saya bersedia untuk mencetak kedua-dua belah bahagian muka surat pada kertas	22	4.8182	0.3948	
4	Saya sering mengamalkan pengkomputeran hijau tanpa makluman/peringatan daripada jabatan	22	4.3182	0.4767	
5	Saya sedar amalan pengkomputeran hijau adalah sesuatu perkara yang amat baik untuk diamalkan	22	4.8636	0.3513	

Rajah 5. Tahap amalan pengkomputeran hijau di kalangan pensyarah bagi Program Software & Development (SAD), JTMK

AMALAN PENGKOMPUTERAN HIJAU DI KALANGAN PENSYARAH					
Item	Pernyataan	N	Mean	Std. Deviation	Total Mean
1	Saya bersedia untuk membeli peralatan ICT yang telah dikitar semula untuk kegunaan persendirian	18	4.2222	0.7321	4.59
2	Saya bersedia untuk menutup (shutdown) peranti ICT atau komputer apabila tidak menggunakannya	18	4.6667	0.5941	
3	Saya bersedia untuk mencetak kedua-dua belah bahagian muka surat pada kertas	18	4.7778	0.5483	
4	Saya sering mengamalkan pengkomputeran hijau tanpa makluman/peringatan daripada jabatan	18	4.4444	0.6157	
5	Saya sedar amalan pengkomputeran hijau adalah sesuatu perkara yang amat baik untuk diamalkan	18	4.8333	0.3835	

Rajah 6 Tahap amalan pengkomputeran hijau di kalangan pensyarah bagi Program Networking System (NS), JTMK

Rajah 5 menunjukkan tahap amalan pengkomputeran hijau di kalangan pensyarah bagi Program Software & Development (SAD) dan Rajah 6 pula terdiri daripada pensyarah bagi Program Networking System (NS). Perbandingan kedua-dua jadual ini mendapati item 1 bagi Program Software & Development memberi nilai skor min terendah iaitu 3.7727 berbanding nilai skor min 4.2222 bagi Program Networking System. Manakala item 5 daripada Program Software & Development memberi nilai skor min tertinggi 4.8636 berbanding nilai skor min 4.8333 bagi Program Networking System. Hasil dapatan juga menunjukkan item selain item 1 dan 5 memberikan nilai skor min 4.3000 ke atas. Jumlah nilai skor min bagi Jadual 8 adalah sebanyak 4.51 manakala jumlah nilai skor min bagi Rajah 6 adalah sebanyak 4.59. Jumlah

skor min yang tinggi ini menunjukkan pensyarah JTMK amat bersedia dengan mengamalkan aktiviti berkaitan pengkomputeran hijau di jabatan.

Rajah 7 menunjukkan tahap amalan pengkomputeran hijau di kalangan keseluruhan pensyarah JTMK. Item 1 berkaitan persediaan untuk membeli peralatan ICT yang telah di kitar semula untuk kegunaan persendirian memberikan nilai skor min terendah iaitu 3.9750, manakala item 5 berkaitan kesedaran amalan pengkomputeran hijau adalah sesuatu perkara yang amat baik untuk diamalkan memberi nilai skor min tertinggi iaitu 4.8500.

Item	Pernyataan	STS	TS	TP	S	SS	Mean	Std. Deviation
AMALAN PENGKOMPUTERAN HIJAU DI KALANGAN PENSYARAH								
1	Saya bersedia untuk membeli peralatan ICT yang telah dikitar semula untuk kegunaan persendirian	0 (0.0)	3 (7.5)	5 (12.5)	22 (55.0)	10 (25.0)	3.9750	0.8317
2	Saya bersedia untuk menutup (shutdown) peranti ICT atau komputer apabila tidak menggunakannya	0 (0.0)	0 (0.0)	1 (2.5)	9 (22.5)	30 (75.0)	4.7250	0.5057
3	Saya bersedia untuk mencetak kedua-dua belah bahagian muka surat pada kertas	0 (0.0)	0 (0.0)	1 (2.5)	6 (15.0)	33 (82.5)	4.8000	0.4641
4	Saya sering mengamalkan pengkomputeran hijau tanpa makluman/peringatan daripada jabatan	0 (0.0)	0 (0.0)	1 (2.5)	23 (57.5)	16 (40.0)	4.3750	0.5401
5	Saya sedar amalan pengkomputeran hijau adalah sesuatu perkara yang amat baik untuk diamalkan	0 (0.0)	0 (0.0)	0 (0.0)	6 (15.0)	34 (85.0)	4.8500	0.3616

Rajah 7. Tahap amalan pengkomputeran hijau di kalangan pensyarah JTMK

Untuk menilai kekuatan dan arah hubungan antara dua pembolehubah, analisis kolerasi pearson telah dijalankan terhadap kedua-dua pembolehubah kajian iaitu tahap literasi berkaitan pengkomputeran hijau dan amalan pengkomputeran hijau di kalangan pensyarah JTMK. Rajah 8 menunjukkan hubungan signifikan kedua-dua pembolehubah dengan nilai pekali kolerasi pearson yang diperolehi hasil daripada analisis yang telah dijalankan. Kajian mendapati nilai pekali kolerasi pearson adalah r = 0.442, p = 0.004 (p<0.01). Ini menunjukkan kedua-dua pembolehubah kajian berhubung secara positif dengan kekuatan perhubungan pada tahap hubungan yang kuat.

		literasi_total	amalan_total
literasi_total	Pearson Correlation	1	.442**
	Sig. (2-tailed)		.004
	N	40	40
amalan_total	Pearson Correlation	.442**	1
	Sig. (2-tailed)	.004	
	N	40	40

**. Correlation is significant at the 0.01 level (2-tailed).

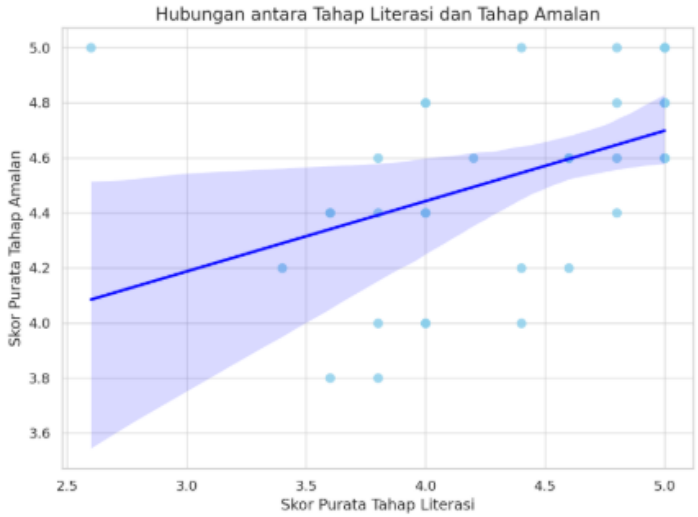
Rajah 8. Hubungan signifikan antara tahap literasi dan pelaksanaan amalan pensyarah JTMK

4. Kesimpulan

Literasi merujuk kepada tahap ilmu atau kesedaran pensyarah terhadap konsep dan kepentingan pengkomputeran hijau manakala amalan pula merujuk kepada pembudayaan dan tingkah laku sebenar pensyarah melaksanakan aktiviti mesra alam berkaitan teknologi dan ICT di jabatan. Menurut II B., (2022) Teori Perilaku Beralasan mengatakan ada dua faktor penentu niat iaitu sikap peribadi dan norma subjektif. Dalam konteks ini pengetahuan dan sikap akan mempengaruhi niat dan amalan seseorang. Maka, semakin tinggi pemahaman pensyarah terhadap pengkomputeran hijau, semakin besar kemungkinan mereka akan mengamalkannya di jabatan mahupun di institusi.

Secara keseluruhan dengan merujuk Jadual 2, nilai skor min bagi kesemua item Rajah 4 berada pada julat skor 3.67-5.00 yang menunjukkan tahap kecenderungan skor min berada pada tahap yang tinggi. Ini secara tidak langsung menggambarkan tahap literasi pensyarah

berkaitan pengkomputeran hijau di jabatan adalah sangat baik. Manakala nilai skor min bagi kesemua item Jadual 10 juga berada pada julat yang menunjukkan tahap kecenderungan skor min berada pada tahap yang tinggi. Ia juga secara tidak langsung menggambarkan tahap amalan pengkomputeran hijau pensyarah di jabatan adalah sangat baik.



Rajah 9. Hubungan antara tahap literasi dan pelaksanaan amalan pensyarah JTMK

Rajah 9 menunjukkan garisan biru regresi arah hubungan kedua pembolehubah dan julat keyakinan berwarna ungu = 95% di sekitar garisan tersebut. Signifikan analisis pada Jadual 11 jelas menunjukkan kolerasi positif antara tahap literasi dan amalan pengkomputeran hijau di kalangan pensyarah yang bermaksud semakin tinggi tahap literasi pensyarah terhadap kefahaman konsep pengkomputeran hijau maka semakin besar kecenderungan mereka untuk mengamalkan prinsip tersebut di tempat kerja. Nilai p = 0.004 ($p<0.01$) pula menyatakan hubungan ini adalah signifikan secara statistik.

Dapatan ini dijangka mampu membantu khususnya JTMK dan amnya PMS dalam merangka pendekatan yang lebih berkesan bagi meningkatkan pemahaman, kesedaran dan pelaksanaan amalan lestari penggunaan komputer dan teknologi ICT. Kerap didapati pembudayaan amalan pengkomputeran hijau di persekitaran tempat kerja lebih tertumpu kepada penjimatan elektrik, pengurangan cetakan kertas dan program kitar semula namun ianya sepatutnya diperluaskan lagi dengan kempen menggunaan peranti yang cekap tenaga contohnya bersijil *energy star*, meningkatkan amalan penggunaan virtualisasi bagi mengurangkan bilangan pelayan fizikal serta menggalakkan penggunaan *cloud computing* dengan pusat data yang mesra alam.

Walaupun hasil kajian menunjukkan signifikan hubungan yang positif antara kedua-dua pembolehubah literasi dan amalan pensyarah terhadap pengkomputeran hijau, namun masih perlu penambahbaikan perlaksanaan JTMK di institusi. Hasil kajian seperti di Jadual 7 (item 5) menunjukkan JTMK perlu meningkatkan cara mempromosi aktiviti dan hebahan agar mesej dan maklumat mampu diterima oleh semua warga JTMK. Menurut Saleh & Rosli, (2020) era IR 4.0 telah berlakunya banyak perubahan dari sudut penggunaan teknologi. Teknologi atas talian khususnya media sosial telah menjadi medan komunikasi dalam menjalankan aktiviti harian termasuklah pengurusan dan pentadbiran sesebuah organisasi. Justeru JTMK perlu pelbagaikan kaedah penggunaan media sosial dengan mendapatkan kerjasama semua warga JTMK.
Manakala hasil kajian seperti di Rajah 7 (item 1) pula menunjukkan JTMK perlu menggiatkan kempen agar pensyarah di PMS membeli dan menggunakan peralatan ICT kitar semula. Dalam konteks pembuangan dan pelupusan barangan ICT dan elektronik, ianya memang

memerlukan satu sistem pengurusan yang berbeza dengan sistem pengurusan sisa pepejal harian. Malah, tempat pelupusan juga amat terhad dan tidak sesuai berikutan ianya mengandungi bahan kimia yang boleh memudaratkan manusia dan alam sekitar. Antara kempen dan aktiviti yang boleh dipertimbangkan oleh JTMK adalah dengan penganjuran kempen inovasi dan komersial rekabentuk bahan kitar semula peralatan ICT. Ia bukan sahaja memberikan kesedaran kepada warga PMS malah mampu mendapatkan pulangan hasil keusahawanan terebut dan berupaya membentuk jati diri pelajar PMS yang cemerlang dari pelbagai sudut terutamanya sebagai sumber pekerja hijau di Malaysia.

Kesimpulannya, Unit SmartGreen PMS amat memerlukan data perlaksanaan program seperti penghasilan kertas kajian berkaitan budaya hijau dan pelestarian PolyCC. Hasil kajian yang dihasilkan ini mampu memberikan gambaran positif kepada Unit SmartGreen PMS terhadap tahap literasi serta keberkesanan amalan pengkomputeran hijau dalam kalangan pensyarah JTMK di PMS. Hasil kajian ini juga boleh dijadikan penanda aras kepada jabatan-jabatan lain di PMS mahupun di PolyCC seluruh Malaysia bagi menyumbang kepada pembangunan dasar dan perlaksanaan program yang menyokong inisiatif hijau di PolyCC.

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SARUNG TANGAN ISTIMEWA 'ZIPPER SLEEVE'

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Abstrak

Zipper Sleeve memudahkan seluruh wanita yang menginginkan aksesori sarung tangan patuh syariah disamping memenuhi keperluan asas wanita moden terkini. Tidak hanya memfokuskan pada masalah wanita muslimah, Zipper Sleeve juga mempunyai ciri-ciri keselamatan, memahami apa wanita perlukan, membawa penampilan cantik bergaya, memudahkan walau apa jua situasi dan suasana, keselesaan kesesuaian cuaca, ringan dipakai, mudah dicuci serta disimpan. Zipper Sleeve memahami wanita ketika menghadapi kesukaran ketika bersosial, bersukan, berbasikal, menunggang, beriadah dalam masa yang sama memerlukan satu ruang penyimpanan aksesori seperti kad, wang, perhiasan berharga atau apa sahaja yang menjadi kesukaran urusan atau aktiviti yang hendak dilakukan. Ketika menunaikan solat, tempat penyimpanan barang-barang kecilan ini juga tidak dinafikan menjadi keraguan fikiran. Kaedah metodologi kajian adalah berbentuk kuantitatif kepada staf dan pelajar di Kolej Komuniti Gerik. Ini memberi inspirasi kepada pelajar Unit Fesyen Pakaian menghasilkan produk inovasi serta peluang buat Unit Alumni Kolej serta Keusahawanan menjana pendapatan memandangkan ia mempunyai nilai komersial yang tinggi kepada masyarakat. Sarung tangan istimewa ini akan terus ditambahbaik nilai kualiti, multi penggunaan, rekacorak bervariasi mahupun saiz yang lebih memberi pilihan. Satu penciptaan pemudahcara, aktiviti tanpa halangan, penyimpanan hanya pada sepasang sarung tangan, tanpa batasan penggunaan dan pastinya ia trampil patuh syariah bergaya.
Kata kunci: Zipper sleeve; Syariah; Wanita.

1. Pengenalan

Dunia sentiasa berubah dari semasa ke semasa mengikut keperluan mahupun fakta yang meminta manusia menelusuri arusnya. Begitu juga dengan kehidupan yang kian aktif, tiada sempadan minda, kerjaya dan juga pencapaian buat semua jantina yang kini sudah tiada bezanya. Mengambil prihatin terhadap perkembangan semasa, bidang fesyen dan pakaian turut terpanggil menjadi antara penyumbang positif merealisasikan pemudahcara buat wanita muslimah asalnya, bersama wanita segenap bangsa dan agama serta kaum lelaki juga. Syariah pula jika difahami membawa konsep mencakupi segenap aspek keagamaan, moral, sosial, ekonomi dan politik. Kamus Dewan (2007) merujuk fesyen sebagai gaya pakaian, kosmetik, tingkah laku dan lain-lain yang menjadi kegemaran serta diminati oleh ramai dan diikuti serta berubah dar semasa ke semasa. Sudah pasti memahami keperluan dan naluri keselesaan wanita khasnya, sarung tangan istimewa direkacipta. Sarung tangan yang asasnya adalah biasa ditambahbaik kepada kepelbagaian guna. Diinovasikan agar penggunaannya tidak hanya sebagai sarung tangan buat muslimah patuh syariah, namun ia berfungsi sebagai penyimpanan barangan kecilan berharga, ciri keselamatan yang mudah dicapai, dibasuh, disimpan malah menjadi satu fesyen bergaya buat semua bangsa, kaum wanita dan kaum lelaki juga. Segala aktiviti seperti bersukan, beriadah, bersosial, solat, berbasikal atau menunggang juga menjadi mudah serta yakin. Ini kerana, barangan kecilan yang berharga sudah di disimpan di tempat yang selamat, tiada keraguan, bersama anda dan cantik bergaya. Dicipta secara asas, namun akan ditambahbaik melalui kualiti material fabrik agar lebih menarik, saiz bervariasi, kesesuaian cuaca, ringan dan pilihan warna serta corak rekaan. Diinspirasikan dari situasi cuaca dan aktiviti lasak, sarung tangan ini boleh didatangkan dengan pilihan kalis air serta material yang mampu memeri. Penambahan ini

akan memberi lebih keselesaan buat penggunanya dan kepelbagaian pilihan akan menarik minat setiap golongan untuk mencuba dan berpuas hati dengan belian.

Sarung tangan Zipper Sleeve ini juga jika berjaya dikomersilkan, akan dijual pada harga mampu milik buat semua supaya setiap golongan mampu memakainya dan secara tidak langsung ia menggalakkan golongan wanita muslimah tidak merasa sesuatu yang membebankan untuk mematuhi syariah. Nilai mampu milik tersebut, memupuk rasa berbaloi pada harga sebuah ketrampilan kepada yang berusia mahupun yang muda belia. Zipper Sleeve juga dijangkakan mampu untuk menarik kumpulan remaja perempuan sekolah yang penuh aktiviti luaran seperti bersukan, berpersatuan dan aktiviti ko-kurikulum yang majoritinya memerlukan fungsi Zipper Sleeve ini sebaiknya. Zipper Sleeve ini mudah dilipat menjadi kecil, menjimatkan ruang atau dipakai terusan sahaja. Golongan sasaran utama selainnya asasnya wanita, muslimah mahupun selainnya, ia turut bersesuaian buat golongan guru yang keperluannya sama seperti para pelajar remaja perempuan, atlet, pekerja kerjaya lasak, pekerja e-hailing, pencuci bangunan, jurutera mesin penghantar barang atau makanan serta sesiapa sahaja yang memerlukan.

Rajah 1. Menunjukkan penyimpanan barangan kecil ke dalam ruang zip yang dibuka

Rajah 2. Menunjukkan sarung tangan istimewa Zipper Sleeve dipakai secara sepasang (kiri kanan tangan) dengan selesa

2. Metodologi

Kaedah atau metodologi yang dipilih adalah berbentuk kuantitatif, yang lebih bersesuaian dengan keperluan kajian terhadap respondan. Kajian dijalankan terhadap para kakitangan

Kolej Komuniti Gerik Perak khususnya para wanita. Bersesuaian dengan budaya serta amalan baik di Kolej Komuniti Gerik yang berkonsepkan syariah, sarung tangan 'Zipper Sleeve' ini menjadi testimonial terbaik. Namun begitu, testimonial penggunaan tidak hanya dikenalpasti terhadap para kakitangan sahaja, ia juga amat bersesuaian dicuba kepada responden yang terdiri daripada para pelajar. Pilihan daripada para responden juga diambilkira sebagai satu sumbangan pendapat. Antara nilai tambahbaik yang disenaraikan adalah seperti faktor fabrik, size, warna dan rekacorak. Para responden juga diminta memilih saranan harga mampu milik yang dianggar bertetapan dengan dunia kini seiring ekonomi masyarakat semasa. Susulan demikian, kajian menyediakan instrument jadual serta pilihan terhadap responden bagi memudahkan mereka memilih serta mengenalpasti kepuasan keselesaan pemakaian sarung tangan istimewa ini. Selain tersebut, pengeluar perlu mengetahui bahawa produk yang ditawarkan turut membawa pakej yang berbaloi, mendengar keperluan dan memenuhi sebaiknya.

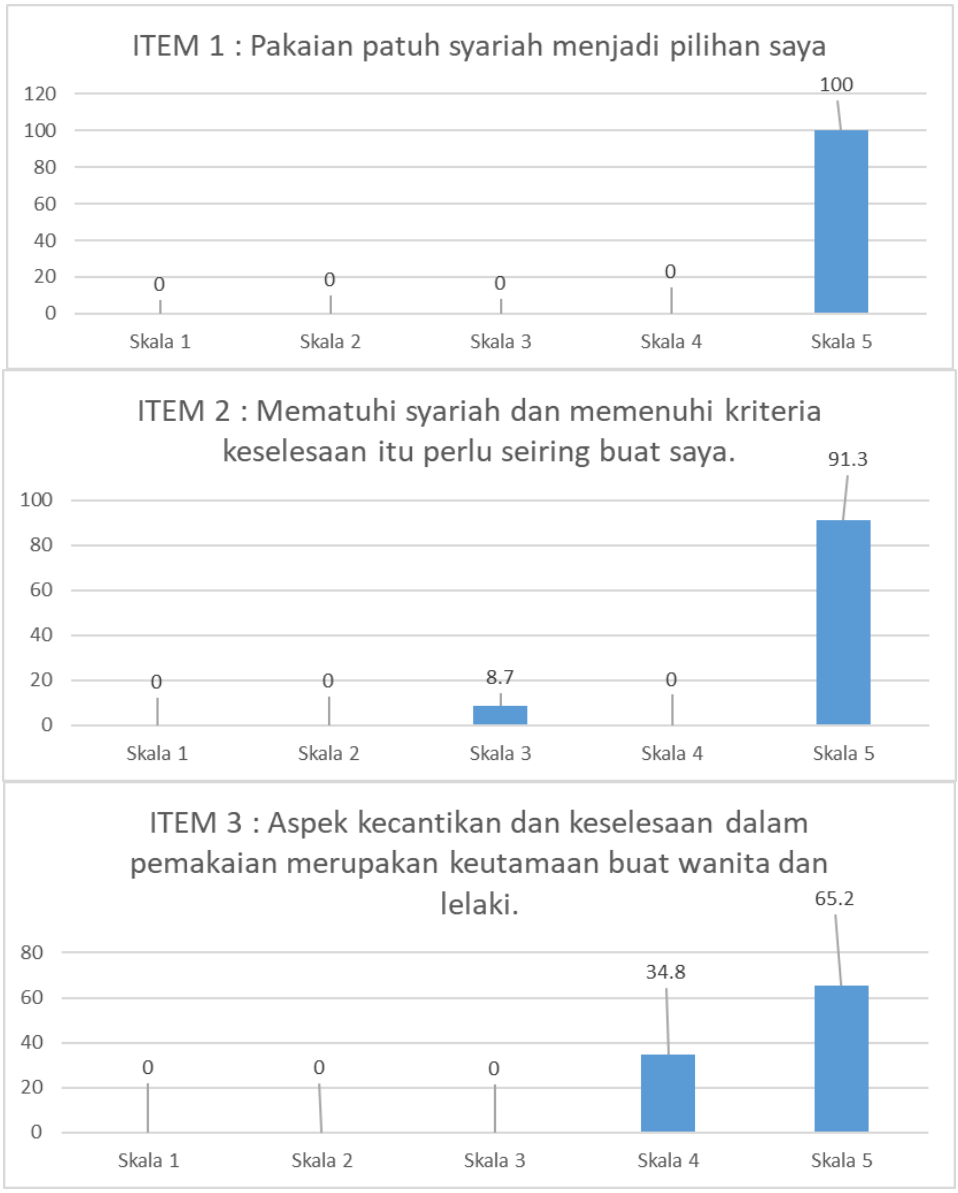
Terminologi fesyen turut merujuk kepada terma gaya si pemakai. Menurut Siti Zanariah Husain, Konsep Fesyen Menurut Syarak dan Kaitan dengan Tabarruj (*Journal of Contemporary Islamic Law*, 2021 Vol. 6 (2), fesyen itu samada diterima oleh semua lapisan masyarakat atau hanya sekelompok sahaja, bergantung kepada apa yang diketengahkan dan penerimaan masyarakat itu sendiri. Oleh yang demikian, mencipta sesuatu fesyen pakaian perlu mempunyai elemen yang mencakupi sentimen penting dan memenuhi kriteria majoriti masyarakat pelbagai golongan. Turut menegaskan pernyataan ini ialah Rashidah Othman et al,2016 menyatakan Islam meletakkan garis penduan bagi fesyen wanita merangkumi aspek bentuk pakaian, jenis pakaian dan aksesori. Maka termaktub bahawa aksesori juga memainkan peranan utama dalam usaha yang mendukung kepada rasa perlu menutup aurat atau rasa memelihara ke arah tanggungjawab tersebut. Ia termasuklah dalam soal ibadah, adat, pakaian serta etika dalam kehidupan. Begitu juga menurut pendapat Siti Sarah Zainal Abidin dan Mohd Nawi Ismail (2018), syariah Islam adalah satu sistem yang komprehensif dan sempurna dan ia telah diubahsuai mengikut keperluan semasa. Melihat kepada pernyataan-pernyataan yang telah dipetik tersebut, maka instrumen yang dipilih masih melestarikan elemen-elemen berteraskan landskap patuh syariah bersama keperluan masa kini. Memetik Norulzaila Ismail, Melestarikan Elemen Melayu Islam Dalam Fesyen Pakaian Masyarakat Melayu (INSANIAH:Online Journal Of Language, Communictions and Humanities Volume 2 (1), June 2019, peniaga dan usahawan juga perlulah memainkan peranan yang penting apabila ingin menjual fesyen pakaian kepada pengguna, pengeluar juga boleh memberi nafas baharu kepada rekaan pakaian masyarakat Melayu supaya kelihatan sohor dan terkini.

Berdasarkan penilaian borang atas talian iaitu yang disediakan kepada responden melalui pemilihan Google Form serta borang kajian skala likert, pilihan-pilihan jawapan yang perlu ditanda melalui kadar skala 1-5 adalah mengikut kesesuaian kadar jawapan.Ini bermaksud skala 1 mewakili kadar terendah sehingga skala 3 membawa wakil kadar sederhana dan skala 5 adalah yang tertinggi kadarnya bagi jawapan kepada sesuatu soalan tersebut. Pilihan kadar skala adalah bergantung setiap individu itu sendiri tanpa pengaruh lain susulan soalan yang ditanya juga adalah berdasarkan rasa peribadi. Jawapan setiap responden dikutip dan dikumpul data bagi setiap kelompok soalan dan jawapan yang bersamaan bagi mendapatkan keputusan. Daripada data dikumpul ini, dapat dikenalpasti apa yg diinginkan sebenar oleh masyarakat dan komuniti pengguna sarung tangan muslimah secara lebih terperinci. Dapat diketahui sejauh mana umur, jantina, keperluan, harga, material dan ciri-ciri selainnya dititik beratkan serta memainkan peranan dalam pilihan.

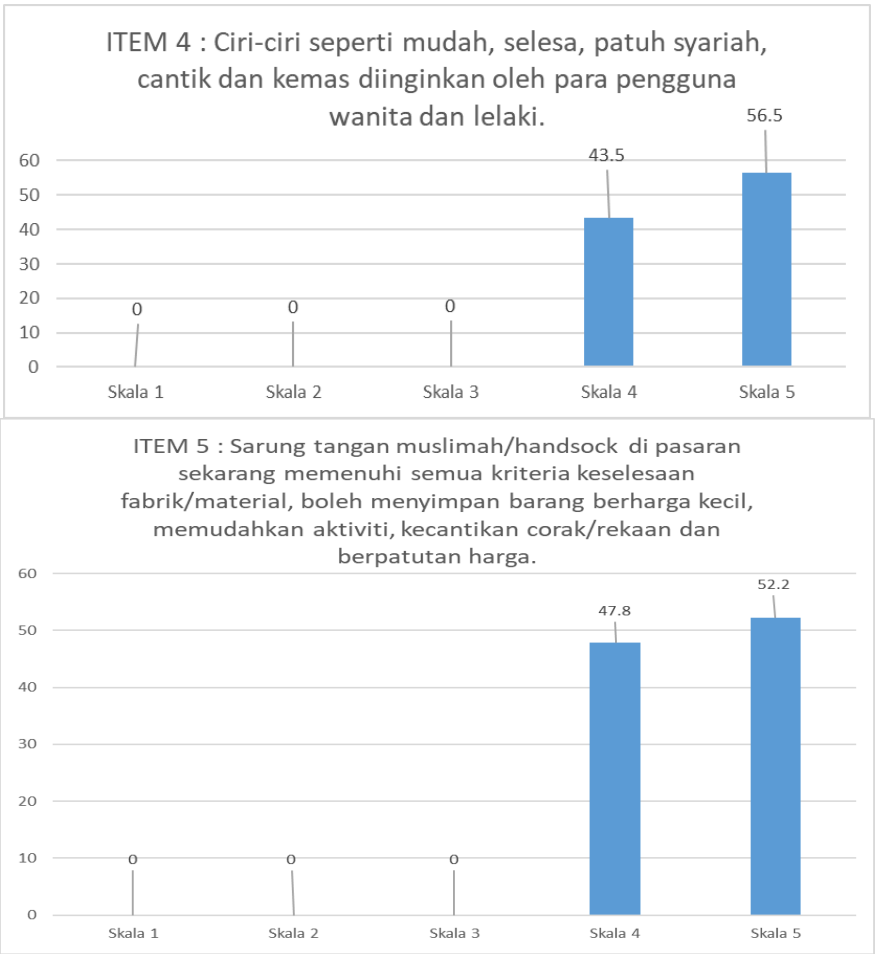
3. Dapatan dan Perbincangan

Mengenalpasti susulan data melalui hasil dapatan, kajian menunjukkan perincian yang lebih jelas pada aspek-aspek yang dijangka sebagai aspek terpencil sebelum ini. Data juga menyatakan maklumbalas yang perlu dari aspek perbezaan jantina, bangsa, agama dan

umur. Kajian atau respon mendapati setiap item mempunyai pengukuhan pendiriannya tersendiri. Berikut ialah data respon (Rajah 1) yang berjaya dikenalpasti melalui intrumen kajian soalan kepada respondan secara borang atas talian *(google form)* juga borang pengisian secara data skala likert. Berikut ialah carta graf menunjukkan peratus bagi setiap item mengikut skala pilihan (1-5)



Rajah 1. Hasil dapatan yang diberikan responden bagi item 1 hingga 3



Rajah 2. Hasil dapatan yang diberikan responden bagi item 4 dan 5

4. Kesimpulan

Sebagai kesimpulan, pemakaian sarung tangan bukan sahaja mampu seiring bersama keperluan dan era fesyen terkini, malah ia juga bukan sekadar memenuhi aksesori biasa. Terampil cantik bergaya dan penuh keselesaan menjadi gabungan serta kombinasi bijak, tidak hanya buat golongan wanita, muslimah, waima lelaki dan segenap bangsa turut memerlukannya. Persepsi sarung tangan juga telah berubah, selain stigma muslimah dan auratnya, ciri-ciri keperluan yang dahulunya hanya kehendak, semua kini menjadi faktor utama. Memudahkan, membantu berserta harga mampu milik buat semua golongan, sarung tangan ini mampu dikomersialkan berdasarkan hasil kajian serta kemampuan memiliki. Penambahbaikan yang dilihat kecil, namun ia mampu menjadi pilihan besar masyarakat.

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THE EFFECT OF ROA AND SALES MARK UP ON THE GROWTH RATE AT CV BATUBARA PRODUCTION

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Abstract

This study aims to examine the effect of Return on Assets (ROA) and Sales Mark Up on Growth Rate in CV Batubara Production, an MSME engaged in the production and sale of traditional Sigale Gale statues, CV Batubara Production is facing significant challenges, including a decline in asset utilization efficiency (ROA) and stagnant revenue growth. On the other hand, the implemented markup strategy has not made a significant contribution to increasing revenue. This research focuses on internal financial performance and pricing strategies as the main factors influencing business growth. The method used is a quantitative approach with multiple linear regression analysis. Data was obtained from the company's financial statements for the period 2014 to 2024. The t-calculated value is 48.783 with a significance level of 0.000 (< 0.05), indicating that ROA (X1) has a stronger influence on Growth Rate (Y) than Sales MarkUp (X2). This suggests that a higher ROA leads to greater revenue growth, the greater the company's revenue growth compared to X2 (Mark Up) which does not have a significant influence due to fluctuations in production costs or pricing strategies that have less direct impact on revenue growth. This research provides practical insights for MSMEs in managing financial efficiency and pricing strategies to support sustainable business growth.
Keywords: ROA; Markup; Growth rate; MSMEs.

1. Introduction

CV Batubara Production is an MSME engaged in the production and sale of traditional Sigale Gale statues, which hold both cultural and economic significance, particularly in the tourism and handicraft sectors. Despite its potential, the company is currently facing significant challenges, including a decline in asset utilization efficiency, as indicated by a decreasing Return on Assets (ROA), and stagnant revenue growth over the period of 2014 to 2024.

Although the company has implemented a sales markup strategy, it has not made a significant contribution to increasing revenue growth. This situation raises important questions regarding whether the company’s asset management and pricing strategies have been effectively optimized to support sustainable business performance.

Given these conditions, this study was conducted to empirically examine the extent to which ROA and sales markup influence the company’s growth rate. The findings of this research are expected to provide valuable recommendations for CV Batubara Production’s management in improving asset utilization efficiency and designing more effective pricing strategies to achieve long-term growth and competitiveness.

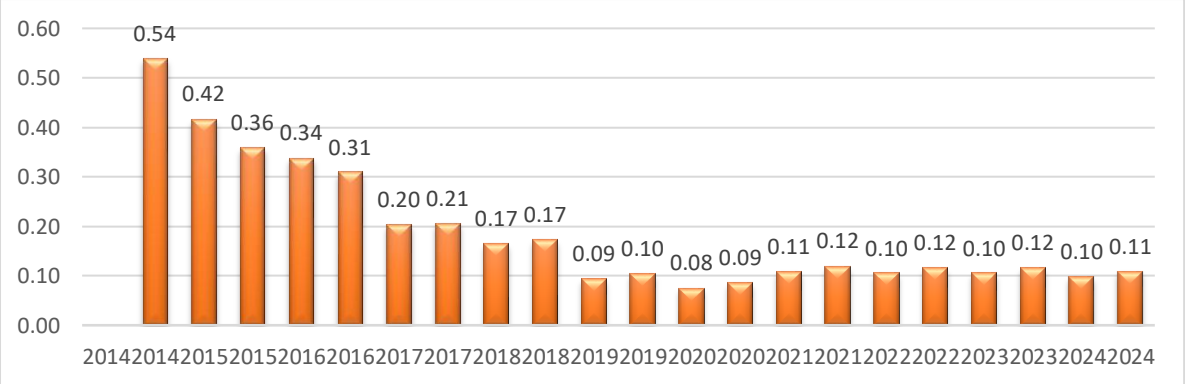

Fig. 1. Growth rate 2014-2024

Based on the data of CV Batubara Production's growth rate growth chart for the period 2014 to 2024, it can be seen that the company's revenue growth rate has fluctuated quite significantly. At the beginning of the research period, especially in 2014 and 2015, the growth rate showed very high values, 0.54 and 0.42, respectively. This reflects that the company is in a phase of rapid growth.

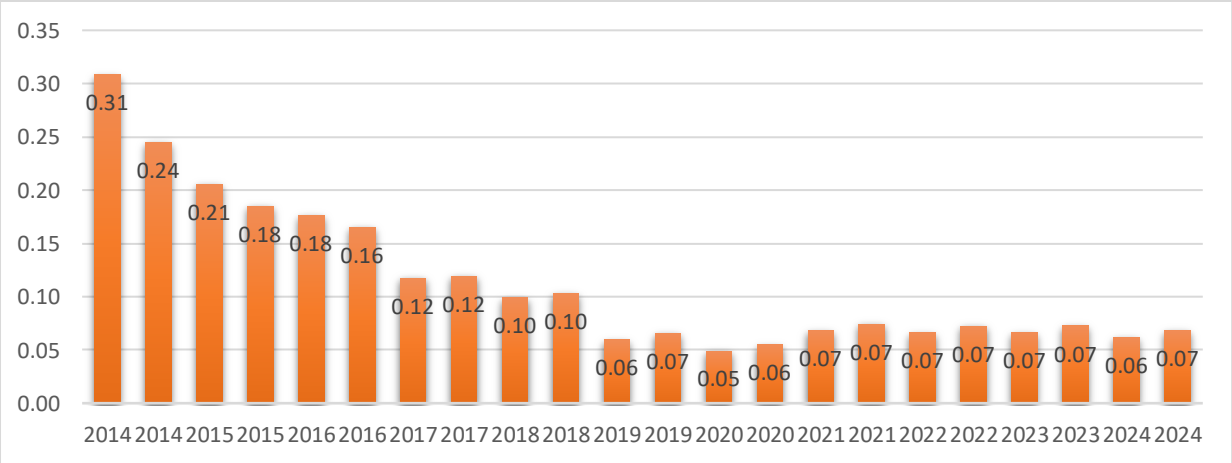

Fig. 2. Return on Assets 2014-2024

Based on the Return on Assets (ROA) graph on CV Batubara Production for the period 2014 to 2024, there is a consistent downward trend. At the beginning of the period, the ROA value was at its highest, which was 0.31 in 2014, then decreased to 0.24 in 2015 and continued to decline gradually until it reached a low of 0.05 in 2021 to 2024. This decrease in ROA reflects the company's reduced efficiency in using total assets to generate net profit. This trend shows that while a company's assets may be increasing or remaining, the ability of these assets to generate profits is actually decreasing. This can be caused by an increase in fixed assets or non-current assets that are not proportional to the increase in revenue or net profit. Managerial efficiency, decreased sales volume, and high operating expenses can be the main causes of a decline in the ROA ratio. Based on the regression results and graphs displayed, it is known that ROA has a significant influence on growth rate. However, empirically there is an interesting phenomenon, although ROA shows a sharp downward trend, the growth rate actually shows stability (albeit low) in the final period. This means that even though the efficiency of asset management has decreased, the company has still been able to maintain its revenue growth at a certain level.

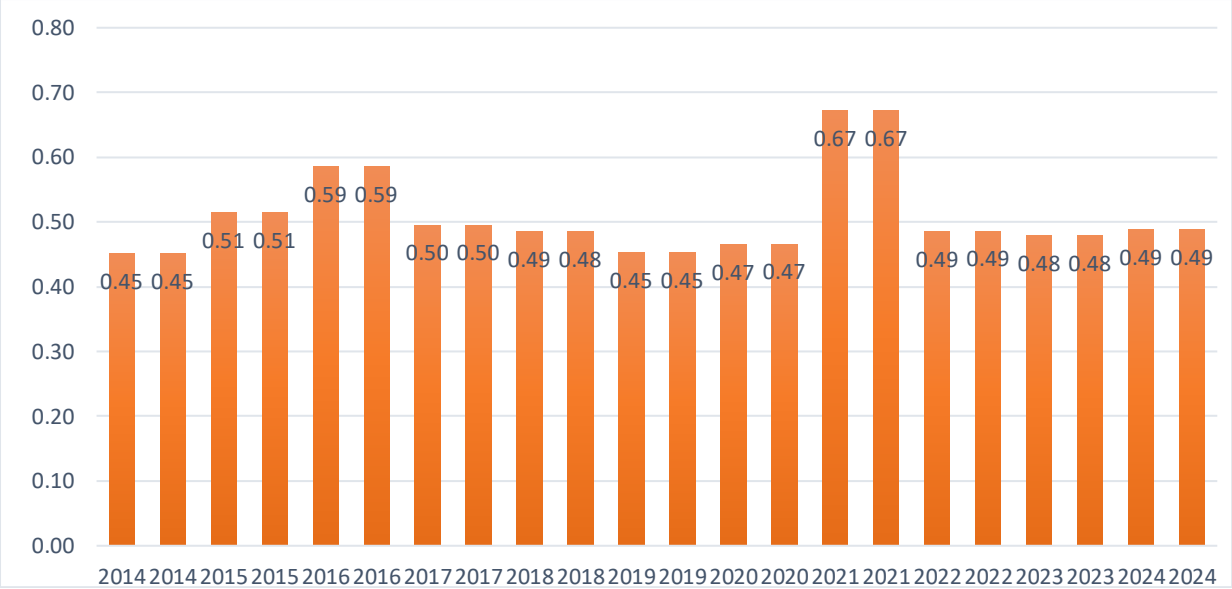

Fig. 3. Sales markup 2014-2024

Based on the Mark up chart of CV Batubara Production's sales for the 2014-2024 period, it can be concluded that in general the mark up value is in the range of 0.45 to 0.55, with a slight significant spike in 2021 of 0.67. However, after that, the mark-up value is stable again in the range of 0.48-0.49 until 2024.In theory, a high markup should be able to provide a larger profit margin for the company, so that it can encourage revenue growth (growth rate). However, based on the results of the partial test in this study, the sales markup did not have a significant effect on the growth rate.

To ascertain whether Return on Asset (ROA) and sales markup have a significant effect on the growth rate of CV Batubara Production, this study was conducted. Where the research was only conducted on CV Batubara Production in Medan City, the data analyzed were annual financial statements from 2014 to 2024, the variables studied only included ROA and sales markup as independent variables, as well as growth rate as dependent variables and did not consider other external factors such as inflation, exchange rates, or global market trends.

The purpose of this research for CV Batubara Production is to provide recommendations to the management in managing assets and developing a more effective pricing strategy to support sustainable business growth.

2. Methodology

This study employs a quantitative research approach, because the data analyzed is in the form of numbers and statistical data processing results. The nature of this study is associative, because it aims to determine the relationship and influence between two independent variables, namely Return on Assets (ROA) and Sales Mark-Up, on the dependent variable, namely Growth Rate.

The population in this study is all annual financial statements belonging to CV Batubara Production for the period from 2014 to 2024. The sample used in this study is annual financial statement data for 11 years (2014–2024) which is fully available and can be accounted for,
This study uses a saturated sample technique, which in this context is seen as the right approach, considering that all available annual financial statements have met the data feasibility criteria. The variables in this study are identified as follows:

Table 1. Operational Research Variables

Variable	Ratio Formula	Unit	Definition	Kind	Source
LENGTH (X_1)	ROA = (Net Profit / Total Assets) × 100%	percentage	Return on Assets (ROA) is a financial ratio used to measure a company's effectiveness in generating profits from the total assets it owns. ROA shows how efficient management is in using the company's assets to generate profits. The higher the ROA value, the better the company's performance in utilizing assets to create profits (Dr. Wirmie Eka Putra et al., n.d.).	Quantitative ratio.	Profit and Loss and Balance Report of CV Batubara Production for 2014–2024.
Mark up sales (X_2)	Markup = (Selling Price – Production Cost) / Production Cost × 100%	percentage	Sales markup is the difference between the cost of goods sold and the selling price of the product, expressed as a percentage of the cost of goods. Markup is used by business actors as a pricing strategy to make a profit. The markup determination must take into account production costs, consumer purchasing power, and market competition levels so as not to reduce the competitiveness of the product (Silfia 2025).	Quantitative ratio.	Report on Selling Price and Production Costs of CV Batubara Production 2014–2024.
Growth Rate (Y)	Growth Rate = (This Year's Revenue – Last Year's Revenue) / Last Year's Revenue × 100%	percentage	Growth Rate is a measure that shows how much a financial variable-such as revenue, profit, or assets-has improved in a given period compared to the previous period. In the context of business or MSMEs, growth rate is often used to assess business sustainability and the effectiveness of strategies implemented in improving business performance over time (Rahmayani et al. 2025).	Quantitative ratio.	CV Batubara Production Profit and Loss Report for 2014–2024.

i. Independent variables are variables that affect related variables consisting of ROA (X1) and sales markup (X2)
ii. The related variable (Dependent variable) is the variable that is influenced by the independent variable, namely Growth Rate (Y)

By considering these factors, all annual financial statements of CV Batubara Production during the 11-year period are used as samples in this study.

The analysis stages are, first a classical assumption test is carried out then followed by multiple liner regression The purpose of this technique is to test the influence of ROA and Sales Mark Up on the company's Growth Rate, the data that has been collected is processed and analyzed using the multiple linear regression analysis method, with the following equation model:

$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + e$
Information:
Y = Growth Rate
X_1 = Return on Assets (ROA)
X_2 = Mark Up Sales
α = Constant
β_1 = ROA regression coefficient
β_2 = Sales Mark Up regression coefficient
e = Error (residual)

3. Results and Discussion

3.1 Classic assumption test

3.1.1 Normality Test

Table 2. Normalization Test Results Using Shapiro-wilk

	Shapiro-Wilk		
	Statistics	Df	Sig.
Growth Rate	.930	21	.139

a.Lilliefors Significance Correction

The normality test was carried out to find out whether the data in this study was normally distributed or not. This test was carried out using the Kolmogorov-Smirnov and Shapiro-Wilk methods with the help of SPSS software.

Based on the test results, the significance value of Kolmogorov-Smirnov is 0.033 and the significance value of Shapiro-Wilk is 0.139. In this study, the main reference used was the significance value of the Shapiro-Wilk test because the number of samples was 21, which was classified as a small sample category.

The Shapiro-Wilk significance value shows a number greater than 0.05, i.e. 0.139, so it can be concluded that the data of the Growth Rate variable is normally distributed and meets the assumptions for subsequent parametric statistical analysis.

3.1.2 Multicollinearity Test

This test was carried out to test whether there was a correlation between the free variable

Table 3. Multicollinearity Test Results

Coefficient						
Type	Unstandardized Coefficients		Standardized Coefficients	T	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIVID

1	(Constant)	-1.865	2.101		-.888	.003		
	ROA	2.254	.046	.998	48.783	.000	.992	1.008
	Mark Up	-.058	.041	-.029	-1.432	.169	.992	1.008
a. Dependent Variable: Growth Rate								

Based on the results of linear regression analysis in the Collinearity Statistics column, the Tolerance and VIF values were obtained as follows:

i. The ROA variable has a Tolerance value of 0.992 and a VIF of 1.008.
ii. The Mark Up variable has a Tolerance value of 0.992 and a VIF of 1.008.

Since all the values of Tolerance > 0.10 and VIF < 10, it can be concluded that there is no multicollinearity in this regression model. Thus, the ROA and Mark Up variables are worthy of further analysis in the regression model against the dependent variable Growth Rate.

3.1.3 Heteroscedasticity Test (Glejser Test)

significance value (Sig.) in the Coefficients table for each independent variable:

i. If the Sig. > 0.05 → heteroscedasticity does not occur.
ii. If the Sig. < 0.05 → There is an indication of heteroscedasticity

Table 4.Heteroscedasticity Test Results (Glejser Test)

Coefficient						
Type		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.063	1.171		-.054	.958
	ROA	.069	.026	.532	.663	.616
	Mark Up	.003	.023	.028	.140	.890
a. Dependent Variable: ABS_RESID						

Interpretation:

i. ROA: Significance value (Sig.) = 0.616 > 0.05, meaning that there is no indication of heteroscedasticity.
ii. Mark Up: Sig. value = 0.890 > 0.05, also shows no indication of heteroscedasticity.
iii. Growth rate: residual of the growth rate prediction to ROA and Sales Mark Up has a homogeneous variance distribution.

Both values are greater than the significance limit of 0.05, so it can be concluded that there are no symptoms of heteroscedasticity in the regression model. This means that the variance of the residual (prediction error) is constant at all levels of the growth rate predicted value.

These results show that the regression model constructed meets one of the important classical assumptions, namely the homogeneity of residual variance. Thus, the regression parameter estimation can be said to be efficient and reliable, and it is feasible to draw conclusions about the influence of ROA and Sales Mark Up on the Growth Rate.

These findings are also reinforced by visual analysis through scatterplots, which show that the residual points are randomly dispersed and do not form a specific pattern, thus supporting the conclusion that the model is free from heteroscedasticity problems.
Supported by scatterplot results, the following:

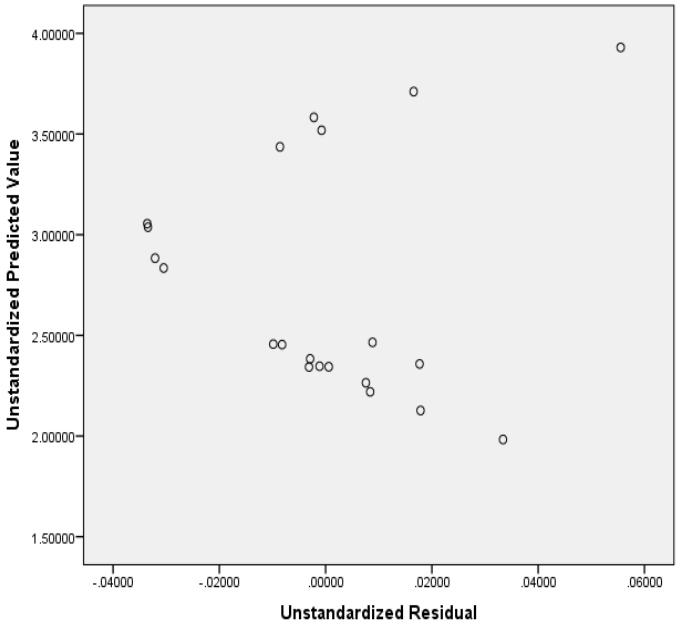

Fig. 1. Scatterplot results

Information:

a. The residual dots are scattered more randomly.
b. No systematic patterns (such as curves or specific lines) appear.
c. The residual spread appears to be relatively consistent across various predictive values.

This model can be considered to have passed the heteroscedasticity test visually based on the residual scatterplot vs predictive value.

4 Autocorrelation Test

Table 5 Autocorrelation Results

Model Summaryb					
Type	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.996a	.993	.992	0.27367	1.760
a. Predictors: (Constant), Mark Up, ROA					
b. Dependent Variable: Growth Rate					

Based on the results of the autocorrelation test using the Durbin-Watson method, a score of 1,760 was obtained. This value is in the range of 1.5 to 2.5, which indicates that there is no autocorrelation in the regression model. Thus, the Model has fulfilled the classical assumption of autocorrelation, so that the results of regression analysis can be interpreted more reliably.
dU < DW < 4 - dU or 1.54 < 1,760 < 2.46

So your DW is between dU and 4 - dU, which Ghozali says means: No autocorrelation

Based on the results of the Durbin-Watson test of 1,760, and referring to the Durbin-Watson critical table according to Ghozali (2021) for n = 21 and k = 2 (dL = 1.10 and dU = 1.54), it is known that the value is in the range of dU < DW < 4 - dU or 1.54 < 1,760 < 2.46. Therefore, it can be concluded that there is no autocorrelation in the regression model used.

3.1.4 Multiple Linear Regression Analysis Test

1. T-test (Pertial)

Table 6. Test Results t

Type		Coefficient			t	Sig.
		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta		
1	(Constant)	-1.865	2.101		-.888	.003
	ROA	2.254	.046	.998	48.783	.000
	Mark Up	-.058	.041	-.029	-1.432	.169

a. Dependent Variable: Growth Rate

From this table, it can be seen that the variable ROA (X1) Value t-calculated = 48.783 with Sig. = 0.000 (< 0.05), meaning that ROA has a significant effect on the Growth Rate (Y). The higher the Return on Assets, the greater the company's revenue growth.

i. The variable of Sales Mark Up (X2) t-calculated value = -1.432 with Sig. = 0.169 (> 0.05), indicating that partially the Sales Mark Up does not have a significant influence on the Growth Rate. This can be caused by fluctuations in production costs or price strategies that have less direct impact on revenue growth in the study period.
ii. Constant (a) Sig. value = 0.003 (< 0.05), indicating that the constant in this regression model is significant.
iii. meaning that even though the ROA and Sales Mark Up variables are worth zero, the Growth Rate is predicted to remain at a certain level as per the constant.
iv. Partially, ROA has a positive and significant influence on the company's revenue growth, while the Sales Mark Up has no significant effect on the Growth Rate in the observation period. This regression model is valid, indicated by the significance of the constant and the subsequent results of the F test.

3.1.5 F-Test (Simultaneous)

Table 7. F Test Results

ANOVA[a]

Type		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	3290.353	2	1645.177	1194.318	.000b
	Residual	24.795	18	1.378		
	Total	3315.148	20			

a. Dependent Variable: Growth Rate
b. Predictors: (Constant), Mark Up, ROA

From the table above, it can be seen that:

i. Fcal value = 1194.318 with Sig. = 0.000.
ii. Because the Sig. value is less than 0.05 (0.000 < 0.05), it can be concluded that ROA (X1) and Sales Mark Up (X2) simultaneously have a significant effect on the Growth Rate (Y) in CV Batubara Production.

These results prove that the regression model built in this study is very feasible to be used to predict and analyze the influence of ROA and Sales Mark Up on the Growth Rate in CV Batubara Production.

3.1.6 Coefficient of Determination Test (R^2)

Table 9. Determination Coefficient Test Results

Model Summary				
Type	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.996a	.993	.992	1.17367

a. Predictors: (Constant), Mark Up, ROA
Source : SPSS output (data in research, 2025)

Based on the output of the Model Summary, an R Square value of 0.993 was obtained. This shows that the independent variables, namely ROA and Sales Mark Up, are able to explain the variation of the variables to the Growth Rate of 99.3%, while the remaining 0.7% is explained by other variables outside the research model.

Although the R Square value shows that the ROA and Sales Mark Up variables are able to explain 99.3% of the variation in the Growth Rate, there is still a residual 0.7% that is not explained by the two variables. The rest of this variation is likely due to the influence of other variables not included in the regression model. These factors can include macroeconomic conditions such as inflation and interest rates, the level of industrial competition, the company's operational costs, as well as managerial policies and strategic decisions such as business expansion or investment.

Although the contribution is relatively small, the existence of these variables can still have an impact on the company's growth, both directly and indirectly.
Double linear equation :

$$\text{Growth Rate} = -1.865 + 2.254\ \text{ROA} - 0.058\ \text{Mark Up} + e$$

Means:

a. The ROA coefficient of 2.254 indicates that any increase in ROA of 1 unit will lead to an increase in the Growth Rate of 2.254 units, assuming the Sales Mark Up variable is under constant condition.
b. A Sales Mark Up coefficient of –0.058 indicates that any increase in Mark Up by 1 unit will lead to a decrease in the Growth Rate of 0.058 units, assuming the ROA variable is fixed.
c. A constant value of -1.865 indicates that if the value of ROA and Sales Mark Up is zero, then the value of the Growth Rate is predicted to be -1.865 units.

The Effect of ROA on Growth Rate, ROA shows the efficiency of the company's asset management. High ROA values have been shown to be positively correlated with increased revenue. These findings are consistent with research (Putra and Sari 2020), (Widyaningrum 2023) and (Maysari, Ferawati, and Putri 2024), which states that asset efficiency is a key factor in financial growth.

The Effect of Mark Up on Growth Rate, although theoretically markup sales increase profit margins, this study shows that markup is not statistically significant. This can be caused by fluctuations in production costs, people's purchasing power, or inconsistent pricing strategies. This is also in line with the opinion (Ramadhani and Wahyuni 2021) that markup must be balanced with cost efficiency to have an impact on growth.

Based on CV Batubara Production's revenue growth data during the period 2014 to 2024, it can be seen that the company's growth rate has fluctuated quite significantly. At the beginning of the research period, namely 2014 and 2015, the growth rate showed very high values of 0.54 and 0.42, respectively. This reflects that the company is in a phase of rapid initial growth. However, entering the following years, the growth rate shows a downward trend and tends to be stable in the range of 0.08 to 0.12 from 2019 to 2024. This stability can indicate that the company has entered a slower or stagnant growth phase.

These fluctuations can be influenced by various factors, including operational efficiency, market conditions, and managerial strategies applied. Although the decline in the growth rate did not reach a negative point, the stagnation in revenue growth indicates that companies need to evaluate their existing growth strategies to achieve business sustainability in the future.

Based on the results of multiple linear regression analysis, the following equations were obtained:

$$Y = -1.865 + 2.254\ X_1 - 0.058\ X_2 + e$$

Information:

a. Y = Growth Rate
b. X_1 = Return on Assets (ROA)
c. X_2 = Mark Up Sales
d. e = Error (residual)

The results of the t-test showed that:

i. The ROA variable (X_1) had a positive and significant effect on the Growth Rate, with a t-count value of 48.783 and a significance of 0.000 (< 0.05). This shows that the higher the efficiency of the company in managing its assets, the greater the revenue growth that can be achieved.
ii. The Sales Mark Up variable (X_2) has a t-calculated value of -1.432 with a significance of 0.169 (> 0.05), which means that it has no significant effect on the Growth Rate. This insignificance can be caused by an imbalance between the increase in selling prices and the efficiency of production costs.

Furthermore, the results of the F test showed that ROA and Sales Mark Up simultaneously had a significant effect on the Growth Rate, with a significance value of 0.000. This reinforces that the two variables together are able to explain the variability of the company's revenue growth.
And the value of the determination coefficient (R^2) of 0.993 indicates that 99.3% of the variation that occurs in the Growth Rate can be explained by both independent variables (ROA and Sales Mark Up), while the remaining 0.7% is influenced by other factors outside the study model.

4. Conclusion

Based on the results of this study, it can be concluded that Return on Assets (ROA) has a positive and significant effect on the Growth Rate of CV Batubara Production, indicating that efficient asset utilization contributes significantly to revenue growth. In contrast, the Sales Mark-Up variable does not have a significant partial effect on the Growth Rate, suggesting that pricing strategies alone are not sufficient to drive business growth without being accompanied by cost efficiency and market alignment.

Furthermore, the simultaneous test results show that ROA and Sales Mark-Up together significantly influence the Growth Rate, with a coefficient of determination (R^2) of 99.3%, meaning that these two internal financial variables can explain the majority of the variation in the company’s growth. This research helps address the practical issue of identifying which financial performance factors most impact business growth, providing valuable insights for managerial decision-making in asset management and pricing strategy formulation.

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THE INFLUENCE OF TOURISM FACILITIES AND PROMOTION ON TOURIST INTEREST IN VISITING BAH DAMANIK, SIMALUNGUN REGION, NORTH SUMATERA, INDONESIA

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Abstract

This study aims to determine the effect of tourism facilities, and promotion on tourist interest in visiting Bah Damanik Bath. This study uses a quantitative approach through the distribution of questionnaires to collect data from representative respondents. The results showed that complete and well-maintained tourist facilities, such as adequate parking areas, clean toilets, attractive tourist spots, and the comfort of the place are the main attractions for tourists to visit. Furthermore, effective promotion through social media and cooperation with travel agents also play an important role in attracting tourists, especially from outside the region. In addition, creating a positive experience for tourists helps increase their interest in visiting. Based on this, it is recommended that the management of Bah Damanik Bath continue to improve existing facilities, and strengthen promotions, in order to attract more tourists.
Keywords: Tourist Facilities; Promotion; Service Quality.

1. Introduction

Tourism is one of the strategic sectors in both regional and national economic development. In addition, to increase local original income (PAD), tourism also contributes to job creation, the expansion of community business networks, and the promotion of a local potential to a wider audience. The current era of globalization depends not only on its natural beauty, but also on the ability of its management to provide a comprehensive, engaging, and memorable travel experience for tourists.

One of the natural tourist destinations with great development potential is Bah Damanik Bath, located in Simalungun Regency, North Sumatra Province. This area is known for its beautiful natural scenery, clear water, and cool and refreshing air. However, this potential has not yet been matched by a consistent increase in tourist visits. This indicates that there are challenges that need to be observed, especially the attractiveness, comfort, and quality of services provided by tour managers.

Several factors are believed to affect tourists' interest in visiting, including the availability and completeness of tourist facilities, as well as the effectiveness of destination promotion. Tourist facilities such as parking areas, public toilets, relaxation places, information centers, and attractive photo spots can increase tourists' comfort and satisfaction. In addition, effective promotions through social media, digital platforms, and cooperation with travel agents also plays an important role in expanding the reach of the tourism market. Therefore, it is important to conduct an in-depth study of how these two aspects affect the interest of tourists in visiting Bah Damanik Bath. This research not only aims to examine the relationship between these variables, but is also expected to provide constructive input for destination managers and related parties in developing targeted and sustainable tourism development strategies. With

proper management, it is hoped that Bah Damanik Bath can become a leading destination capable of competing in the midst of the rapid growth of the tourism sector.

According to Saputra and Maulana (2025), well-maintained tourist facilities play an important role in creating positive experiences for tourists, so that they can increase their chances of making repeat visits or recommending destinations to others. When facilities are available and easily accessible, travellers feel more satisfied and motivated to come back.

Tourism promotion is a communication activity that aims to introduce the attraction of a destination and influence the perception and interest of potential tourists. In the digital era, promotion is not only carried out conventionally through billboards or brochures, but also through digital platforms such as social media, tourism websites, and influencers. Hutasoit et al (2024) in their research at Mayang Nature Recreational Park, Pekanbaru, revealed that promotions carried out actively through social media such as *Instagram* and *Tik Tok* have a big impact on attracting the attention of tourists, especially from the younger generation. Visual and interactive content has proven to be more effective in building a destination image.

Tourist interest refers to an individual's interest or desire to visit a tourist attraction which is influenced by various factors such as perception, motivation, information, and previous experiences. According to Putri (2024), interest is part of the consumer decision-making process which goes through the stages of Attention, Interest, Desire, and Action, known as the AIDA model.

Several previous studies have shown that tourism and promotional facilities have a significant influence on tourist interest in visiting. Research by Andriansyah et al. (2024) at Gedambaan Beach, Kotabaru, states that facilities and promotions simultaneously have a positive effect on people's interest in visiting, with a contribution of 40.8%. Similar findings were also conveyed by Kusnaidi & Senin (2024) who researched the tourist attraction of the Tirta Lebak Hot Springs, where facilities and promotions were proven to have a strong relationship with visitor satisfaction. Meanwhile, research by Dahmiri & Bhayangkari (2022) at Muaro Jambi Temple concluded that visual promotion and tourist facilities have a partial significant influence on tourist interest in visiting. These three studies reinforce the assumption that the availability of proper facilities and promotional strategies is an important factor in increasing interest in visiting tourist destinations.

Tourism facilities play an important role in shaping visitor satisfaction and interest. A study by Chiu et al, (2019) shows that comfortable and well-maintained facilities influence the image of a destination and tourists' intention to revisit. Effective promotion can expand market reach and build a positive destination image. Research by Wang et al (2020) emphasizes that the use of interactive digital media increases the engagement of potential tourists, while Kim & Park (2021) found that authentic promotional messages increase tourist trust and loyalty.

Visitor interest is influenced by perceptions of quality, previous experiences, and information exposure. According to Li & Katsumata (2022), visitor interest grows when the destination's image is positive and the information received is consistent. Based on the background described, the main problem in this study is that the number of tourist visits to Bah Damanik Bath is still not optimal, despite the destination's great natural potential. This is allegedly caused by several factors, including the quality and availability of tourism facilities that have not been maximized and promotional strategies that have not effectively reached the target market. Therefore, this research is focused on answering the question of how much influence tourism facilities and promotions have on tourists' interest in visiting. This study also seeks to determine whether these two variables simultaneously have a significant influence on tourists' decisions in choosing Bah Damanik Bath as a travel destination.

2. Methodology

Data Types and Sources

This study uses a quantitative approach with a survey method through the distribution of questionnaires to visitors who have travelled to Bah Damanik Bath. This approach was chosen because it is able to provide measurable and objective data on the influence of tourism facilities and promotional efforts on tourists' interest in visiting. The data in this study consists of two types, namely primary data and secondary data. Primary data was obtained directly from respondents through a closed questionnaire based on a Likert scale, while secondary data was obtained from various sources such as official documents, observation results, and relevant literature. In addition, based on its nature, the data used is quantitative as it is processed in numerical form and analyzed using statistical techniques.

Population and Sample

The population in this study consists of all visitors who have visited Bah Damenik Bath tourist attraction, totalling 60 individuals. This population was chosen because they are directly involved as users of the facility and a recipient of promotional information from the tour manager, so it was considered relevant to assess the interest in visiting. From this population, the researchers used the Slovin formula to determine the number of samples with a margin of error of 5%. Based on this calculation, a sample of 48 respondents was obtained. The sampling technique employed was an accidental sampling method, which involves selecting respondents by chance, namely visitors who were met directly at the location and were willing to complete the questionnaire. This technique was chosen for its practicality and in accordance with field conditions, where not all visitors can be reached within a limited time available.

Data Collection Techniques

The data collection technique in this study involved a survey method using a closed questionnaire based on a Likert scale. The questionnaire contained statements representing each research variable, namely tourist facilities, promotions, and tourist visit interests. Respondents were asked to rate each statement on a five-point scale, ranging from strongly disagree to strongly agree. In addition, data collection is also complemented by direct observation in the field and documentation to support the validity of the results. The use of questionnaires was chosen because it was considered effective in collecting large amounts of data in a relatively short period.

Data Analysis Techniques

The data analysis technique used in this study is quantitative analysis with the assistance of SPSS software version 27. The analysis begins with validity and reliability tests to ensure that the research instrument is trustworthy and consistent. Furthermore, multiple linear regression analysis was carried out to determine the partial and simultaneous influence between free variables (facilities and promotions) on bound variables (tourist interest in visits). In addition, a t-test was also conducted to test the influence of each variable partially, and an F test to see the influence simultaneously. The determination coefficient (R^2) test was used to determine how much the independent variable contributed to the dependent variable in this research model.

3. Results and Discussion

History of Research Objects

Bah Damanik Bath is one of the natural tourist attractions located in Sidamanik District, Simalungun Regency, North Sumatra. This place is known for its water clarity, natural atmosphere, and cool air. Since becoming known to the wider community in the 1980s, Bah Damanik Bath has become a favourite tourist destination, especially for local tourists who like a calm and natural atmosphere. Although the management remains traditional, its main attraction still survives because of the natural beauty and cultural values inherent in the area. The uniqueness of this place also lies in the existence of mountain springs which are believed to bring blessings and health. Over time, this area began to be looked at as a subject of study in the fields of local tourism and culture, especially in the context of community-based tourism development and environmental sustainability.

Vision and Mission of Research Objects

The vision of this tourist attraction is to develop Bah Damanik Bath into a sustainable, educational, and environmentally friendly local culture-based natural tourism destination to support nature conservation and empowerment of the local community. Its mission is to enhance and expand tourist facilities at Bah Damanik Bath to increase the number of visitors.

Respondent Characteristics

A total of 48 respondents were selected as the sample for this study, obtained through the calculation of the Slovin formula from a total population of 60 visitors. Respondents are tourists who have visited Bah Damanik Bath and are willing to participate in filling out the questionnaire. The questionnaire included a series of statements related to facilities, promotions and interest in visiting. The results were then analyzed descriptively to illustrate the trends of respondents' data.

Table 1. Respondent Demographics

Characteristics		Frequency	Percent
Gender	Man	22	45,8
	Woman	26	54,2
	Amount	48	100
Pekerjaan	Pelajar / Mahasiswa	20	41,7
	Karyawan	12	25,0
	PNS	6	12,5
	Wiraswasta	10	20,8
	Amount	48	100

Source: Data processed (2025)

The characteristics of the respondents in this study varied in terms of gender and occupation. Based on the data analysis, the majority of respondents were women with a percentage of 54.2%, while men were 45.8%. This indicates that women's participation in tourism activities and in filling out questionnaires is quite dominant. In terms of employment, most respondents are from students, making up 41.7%, followed by employees at 25%, self-employed individuals at 20.8%, and Civil Servants (PNS) at 12.5%. This data illustrates that Bah Damanik Bath tourist attraction is particularly popular among young people and students, and has its own attraction for people from various professional backgrounds. The diversity of respondents' backgrounds provides a broader perspective in assessing the influence of facilities and promotions on tourists' interest in visiting.

Summary of Respondents' Answers

For the tourist facilities variable, the researcher used 5 statements that were distributed to the respondents. Based on their responses, the following data was obtained:

Table 2. Replication of Respondents' Answers to Tourism Facilities (X1)

No	Statement	Respondents' answers SS		S		N		TS		STS		Amount
		F	%	F	%	F	%	F	%	F	%	
1.	Public facilities such as toilets, bathrooms, and dining areas are well available.	11	23%	26	54 %	11	23 %	0	0 %	0	0 %	48
2.	The environment around the bathing area is well maintained.	9	19%	25	52 %	13	27 %	1	0 %	0	0 %	48
3.	The tourist facilities of Bah Damanik Bath are well maintained and undamaged.	13	27%	26	54 %	9	19 %	0	2 %	0	0 %	48
4.	Access to the location of BathBah Damanik is easy to reach.	10	21%	26	54 %	12	25 %	0	0 %	0	0 %	48
5.	The tourist area of Bah Damanik Bath is safe for visitors, including children and the elderly.	12	25%	21	44 %	15	31 %	0	0 %	0	0 %	48
	Average		23%		52 %		25 %		0 %		0 %	100 %

Source: Primary data processed 2025

The results in Table 2 show that the tourist facilities at Bah Damanik Bath are quite good, with 48% of respondents, who answered an average of 23% agreed, and those who answered an average of 52% agreed. Tourist facilities at Bah Damanik Bath are quite adequate. This shows that most visitors consider the existing facilities support a comfortable travel experience. However, 25% of respondents choose a neutral response, indicating that there is still room for improvement in the quality and completeness of the facilities, such as clean public toilets, adequate garbage cans, and more comfortable and representative rest areas. Therefore, the management is expected to continue to evaluate and develop the available facilities to enhance visitor comfort and satisfaction on an ongoing basis.

Table 3. Replication of Respondents' Answers to Promotion (X2)

No	Statement	Respondents' answers SS		S		N		TS		STS		Amount
		F	%	F	%	F	%	F	%	F	%	
1.	I found out about Bah Damanik Bath through social media or the internet.	13	27%	22	46 %	13	27 %	0	0 %	0	0 %	48
2.	I often hear and see information about the Bah Damanik Bath in various media.	19	40%	23	48 %	6	13 %	0	0 %	0	0 %	48
3.	Promotional information for Bah Damanik Bath is in accordance with the actual conditions at the tourist location.	22	46%	25	52 %	1	2%	0	0 %	0	0 %	48

4.	The promotional content of the Bah Damanik Bath attracted my attention to visit.	18	38%	25	52 %	5	10 %	0	0 %	0	0 %	48
5.	Promotional content explains its main appeal clearly and is packaged in an attractive and creative way and different from other places.	20	42%	27	56 %	1	2%	0	0 %	0	0 %	48
	Average		38%		51 %		11 %		0 %		0 %	100 %

Source: Primary data processed 2025

The results in Table 3 show that the promotion carried out at Bah Damanik Bath, with an average of 51% answered agreed, and those who answered on average strongly agreed with 38% to the statement that the tourism promotion of Bah Damanik Bath has been done well. This shows that the majority of visitors consider the promotional efforts by the management to be quite effective in attracting tourists to visit. Meanwhile, 11% of respondents answered neutrally indicating that efforts are still needed to improve promotional strategies, both in terms of reach, the media used, and the quality of information delivered. By optimizing promotional activities in a more targeted and creative manner, it is hoped that public awareness can increase and lead to a rise in the number of tourist visits at the Bah Damanik Bath.

Table 4. Replication of Respondents' Answers Interested in Visiting Tourists (Y)

No	Statement	Respondents' answers										Amount
		SS		S		N		TS		STS		
		F	%	F	%	F	%	F	%	F	%	
1.	I am interested in the natural tourism offered by the Bah Damanik Bath.	13	27%	29	46 %	6	27 %	0	0 %	0	0 %	48
2.	I am willing to recommend Bah Damanik Bath to friends and others.	9	19%	30	48 %	8	13 %	1	0 %	0	0 %	48
3.	I want to visit Bah Damanik Bath again in the future.	10	21%	27	52 %	9	2%	2	0 %	0	0 %	48
4.	I have a desire to visit Bah Damanik Bath in the near future.	14	29%	28	52 %	6	10 %	0	0 %	0	0 %	48
5.	I felt curious to see the beauty of the natural tourism of the Bah Damanik Bath.	19	40%	24	50 %	5	10 %	0	0 %	0	0 %	48
	Average		27%		58 %		14 %		1 %		0 %	100%

Source: Primary data processed 2025

The results in Table 4 show that tourists' interest in visiting Bah Damanik Bath, with an average of 58% of respondents agreeing, and 27% of respondents who answered the average who said they strongly agreed. This indicates that the level of interest in tourists visiting Bah Damanik Bath is relatively high. Furthermore, it has a positive response that can be a special attraction in the eyes of tourists, both in terms of natural beauty, atmosphere, and experiences offered. Meanwhile, those who stated neutrality with an average of 14% of respondents, and those who stated that they did not agree with an average of 1% of respondents expressed interest in visiting the Bah Damanik Bath. Respondents who are neutral point to opportunities to better convince tourists through increased promotions and facilities, while the number who disagree is very small. This data indicates that Bah Damanik Bath has good potential in

attracting tourists, so management needs to maintain and improve the quality of services and tourist attractions to maintain and increase visitor numbers.

Validity Test

The validity test was carried out to find out whether the questionnaire instrument used in this study could measure what should be measured. The validity test was performed using *the* Pearson Product Moment correlation, by calculating the correlation between the score of each statement item and the total score of each variable. In this study, there are three variables, namely:

Table 5. Validity Test of Tourist Facilities (X1)

Variable	Item Questionnaire	r count	r table	Information
Tourism Facilities (X1)	X1	0,550	0,2845	Valid
	X2	0,717	0,2845	Valid
	X3	0,760	0,2845	Valid
	X4	0,543	0,2845	Valid
	X5	0,798	0,2845	Valid

Source: SPSS data processing results 27, 2025

Table 6. Promotional Validity Test Results (X2)

Variable	Item Questionnaire	r count	R table	Information
Promotions (X2)	X1	0,407	0,2845	Valid
	X2	0,715	0,2845	Valid
	X3	0,685	0,2845	Valid
	X4	0,701	0,2845	Valid
	X5	0,707	0,2845	Valid

Source: SPSS data processing results 27, 2025

Table 7. Results of the Validity Test of Tourist Interest (Y)

Variable	Item Questionnaire	r count	R table	Information
Tourist Attraction (Y)	X1	0,693	0,2845	Valid
	X2	0,821	0,2845	Valid
	X3	0,833	0,2845	Valid
	X4	0,671	0,2845	Valid
	X5	0,548	0,2845	Valid

SPSS data processing results 27, 2025

The results of the above validity test allow an evaluation of the correlation strength of each statement item. To determine the significance of this relationship, the correlation value of each item is calculated compared to the value of the table. With the number of respondents (n) as many as 48, the degree of freedom (df) was calculated using the formula n-2, which is 48-2=46. Referring to the table r with a real level of 5% (0.05), a rateable value of 0.2845 was obtained. Based on the table of test results that have been presented, overall all items for the variables of tourist facilities (X1), promotions (X2), and tourist interest (Y), show a calculation value greater than the value of the table with a significant value below 0.05.

This shows that each statement in the research instrument has sufficient correlation strength to the total value of each variable, so that it can be declared valid. Each statement in the questionnaire is suitable for use as a research instrument because it is proven to have a significant and strong correlation to the total value of its variables and the data collected reflects the actual conditions in the field.

Reliability Test

The reliability test is used to determine the extent to which the research instrument (questionnaire) is reliable or consistent if measured again under similar conditions. An instrument is said to be reliable if it provides consistent and stable results over time. In this study, reliability was measured using Cronbach's Alpha coefficient, with a minimum limit of ≥ 0.60 as a condition for the instrument to be considered reliable. Based on the results of the reliability test conducted, the following Cronbach's Alpha values are obtained:

Table 8. Reliability Test

Variable	Cronbach's Alpha	Condition	Reliability Levels
Tourist Facilities	0,825	>0,60	Reliable
Promotion	0,617		Reliable
Interest in Visiting Tourists	0,763		Reliable

SPSS data processing results 27, 2025

The three values of Cronbach's Alpha of each variable greater than 0.60, so it can be concluded that all items in the variables X1, X2, and Y are declared reliable. This means that the instruments used in this study are reliable and consistent in measuring each variable.

Multiple Linear Regression Test

Table 9. Multiple Linear Regression Test

Model	Unstandardized Coefficients		Unstandardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1. (Constant)	3.424	3.099		1.105	.275
Tourist Facilities	.369	.091	.463	4.073	.000
Promotion	.452	.136	.377	3.316	.002

b. Dependent Variable: Visiting Interest

Based on the test results in table 4.9 above, the following linear regression equations are obtained:

$$Y = 3.424 + 0.369X1 + 0.452X2 \quad (1)$$

In the multiple linear regression model, a constant value of interest in visiting is obtained of 3,424, indicating that the variable of tourist facilities and promotions has a value of 0, then the interest in visiting tourists is 3,424. The regression coefficient of tourist facilities is 0.369 where every one unit increase in tourist facilities will increase interest in visiting by 0.369, while the regression coefficient of promotion of 0.452 shows that an increase in one promotion unit will increase interest in visiting by 0.452. The significance value for tourist facilities is 0.000 and for promotions is 0.002, both of which are smaller than 0.05. Thus, it can be concluded that tourism and promotional facilities have a positive and significant effect on the interest of tourists visiting the Bah Damanik Bath.

Hypothesis Test (T Test)

Table 10. T Test (Partial) Coefficients[a]

Model	Unstandardized Coefficients		Unstandardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1.(Constant)	3.424	3.099		1.105	.275
Tourist Facilities	.369	.091	.463	4.073	.000
Promotion	.452	.136	.377	3.316	.002

b. Dependent Variable: Interest in Visiting

Based on the results of Table 10 above, it can be seen that:

4. The calculated value for the variable of tourist facilities is 4.073 and the significant value is 0.000 < alpha 0.05, so the variable of tourist facilities has a partial significant effect on the interest in visiting.
5. The calculation value for the promotional variable is 3,316 and the significant value is 0.002 < alpha 0.05, so the promotional variable also has a partial significant effect on the interest in visiting.
6. A Sig value of 0.275 is not significant, indicating that if the tourist and promotional facilities are worth 0.

The results of this study are in line with several previous studies that stated that the quality of complete and comfortable facilities can increase the attractiveness of tourist visits (sari, 2021). However, this study is different from the previous research in terms of the number and types of variables observed. Thus, it can be concluded that the improvement of tourist facilities and promotions respectively will increase the interest of tourist visits in a real and significant way.

F Test (Simultaneous)

The F test was used to test whether the independent variables (Tourism facilities and promotions) together had a significant effect on the dependent variables (Interest in visiting).

Table 11. Simultaneous Test Results (F Test) ANOVA

Model	Sum of Square	Df	Mean Square	F	Sig.
1.Regresion	118.786	2	59.393	17.365	<,001[b]
Residual	157.336	46	3.420		
Total	276.122	48			

a.Dependent variable: Visiting Interest
b.Predictors: (Constant), Promotions, Tourism Facilities

Based on Table 11 above, it can be seen that the Fcal value is 17,365 with a significance value of <0.001 which is smaller than alpha 0.05. So, the decision taken H0 is accepted H1, thus simultaneously the variables of tourist facilities have a significant effect on the interest of tourists to visit.

Coefficient Determination Test

Table 4.12 Determination Coefficient Test Results (R2) Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.656[a]	.430	.405	1.84942

a. Predictors: (Constant), Promotions, Tourism Facilities

The Coefficient of Determination (R2) is used to measure how far the model's ability to explain variations in dependent variables (Ghozali, 2018). From the results of multiple linear regression analysis in table 4.10, the *value of R Square* (R2) was obtained as 0.430. This shows that 43.0% of variations or changes in interest in visiting can be explained by the variables of tourism facilities and promotions together. Meanwhile, it can be explained by the variables of Tourism and Promotion Facilities together. Meanwhile, the R2 value is 57% which (100% - 43.0% = 57%) is influenced by variable factors outside the study, such as ticket prices, weather, and so on.

5. The Influence of Tourist Facilities on Tourists' Interest in Visiting

The results of the study show that tourist facilities have a significant influence on the interest of tourists visiting Bah Damanik Bath. Adequate, clean, and comfortable facilities are one of the determining factors in tourists' decisions in choosing tourist destinations. This is in accordance with the opinion of Sintyawati (2024) who stated that complete facilities will increase the comfort and satisfaction of visitors, thereby encouraging them to return or recommend to others.

6. The Effect of Promotion on Tourist Interest

In addition, promotion has also been proven to have a significant impact. Promotional strategies carried out through social media, the internet, and information presented in an attractive manner are effective in building a positive image of tourist destinations. Promotions that are in accordance with real conditions in the field increase tourists' confidence, thereby boosting their interest in visiting. These findings support the research of Hutasoit et al. (2024) which emphasizes the importance of digital promotion in attracting tourists' attention, especially in the current technological era.

7. The Influence of Tourism Facilities and Promotion on Tourist Interest in Visiting

When analyzed simultaneously, tourism and promotional facilities are able to make a strong contribution to increasing interest in visits. This can be seen from the response of the majority of visitors who expressed interest in visiting again, were willing to recommend to others, and felt satisfied with the experience obtained. These findings prove that the combination of improving the quality of facilities and the right promotional strategy can be the main key in developing the attractiveness of tourist destinations.
Overall, the results of this study show that the management of Bah Damanik Bath needs to continue innovating by improving facilities and strengthening more creative and informative promotional activities. Thus, these destinations can sustain the interest of returning tourists and attracting new tourists on a continuous basis.

8. Comparison with National and Global Tourism Trends

In a global context, the tourism sector has experienced significant growth, especially after the COVID-19 pandemic. According to the UNWTO report (2024), international tourist arrivals in 2023 have recovered to 88% of pre-pandemic levels. Nature-based tourism, local culture, and authentic experiences are increasingly popular among global travellers, especially among millennials and Gen Z. This aligns with trends in Indonesia, where the Ministry of Tourism and Creative Economy aims to increase visitor numbers to local destinations offering natural, cultural, and local experiences (Kemenparekraf, 2025). Destinations such as touristic villages and natural hot springs like Bah Damanik are concrete examples of this trend. However, to compete in the modern tourism market, destinations like Bah Damanik Hot Springs need to adopt more aggressive digital promotion strategies, including social media optimization, collaborations with travel vloggers, and leveraging digital reviews (TripAdvisor, Google Maps). In terms of facilities, many top destinations in Indonesia—such as Puncak B29 in Lumajang or Bukit Lawang in Langkat—have invested in basic facilities and aesthetic photo spots to increase visitor interest and length of stay. Thus, the findings of this study not only reflect local phenomena but also indicate that Bah Damanik Hot Spring has significant potential if it can align itself with the direction of national and global tourism development. Emphasizing facility comfort and digitalizing promotions are key to the success of future tourism destination development.

4. Conclusion

This study shows that tourism facilities and promotion have a significant effect on tourists' interest in visiting, both partially and simultaneously. Clean, complete, and easily accessible facilities increase the comfort and attractiveness of a destination, while creative, consistent, and authentic promotion strengthens the image and encourages the decision to visit. The combination of the two produces a greater synergistic effect on increasing visits.

Based on the data analysis and discussions conducted, it can be concluded that:

4. Tourist facilities have a significant effect on the interest of visitors. Adequate facilities such as clean toilets, parking lots, attractive photo spots, and environmental comfort have been proven to increase the interest of visitors to come to Bah Damanik Bath. Most respondents agreed that the facilities at Bah Damanik Bath were sufficient to support the comfort of traveling.
5. Promotions have a significant influence on tourist visits. Promotions carried out through social media, attractive visual content, and positive testimonials have proven to be effective in attracting the attention of potential visitors.
6. Simultaneously, tourism facilities and promotions have a significant effect on the interest of tourist visits, that the combination of providing good facilities and the right promising strategy can increase the number of tourists visits more optimally.

Research Limitations

This study is limited to one location, Pemandian Bah Damanik, with a limited number of respondents. The variables studied only include facilities and promotion, so other factors such as service quality, price, and destination image have not been considered.

Recommendations for Further Research

Future research is recommended to involve more diverse destinations and larger samples, as well as adding other variables for a more comprehensive analysis. The use of mixed methods is also recommended to gain a deeper understanding of tourist behavior and motivations.

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EFFECT OF TOURISM EVENT ON LOCAL ECONOMIC IMPROVEMENT IN THE BAHARI KAWASAN CERMIN

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Abstract

This study aims to analyze the influence of tourism events on local economic improvement and examine the long-term impacts on the economic sustainability of communities in the Pantai Cermin tourism area, Serdang Bedagai Regency, North Sumatra. In the context of an increasingly competitive tourism business, effective event organization to attract tourists and enhance the local economy is crucial. The research method employed is a mixed-method approach combining quantitative and qualitative analysis, where data were collected through structured questionnaires distributed to 100 respondents and in-depth interviews with 15 key informants. The results show that tourism events significantly influence local economic improvement with a CR value = 6.847 ($p < 0.001$) and a standardized coefficient = 0.683. Quality tourism events involving active participation of local communities not only increase tourist visits but also contribute to sustainable economic improvement. This research confirms that organizing tourism events that are responsive and adaptive to local community needs is key to building sustainable, long-term economic foundations. The conclusion of this study emphasizes that effective utilization of tourism events contributes significantly to local economic improvement and community economic sustainability. The resulting recommendations include the need for further development in local human resource capacity and improvement of event management systems to maintain economic momentum and enhance community welfare. This research is expected to provide insights for the Pantai Cermin area and other tourism destinations in managing tourism events in the digital era.
Keywords: Tourism Events, Local Economy, Economic Sustainability

1. Introduction

The development of the tourism sector is currently increasing, and with this increase, the role of tourism events as drivers of the local economy is also changing. This is particularly evident in Indonesia and in coastal areas where tourism potential is increasingly developing. With the growing demands to improve local community welfare, tourism areas need strategies that can provide sustainable economic impacts. They also require approaches that can be used to develop businesses, create employment opportunities, and increase income in ways that are sustainable and environmentally friendly. Tourism events have become one of the strategies that can be implemented to drive the local economy. As a form of impact from the need to increase destination attractiveness through unique experiences, the development in this era is the emergence of various events that enable increased tourist visits, namely tourism events, which can involve the entire local community. Currently, tourism events are no longer merely entertainment.

However, with the paradigm shift in tourism, tourism events have now become popular economic catalysts, with many local communities developing creative economies through events. These tourism events are not only found in major cities in Indonesia but also throughout tourism destinations in Indonesia. The rapid development of tourism events has

become an opportunity for local communities to develop their tourism-related businesses. With this rapid development of tourism events, more and more various ideas emerge to make their events as unique and attractive as possible to be visited by tourists from all walks of life. Some challenges faced in organizing tourism events include how to maintain and increase sustainable economic impacts and threats in the form of competition with other tourism destinations. Local economic impact plays an important role, especially in the tourism sector, with event organizers competing to provide quality and experiences that can benefit local communities.

Tourism events at Pantai Cermin are among the events in Serdang Bedagai Regency, North Sumatra, characterized by coastal features with various activities and attractions. Tourism events at Pantai Cermin began to be organized regularly in 2021 with various innovations from concept to implementation, following the development of the times to improve local community welfare. The key to the economic impact of Pantai Cermin tourism events lies in the consistency of stakeholders in attracting and maintaining tourist visits through various commitments and managerial strategies, with the emergence of ideas to maintain economic momentum. From direct satisfaction responses by tourists, Pantai Cermin tourism events will gain added value for their economy, which is certainly very important for the economic progress of the Pantai Cermin community in the future.

The factors influencing economic impact and sustainability in this analysis are Event Quality, Event Frequency, Community Participation, Promotion and Accessibility, and Infrastructure Support, which aim to drive sustainable economic development for local communities. Economic impact refers to changes in the economic conditions of local communities arising as direct or indirect consequences of tourism event organization (Dwyer et al., 2021). According to Getz & Page (2020), economic impact is the goal that event organizers want to achieve to understand the extent of benefits felt by local communities. The economic impact of tourism events is a combination of direct impact, indirect impact, and induced impact used to provide economic benefits to communities.

Tourism events are a collection of planned activities, unique experiences, and cultural activities conducted by destinations to attract tourists and enhance the local economy (Liu et al., 2022). According to Anderson & Smith (2023) in Blackstock (2021), there are several dimensions of economic impact that must be fulfilled to create community economic sustainability, including: (a) Income Enhancement, (b) Job Creation, (c) Business Diversification, (d) Revenue Increase, (e) Multiplier Effect, (f) Benefit Distribution, (g) Economic Resilience. Regarding economic sustainability, this is something that must be achieved by tourism destinations properly and sustainably (Butler, 2020). Economic sustainability is something directly felt by local communities; with economic sustainability, destinations hope that the impacts provided by tourism events can provide long-term welfare for communities. There are 5 dimensions in economic sustainability: (a) Economic Diversification, (b) Benefit Distribution, (c) Human Resource Capacity, (d) Economic Resilience, (e) Economic Independence (Dwyer et al., 2021).

According to UNWTO (2023), all tourism event activities certainly want their impacts to remain sustainable and provide long-term benefits for the local economy generated by these events. Economic sustainability is highly desired by organizers so that local communities feel prosperous with the events organized. Economic sustainability has many benefits for communities because if this is achieved, communities will provide full support for event organization, which will certainly benefit destinations. Economic sustainability refers to the ability of local communities to maintain and improve economic welfare in the long term (Rahmawati et al., 2022). Simply put, economic sustainability can occur due to a combination of positive economic impacts and long-term commitment. Creating community enthusiasm for tourism events at destinations can be achieved sustainably without compromising environmental quality. These changes require new approaches in tourism event management,

including local community empowerment, increased use of digital technology, and adjustment of effective marketing strategies. In this case, the concept of economic sustainability is more demonstrated in long-term impacts, one of which is shown by sustainable community welfare improvement.

Fadhilah & Wijaya (2021) state that sustainable destinations have the following characteristics: a. Creating consistent income increases b. Developing local business diversification c. Involving active community participation d. Showing resilience to external changes. Factors influencing economic sustainability, according to Lotim & Damayanti (2020) in Pratminingsih et al. (2013) are: a. Sustainable event quality b. Local community participation c. Infrastructure support d. Promotional effectiveness Tourism events are one of the destination development strategies that provide direct economic impacts for communities. Tourism events are planned activities designed to attract tourists or a number of specific activities that destinations exchange to gain benefits from organizing these events. When events organized by destinations match local potential, they will certainly encourage tourists to visit, and when these events provide satisfying experiences, tourists will recommend these destinations to others. The hypothesis formulated in this research is: Tourism events influence local economic sustainability.

The tourism event situation at Pantai Cermin reflects national trends where coastal areas are increasingly developed, and the need for local economic improvement strategies is increasing. Tourism events provide an effective platform, making them a strategic choice not only for attracting tourists but also for driving the local economy, creating employment opportunities, and developing community businesses. The growth of tourism events at Pantai Cermin is also driven by the influence of social media and digitalization. The use of social media as a promotional and marketing tool has become an important strategy for event organizers to reach wider tourists and build supporting communities. Through platforms like Instagram, Facebook, and Twitter, event organizers can introduce their activities and attractions to the public in creative and attractive ways.

The rapid development of technology has created major transformations in tourism, particularly in the use of social media as one of the main pillars of modern event marketing strategies. Therefore, social media is not only a communication platform but has become a very effective forum for destinations to interact with potential tourists, build destination brands, and increase visibility. In the rapidly developing digital era today, the use of social media has become one of the most effective tools in promoting tourism events, especially for destinations with limited resources. One type of activity that has adopted many promotional strategies through social media is coastal tourism events. For example, tourism events at Pantai Cermin, a tourism destination standing in the midst of coastal communities with a unique approach, implement intensive event promotion through community-based social media. If managed well, this can provide significant positive impacts on the local economy.

Therefore, in this research, we will conduct an in-depth analysis of tourism event strategies used at Pantai Cermin, focusing on local economic impacts. Based on initial observation results obtained, it is known that several things related to tourism event organization are: tourism events at Pantai Cermin use a participatory approach to drive the local economy so that their economic impacts are more optimal and sustainable compared to using conventional top-down approaches. Before organized tourism events existed, the economic activities of the Pantai Cermin community only depended on traditional fisheries and small trade sectors. This certainly limited economic diversification and income improvement opportunities. However, after regular tourism events, economic activities became more diverse and sustainable. Pantai Cermin tourism events use social media as part of their digital marketing channels. Event organization must be attractive to tourists, especially tourists who have followed the development of Pantai Cermin destination. Tourism events can be a means to improve the economic welfare of local communities. Based on the problems that occur, the author is

interested in researching further about "The Influence of Tourism Events on Local Economic Improvement in the Pantai Cermin Coastal Area."

2. Methodology

This research uses a mixed-method approach with a sequential explanatory design. This approach was chosen to obtain a comprehensive understanding of the influence of tourism events on local economic improvement in the Pantai Cermin area to enhance community economic sustainability. Mixed-method research is a research approach that focuses on economic and social phenomena using integrated quantitative and qualitative analysis (Creswell & Plano Clark, 2022).

In this research, data collection was conducted through questionnaires and in-depth interviews. Questionnaires were distributed to 100 respondents, consisting of local tourism stakeholders, with the aim of understanding the extent to which tourism events influence local economic improvement felt by communities. Through this questionnaire distribution, researchers wanted to measure the effectiveness of tourism events in driving the local economy as part of efforts to maintain and improve community welfare.

The instruments used include a number of questions that assess how well tourism event organization provides economic impacts for local communities. Additionally, this questionnaire also identifies various challenges faced in the event organization process and measures the relationship between tourism event quality and the level of economic sustainability felt by communities. In this research, the author used open-ended questions and applied Likert scales in questionnaires (Razali et al., 2023). Likert scales are used to measure attitudes, opinions, and perceptions of individuals or groups of people. The questionnaire presented in this research is as follows:

Tabel 1. Instrumen Penilaian Pengaruh Event Pariwisata terhadap Ekonomi Lokal

NO	ASPECT	COMPONENT	
1	Perceptions of Tourism Events	1	Tourism events at Pantai Cermin are organized regularly
		2	Tourism events attract tourist interest to visit
		3	Tourism events held are well-promoted
		4	Tourism events held have varied themes
		5	Tourism events held involve local communities
		6	Tourism events held utilize existing coastal potential
		7	Tourism events held attract domestic and international tourists
		8	Local government supports tourism event organization
2	Economic Impact	1.	My income increases during tourism events
		2.	Number of consumers/buyers increases during events
		3.	Sales revenue increases significantly during events
		4.	Tourism events help develop my business
		5.	Events create new job opportunities for local communities
		6.	Product/service prices tend to rise during events
		7.	I can sell products/services at higher prices during tourism events
		8.	Products/services I offer become more diverse due to tourism events
3	Economic Sustainability	1.	.Economic impacts occur long-term
		2.	Events promote infrastructure development
		3.	Events introduce local products to broader markets
		4.	Events enhance community business skills
		5.	Events encourage business diversification
		6.	Economic impacts are distributed equitably

	7. Event enhance investment activities within the region 8. Economic dependence on events is quite high

Data collected from questionnaires in this research were analyzed using mixed-method analysis techniques. This analysis process was conducted in questionnaire data processing, where coding was done by grouping responses given by respondents based on Likert scales 1 to 5. This grouping aims to simplify data so it can be arranged systematically, ultimately facilitating the analysis process and drawing conclusions from the obtained data. Additionally, questionnaire results were also analyzed to determine whether there was an increase in community economic sustainability. After analysis, data were presented descriptively so readers could understand more clearly the relationship between tourism events and the level of community economic sustainability in the Pantai Cermin area. Data were collected through questionnaires in Google Forms and in-depth interviews, where the analysis results are expected to provide insights into how tourism events provide economic impacts in enhancing local community economic sustainability.

3. Result and Discussion

3.3.1 Research Object Profile

Woong Rame Pantai Cermin Restaurant & Resort is a hospitality company operating since 2015, located in the historic Pantai Cermin area, Serdang Bedagai Regency, North Sumatra. This area has historical value as the landing site of Japanese forces during World War II and is known for its clear seawater characteristics resembling a mirror.

The resort operates with 3-star standards, providing 77 rooms with complete facilities including air conditioning, television, beverages, and bathrooms. As an integrated coastal tourism destination, this area includes various beaches (Wong Rame, Pondok Permai, Bali Lestari, and Cermin Waterboom), seafood restaurants, and supporting facilities such as fun games, outbound activities, meeting rooms, playgrounds, and theme park resorts. The latest innovation since 2019 is a container-shaped accommodation concept that provides unique lodging experiences.

Pantai Cermin Wong Rame has become a leading tourism destination that provides significant contributions to the local economy of Serdang Bedagai Regency through job creation and community income improvement. This resort implements a sustainable tourism development model that combines modernization with preservation of natural and cultural heritage, while committing to becoming a world-class tourism destination that supports the positive image of Indonesian tourism.

Table 2. Respondent Characteristics Based on Occupation/Business

Occupation/Business	Frequency
Merchant/Food Stall Owner	10
Tourism Object Employee	10
Fisherman	7
Tourism Service Provider	1
Part-time	2
Total	30

From the table above, it can be seen that occupations and businesses around Pantai Cermin Woong Rame include Tourism Service Providers (1 person), Tourism Object Employees (10

people), Part-time workers (2 people), Fishermen (7 people), and Merchants/Food Stall Owners (10 people).

3.3.2 Multiple Linear Regression Analysis Results

To determine the extent to which tourism event variables (X1) and economic impact (X2) play a role in influencing Economic Sustainability (Y), this research uses multiple linear regression analysis methods. Calculations and data analysis were conducted with the assistance of SPSS 27 for Windows software. Analysis of each variable is explained in the following description:

Table 3. Multiple Linear Regression Analysis Results

Coefficients[a]			
Model		Unstandardized Coefficients	
		B	Std. Error
1	(Constant)	-8.447	6.380
	Tourism Events	.654	.121
	Economic Impact	.581	.165

a. Dependent Variable: Keberlangsungan Ekonomi

Source: SPSS 27 data processing results, 2025

Based on the analysis results, a multiple linear regression equation was obtained that describes the relationship between research variables:

$$Y= -8,447+0,654TE+0,581EI+e.$$

Coefficient interpretation:

i. Constant (-8.447): Economic sustainability value when tourism events and economic impact are zero
ii. X1 (0.654): Each one-unit increase in tourism events increases economic sustainability by 0.654 units
iii. X2 (0.581): Each one-unit increase in economic impact increases economic sustainability by 0.581 units

3.3.3 Hypothesis Testing Result

i. t-Test (Partial)

Table 4. t-Test Hypothesis Testing

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	-8,447	6.380		-1.324	.197
	Tourism Event	.654	.121	.631	5.410	.000
	Economic Impact	.581	.165	.410	3.515	.002

Source: SPSS 27 data processing results, 2025

H1: Tourism events significantly influence economic sustainability (t-calculated 5.410 > t-table 2.518; sig. 0.000 < 0.05) - ACCEPTED

H2: Economic impact significantly influences economic sustainability (t-calculated 3.515 > t-table 2.518; sig. 0.002 < 0.05) – ACCEPTED

ii. F-Test (Simultaneous)

Table 5. F-Test Hypothesis Testing

ANOVA[a]						
Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	374.356	2	187.178	24.015	,000[b]
	Residual	210.444	27	7.794		
	Total	584.800	29			

Source: SPSS 27 data processing results, 2025

H3: Tourism events and economic impact simultaneously significantly influence economic sustainability (F-calculated 24.015 > F-table 3.35; sig. 0.000 < 0.05) – ACCEPTED

3.3.4 Coefficient of Determination (R^2)

Table 6. R^2 Hypothesis Testing

Model Summary[b]				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,800[a]	,640	,613	2.79182

Source: SPSS 27 data processing results, 2025

The R^2 value of 0.640 (64%) shows that tourism events and economic impact can explain 64% of the variation in economic sustainability, while the remaining 36% is influenced by other factors outside the research.

4. Discussion

4.1 Influence of Tourism Events on Economic Sustainability

Tourism events organized regularly at Pantai Cermin have proven to provide a significant positive influence on the local community's economic sustainability. Events with varied themes, involving local communities, and utilizing coastal potential create stable and sustainable economic opportunities. Local government support and the ability to attract domestic and international tourists strengthen the contribution of tourism events as catalysts for local economic growth.

4.2 Influence of Economic Impact on Economic Sustainability

Economic impacts from tourism events play an important role in supporting economic sustainability through income increases, increased consumers, and rising sales revenue. This helps communities develop businesses, create new job opportunities, encourage product diversification, and enable higher pricing, thereby increasing profitability and introducing local products to broader markets.

4.3 Simultaneous Influence of Tourism Events and Economic Impact

The combination of tourism events and economic impact forms a strong foundation for economic sustainability. This simultaneous influence shows that economic sustainability

requires not only quality tourism events but also real economic impacts for local communities. Effective tourism area management requires a comprehensive understanding in planning tourism events that can generate optimal economic impacts to create sustainable competitive advantages.

4. Conclusion

Based on the discussion in previous sections, it can be concluded that strategies that researchers can elaborate during research on tourism events at Pantai Cermin include: 1) Tourism events at Pantai Cermin have provided quite significant impacts on local economic improvement, including through job creation, community income increases, SME development, and local business diversification that supports long-term economic sustainability. 2) Several challenges faced in organizing tourism events include infrastructure limitations, a lack of local human resource capacity, challenges in professional event management, and high competition between destinations. However, generally, the Pantai Cermin area already has good potential to utilize tourism events to improve the local economy. 3) Organizing quality tourism events involving active participation of local communities has proven to provide significant impacts on economic sustainability. Communities feel involved, receive direct economic benefits, and are more optimistic about continuing to develop tourism-related businesses in the future.

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THE INFLUENCE OF SERVICE QUALITY AND THE ROLE OF THE COMMUNITY IN INCREASING TOURIST VISITING INTEREST IN TUKTUK SIADONG, SAMOSIR REGENCY

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Abstract

Tourism is a strategic sector that supports regional economic growth. Tuktuk Siadong in Samosir Regency has developed rapidly as a tourist destination, yet it still faces challenges in attracting visitors. Service quality, which includes comfort, friendliness, responsiveness, and professionalism, strongly influences tourist satisfaction and loyalty. Meanwhile, the active role of local communities through culinary businesses, accommodations, and transportation services also contributes significantly to the tourist experience. The purpose of this study is to investigate the impact of service quality and community participation on visitors' interest in visiting Tuktuk Siadong. The study employs a quantitative approach with a purposeful sample procedure, with data collected via questionnaires from 80 tourist respondents. The findings of multiple regression analysis suggest that both service quality and community involvement have a substantial impact on visitor interest. This research highlights the importance of collaboration between destination management and the local community in enhancing service quality and promoting sustainable tourism development.
Keywords: Service; Society; Visiting.

1. Introduction

One of the most important areas of growth in a country is tourism, which international tourism organizations define as the activities of people who travel to a place and stay outside their original environment for vacation, business purposes, or other reasons not related to the pursuit of their activities at their place of residence (Adi *et al.* ,2022).

The district of Samosir, particularly the Tuktuk Siadong area, is one of the regions with the greatest potential for the tourism industry. Tourism is described in Law No. 10 of 2009 of the Republic of Indonesia on Tourism as a variety of tourism-related activities supported by various facilities and services offered by the government, economy, and economic players. Tourism has a large market since it may impact all levels of society (OECD, 2022). Tourism can generate jobs, stimulate several production sectors, promote progress in efforts to build or improve highway and transportation ports, and encourage the implementation of cleanliness programs, health projects, cultural facilities, and environmental preservation that can benefit and entertain local communities and foreign tourists (Elgin & Elveren, ,2024).

One of the most important factors influencing travelers is the quality of services offered by accommodation providers, restaurants, transport companies, and travel agencies. Brightness, responsiveness, reliability, empathy, and tangible evidence are examples of high-quality services that can increase visitor satisfaction and encourage them to return. Visitors' intention to return to Samosir Island is significantly influenced by the quality of services offered (Yulihapsasi et al., 2025). In addition, local communities' support for tourism-related activities such as keeping the environment clean, participating in cultural events, and offering hospitable services contributes to visitors having an enjoyable time. Community involvement can improve the image of a destination and encourage sustainable growth of the tourism sector. In addition,

the success of tourism development is also greatly influenced by the participation of local communities. The community not only plays a role as a beneficiary, but also as a major actor in maintaining tourist attractions through preserving culture, the environment, and a friendly attitude towards tourists. When the community also actively supports tourism activities, this can create a comfortable atmosphere for tourists and increase the appeal of the tourist area.

Tourist facilities and infrastructure Tuk-tuk is known for its accommodation options, restaurants, and cultural venues, such as the Open Stage and the Tuktuk Siadong Arts Building. These facilities contribute to tourist events such as the Horas Samosir Fiesta and traditional Batak art performances. Tourism Awareness Group (Pokdarwi). Pokdarwis in the tourist village of Bagot, in the Simanindo area, is actively involved in the creation of Batak culinary companies, such as tuak and bagot. They invent products and venues to attract tourists, despite problems in meeting demand and improving the quality of human resources. Participation in tourism activities. Communities in the Simanindo area, especially tuk-tuk drivers, participate in tourism activities through cooperation to ensure environmental cleanliness, safety, and cultural preservation. This improves the quality of tourist destinations and attracts tourists. Environmental Identity and Sustainable Tourism. Research shows that a strong environmental identity among the Tuktuk community contributes to positive attitudes towards sustainable tourism, which is important in attracting tourists who care about nature conservation

2. Research Methods

This study employed a quantitative research approach. Sugiyono defines research as a method of collecting data through the use of a questionnaire (Sugiyono, 2025). The goal is to collect information from a variety of responders who are thought to represent a certain community. The population is the total number of items or persons that contain specified features and attributes chosen by researchers to be recognized, and then conclusions are formed (Sugiyono, 2025). In this study, the population used was tourists who visited Siadong Tuktuk, Samosir Regency, Medan, with a total of 400 respondents.

Sampling was carried out using numerous specific samples based on the criteria set for determining the quantity of samples to be analyzed (Sugiyono, 2025). The characteristics of the sample used for the study are: 1. Respondents who visited Siadong Tuktuk twice. 2. The respondents. The researchers collected data for this study by distributing questionnaires to tourists who visited Siadong Tuktuk, in the province of Samosir. The questionnaire was distributed online and offline using Google Forms.

3. Results and Discussion

Table 1. Multicollinearity Test

Model		Coefficients[a] Unstandardized Coefficients		Standardized Coefficients	T	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	25,168	2,877		8,748	,000		
	Service Quality	,430	,209	,362	2,059	,042	,318	3,140
2	Community Role	-,308	,210	-,259	-1,469	,145	,318	3,140

Note. a. Dependent Variable: Tourist Interest in Visiting. Source: SPSS Management Result (2025)

Based results of the Table test, it can be concluded that:

i. 1. The VIF value of X1 (Service Quality) and X2 (Community Role) is 3.140 or <10
ii. The Tolerance Value of X1 (Service Quality) and X2 (Community Role) is 0.318 or >0.1

The results of the test are considered to be free from multicollinearity so that the regression model is considered reliable in the analysis.

Table 2. Heteroscedasticity Test Result

Model	Coefficients[a] Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	T	Sig.
(Constant)	1.228	1.573		.781	.437
Service Quality	-,041	,061	-,119	-,662	,510
Community Role	,070	,049	,254	1.409	,162

Note. a. Dependent Variable: Abs_Res. Source: SPSS Management Result (2025)

Based on the table of contents, it can be concluded that the residual value is free from heteroscedasticity, because it can be seen from the Sig. value of the X variable from the two variables, namely variable X1 (Service Quality) of 0.510 and X2 (Community Role) of 0.162, which means > 0.05, thus indicating that non-heteroscedasticity is met.

Table 3. Multiple Linear Regression Test

	Model	Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.
	(Constant)	5.548	2.711		2.084	.040
1	Service Quality	.673	.104	.576	6.461	.000
	Community Role	.313	.084	.331	3.713	.000

Note. a. Dependent Variable: Tourist Interest in Visiting. Source: SPSS Management Result (2025)

Regression Coefficients are obtained:
$Y = \alpha + b_1X_1 + b_2X_2 + \varepsilon$

$Y = 5{,}548 + 0{,}673X_1 + 0{,}313X_2$

i. The multiple regression equation allows for the following explanation:
The positive constant (α) of 5.548 indicates that the independent variables X1 (Service Quality) and X2 (Community Role) have a positive influence.
ii. With a value of 0.673, the coefficient X1 (b1) indicates that the independent variable X1 (Service Quality) has a positive effect on the variable Y (Tourist Visiting Interest).
iii. With a value of 0.313, the coefficient X2 (b2) indicates that the independent variable X2 (Community Role) has a positive effect on the variable Y (Tourist Visiting Interest).

Table 4. Partial Test (Test T)

	Model	Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	T	Sig.
	(Constant)	5.648	2.711		2.084	.040
1	Service Quality	.673	.104	.576	6.461	.000
	Community Role	.313	.084	.331	3.713	.000

Note. Dependent : Tourist Interest in Visiting. Source: SPSS Management Report (2025)

Based on the results of the t-test performed on the above table, it can be concluded:

i. . Independent variable X1 (service quality).

In the test of X1 (service quality), the t value obtained was 6.461, which is greater than the t table value of 1.666. The p value in the significance column is 0.000 < 0.05, which indicates a significant effect. The tolerance value Hα shows that service quality has a positive and significant effect on interest in revisiting Tuktuk Siadong, Samosir Regency.

ii. Independent variable X2 (Community Role).

The X2 test (Community Role) gave a value of 3.713, which shows that the t-value of 3.713 is greater than the t-value in Table 1.666. The p-value in the Sig column is 0.000 < 0.05, which indicates a significant effect. Accepting Hα means that the role of community has a good and significant effect on tourists' interest in Tuktuk Siadong in Samosir District.

According to the existing theory, two factors, namely the independent variables X1 (service quality) and X2 (community role), have a positive and significant effect on tourists' interest in Tuktuk Siadong in Samosir District.

Table 5. Simultaneous Test (Test F) ANOVA

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	4543,447	2	2271,724	150.083	.000[b]
	Residual	1453.098	73	15.136		
	Total	5996,545	75			

Note. Dependent variable: Tourist Interest in Visiting. Source: SPSS Management Results (2025)

The results of the table test showed that the calculated F value (150.083) > F table (3.09), with a significant difference of 0.000 < 0.05, which is consistent with the existing theory. This indicates that Hα is acceptable, and it can be interpreted that the quality of service and the role of the local community have a positive and significant effect on tourists' willingness to visit Tuktuk Siadong, Samosir Regency.

Table 6. Coefficient of Determination Test (R^2)
MODEL SUMMARY

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.870[a]	.758	.753	3.891

Note. Predictors variable : Service Quality, Community Role. Source: SPSS Management Report (2025)

Based on the overall calculation of the coefficient of determination (R2) test, the corrected R-squared value obtained is 0.753 (75.3%). This indicates that the value of the dependent variable Y (tourist interest), which is uniquely explained by the independent variables X1 (service quality) and X2 (community role), is 75.3%. The remaining 24.7% is influenced by factors that are not fully described in this study.

4. Conclusion

After analyzing and presenting the results, the author can draw the following conclusions from the study the results show that, based on the t count value (6.461), we know that the t count value is greater than t table 1.666. Furthermore, we can conclude that Hα is accepted, which means that it may be in. The results of the study showed that the t count value of 3.713 is greater than the t table of 1.666, and the p-value in the sig column is 0.000 <0.05, which indicates that there is a significant effect. So, Hα is accepted, and it can be interpreted that the Society's Role has a positive and significant effect on Tourists' Interest in Visiting Tuktuk Siadong, Samosir Regency. 3. The results of the study showed that both variables have a positive and significant effect on Tourists' Interest in Visiting Tuktuk Siadong, Samosir Regency, simultaneously (with a f value of 150.083).

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ANALYSIS OF THE INFLUENCE OF LOCAL COMMUNITY ON THE DEVELOPMENT OF MERGA SILIMA PEAK TOURISM, INDONESIA, SUMATERA UTARA

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Abstract

This study aims to analyze the influence of local community participation and investors on the development of the Puncak Merga Silima tourist destination in Karo Regency, North Sumatra. The research method used is a quantitative approach by distributing questionnaires to 96 local community respondents who live around the tourist area. Data processing was carried out using multiple linear regression analysis using SPSS software version 18.0. The results of the study indicate that local community participation and the role of investors each have a positive and significant effect on tourism development. This is evidenced by the regression coefficient value of 0.420 for local community participation and 0.310 for the role of investors. The F test states that both variables simultaneously also have a significant effect on destination development. The determination coefficient of 63.7% indicates that the contribution of both variables to tourism development is very large, while the rest is influenced by other factors. This study concludes that local community involvement not only strengthens the sense of ownership of the destination, but also encourages the social and economic sustainability of tourism. Meanwhile, support from investors accelerates infrastructure development and destination promotion. Therefore, synergy between the community, government, and investors is needed in creating sustainable and competitive tourist destinations.
Keywords: Local Community; Investor; Sustainable Tourism.

1. Introduction

Tourism has long been one of the leading sectors in Indonesia's national economic development. As an archipelagic country with extraordinary cultural wealth, biodiversity, and natural beauty, Indonesia has great potential to make tourism a main pillar of the economy. Not only as a source of foreign exchange, this sector also plays an important role in absorg labor, increasing community income, and encouraging infrastructure development in various regions, especially remote or rural areas. In the context of regional development, tourism can be an instrument to overcome development disparities between regions and create new centers of economic growth.

However, along with the development of the times and increasing awareness of sustainability, the conventional approach that emphasizes physical development and exploitation of natural resources is starting to be abandoned. The new paradigm in tourism development now emphasizes the importance of involving various stakeholders, especially local communities, as subjects—not merely objects—of development. This concept is known as *Community-Based Tourism* (CBT), which is a tourism development model based on the strength and active participation of local communities in all aspects of tourism, from planning and implementation to supervision. Through CBT, the community becomes the main actor who maintains the authenticity of the area, preserves local culture, and ensures equitable economic benefits. As Nugroho & Susanto (2021) emphasized, community participation is one of the cornerstones of sustainable tourism because it fosters a sense of ownership, cultural pride, and accountability in managing local destinations.

One of the areas that has great potential to implement the CBT approach is Puncak Merga Silima, a natural tourism destination located in Karo Regency, North Sumatra Province. This area offers a panorama of green hills, cool air, and charming landscapes, making it a new magnet for tourists, both domestic and local. In addition, Puncak Merga Silima is also full of Karo cultural values, including customs, social systems, and agrarian traditions that are still well maintained. The comation of natural beauty and cultural richness makes the area an ideal location to be developed as a community-based tourism destination. Despite its promising potential, the development of Puncak Merga Silima still faces various structural and social challenges.

One of the main challenges is the level of community participation which still varies, where some people have been active in tourism activities such as managing homestays, becoming tour guides, or selling local craft products, while others are still passive due to limited knowledge, access to information, or institutional support. On the other hand, the role of investors in the development of the area is also not fully optimal. In fact, investor involvement is greatly needed in providing supporting tourism facilities, such as the construction of access roads, accommodation, digital promotion, and other public facilities. Amelia & Susanti (2023) noted that successful tourism areas often result from strong collaboration between local communities and external investors, which enables both cultural preservation and economic growth.

The importance of synergy between stakeholders is further emphasized by Kasman (2024), who stated that revitalizing local wisdom and strengthening community capacity can only be effective when supported by inclusive investment and facilitative government policies. Similarly, Ramdani, Yusuf, & Zahra (2023) argue that community involvement in decision-making not only reduces resistance but also enhances local innovation in tourism services.
Based on the various considerations above, this study was conducted to empirically test and analyze the extent to which local community participation and the role of investors influence the development of the Puncak Merga Silima tourist destination. This study will specifically answer three main questions:

i. How does local community participation affect the development of the Puncak Merga Silima tourist destination?
ii. What role do investors play in supporting the development and promotion of tourism in the area?
iii. How much do the two variables contribute together to the progress of the tourist destination from the perspective of economic, social, and cultural sustainability?

By answering these questions, it is hoped that the research can contribute to the formulation of a more participatory, inclusive, and sustainable tourism development strategy, especially in the context of community-based tourism management.

2. Methodology

Method this research was conducted using a quantitative approach, namely an approach that relies on numerical data and statistical processing to test hypotheses and explain the relationship between variables. This approach was chosen because it is able to provide an objective picture of the influence of two independent variables, namely local community participation and the role of investors, on one dependent variable, namely the development of the Puncak Merga Silima tourist destination. In addition, the quantitative approach provides a strong foundation for data-based decision making, so it is very appropriate to answer the problem formulation in this study which is causal and generalist. The method used in data collection is the survey method, which is carried out by distributing questionnaires to local people living around the Puncak Merga Silima tourist area, Karo Regency, North Sumatra.

The number of respondents involved in this study was 96 people, who were selected using the purposive sampling technique. This technique is used to ensure that the selected respondents are those who have direct or indirect involvement in tourism activities in the area, such as homestay managers, tour guides, local product sellers, traditional figures, to ordinary residents who live around the tourist location. The research instrument used was a closed questionnaire with a five-point Likert scale, ranging from strongly disagree (1) to strongly agree (5). This instrument was designed to measure three main variables, namely: Local Community Participation (X_1): Measures the extent of local community involvement in various aspects of tourism development, such as participation in planning, attraction management, cultural preservation, and promotional activities. Investor Role (X_2): Measures the contribution of investors in supporting physical development, financing, provision of facilities, and involvement in promoting tourist destinations.

Tourism Development (Y): Describes the level of destination progress in terms of the number of visits, local economic growth, cultural and natural conservation, and improvement of tourist facilities. Before being used widely, the research instrument was first validated and tested for reliability to ensure that the measuring instrument was valid and consistent. The validity test was carried out using the Pearson Product Moment correlation method, and the results showed that all questions had a correlation value above 0.30, which means valid. Next, the reliability test was conducted using Cronbach's Alpha, and the results showed that all variables had an alpha value above 0.60, which means that the instrument used is reliable and suitable for use in data collection. After the data was collected, the analysis was conducted using multiple linear regression techniques. This technique is used because there are two independent variables (X_1 and X_2) which are suspected of simultaneously and partially influencing the dependent variable (Y). The multiple linear regression model used in this study is formulated as follows

$$Y= a+ b_1 X_1+ b_2 X_2+e \quad (1)$$

Description:
Y = Tourism destination development
X_1 = Local community participation
X_2 = Investor role
a = Regression constant
b_1 and b_2 = Regression coefficients of each independent variable
e = Error or confounding factor

To test the level of significance of the relationship between variables, three types of statistical tests are carried out: t-test (partial): Used to determine whether each independent variable (X_1 and X_2) separately has a significant effect on the dependent variable (Y). A significance value <0.05 is the basis for drawing a conclusion that an independent variable has a statistically significant influence. F test (simultaneous): Aims to determine whether the overall regression model is feasible to use and whether the two independent variables together have a significant influence on the dependent variable. The F calculated value is compared to the F_table, and a p-value smaller than 0.05 indicates the significance of the model. Coefficient of Determination (R^2): Used to measure the magnitude of the contribution of the two independent variables in explaining the variations that occur in the dependent variable.

The R^2 value ranges from 0 to 1, where the closer it is to 1, the stronger the model has a strong predictive ability. The entire analysis process was carried out using the help of SPSS statistical software version 18.0, which facilitates the process of processing numerical data and interpreting statistical results accurately and efficiently. With the approach and methods used, it is hoped that the research will be able to provide strong empirical evidence about the importance of the role of local communities and investors in supporting the success of sustainable tourism development at Puncak Merga Silima. This research was conducted using

a quantitative approach, namely an approach that relies on numerical data and statistical processing to test hypotheses and explain the relationship between variables.

This approach was chosen because it is able to provide an objective picture of the influence of two independent variables, namely local community participation and the role of investors, on one dependent variable, namely the development of the Puncak Merga Silima tourist destination. In addition, the quantitative approach provides a strong foundation for data-based decision making, so it is very appropriate to answer the problem formulation in this study which is causal and generalistic. The population in this study includes all residents living in the area around the Puncak Merga Silima tourism site, Barusjahe District, Karo Regency. Based on administrative data from local village and urban village offices, the number of residents living in the surrounding area is approximately 320 households or estimated to be around 1,200 individuals.

However, not all individuals in the population are directly involved in tourism activities. Therefore, the sample was selected using purposive sampling technique, which is a sampling technique that deliberately selects respondents based on certain criteria deemed relevant to the research objectives. This technique was chosen to ensure that the respondents involved truly have knowledge, experience, or direct involvement in tourism-related activities. Selected respondents include homestay owners, local tour guides, handicraft sellers, traditional leaders, and residents who live near the site and routinely interact with tourists.
Purposive sampling is considered appropriate in this context because:

i. The population characteristics are heterogeneous – not all residents are engaged in tourism, so a selective approach ensures relevant data is collected.
ii. It ensures efficiency and focus – by targeting individuals directly involved in tourism, the collected data are more meaningful and contextually appropriate.
iii. It aligns with the applied objective of the research – since this study measures influence rather than general description, active respondent engagement is essential for valid results.

The number of respondents involved in this study was 96 people, which is considered sufficient to represent strategic community groups in the context of tourism development. This number also meets the minimum requirement for multiple regression analysis, which typically requires at least 15 respondents per independent variable—so a minimum of 30. The sample size of 96 therefore significantly exceeds this threshold and enhances the reliability of statistical results.

3. Results and Discussion

The results of this study are compiled based on the stages of quantitative data analysis from questionnaires distributed to 96 respondents of local communities around the Puncak Merga Silima tourist area. The following discussion will not only explain the results of statistical figures but also relate them to the theory and findings of previous studies.

a) Characteristics of Respondents

Most respondents were of productive age and had a strong social attachment to the tourism area. This is in line with the concept of Community-Based Tourism (CBT), which emphasizes the importance of the involvement of local people who have emotional and cultural attachments to the region (Wulandari et al., 2022). The involvement of people who have long lived in the area is an important social capital in the development of sustainable tourism.

b) Average Respondents' Answers to Research Variables

The average value of each variable ranges in the “agree” category, which indicates that the community feels involved in tourism development and feels the role of investors. This finding supports the theory of active participation of local communities (Nugroho & Susanto, 2021), which states that the success of tourism development is largely determined by community participation in planning, implementation, and supervision.

c) Multiple Linear Regression Results

The regression model obtained is:

$$Y = 2.150 + 0.420\ X_1 + 0.310\ X_2$$

The regression coefficient shows that local community participation (X_1) has a greater influence than the role of investors (X_2) on tourism development (Y). This is in line with the opinion of Kasman (2024) who emphasizes that local community empowerment is the main foundation in regional development, especially in the context of local wisdom-based tourism.

d) Partial Significance Test (t-Test)

The test results show that both independent variables partially have a significant effect on the dependent variable. This shows that both local communities and investors have an important role in the development of tourist destinations. Theoretically, this is reinforced by Nurcahyono (2020) who states that rural tourism development cannot be separated from community capacity and external support such as investment.

e) Simultaneous Significance Test (F-Test)

A high F-count indicates that community participation and the role of investors jointly influence destination development. This concept is in accordance with the collaborative approach in tourism development, where multi-stakeholder involvement is the key to success (Prasetyo et al., 2020).

f) Coefficient of Determination (R^2)

The R^2 value of 0.637 indicates that 63.7% of the variation in tourism development can be explained by the two main variables in this study. The rest (36.3%) is likely influenced by other factors such as government policy, service quality, digital promotion, and environmental sustainability. This finding corroborates Amelia & Susanti's (2023) argument that sustainable tourism development requires cross-sectoral involvement and holistic systemic support.

4. Conclusion

The study concludes that local community participation has a positive and significant impact on tourism development, highlighting the importance of involving residents in tourism-related activities. Similarly, the role of investors is also found to significantly influence tourism growth. Together, these two factors account for 63.7% of the variation in the development of the Puncak Merga Silima destination. This indicates that collaboration between local communities and investors serves as a crucial foundation for building inclusive and sustainable tourism in the region.

Based on these findings, it is recommended that local governments enhance their role as facilitators to encourage greater community engagement in tourism. In addition, establishing partnership schemes between investors and local communities based on mutual benefit is

essential for long-term success. Future research is also encouraged to include additional variables such as service quality, digital promotion, and environmental sustainability to gain a more comprehensive understanding of tourism development dynamics.

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DESIGN OF WEB-BASED ONLINE BUS TICKET ORDERING INFORMATION SYSTEM AT PT. LALUPA KARONA (ALMASAR) MEDAN

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Abstract

Currently, the use of internet services as a means of obtaining information is increasingly being used. Because of its wide reach, the internet is ideal when used as a means of promotion and a means of publishing information. The purpose of creating this web program is to promote the company while providing services to customers regarding online ticket reservations. The internet is a very potential media for developing a dynamic and large-scale information system, with the internet information about anything can be obtained easily and quickly. Based on the various conveniences and uses of the internet, an "Online Bus Ticket Reservation System" was developed. This Web-Based Online Ticket Reservation System is made with PHP, MySQL software. This Information System is designed to provide convenience in terms of ticket reservation services and obtaining other information needed by customers, especially for the services of PT. Lalupa Karona (ALMASAR) Medan.
Keywords: Online Bus Tickets; Web Application; MySQL.

1. Introduction

The development of information technology has brought major changes in the business world, including in the customer service system. One important aspect is the ticket booking system. PT Lalupa Karona still uses a manual ticket booking system, which causes various problems such as long queues, the risk of data recording errors, limited service coverage, and lack of efficiency in the transaction process. Various previous studies have shown that a web-based ticket booking system can increase efficiency by up to 78% compared to manual methods.

According to research by Prasetyo and Handayani (2020), the implementation of a web-based booking system can reduce transaction time and minimize the potential for errors in customer data input. A similar thing was also conveyed by Sari et al. (2019), who found that the use of web-based applications in transportation services can significantly increase customer satisfaction. In addition, a study by Ramadhan (2021) stated that a digital-based system can expand service access to areas that were previously difficult to reach with manual methods. This research will focus on designing an online ticket booking system that is user-friendly, efficient, and integrated with the specific needs of the company, with the hope that it can become an innovative model in improving the quality of service and ticket booking management in the transportation industry.

2. Methodology

This study applies a software engineering design approach that aims to design an online ticket booking system that suits the operational needs at PT Lalupa Karona. The research process begins with the system needs identification stage, followed by analysis, design, and implementation of the system prototype.

The research location was conducted directly at PT Lalupa Karona located in Medan, North Sumatra. To obtain accurate and relevant data, several data collection techniques were used, namely: direct observation of the manual ticket ordering process taking place in the field, structured interviews with management and counter staff to dig up detailed information about

system needs, and literature studies to understand the theory and basic principles in designing a web-based ticket ordering information system. System design is done with tools such as:

2.1 Flow chart

Flowcharts are used to describe the overall flow of the Web-Based Ticket Booking activity recording process.

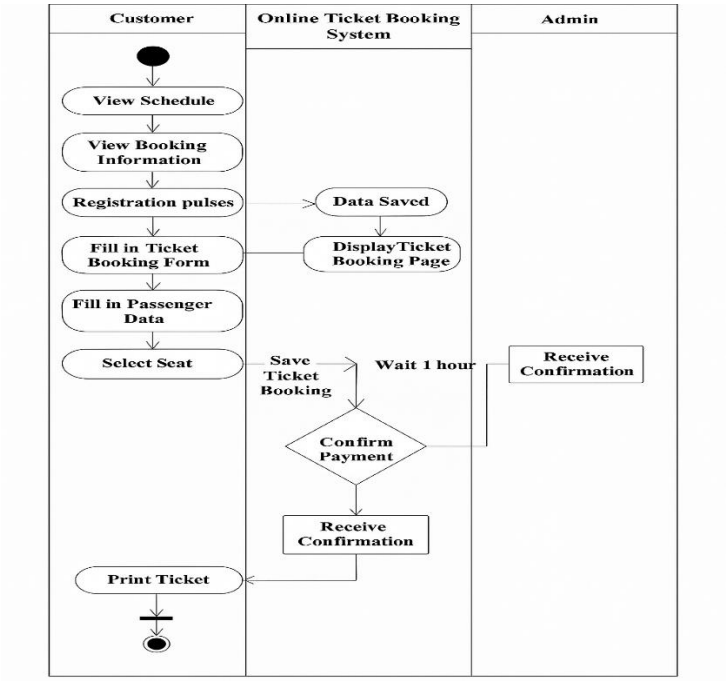

Fig. 1. Flow chart

2.2 Data Flow Diagram (DFD)

Data Flow Diagrams (DFD) are used to depict the flow of data between processes and entities in a system.

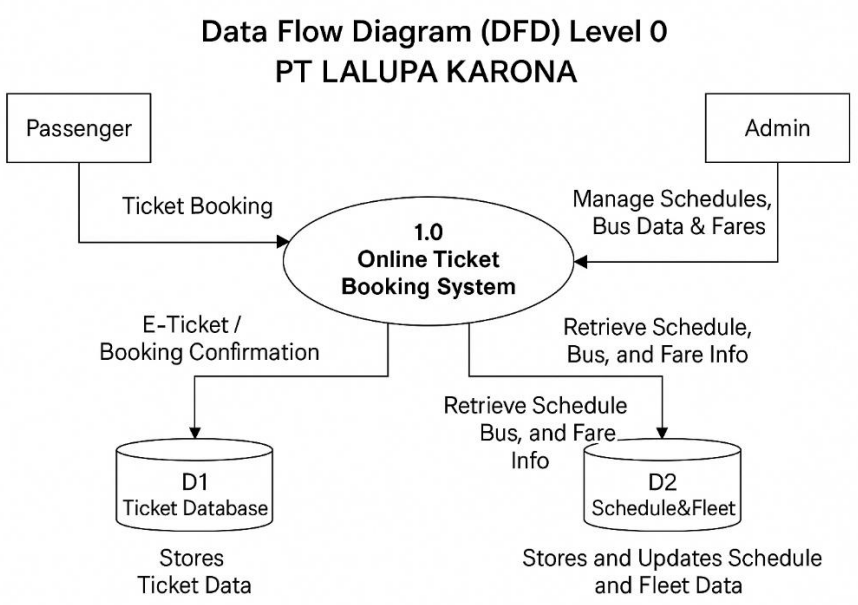

Fig. 2. Data Flow Diagram (DFD)

3. Results and Discussion

3.1 Interface View

The system interface is designed to produce a user-friendly display, easy to operate, and supports the user's interaction experience with the application efficiently.

i. Login Page View

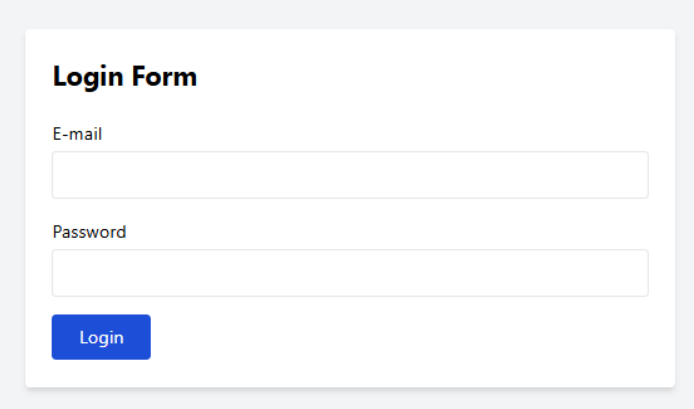

Fig. 3. Login Page View

ii. Dashboard View

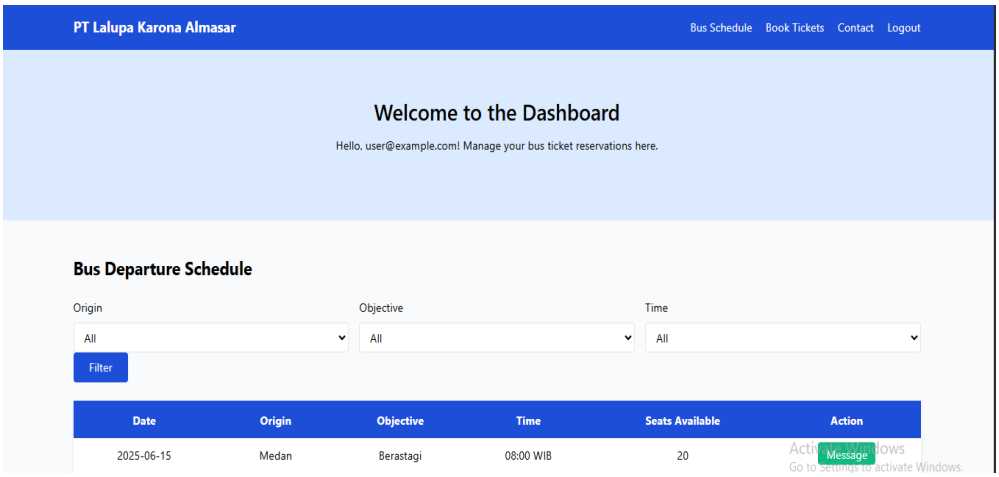

Fig. 4. Dashboard View

iii. Bus Schedule View

Date	Origin	Objective	Time	Seats Available	Action
2025-06-15	Medan	Berastagi	08:00 WIB	20	Message
2025-06-16	Medan	Unimed	09:00 WIB	25	Message
2025-06-17	Berastagi	Medan	10:00 WIB	15	Message
2025-06-18	Unimed	Medan	11:00 WIB	10	Message

Fig. 5. Bus Schedule Display

iv. AppearanceBook Tickets

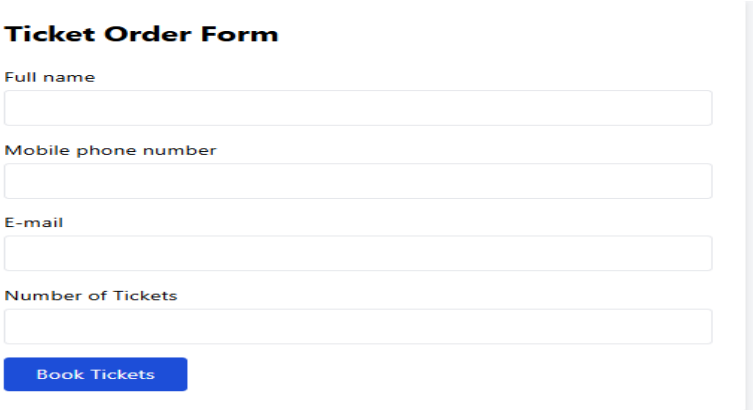

Fig. 6. Ticket Message View

v. AppearanceTicket Payment

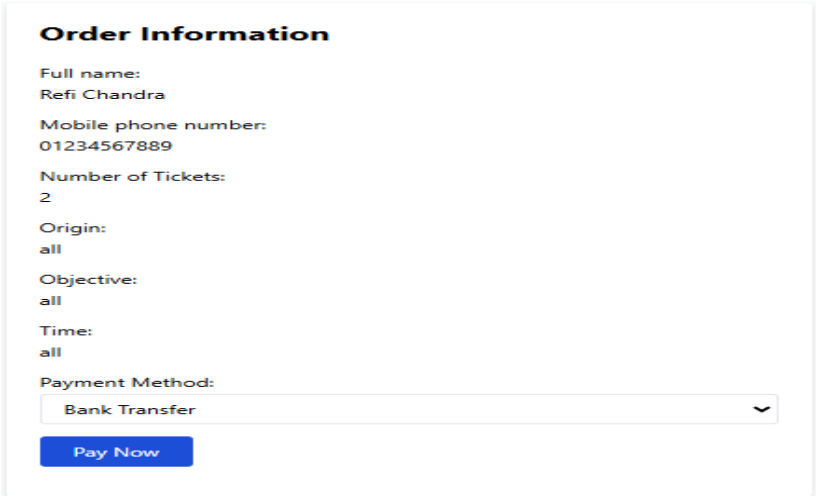

Fig. 7. Ticket Payment

The main problem faced by PT Almasar Indonesia and its affiliates in managing transportation operations before the development of the digital system was the low efficiency in recording schedules, fleet data, and route and passenger management. The system, which was still manual and separated between the operational, financial, and customer service divisions, caused delays in decision making, errors in recording fleet data, and a lack of information integration between divisions.

This has a direct impact on customer service, decreased operational efficiency, and the difficulty of conducting comprehensive fleet and route performance evaluations. The company also faces challenges in ensuring the accuracy of departure schedules, ticket management, and accurate and real-time financial reporting.

To answer these problems, a web-based transportation management system was developed with a data integration approach and operational process automation. This system is designed with a client-server architecture that allows recording and monitoring to be carried out in real-time by various divisions, from operations, administration, to marketing. Some of the key features of this system include digital recording of bus departure and arrival schedules integrated with route and fleet databases. Daily and monthly recaps that can be downloaded in printed format.

Online ticket management and automatic transaction recap that can be accessed by the finance department and conductors. Multi-level login, such as Admin, Operational Staff, Finance Department, and CS (Customer Service) for different access rights according to responsibilities. Through the results of the system trial on a number of AKDP and AKAP routes, it showed an increase in operational efficiency of up to 55% and a decrease in the error rate of recording by more than 70% compared to the previous method. The financial reporting process becomes faster and more transparent, and fleet management can be controlled more accurately.

Overall, the implementation of a web-based transportation management system has had a positive impact on the operations of PT Almasar Indonesia and its affiliated groups. This system not only functions as an operational tool, but also as a strategic instrument for developing customer service, strengthening the company's internal control, and the basis for sustainable digital transformation in the land transportation industry.

4. Conclusion

A web-based bus ticket booking system was successfully designed and implemented with a systematic approach that was able to answer the problems of the manual booking system. This system has been proven to improve the accuracy of booking data recording, service time efficiency, and convenience for passengers in making transactions independently. This system also shows the potential for wider adoption by other transportation companies that have similar needs.

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UNDERSTANDING CYBERSECURITY AWARENESS THROUGH THE PMT FRAMEWORK FOR DIPLOMA INFORMATION TECHNOLOGY STUDENTS AT POLITEKNIK SULTAN IDRIS SHAH

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Abstract

As cybersecurity threats continue to grow more sophisticated, it's becoming more important than ever for IT students to understand how to stay safe online. This study examines how Diploma in Information Technology (DIT) students at Politeknik Sultan Idris Shah (PSIS) perceive and react to cybersecurity threats, using the Protection Motivation Theory (PMT) as the underlying framework. Despite the importance of cybersecurity, limited research has been conducted on how students at PSIS perceive cybersecurity threats and how confident they are in handling them. To address this gap, a quantitative, survey-based descriptive research design was adopted. A survey was conducted with 139 DIT students at PSIS using a structured questionnaire, developed around verified PMT constructs, focusing on their perception of threat severity, sense of vulnerability, belief in the effectiveness of protective measures, and confidence in their ability to stay secure. Data was collected online via Google Forms and analyzed using IBM SPSS Statistics software. The findings reveal important patterns in how students understand and react to cybersecurity risks, including areas where their knowledge or habits could be improved. This study offers practical suggestions to help strengthen cybersecurity education at PSIS and aims to shape better learning strategies so that future IT professionals are well-equipped to face cybersecurity challenges.
Keywords: Cybersecurity Awareness; Protection Motivation Theory (PMT); Diploma in Information Technology.

1. Introduction

The rapid advancement of digital technologies has significantly increased the exposure of individuals and organizations to a growing range of cybersecurity threats (Alghazo et al., 2025; Al-Harthy et al., 2020; Akhtar et al., 2024; Chouraik et al., 2024; Salem et al., 2024). According to Alawida et al. (2022) and Al Siam et al. (2025), cybersecurity incidents have become more complex and frequent, ranging from widespread phishing attacks and disastrous data breaches to stealthy malware infections and identity theft. Students nowadays, especially those majoring in information technology (IT), are expected to be digital natives with strong technical competencies and a solid grasp of safe digital behaviors. Future IT professionals will be responsible for designing, implementing, and maintaining safe systems. Inadequate cybersecurity education may leave students unprepared to address the problems of safeguarding essential digital assets (Alqahtani, 2022; Mtambeka et al., 2023).

The increasing complexity and seriousness of cybersecurity threats requires IT students to possess the necessary skills and mindset for effective response. Nonetheless, there exists a notable deficiency of study at Politeknik Sultan Idris Shah (PSIS) about the perceptions and responses of its Diploma in Information Technology (DIT) students towards cybersecurity risks. The lack of analysis grounded in the Protection Motivation Theory (PMT) in this context further constrains our knowledge of student behavior. In the absence of evidence-based insights, it is difficult to build successful cybersecurity awareness programs that cater to the specific needs of PSIS students.

The primary objective of this study is to assess the existing degree of cybersecurity awareness among DIT students at PSIS and analyze their perceptions of cybersecurity threats. This analysis will be undertaken through the framework of the Protection Motivation Theory (PMT), emphasizing four principal components: perceived severity, perceived vulnerability, response efficacy, and self-efficacy. The necessity for this study stems from the increasing sophistication and frequency of cybersecurity incidents, which critically impact IT students who are expected to be digitally competent future professionals responsible for secure systems. Despite the importance, a persistent knowledge-practice gap exists where students' cybersecurity knowledge doesn't always translate into secure online behavior, partly due to psychological biases or perceived inconvenience in adopting preventative measures. This study distinguishes itself by uniquely addressing a notable research deficiency at PSIS regarding its DIT students' perceptions and responses to cybersecurity risks, particularly through the lens of PMT. This unique context allows for the generation of specific insights into cybersecurity behaviors that may differ from findings in other populations or educational systems, thereby enriching the broader understanding of PMT's applicability and offering tailored recommendations for improving cybersecurity education and awareness campaigns at PSIS, ensuring they are customized to the distinct needs and habits of IT students.

Zaidi et al. (2024) states that cybersecurity has become a critical issue in today's digital age, essential for protecting information and systems from a continuously changing variety of cybersecurity threats. While security technologies have improved, the human factor remains a major weakness and often the weakest link in the cybersecurity chain (Al-Harthy et al., 2020; Al-Hashem et al. 2023; Almansoori et al., 2023; Malem et al., 2020). The development of research into the behavioral aspects of cybersecurity is crucial for improving the present security landscape, as most cybersecurity incidents are enabled by humans. As a result, research of cybersecurity behavior, which includes individuals' actions and decisions regarding cybersecurity threats, has received considerable attention in recent years (Al-Harthy et al., 2020; Al-Hashem et al. 2023; Almansoori et al., 2023; Malem et al., 2020).

The Protection Motivation Theory (PMT), initially introduced by Rogers in 1975 and subsequently developed for cybersecurity applications, offers a comprehensive psychological framework for evaluating how individuals perceive risks and determining defensive measures (Alghazo et al., 2025; Mtambeka et al., 2023; Schneider, 2020; Song et al., 2025). This theory claims that protective behavior is determined by two cognitive appraisal processes: threat appraisal and coping appraisal. threat appraisal includes the assessment of perceived severity, which refers to the seriousness of potential consequences if the threat occurs, and perceived vulnerability, which suggests the likelihood of encountering the threat (Alghazo et al., 2025; Alrawhani et al., 2025; Mtambeka et al., 2023). Conversely, coping appraisal evaluates an individual's perceived response efficacy, which is their trust that the suggested action will effectively mitigate the threat, self-efficacy, or the individual's confidence in their ability to carry out the recommended action, and response cost, which refers to the perceived costs, including time, effort, or financial resources, related to undertaking the protective action (Alghazo et al., 2025, Alrawhani et al., 2025; Kiran et al. 2025; Mtambeka et al., 2023; Schneider, 2020). The appraisals generate protective motivation, which affects the intention to undertake protective actions.

Mtambeka et al. (2023) and Schneider (2020) indicate that the application of PMT is particularly relevant for recognizing cybersecurity behavior among students, a demographic that frequently uses digital technologies and is often vulnerable within the cybersecurity framework. As noted by Baher et al. (2025), Hejase et al. (2021), Kiran et al. (2025), Mtambeka et al. (2023) and Schneider (2020), research has examined PMT constructs concerning smartphone security practices and overall computer security among university students, indicating that self-efficacy frequently has a significant impact on behavioral intentions regarding cybersecurity compliance. Al-Harthy et al. (2020), Antunes et al. (2021), and Vafaei-

Zadeh et al. (2025) similarly reported that perceived security and response efficacy positively influence protective behaviors among students. However, students' compliance with cybersecurity measures reduces when they perceive the risk as not severe enough or the recommended actions as impractical (Mtambeka et al., 2023).

Research assessing Cybersecurity Awareness (CSA) among students typically encompasses topics such as password management, cyberbullying, social engineering including phishing and online scams, malware, identity theft, and overall secure online practices, such as downloading unlicensed content (Chandarman & Van Niekerk, 2017). Research often reveals an inadequate level of actual cybersecurity understanding among students, regardless of their awareness of the significance of CSA (Alqahtani, 2022; Antunes et al., 2021). Categories of knowledge, including appropriate password security, browser security, and understanding of social media risks, have been recognized as substantially influencing overall cybersecurity awareness among students (Alqahtani, 2022).

Significant research deficiencies persist regarding cybersecurity behavior, particularly at the individual level (Almansoori et al., 2023; Alrawhani et al., 2025). Many fields of research have focused on organizational employees, whereas fewer have precisely examined the individual student demography, particularly in collectivistic societies or distinct educational contexts (Almansoori et al., 2023; Alrawhani et al., 2025; Kiran et al., 2025). Moreover, although PMT is extensively utilized, there is a desire for further study that incorporates new social, psychological, and technical determinants, as well as examines moderating variables that may affect the efficacy of PMT elements (Almansoori et al., 2023; Alrawhani et al., 2025). This proposed study seeks to fill existing gaps by examining the cybersecurity behavior of Diploma Information Technology students, a distinctive group within higher education, utilizing the PMT framework in the setting of PSIS. This focused research may provide useful, context-specific information to enhance the effectiveness of cybersecurity education and awareness programs designed for DIT students at PSIS.

2. Methodology

Fig.1. the methodology process outlines the step-by-step process of this study. It starts with the research design, which sets the overall structure for the study. Following that it lists the population and sampling method, explaining who will be studied and how they will be chosen to make sure the sample is representative. The research instruments that are used to collect data, such as surveys, are described. This is followed by the data collection procedures, which explain how these instruments will be applied. In the direction to ensure the trustworthiness of the findings, validity and reliability measures are discussed, indicating how the accuracy and consistency of the data will be ensured. Finally, the last section details the data analysis techniques employed to interpret the information collected by participants throughout the research process.

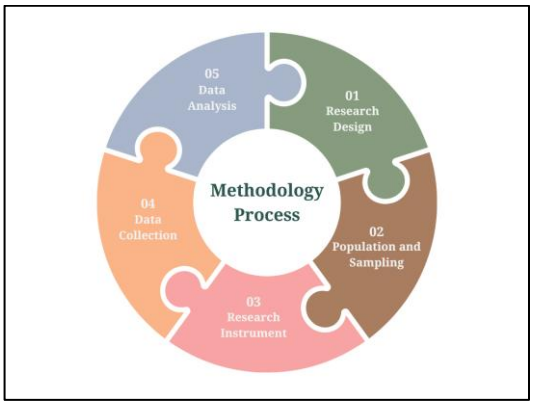

Fig.1. Methodology Process

This study adopted a quantitative, survey-based descriptive research design to investigate cybersecurity knowledge and motivation to act among DIT students at PSIS. Structured in Protection Motivation Theory (PMT), the research focused on four major cognitive constructs: perceived severity, perceived vulnerability (threat appraisal), response efficacy, and self-efficacy (coping appraisal). PMT provides a valuable framework for understanding how individuals assess cybersecurity threats and make protective decisions. This technique allowed the collection of quantitative data and identification of psychological and motivational patterns impacting students' cybersecurity behaviours. Previous research has proved the efficiency of PMT in studying human aspects in cybersecurity, emphasizing that most events come from user-related errors (Almansoori et al., 2023; Alrawhani et al., 2025; Kiran et al., 2025). Thus, adopting PMT in this context offered evidence-based insights into the decision-making processes driving students' cybersecurity activities.

The target population for this study comprised Diploma in Information Technology (DIT) students from various semesters at PSIS. Specifically, the survey focused on Semester 2 to 4 DIT students enrolled in the DFC20313 Cybersecurity Fundamental and DFP40263 Secure Mobile Computing courses. A convenience sampling strategy was adopted to meet logistical and time restrictions, resulting in a total of 139 responses. The focus on university and polytechnic students corresponds with other previous studies that have identified this population as particularly vulnerable to cybersecurity attacks due to variables such as overconfidence or improper practices (Almansoori et al., 2023). Furthermore, existing data emphasizes the urgent need for localized cybersecurity awareness activities among students in Malaysian higher education institutions (Mtambeka et al., 2023; Ramakrishnan et al., 2022)

Data were collected using a structured questionnaire, developed around verified PMT constructs adapted from recent cybersecurity behavior studies (Alghazo et al., 2025; Phan et al., 2025). The questionnaire included the three (3) sections: Section A on demographic information, Section B on PMT frameworks (perceived severity, perceived vulnerability, response efficacy and self-efficacy), and Section C for general awareness and attitudes toward cybersecurity practices. Each component was evaluated using multiple statements on a 4-point Likert scale ranging from 1 (Strongly Disagree) to 4 (Strongly Agree), intended to reflect both perception and behavioral intent. The questionnaire was designed to capture varying degrees of agreement and perception across key PMT factors, which are widely recognized as essential motivators for protective cybersecurity behaviors (Alghazo et al., 2025; Mtambeka et al., 2023).

3.4 Data Collection

Data collection was conducted entirely online using Google Forms as a survey platform. The survey link was shared with the target student population through class WhatsApp groups and formal communication channels within PSIS to ensure wide dissemination and accessibility. Participation in the study was fully voluntary, and students were not subjected to any type of obligation. At the beginning of the survey, all participants were properly informed about the aims of the study as well as the procedures taken to ensure the confidentiality and integrity of their responses. Informed consent was formally requested inside the Google Form before students proceeded to answer the questionnaire. Importantly, no personally identifying information was sought or recorded, thereby ensuring the anonymity and privacy of all responders throughout the data gathering process.

Quantitative data collected from the survey was carefully analysed using IBM SPSS Statistics software. Descriptive statistics, including frequencies, and standard deviations, were primarily employed to summarize the demographic characteristics of the participants and to present the aggregated responses pertaining to the various PMT constructs.

3. Results and Discussion

The analysis is structured to first outline the demographic profile of the respondents, followed by an in-depth examination of their perceptions of cybersecurity threats, personal vulnerability, confidence in protective measures, and reported security behaviors.

Table 1 provides a clear breakdown of the age distribution among the participants. The data indicates that most respondents fall within the 19-21 age group, accounting for 85.6% of the total, with a frequency of 119 individuals. A smaller proportion, 13.6% (n=19), are aged 22 or older, categorized as "22 - Others." Only a single respondent, representing 0.7%, is 18 years old. This distribution suggests that the study primarily surveyed young adults, predominantly those in their late teens and early twenties.

Table 1. Age Distribution

Age	Frequency	Percentage
18	1	0.7%
19 - 21	119	85.6%
22 - Others	19	13.6%

Fig. 2. Illustrates the gender distribution of the participants. It clearly shows that the sample comprises a slightly larger proportion of males, who constitute 54% of the respondents. On the other hand, females make up 46% of the participants.

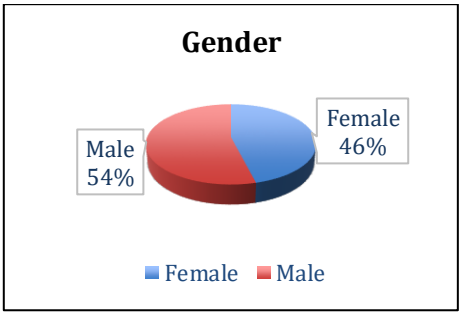

Fig. 2. Gender Distribution

Table 2 illustrates respondents' perceptions of the seriousness of cybersecurity threats for individuals and organizations. A substantial majority, 61.2% (n=85), believe these threats are "Very Serious," indicating a high level of awareness and concern regarding cyberattack impact. Another significant portion, 34.5% (n=48), perceive these threats as "Serious". In contrast, only 4.3% (n=6) consider them "Somewhat Serious". The absence of "Not Serious" responses further emphasizes the widespread acknowledgment of cybersecurity as a critical issue among the surveyed group. This strong perception of importance suggests a receptive audience for cybersecurity education and awareness initiatives.

Table 2. Perceived Seriousness of Cybersecurity Threats

How serious do you think cybersecurity threats are for individuals and organizations?	Frequency	Percentage
Serious	48	34.5%
Somewhat Serious	6	4.3%
Very Serious	85	61.2%

Table 3 presents insights into respondents' perceived likelihood of their personal information being compromised online. The data indicates a notable level of concern among the participants. A significant portion, 41.7% (n=58), believe it is "Likely" that their personal information could be compromised online. Following this, 29.5% (n=41) consider it "Somewhat Likely." These two categories comed suggest that most of the respondents (71.2%) perceive

a moderate to high chance of their personal data being at risk. On the other hand, 16.5% (n=23) deem it "Not Likely," while a smaller percentage, 12.2% (n=17), consider it "Very Likely" that their information could be compromised. The distribution highlights a diverse range of perceptions regarding personal vulnerability, with a leaning towards acknowledging the possibility of compromise.

Table 3. Perceived Likelihood of Information Compromise

How likely do you think it is that your personal information could be compromised online?	Frequency	Percentage
Likely	58	41.7%
Not Likely	23	16.5%
Somewhat Likely	41	29.5%
Very Likely	17	12.2%

Table 4 explores respondents' perceptions of a cybersecurity breach's potential impact on an organization like PSIS. A significant level of concern is evident among participants. The largest group, 43.9% (n=61), believes a breach could be "Devastating" to PSIS. Following this, 30.2% (n=42) consider such an event "Very Devastating". Comed, these two categories represent 74.1% who foresee severe consequences from a breach. Additionally, 21.6% (n=30) view a breach as "Somewhat devastating," indicating they recognize the impact, perhaps less severely. Only a small minority, 4.3% (n=6), believe a breach would be "Not devastating". This collective perception highlights students' understanding of the significant harm cybersecurity incidents could inflict upon their institution.

Table 4. Potential Impact of PSIS Cybersecurity Breach

In your opinion, how devastating could a cybersecurity breach be to an organization like PSIS?	Frequency	Percentage
Devastating	61	43.9%
Not devastating	6	4.3%
Somewhat devastating	30	21.6%
Very Devastating	42	30.2%

Table 5 provides insights into how often respondents believe their personal devices are at risk of malware infection. The data reveals a varied perception among the participants. The largest group, 40.3% (n=56), believe their devices are at risk "Sometimes." This suggests a moderate level of awareness regarding the continuous, though not constant, threat of malware. Subsequently, 36.7% (n=51) perceive the risk as occurring "Rarely," indicating a lower level of perceived vulnerability for a significant portion of the sample. Alternatively, 14.4% (n=20) feel their devices are at risk "Often," highlighting a higher sense of ongoing threat. The smallest group, 8.6% (n=12), believe their devices are "Never" at risk, which could indicate a lack of awareness or a high level of confidence in their current security measures. Overall, the responses suggest that while many acknowledge the risk, there's a considerable range in how frequently individuals perceive their devices to be susceptible to malware.

Table 5. Perceived Malware Infection Frequency

How often do you think your personal devices are at risk of being infected with malware?	Frequency	Percentage
Never	12	8.6%
Often	20	14.4%
Rarely	51	36.7%
Sometimes	56	40.3%

Table 6 examines the extent to which respondents believe their online shared information could be targeted by cybercriminals. The data indicates a prevalent awareness of this risk among the participants. The largest proportion, 46.0% (n=64), feel that their information could

be targeted "Somewhat" by cybercriminals. This suggests a general understanding of the potential for their data to be compromised. Additionally, 26.6% (n=37) believe their information could be targeted "A little," while 23.0% (n=32) strongly believe it could be targeted "Very much." Comed, these categories represent a significant majority of respondents who acknowledge some level of risk. Only a small minority, 4.3% (n=6), believe their information would be "Not at all" targeted by cybercriminals, which could indicate a lack of awareness or a perception of minimal personal risk. Overall, the results suggest that most respondents are aware that their online shared information is a potential target for cybercriminals.

Table 6. Perceived Targeting of Online Information

Do you believe that the information you share online could be targeted by cybercriminals?	Frequency	Percentage
A little	37	26.6%
Not at all	6	4.3%
Somewhat	64	46.0%
Very much	32	23.0%

Table 7 illustrates respondents' perceptions of their accounts' vulnerability to hacking attempts, revealing a mixed yet cautious outlook. The largest group, 39.6% (n=55), perceived their accounts as "Slightly vulnerable," indicating some risk awareness. Closely following, 37.4% (n=52) felt their accounts were "Vulnerable," suggesting a stronger sense of susceptibility. Comed, 77% acknowledged some degree of vulnerability. A smaller segment, 12.2% (n=17), considered their accounts "Highly vulnerable," while 10.8% (n=15) believed them "Not vulnerable," potentially due to strong security confidence or lack of awareness. Overall, responses indicate varying intensities of perceived account vulnerability.

Table 7. Vulnerability to Hacking Attempts

How vulnerable do you feel your accounts are to hacking attempts?	Frequency	Percentage
Highly vulnerable	17	12.2%
Not vulnerable	15	10.8%
Slightly vulnerable	55	39.6%
Vulnerable	52	37.4%

Table 8 assesses respondents' confidence in strong, unique passwords as a protective measure against most online threats. The data reveals a generally high level of confidence among participants. The largest group, 51.8% (n=72), reported feeling "Confident" that strong, unique passwords offer protection. Furthermore, 25.9% (n=36) expressed being "Very confident." Comed, these two categories represent a substantial majority (77.7%) who trust in the effectiveness of robust passwords. A smaller proportion, 19.4% (n=27), are "Somewhat confident," suggesting some reservations. Only a very small minority, 2.9% (n=4), are "Not confident." This overwhelmingly positive perception suggests a good understanding of a key defense mechanism against online threats.

Table 8. Confidence in Strong Passwords Protection

How confident are you that using strong, unique passwords will protect you from most online threats?	Frequency	Percentage
Confident	72	51.8%
Not confident	4	2.9%
Somewhat confident	27	19.4%
Very confident	36	25.9%

Table 9 illustrates respondents' perceptions of antivirus software effectiveness in preventing cyberattacks, showing a strong belief in its utility. The majority, 56.8% (n=79), deem it "Effective," with an additional 16.5% (n=23) considering it "Very effective," totaling 73.3% who

trust its preventative capabilities. A notable 25.2% (n=35) view it as "Somewhat effective," acknowledging benefits with potential limitations. Only 1.4% (n=2) perceive it as "Not effective," possibly due to lack of experience or reliance on other security measures. Overall, the results indicate high confidence in antivirus software as a crucial defense against cyber threats.

Table 9. Belief in Antivirus Protection

How effective do you think antivirus software is in preventing cyberattacks on your devices?	Frequency	Percentage
Effective	79	56.8%
Not effective	2	1.4%
Somewhat effective	35	25.2%
Very effective	23	16.5%

Table 10 investigates respondents' belief in the effectiveness of learning cybersecurity best practices, like recognizing phishing emails, in reducing cyberattack risks. The data reveals an overwhelmingly positive outlook. A significant majority, 60.4% (n=84), strongly believe learning these practices will help "Very much" in reducing cyberattack risks. Additionally, 29.5% (n=41) believe it will help "Somewhat." Comed, these two categories represent a very strong consensus (89.9%) on the value of cybersecurity education. A smaller proportion, 9.4% (n=13), think it will help "A little," while a negligible 0.7% (n=1) believes it will help "Not at all." This widespread belief in the efficacy of cybersecurity education underscores its importance and suggests a receptive audience for awareness initiatives.

Table 10 Perceived Efficacy of Cybersecurity Education

Do you believe that learning about cybersecurity best practices (e.g., recognizing phishing emails) will help reduce the risk of cyberattacks?	Frequency	Percent
A little	13	9.4%
Not at all	1	0.7%
Somewhat	41	29.5%
Very much	84	60.4%

Table 11 explores respondents' confidence in their ability to identify phishing emails or malicious websites. The data reveals a generally positive, though varied, level of self-efficacy among the participants. The largest group, 48.2% (n=67), reported feeling "Confident" in their ability to identify such threats. This suggests a good baseline level of awareness and practical skill. A notable proportion, 36.7% (n=51), feel "Somewhat confident," indicating they possess some ability but perhaps acknowledge room for improvement or uncertainty in more subtle cases. On the other hand, 10.8% (n=15) feel "Very confident," highlighting a strong sense of mastery in recognizing these cybersecurity risks. Conversely, a small minority, 4.3% (n=6), are "Not confident," which could suggest a need for more targeted training and awareness for this group. Overall, while a majority expresses confidence, there is a clear segment that could benefit from further development of their threat identification skills.

Table 11. Self-Efficacy in Threat Identification

How confident are you in your ability to identify phishing emails or malicious websites?	Frequency	Percentage
Confident	67	48.2%
Not confident	6	4.3%
Somewhat confident	51	36.7%
Very confident	15	10.8%

Table 12 assesses respondents' confidence in their ability to use firewalls or antivirus software for device protection. The data indicates a high overall level of self-efficacy in employing these

security tools. The largest segment, 53.2% (n=74), reported feeling "Confident" in their usage. This suggests a strong foundational understanding and comfort with these essential cybersecurity measures. Additionally, 14.4% (n=20) are "Very confident," highlighting a segment with advanced proficiency or high assurance in their skills. Comed, a substantial majority (67.6%) of participants express strong confidence. A notable proportion, 30.9% (n=43), feel "Somewhat confident," indicating a basic understanding but perhaps a need for further guidance or more hands-on experience. Only a minimal 1.4% (n=2) reported being "Not confident," suggesting that almost all participants possess at least some level of familiarity and trust in using these protective software solutions.

Table 12. Confidence in Device Protection Tools

How confident are you in using a firewall or antivirus software to protect your devices?	Frequency	Percentage
Confident	74	53.2%
Not confident	2	1.4%
Somewhat confident	43	30.9%
Very confident	20	14.4%

Table 13 investigates respondents' perceived capability in appropriately handling a cybersecurity threat. The data reveals a generally positive but varied sense of self-efficacy in responding to such incidents. The largest group, 48.9% (n=68), reported feeling "Capable" in handling a cybersecurity threat. This suggests a foundational belief in their ability to manage such situations. A notable proportion, 36.0% (n=50), feel "Somewhat capable," indicating they possess some readiness but might acknowledge limitations or a need for more support. A smaller segment, 13.7% (n=19), feel "Very capable," highlighting a high degree of confidence and readiness. Conversely, only a minimal 1.4% (n=2) reported being "Not capable," suggesting that nearly all participants believe they possess some capacity to address cybersecurity threats. Overall, while a significant portion feels capable, there is also a considerable segment that acknowledges a more limited or partial capability, pointing to areas where further empowerment through training or resources could be beneficial.

Table 13. Confidence in Cybersecurity Incident Response

If you were faced with a cybersecurity threat, how capable do you feel in handling it appropriately?	Frequency	Percentage
Capable	68	48.9%
Not capable	2	1.4%
Somewhat capable	50	36.0%
Very capable	19	13.7%

Table 14 examines respondents' perception of the importance of implementing cybersecurity practices in their daily lives. The data clearly indicates that participants overwhelmingly recognize the significance of these practices. A substantial majority, 46.8% (n=65), believe it is "Very important" to implement cybersecurity practices daily. This highlights a strong awareness of the constant need for digital vigilance. Following closely, another 41.7% (n=58) perceive it as "Important." Comed, these two categories represent a resounding 88.5% of respondents who understand the critical role of daily cybersecurity measures. A smaller proportion, 10.8% (n=15), consider it "Somewhat important," indicating a lesser but still present acknowledgment of its value. Only a negligible 0.7% (n=1) views it as "Not important," reinforcing the widespread recognition of cybersecurity as a crucial aspect of modern life. This strong collective belief in the importance of daily cybersecurity practices bodes well for promoting safer online behaviors.

Table 14. Relevance of Cybersecurity in Daily Life

How important do you think it is to implement cybersecurity practices in your daily life?	Frequency	Percentage
Important	58	41.7%
Not important	1	0.7%
Somewhat important	15	10.8%
Very important	65	46.8%

Table 15 examines the frequency with which respondents update their software to protect against the latest vulnerabilities. The data reveals a mixed but generally positive trend in software update practices. The largest group, 48.2% (n=67), reported updating their software "Sometimes." This indicates a recognition of the importance of updates, though perhaps not a consistent, proactive approach. A significant portion, 37.4% (n=52), stated they update their software "Often," suggesting a more diligent and regular practice to maintain security. Conversely, 13.7% (n=19) update "Rarely," which could leave their devices more exposed to known vulnerabilities. Only 0.7% (n=1), admitted to "Never" updating their software, highlighting a critical gap in their security habits. Overall, while most respondents engage in some form of software updating, there's a considerable segment that could improve their frequency to enhance their cybersecurity posture.

Table 15. Frequency of Security Updates

How often do you update your software to ensure they are secure from the latest vulnerabilities?	Frequency	Percentage
Never	1	0.7%
Often	52	37.4%
Rarely	19	13.7%
Sometimes	67	48.2%

Table 16 indicates that a majority of respondents (56.1%, n=78) perceive PSIS as providing sufficient cybersecurity awareness resources and training. This suggests that the institution's current efforts are largely perceived as adequate by over half of the student body. However, a notable portion (39.6%, n=55) are uncertain ("Maybe"), suggesting potential for clearer communication or expanded initiatives. A small minority (4.3%, n=6) believe resources are inadequate. This data suggests that while PSIS has been effective, there's still room to improve clarity and provision of cybersecurity awareness efforts for a significant portion of its students.

Table 16. Sufficiency of Institutional Cybersecurity Training

Do you feel that PSIS provides enough resources and training to raise awareness about cybersecurity issues?	Frequency	Percentage
Maybe	55	39.6%
No	6	4.3%
Yes	78	56.1%

Overall, a key contrast is evident in threat appraisal: while Mtambeka et al. (2023) reported that students generally exhibited low perceived vulnerability, believing they lacked information of interest to cybercriminals and were sufficiently protected by institutional ICT services factors contributing to non-compliance, the present study identifies a high perceived likelihood of personal information compromise (71.2% rated it as "Likely" or "Somewhat Likely") and a general sense of vulnerability to hacking attempts (77% perceived themselves as "Slightly vulnerable" or "Vulnerable"). Regarding perceived severity, Mtambeka et al. (2023) observed that students did not recognize the seriousness of cyber threats, often due to a lack of direct experience. In contrast, the present data indicate that a substantial majority (95.7%) perceive cybersecurity threats as "Serious" or "Very Serious" for both individuals and organizations,

with 74.1% believing a cybersecurity breach could be "Devastating" or "Very Devastating" for an institution such as PSIS.

In terms of coping appraisal, Mtambeka et al. (2023) found that some students questioned the necessity or effectiveness of antivirus software and displayed low self-efficacy, frequently depending on institutional ICT services instead of taking personal initiative. By contrast, the findings in current study demonstrate high confidence in the effectiveness of strong passwords (77.7%) and antivirus software (73.3%), along with generally positive self-efficacy in identifying and responding to threats. Additionally, 89.9% of respondents expressed a strong belief in the value and effectiveness of cybersecurity education. It is also noteworthy that Mtambeka et al. (2023) explicitly identified response cost including perceived burdens such as time, effort, and financial expenditure as a primary reason for non-compliance, citing the high perceived costs of compliance and low perceived consequences of non-compliance. This aspect, however, was not explicitly addressed in this paper, limiting direct comparison. In summary, while Mtambeka et al. (2023) underscored how deficiencies in both threat and coping appraisals contributed to cybersecurity non-compliance, the current findings emphasize how strengths in those same constructs namely, elevated threat perceptions and strong coping appraisals. Reflect a robust potential for protection motivation among the student population surveyed.

Based on the discussion of the survey findings, the following recommendations are proposed to enhance cybersecurity education and awareness initiatives at PSIS, tailored to the specific needs and behaviors of its DIT students. To address the identified gaps, it is important to develop or short quizzes for students to assess their cybersecurity behaviors and link them to personal risk. Simultaneously, PSIS should enhance practical threat identification skills and confidence through simulated phishing campaigns with educational follow-ups. This provides safe, hands-on experience in recognizing and reporting malicious attempts.

Furthermore, interactive workshops on emerging threats can provide practical mitigation skills, moving beyond basic awareness. To bridge the gap between intention and action in daily cybersecurity, incorporate gamified elements or regular activities for crucial practices such as software updates and strong password changes. Additionally, offer clear instructions and promote tools like password managers to simplify the adoption of good cybersecurity habits.

It is vital to optimize and communicate institutional support for cybersecurity awareness. This involves creating a prominent, easily accessible PSIS website that centralizes all cybersecurity resources, including guides, FAQs, reporting mechanisms, training schedules, and links to trusted external resources. In addition, PSIS should launch consistent and diverse communication campaigns (e.g., emails, posters, social media, short videos) that highlight cybersecurity tips, common threats, and available resources. These comed strategies are designed to help PSIS students become more proactive and resilient in their cybersecurity habits and awareness.

4. Conclusion

This study provided a comprehensive assessment of cybersecurity awareness among DIT students at PSIS, analyzing their perceptions through the Protection Motivation Theory. The findings reveal a strong understanding among students regarding the severity of cybersecurity threats, with a clear recognition of their serious and potentially devastating impacts on both individuals and the institution. Furthermore, students generally exhibit positive beliefs in the efficacy of protective measures and a commendable level of self-efficacy in their ability to identify and respond to cybersecurity threats. This collective awareness and confidence serve as a starting point for fostering a secure digital environment. However, the study also identified critical areas for improvement. A key finding is the nuanced perception of personal vulnerability, where despite acknowledging the overall threat, a significant portion of students may underestimate their direct vulnerability to specific cybersecurity attacks on their personal

devices and accounts. This highlights a potential intention-behavior gap, as high awareness does not always interpret into consistent daily cybersecurity practices like regular software updates. Addressing these discrepancies by making personal vulnerability more tangible, enhancing practical skills through targeted training, and bridging the gap between knowledge and consistent action will be crucial for PSIS to cultivate a more proactive and resilient cybersecurity posture among its students.

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PEMBANGUNAN I-MAP PUSAT PROGRAM PEMULIHAN DALAM KOMUNITI (PPDK) PULAU PINANG

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Abstrak

Program Pemulihan Dalam Komuniti (PPDK) merupakan strategi pembangunan komuniti setempat untuk menyokong integrasi sosial dan penyamaan peluang bagi golongan orang kurang upaya (OKU). Data menunjukkan sejumlah 24 PPDK berada di Pulau Pinang, namun maklum balas daripada JKM menyatakan tiada sebarang kajian yang telah dilakukan sebelum ini bagi membantu golongan ibu bapa atau penjaga mengetahui kedudukan dan taburan PPDK tersebut. Objektif kajian ini adalah bertujuan membangunkan peta interaktif (I-Map) yang memaparkan taburan PPDK di Pulau Pinang. Seterusnya mengkaji keberkesanan I-Map yang dihasilkan dengan menyebarkannya melalui platform media sosial terpilih. Metodologi utama kajian ini melibatkan pengumpulan data, pendigitan dan kemasukkan data, pembangunan I-Map menggunakan perisian QGIS versi 3.34.3. dan penyebaran I-Map serta soal selidik kepada pengguna. Hasil analisis menunjukkan 91% responden bersetuju I-Map membantu mereka mengenal pasti lokasi PPDK, manakala 98% berpuas hati dan menganggap I-Map memberi manfaat kepada masyarakat. Kajian ini membuktikan bahawa penggunaan teknologi geospatial seperti I-Map mampu meningkatkan kesedaran, akses dan penyertaan ibu bapa serta penjaga terhadap perkhidmatan yang ditawarkan oleh PPDK.
Kata Kunci: I-Map; PPDK; OKU.

1. Pengenalan

Program Pemulihan Dalam Komuniti (PPDK) berkonsepkan *"One Stop Centre"* diwujudkan khusus untuk membantu golongan istimewa mendapatkan akses kepada maklumat, khidmat nasihat dan keperluan semasa serta latihan yang bersesuaian di satu lokasi yang mudah diakses. Umumnya PPDK bersifat *Community-Based Rehabilitation (CBR)* yang dperkenalkan oleh Pertubuhan Kesihatan Sedunia (WHO) (Ghebreyesus, 2022) dan di Malaysia pula pelaksanaannya diselaraskan oleh Jabatan Kebajikan Masyarakat (Jabatan Kebajikan Masyarakat, 2023). Menurut data JKM pada tahun 2024, terdapat sebanyak 565 buah PPDK di seluruh Malaysia dan 24 daripadanya berada di negeri Pulau Pinang, meliputi kawasan Pulau (Timur Laut dan Barat Daya) serta Seberang Perai (Utara, Tengah dan Selatan) (Jabatan Kebajikan Masyarakat, 2024). Hasil maklum balas daripada JKM Pulau Pinang menyatakan tiada sebarang kajian yang telah dilakukan sebelum ini bagi menunjukkan lokasi dan taburan PPDK yang berada di Pulau Pinang. Maklumbalas tersebut juga menunjukkan majoriti ibu bapa atau penjaga masih belum mengetahui kewujudan serta lokasi PPDK di negeri ini. Keadaan ini menyumbang kepada kadar pendaftaran yang rendah bagi anak-anak atau individu kelainan upaya (OKU) ke pusat-pusat berkenaan ((Noraziana Ibrahim, 2024). Bagi menangani isu ini, pihak JKM Pulau Pinang telah mencadangkan penghasilan peta interaktif (I-Map) sebagai satu alternatif untuk mempromosikan dan menyebarluaskan maklumat berkaitan taburan dan lokasi pusat PPDK. I-Map ini akan berfungsi sebagai medium capaian mudah masyarakat kepada maklumat serta perkhidmatan yang ditawarkan oleh setiap PPDK, selain memudahkan orang awam berhubung secara langsung bagi mendapatkan penjelasan lanjut.

Menurut (Nurul Anisah Jaafar, 2021)walaupun PPDK telah lama ditubuhkan, penggunaan perkhidmatannya masih lagi berada pada tahap minimum. Kekurangan penerbitan ilmiah berkaitan PPDK menjadikan keberkesanan program ini terhadap golongan sasar khususnya kanak-kanak OKU sukar diukur. Tambahan pula, carian dan pemerhatian yang dilakukan mendapati peta interaktif khusus bagi memaparkan kedudukan PPDK di Pulau Pinang masih belum pernah dihasilkan. Maka, kajian ini amat penting dalam mengisi kekosongan maklumat tersebut serta menawarkan pendekatan teknologi yang lebih mesra pengguna.

Kajian ini dijalankan dengan dengan dua objektif utama:

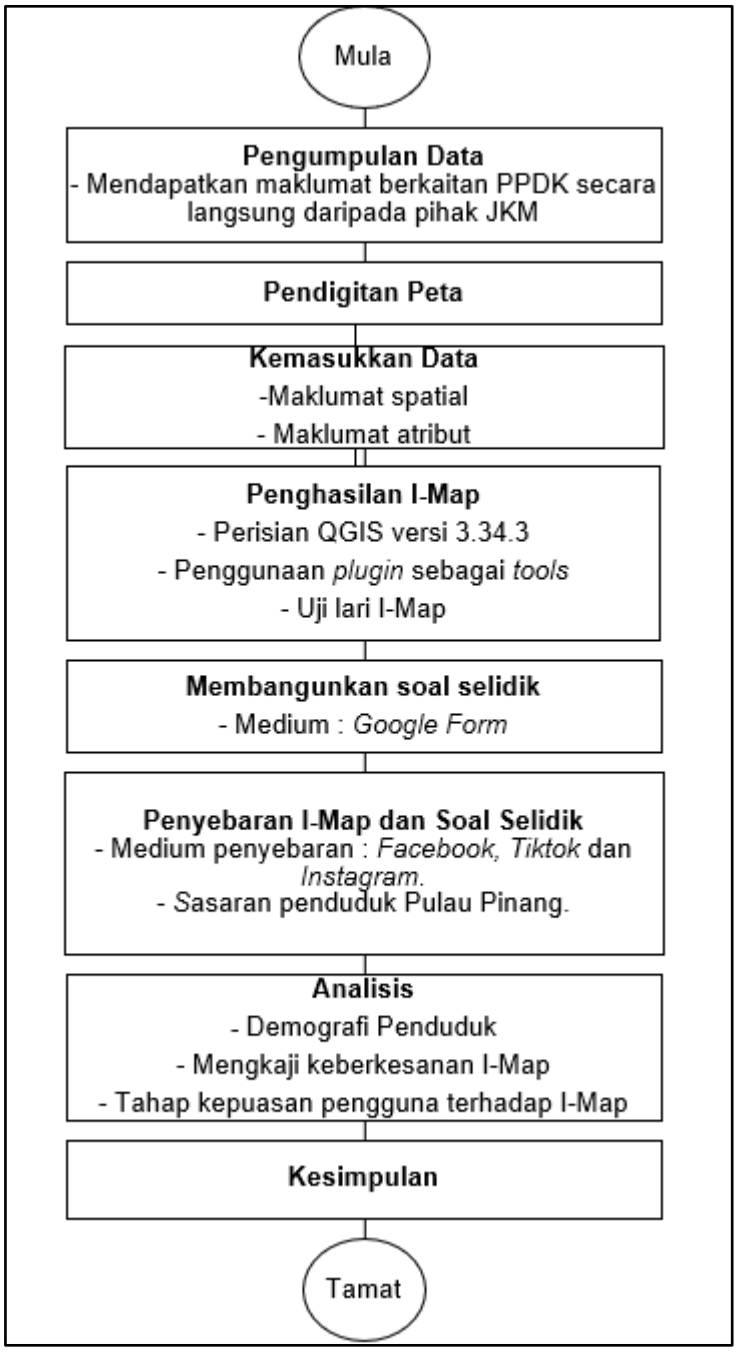
i. Menghasilkan peta interaktif (I-Map) yang memaparkan taburan dan kedudukan pusat PPDK di negeri Pulau Pinang.
ii. Menilai keberkesanan I-Map melalui pengedaran peta interaktif ini serta soal selidik secara atas talian menggunakan platform media sosial terpilih.

Menurut (ICA Strategic Plan (2003-2011), 2019), peta ialah representasi unsur rupa bumi yang digambarkan pada satah rata dengan skala tertentu. Peta tradisional yang dicetak di atas kertas sering dianggap statik dan kurang menarik. Namun, kemajuan teknologi kini membolehkan penghasilan peta interaktif menggunakan perisian Sistem Maklumat Geografi (GIS) yang jauh lebih dinamik dan menarik. Seperti yang dijelaskan oleh (Mohd Zaki), peta interaktif membolehkan pengguna memperoleh maklumat hanya dengan klik pada lokasi tertentu. Menurut (Kamus Dewan Dan Pustaka, Cetakan 2023) mendefinisikan "interaktif" sebagai keupayaan untuk saling berhubung dan bertindak balas. Ini sejajar dengan ciri-ciri peta interaktif seperti fungsi *zoom*, pencarian, *pan* dan lapisan maklumat (*layer)*. Dalam konteks kajian ini, peta interaktif eBiz daripada JUPEM dijadikan rujukan utama dalam pemaan I-Map. Menurut (Zulkefli Mohd Yusop, 2011)menyatakan bahawa penggunaan aplikasi atas talian membolehkan pengguna mengakses maklumat secara fleksibel. Ini bermakna peta interaktif boleh diakses menerusi pelbagai peranti seperti komputer dan telefon pintar dan menjadikannya satu alat penyebaran maklumat yang sangat efektif dan inklusif. Kajian oleh (Ahmad, 2013) di negeri Kedah mendapati bahawa tahap penglibatan ibu bapa dalam program PPDK masih rendah. Faktor utama yang dikenal pasti adalah persepsi ibu bapa terhadap PPDK, yang secara langsung mempengaruhi keputusan mereka untuk menghantar anak ke pusat berkenaan. Maka jelas bahawa, tanpa kesedaran dan maklumat mencukupi, ramai ibu bapa tidak akan mengambil inisiatif untuk mendaftarkan anak OKU mereka ke PPDK dan menyebabkan mereka terlepas peluang mendapatkan sokongan pemulihan yang disediakan. Justeru itu penghasilan peta interaktif (I-Map) bukan sahaja mampu menangani isu kekurangan maklumat mengenai taburan PPDK, malah boleh menjadi alat bantu utama dalam mempertingkat kesedaran serta penglibatan masyarakat khususnya ibu bapa dan penjaga.

2. Metodologi

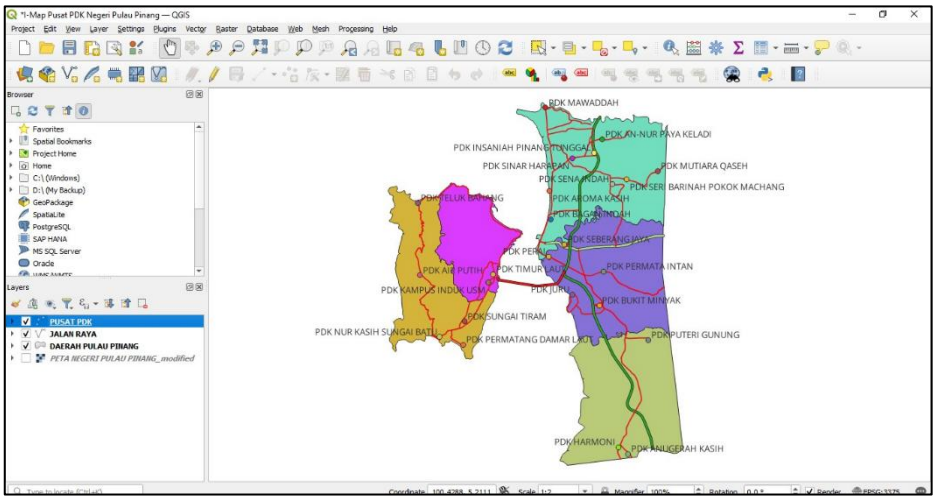
Kajian ini dijalankan di Pulau Pinang yang meliputi kesemua daerah dalam negeri tersebut (Portal Rasmi Pulau Pinang,2024). Perisian utama yang digunakan bagi menghasilkan I-Map ialah perisian QGIS versi 3.34.3 atau *Quantum Geographic Information System*. QGIS merupakan perisian GIS sumber terbuka yang mudah digunakan, fleksibel dan mesra pengguna (Mulkar, 2024).Perisian ini dipilih kerana ia merupakan perisian terkini, sentiasa dikemaskini dan merupakan versi terbaharu pada masa kajian ini dijalankan. Selain itu, perisian ini juga berkebolehan untuk menukarkan peta atau hasil kerja yang dibuat kepada laman web dan dapat menjadikan peta yang dihasilkan dalam bentuk interaktif seterusnya memudahkan penyebaran peta dilakukan. Peta asas atau *base map* yang digunakan adalah peta negeri Pulau Pinang yang diperolehi daripada Jabatan Ukur dan Pemetaan Malaysia (JUPEM).

Rajah 1 berikut menunjukkan carta alir metodologi kajian bermula dari pengumpulan data sehingga selesainya kajian dijalankan.



Rajah 1. Carta alir metodologi kajian

Pada peringkat awal, proses kajian dimulakan dengan aktiviti pengumpulan data spatial yang berkaitan dengan pusat Program Pemulihan Dalam Komuniti (PPDK) di negeri Pulau Pinang. Data spatial yang dikumpulkan terdiri daripada data lokasi dan koordinat geografi setiap pusat PPDK. Selain itu, data atribut turut dikumpulkan merangkumi maklumat seperti nama pusat PPDK, nama daerah, alamat lengkap pusat, serta maklumat sokongan lain yang berkaitan. Pembangunan I-Map diteruskan melalui proses pendigitan bertahap melibatkan tiga komponen utama iaitu *polygon* bagi sempadan daerah, *point* bagi lokasi pusat PPDK, dan *linestring* untuk rangkaian jalan raya. Semua elemen spatial disusun mengikut struktur data yang ditetapkan. Proses ini dijalankan menggunakan perisian QGIS 3.34.3 dengan menjadikan peta tematik Pulau Pinang yang diperolehi daripada pihak Jabatan Ukur dan Pemetaan Malaysia (JUPEM) sebagai peta asas. Hasil pendigitan yang telah lengkap ditunjukkan seperti dalam pada Rajah 2 berikut.



Rajah 2. Hasil lengkap pendigitan peta Pulau Pinang

Setelah proses pendigitan peta selesai, langkah seterusnya adalah kemasukan data yang merangkumi maklumat spatial dan atribut ke dalam sistem peta digital. Data ini penting bagi melengkapkan setiap elemen spatial dengan maklumat deskriptif yang relevan untuk tujuan paparan dan analisis. Jadual 1 berikut memaparkan maklumat ringkas berkaitan daerah-daerah di Pulau Pinang serta maklumat atribut bagi setiap pusat PPDK. Maklumat tersebut antaranya termasuklah nama pusat, alamat lengkap, nama penyelia, serta maklumat sokongan lain yang diperlukan

Jadual 1. Data atribut maklumat PPDK Pulau Pinang

PUSAT PDK — Features Total: 24, Filtered: 24, Selected: 0

	NAMA PDK	ID	POSKOD	ALAMAT	PENYELIA
1	PDK ANUGERAH KASIH	21	14300	25, JALAN TEMPUA, TAMAN MUTIARA 14300 NIBONG TEBAL. PULAU PINANG	SALBIAH BINTI BAHARUDIN
2	PDK AN-NUR PAYA KELADI	1	13200	2562 A & B, PAYA KELADI TENGAH, 13200 KEPALA BATAS	SAMEHAH BT SAAD
3	PDK SERI BARINAH POKOK MACHANG	6	13300	2756 N/TO, JALAN POKOK MACHANG, 13300 TASEK GELUGOR, PULAU PINANG	SITI ASA BT SHARIFF
4	PDK PERMATANG DAMAR LAUT	20	11960	7307 BLOK J MK 12 PERMATANG DAMAR LAUT	NURHIDAYAH BINTI CHE ROSE
5	PDK NUR KASIH SUNGAI BATU	16	11920	BERSEBELAHAN MASJID RIDWANIAH SG BATU, SG BATU, 11920 B. LEPAS, P. PINANG	NORMILA BINTI ABDUL KARIM
6	PDK SENA INDAH	5	13310	D/A LORONG 4, TAMAN POKOK SENA INDAH, 13310 TASEK GELUGOR, PULAU PINANG	TENGKU KHAIRU...
7	PDK INSANIAH PINANG TUNGGAL	3	13210	D/A SEKOLAH AGAMA PINANG TUNGGAL, KAMPUNG SETOL, 13210 KEPALA BATAS	ZAITON BT BAKAR
8	PDK SEBERANG JAYA	10	13700	DEWAN PDK (OKU) PERSIARAN SEMBILANG BANDAR SEBERANG JAYA	INTAN SAPURA BT KHAIRUDDIN
9	PDK BAGAN INDAH	7	12000	JALAN ST MARK, 12000,BUTTERWORTH, PULAU PINANG	ZALINA BINTI SAMDIN
10	PDK SINAR HARAPAN	2	13100	KOMPLEKS PERNIAGAAN BLOK 1, JALAN PERMATANG MANGGIS, 13200 KEPALA BATAS	NORYANI BINTI ABDUL MANAP

Jadual 2 menunjukkan maklumat berkaitan jalan raya, khususnya nama-nama jalan yang telah didigitkan untuk melengkapkan peta dan memberikan gambaran sebenar jaringan akses ke pusat-pusat PPDK.Semua data ini dimasukkan dan dihubungkan kepada elemen spatial masing-masing (*polygon, point, linestring*) dalam perisian QGIS bagi membolehkan pembentukan peta interaktif yang lengkap dan berfungsi.

Setelah proses pendigitan peta selesai, langkah seterusnya adalah menukarkan peta tersebut kepada bentuk interaktif menggunakan *plugin qgis2web* dalam perisian QGIS itu sendiri. Peta interaktif yang terhasil kemudiannya dibangunkan sebagai laman web dinamakan I-Map Pusat Program Pemulihan Dalam Komuniti (PPDK) Pulau Pinang, yang dihoskan melalui platform *Github Pages.*

Jadual 2. Data atribut jalan raya

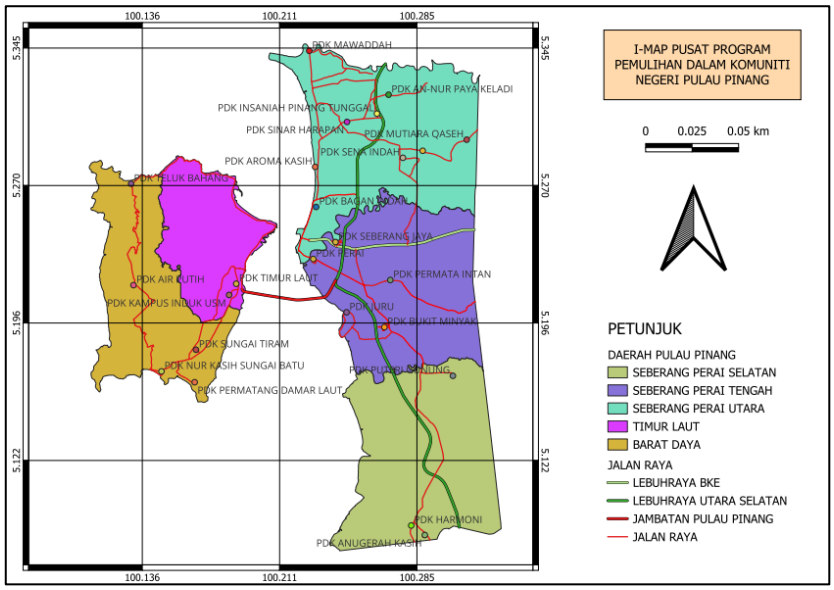
JALAN RAYA — Features Total: 83, Fil

	NAMA JALAN	ID
1	LEBUHRAYA BKE	1
2	JALAN SEMBILANG 2	NULL
3	JALAN SEMBILANG 2	2
4	JALAN SEMBILANG 2	2
5	JALAN SEMBILANG 2	2
6	JALAN KAMPUNG PERTAMA	3
7	JALAN SEMBILANG 2	2
8	JALAN SEMBILANG 2	2
9	JALAN SEMBILANG 2	2
10	JALAN SEMBILANG 2	2

JALAN RAYA — Features Total: 83, Fi

	NAMA JALAN	ID
22	JALAN PERMATA...	11
23	JALAN BUKIT MINYAK	12
24	JALAN BUKIT MINYAK	12
25	JALAN PERAI UTAMA 1	14
26	JALAN PERAI UTAMA 1	14
27	JALAN KUALA JURU	15
28	JALAN JURU	16
29	LEBUHRAYA UTARA SELATAN	17
30	JALAN PERMATA...	18

Hasil akhir pembangunan ini adalah dalam bentuk pautan web (URL), membolehkan pengguna mengakses I-Map secara atas talian. Pendekatan ini memberikan kemudahan dan fleksibiliti kepada pengguna, kerana akses ke peta hanya memerlukan sambungan internet tanpa keperluan memasang perisian khusus. Rajah 3 memaparkan hasil akhir pendigitan peta dalam bentuk *Map Layout*.



Rajah 3. Paparan peta dalam bentuk *Map Layout*

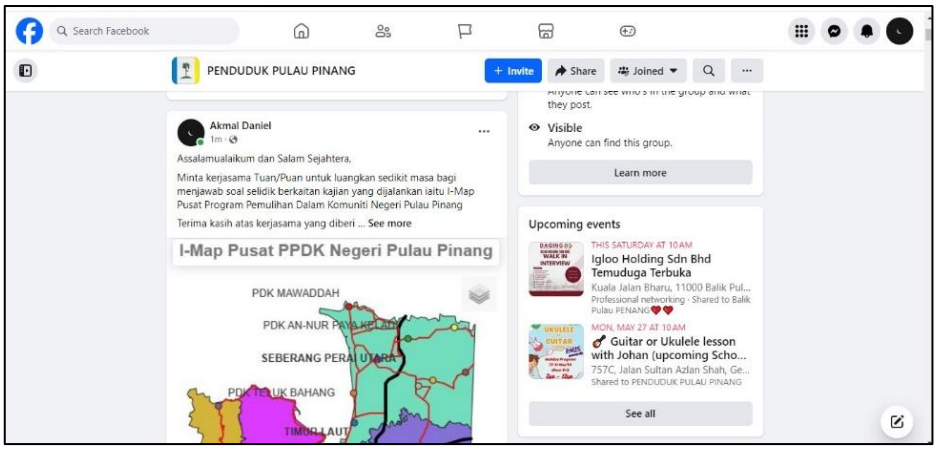
Setelah I-Map ini berjaya dibangunkan, satu sesi uji lari telah dijalankan bersama Penolong Pengarah Kanan JKM Pulau Pinang bagi menilai kebolehgunaan dan keberkesanan aplikasi tersebut dalam menyampaikan maklumat lokasi dan fungsi pusat PPDK. Dapatan uji lari menunjukkan I-Map yang dihasilkan dapat memberi impak yang positif kepada masyarakat setempat serta memberi kesan yang baik terhadap pusat PPDK. Langkah seterusnya adalah membangunkan soal selidik dan membuat penyebaran I-Map kepada pengguna sasaran.

Tujuan soal selidik ini dibangunkan adalah untuk mengkaji keberkesanan I-Map yang dihasilkan, samaada memberikan impak positif atau sebaliknya selepas penggunaan I-Map ini. Responden sasaran yang terlibat dalam kajian ini adalah dikalangan warga Pulau Pinang itu sendiri. Satu instrument soal selidik berstruktur dibangunkan yang terdiri daripada tiga bahagian iaitu Bahagian A (demografi), Bahagian B (keberkesanan I-Map) dan Bahagian C

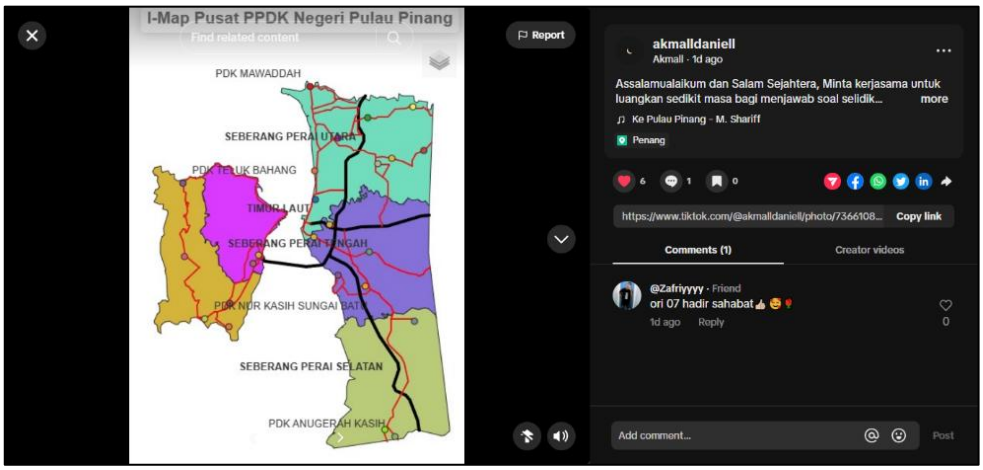
(tahap kepuasan pengguna). Soal-selidik ini menggunakan skala Likert bagi tujuan pengumpulan data empirikal dan seterusnya menganalisis data secara kuantitatif. Rajah 4 berikut menunjukkan contoh soal selidik yang telah dibangunkan dalam kajian ini.

Rajah 4. Soal selidik yang telah dibangunkan

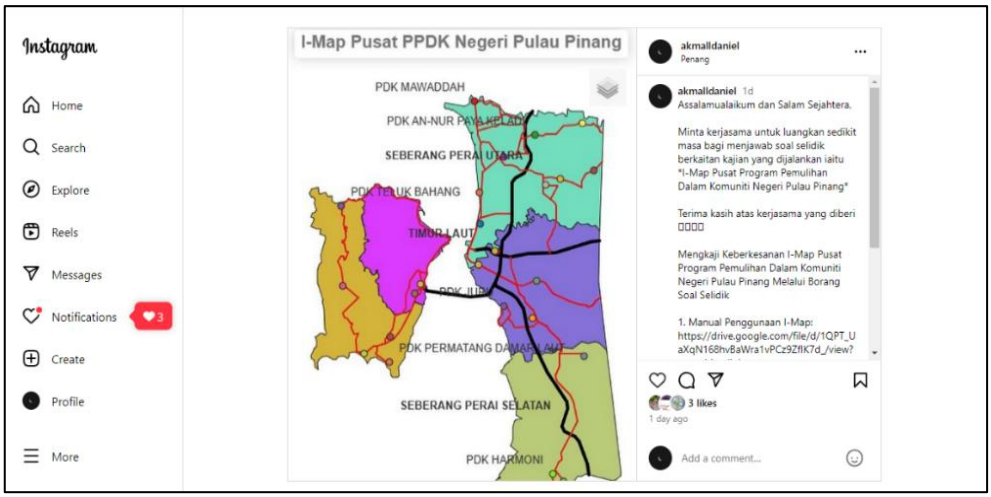
Setelah I-Map Pusat Program Pemulihan Dalam Komuniti (PPDK) Negeri Pulau Pinang berjaya dihasilkan, penyebarannya dilaksanakan secara dalam talian melalui platform media sosial seperti *Facebook, TikTok dan Instagram*. Bersama penyebaran tersebut, turut disertakan tiga komponen utama iaitu pautan I-Map, manual penggunaan I-Map itu sendiri serta borang soal selidik bagi menilai keberkesanannya. Langkah ini dilaksanakan bagi memenuhi objektif kedua kajian ini. Rajah 5, 6 dan 7 berikut menunjukkan contoh penyebaran I-Map menerusi media sosial.



Rajah 5. Penyebaran I-Map melalui *Facebook*



Rajah 6. Penyebaran I-Map melalui *TikTok*

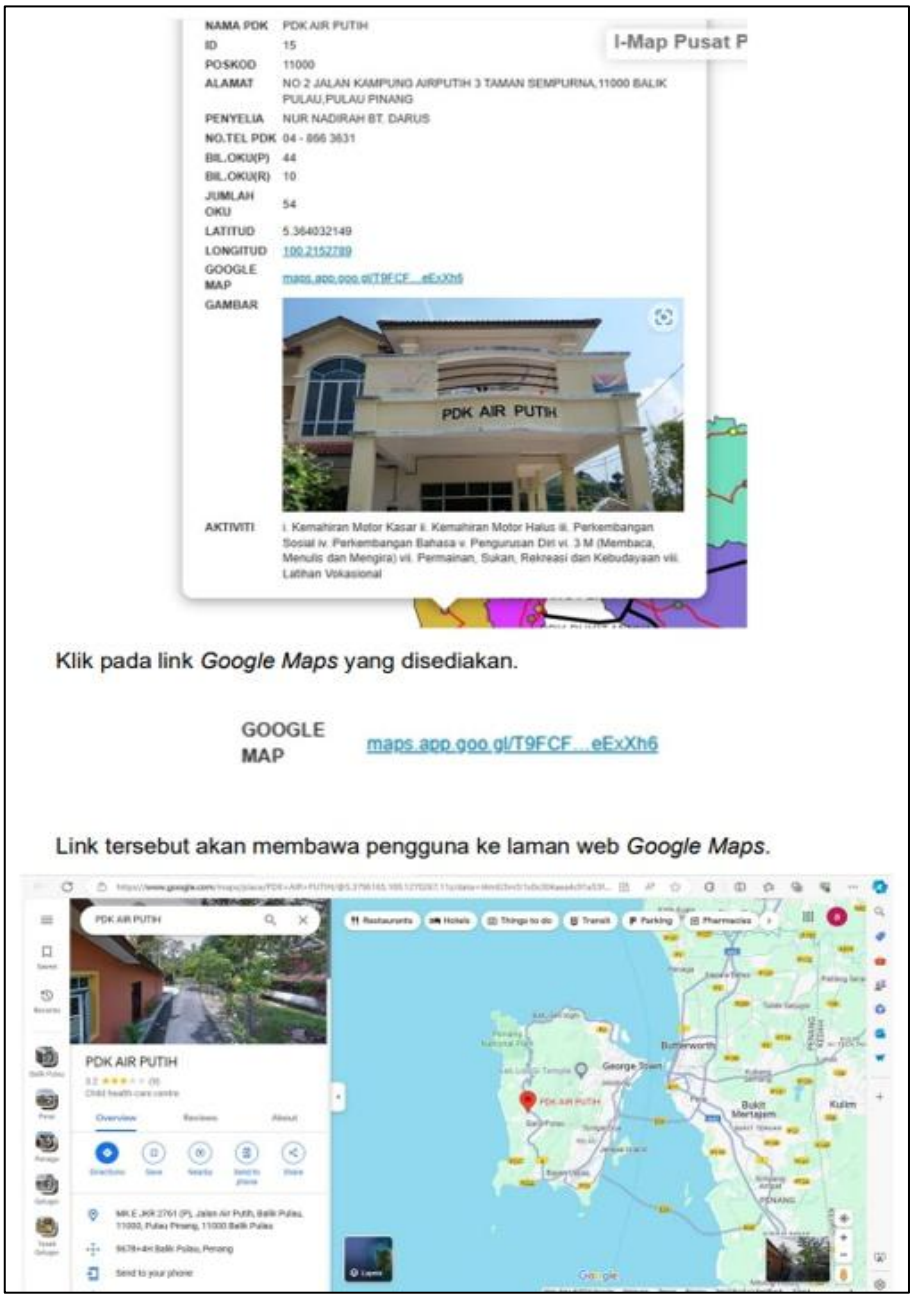


Rajah 7. Penyebaran I-Map melalui *Instagram*

3. Dapatan dan Percangan

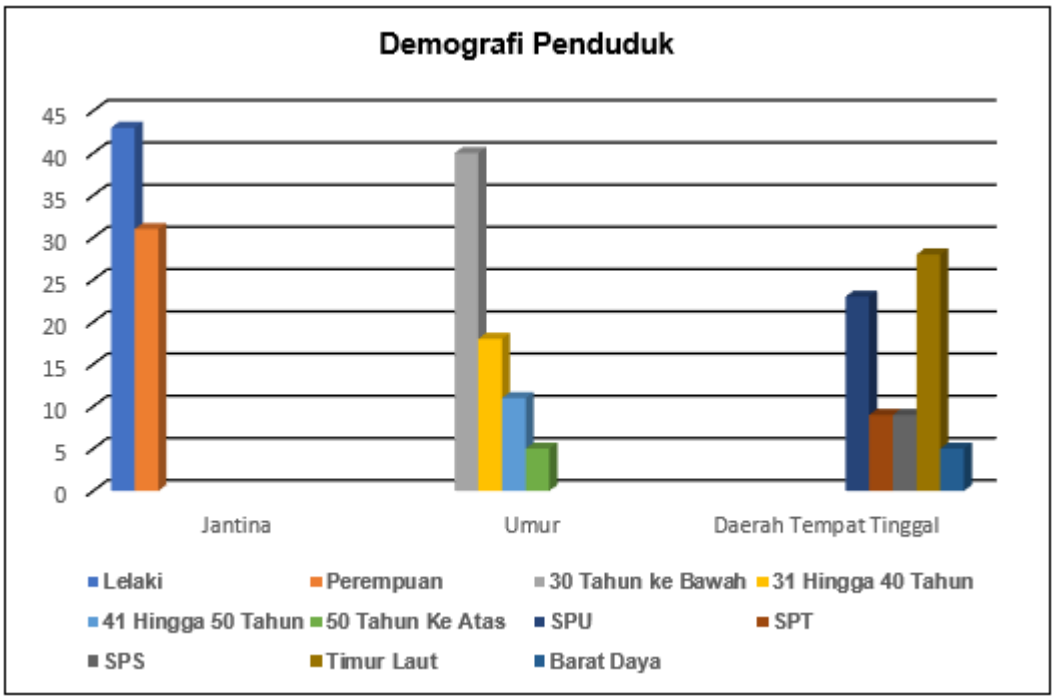
Bahagian ini menunjukkan hasil akhir kajian iaitu pembangunan I-Map Pusat Program Pemulihan Dalam Komuniti (PPDK) Negeri Pulau Pinang yang kini boleh diakses secara dalam talian. I-Map ini membolehkan pengguna mendapatkan maklumat berkenaan pusat PPDK seperti alamat, lokasi dan fungsi, serta mengenal pasti taburan PPDK tersebut di seluruh Pulau Pinang. Aplikasi ini berfungsi sebagai sumber rujukan yang berguna, dan boleh diakses dengan mudah melalui pautan yang disediakan selagi pengguna mempunyai peranti seperti telefon pintar atau komputer serta capaian internet. Berikut adalah pautan web (URL) bagi membolehkan pengguna mengakses I-Map PPDK yang berjaya dibangunkan secara atas talian berikut : https://akmaldaniel.github.io/I-Map-Pusat-PPDK-Negeri-Pulau-Pinang-IV/#28/0.00941/98.01987

I-Map ini memaparkan butiran seperti nama daerah, nama jalan, dan nama pusat PPDK, di mana pengguna boleh klik pada elemen-elemen tersebut untuk mendapatkan maklumat lanjut. Dengan klikn pada titik lokasi pusat PPDK, pengguna dapat melihat maklumat terperinci seperti nama pusat, alamat, nama penyelia, nombor telefon, dan lain-lain. Selain itu, turut disertakan gambar pusat PPDK bagi memudahkan pengecaman visual. I-Map ini juga menyediakan pautan ke *Google Maps* bagi setiap pusat PPDK, yang membolehkan pengguna mendapatkan arah laluan ke lokasi dengan lebih mudah. Rajah 8 berikut menunjukkan paparan apabila pautan *Google Maps* diakses oleh pengguna.

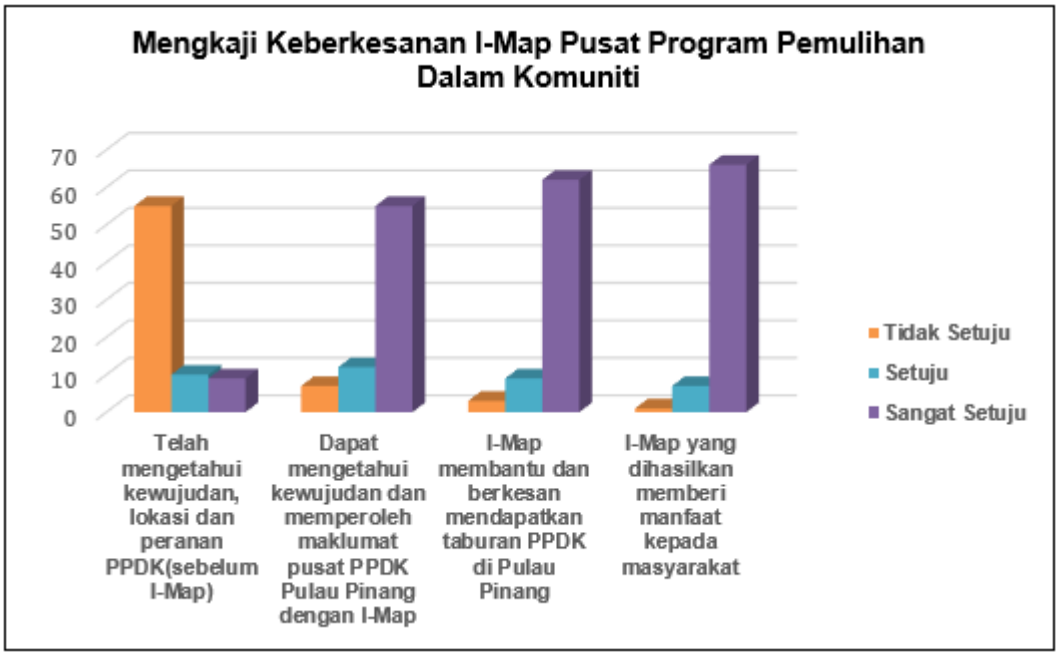


Rajah 8. Paparan I-Map apabila pautan Google Maps diakses oleh pengguna

Analisis kajian mendapati rata-rata peringkat umur responden yang memberikan maklumbalas terdiri daripada golongan berumur 30 tahun ke bawah. Ini menunjukkan bahawa lebih ramai golongan muda menggunakan media sosial berbanding golongan yang lebih berumur dan penyampaian maklumat terhadap golongan ini lebih efektif melalui kaedah media sosial termasuklah I-Map yang telah dihasilkan ini. Berdasarkan kepada lokasi kajian, menunjukkan majoriti responden tinggal di daerah Timur Laut dan minoriti responden tinggal di daerah Barat Daya seperti ditunjukkan dalam graf pada Rajah 9.



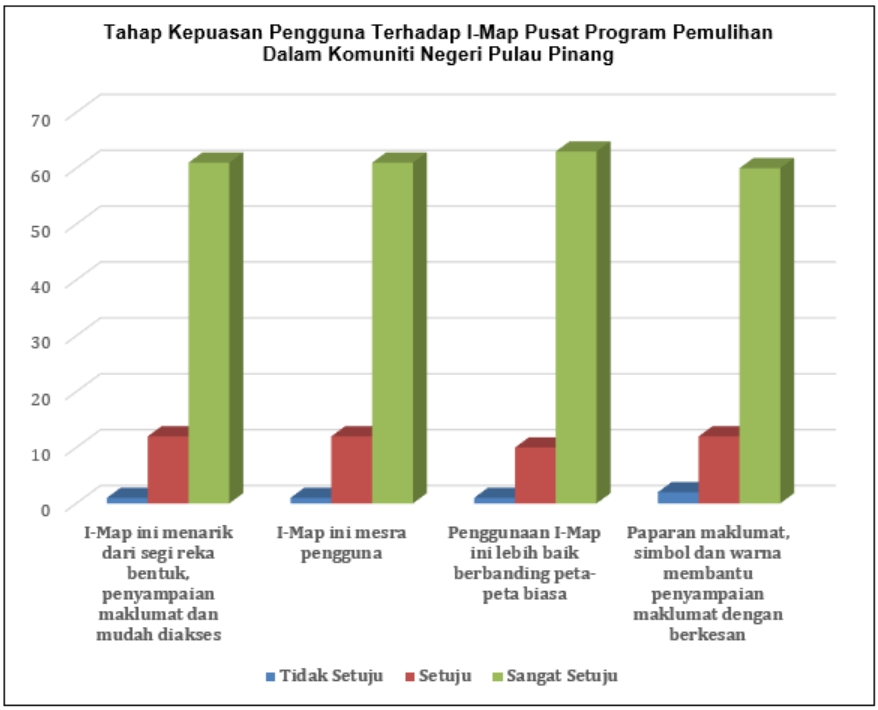
Rajah 9. Data demografi responden I-Map



Rajah 10. Graf analisis keberkesanan I-Map

Rajah 10 menunjukkan analisis keberkesanan I-Map Pusat Program Pemulihan Dalam Komuniti (PPDK) Pulau Pinang. 74 peratus responden menyatakan mereka belum mengetahui kewujudan, lokasi dan peranan PPDK sebelum terhasilnya I-Map. Sebaliknya setelah terhasilnya I-Map, 91 peratus responden bersetuju I-Map membantu mereka mengetahui kewujudan PPDK dan melalui I-Map juga mereka dapat memperolehi maklumat serta info penting sesuatu pusat PPDK di Pulau Pinang. Sebelum adanya I-Map, rata-rata responden mengatakan bahawa mereka tidak mengetahui lokasi, peranan malah kewujudan PPDK itu sendiri. Seterusnya, selepas terhasilnya I-Map, majoriti responden memberi maklum balas yang baik bahawa mereka dapat mengetahui kewujudan dan memperoleh maklumat berkaitan pusat PPDK di Pulau Pinang. Graf analisis yang ditunjukkan dalam Rajah 10 juga

menunjukkan 71 responden atau 96 peratus bersetuju I-Map ini membantu mereka mendapatkan taburan pusat PPDK Pulau Pinang. Hanya sebilangan kecil sahaja yang tidak bersetuju iaitu 4% daripada keseluruhan responden. Di samping itu, I-Map yang dihasilkan juga memberi manfaat kepada masyarakat dengan majoriti responden iaitu 99% bersetuju I-Map ini memberikan faedah terbaik kepada masyarakat.



Rajah 11. Graf tahap kepuasan pengguna terhadap I-Map

Rajah 11 menunjukkan graf tahap kepuasan pengguna terhadap I-Map berdasarkan maklum balas yang diterima daripada responden. Hasil analisis menunjukkan bahawa hampir kesemua responden iaitu mewakili 98% bersetuju dan berpuas hati dengan I-Map yang dibangunkan. Soalan yang dikemukakan merangkumi aspek seperti mesra pengguna, keberkesanan dalam penyampaian maklumat, kemudahan akses dan sebagainya. Dapatan ini membuktikan bahawa I-Map telah mencapai matlamat pembangunannya dan memberi kesan yang positif berdasarkan maklum balas yang diperoleh melalui soal selidik yang diedarkan.

4. Kesimpulan

Sebagai kesimpulan, I-Map Pusat Program Pemulihan Dalam Komuniti (PPDK) Negeri Pulau Pinang yang telah dibangunkan berfungsi sebagai platform maklumat interaktif yang memberi manfaat kepada tiga golongan utama: orang awam, golongan orang kelainan upaya (OKU), dan pusat PPDK sendiri. Bagi orang awam khususnya ibu bapa atau penjaga kepada OKU, I-Map memudahkan akses kepada maklumat lokasi dan perkhidmatan PPDK berhampiran. Bagi golongan OKU pula, I-Map membantu mengenal pasti pusat PPDK yang boleh mereka sertai untuk menjalani latihan, pemulihan dan bimgan kendiri secara lebih teratur. Manakala bagi pihak PPDK, I-Map menjadi medium promosi dan penyebaran maklumat lokasi serta perkhidmatan, sekaligus meningkatkan kesedaran masyarakat. I-Map ini lengkap dengan maklumat atribut dan spatial seperti nama pusat, gambar, bilangan OKU, serta pautan ke Google Maps, dan boleh diakses dengan mudah tanpa memerlukan perisian khusus. Reka bentuk yang menarik dan tersusun serta warna yang sesuai menjadikan paparannya mesra pengguna, manakala kesahihan data dijamin kerana bersumberkan Jabatan Kebajikan Masyarakat Pulau Pinang. Cadangan kajian lanjutan adalah untuk memperluaskan pembangunan I-Map ke negeri-negeri wilayah utara Semenanjung Malaysia, agar

penyebaran maklumat sosial berkaitan PPDK dapat diperkukuh dengan pendekatan teknologi yang lebih canggih dan inklusif.

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PENEROKAAN MINAT TERHADAP BIDANG TVET MELALUI KURSUS ASAS ELEKTRONIK DAN PENDAWAIAN ELEKTRIK DALAM KALANGAN PELAJAR SEKOLAH

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Abstrak

Kajian ini meneliti kesan penyertaan dalam kursus pendek Asas Elektronik dan Pendawaian Elektrik terhadap minat, persepsi, dan kecenderungan pelajar untuk melanjutkan pengajian dalam bidang Pendidikan Teknikal dan Vokasional (TVET). Kursus ini dijalankan di Kolej Komuniti Seberang Jaya dan melibatkan 42 orang pelajar dari pelbagai peringkat umur. Reka bentuk kajian kuantitatif deskriptif digunakan dengan pengumpulan data melalui soal selidik berstruktur. Analisis data dilakukan menggunakan statistik deskriptif dan korelasi Pearson menerusi perisian SPSS versi 26.0. Keputusan kajian menunjukkan bahawa pelajar mempunyai minat yang tinggi terhadap TVET (min = 4.15), persepsi positif terhadap kursus elektrik (min = 4.18), dan kecenderungan yang tinggi untuk meneruskan pengajian dalam bidang elektrik (min = 4.20). Namun, analisis korelasi mendapati hubungan negatif lemah antara minat terhadap TVET dan kecenderungan untuk melanjutkan pengajian dalam bidang elektrik ($r = -0.112$, $p = 0.812$). Sebaliknya, persepsi terhadap kursus elektrik menunjukkan hubungan positif sederhana dengan kecenderungan untuk melanjutkan pengajian dalam bidang elektrik ($r = 0.740$, $p = 0.057$). Meskipun tidak signifikan pada aras 0.05, hubungan ini hampir signifikan dan mencadangkan bahawa persepsi positif terhadap kursus boleh menjadi pemangkin kepada peningkatan kecenderungan pelajar untuk terus mendalami bidang elektrik.
Kata Kunci: TVET; Minat pelajar; Pendidikan teknikal.

1. Pengenalan

Pendidikan Teknikal dan Vokasional (TVET) memainkan fungsi yang utama kerana ia menjana sumber manusia mahir yang dikehendaki oleh sektor perindustrian pada masa kini. Dengan pelaksanaan TVET itu, para pelajar berpeluang untuk memperoleh kemahiran teknikal yang mana adalah selari dengan keperluan pasaran kerja yang sedang berkembang pesat (Shahran, 2024). Walaupun begitu, minat murid sekolah di Malaysia dalam bidang ini masih kurang, dan TVET selalu dianggap pilihan yang seterusnya oleh tanggapan biasa (Jie & Yasin, 2022). Pendekatan awal telah diperkenalkan untuk menangani kurangnya minat dalam bidang ini, contohnya mengadakan kursus TVET ringkas semasa cuti sekolah. Kursus seperti Kursus Asas Elektronik serta Pendawaian Elektrik dianjurkan oleh Kolej Komuniti Seberang Jaya yang mana menyasarkan pelajar menengah juga rendah. Pendekatan ini adalah bertujuan untuk mendedahkan para pelajar sejak dari peringkat awal. Ia juga adalah bermatlamat untuk mendedahkan perihal potensi kerjaya dalam bidang TVET ini. Tambahan pula, TVET turut menekankan konsep pembelajaran sepanjang hayat melalui perangkuman peringkat sekolah menengah, lepasan sekolah sehingga ke tenaga kerja industri melalui latihan berterusan serta pembangunan profesional (Sekretariat Majlis TVET Negara, 2024). Kursus pendek di Kolej Komuniti Seberang Jaya dirangka untuk menarik minat pelajar dalam bidang teknikal. Di samping itu juga, ia dapat memberi pendedahan asas berkaitan kemahiran elektronik dan pendawaian elektrik. Kajian ini dijalankan untuk menilai tahap minat pelajar selepas mengikuti kursus tersebut, sekaligus meneliti persepsi mereka terhadap kandungan serta pelaksanaan kursus. Selain itu, kajian turut meneliti kecenderungan pelajar untuk meneruskan penglibatan dalam bidang TVET selepas kursus dijalankan. Analisis turut dilakukan bagi menilai hubungan antara minat pelajar terhadap TVET, persepsi mereka terhadap kursus elektrik, serta kecenderungan menyambung pengajian dalam bidang berkaitan. Dalam konteks pendidikan teknikal, pemahaman tentang faktor yang mempengaruhi pelajar memilih untuk meneruskan pengajian dalam bidang

tertentu amat penting. Pengetahuan ini bukan sahaja membantu dalam perancangan kurikulum, malah menjadi input penting buat penganjur kursus bagi memastikan keberkesanan pendekatan pengajaran yang digunakan. Kajian ini penting kerana ia boleh memberi maklum balas berguna kepada penganjur kursus pendek mengenai sejauh mana program itu berkesan, di samping menyokong strategi penjenamaan TVET di sekolah dan membantu pembuat dasar merangka cara menarik lebih ramai pelajar ke bidang kemahiran. Dengan mengambil kira tujuan tersebut, penyelidik meneliti tahap minat yang ditunjukkan pelajar terhadap TVET selepas mereka menyertai kursus dan bagaimana mereka melihat keberkesanan latihan itu untuk diri mereka. Fokus seterusnya ialah kecenderungan pelajar untuk terus terlibat dalam dunia TVET sebaik sahaja kursus selesai dan peluang yang terbuka kepada mereka ketika memasuki pasaran kerja kelak.

Kajian ini merangkumi tiga aspek utama iaitu minat pelajar tehadap bidang TVET, persepsi pelajar terhadap kandungan dan pelaksanaan kursus dan kecenderungan memilih bidang TVET. Pengalaman awal yang diperolehi melalui kursus pendek tidak hanya membantu pelajar mengetahui pilihan kerjaya yang ada, malah ia juga secara jelas menambah minat mereka terhadap bidang tersebut. Misalnya, Sabarem dan Anua (2024) menunjukkan dalam penyelidikan di Kolej Komuniti Kota Melaka bahawa sesi latihan ringkas itu memberi gambaran awal tentang peluang dalam TVET dan seterusnya mendorong pelajar lebih teruja untuk mendalami kemahiran teknikal. Menurut Wahab dan Saud (2021), elemen hands-on dan praktikal yang diterapkan dalam kursus pendek menjadi faktor utama yang mendorong minat pelajar. Kajian mereka menunjukkan bahawa pelajar yang terlibat dalam aktiviti praktikal lebih cenderung memilih TVET sebagai laluan pendidikan seterusnya. Seterusnya, kajian Jie dan Yasin (2022) di sekolah menengah di Pulau Pinang turut menegaskan bahawa penglibatan awal pelajar dalam kursus TVET dapat mengubah persepsi mereka terhadap bidang kemahiran. Data kajian mereka menunjukkan bahawa 60% pelajar yang mengikuti kursus pendek lebih cenderung mempertimbangkan TVET sebagai pilihan kerjaya. Selain itu, Shahran (2024) dalam kajian di beberapa Kolej Komuniti di Malaysia mendapati kursus pendek berjaya meningkatkan kesedaran pelajar mengenai peluang pekerjaan dalam bidang elektrik dan elektronik. Pelajar yang menyertai kursus pendek menunjukkan minat yang lebih kuat untuk meneruskan pengajian dalam bidang itu berbanding rakan-rakan yang tidak terlibat. Haron dan Sumeri (2024) juga menekankan bahawa pendedahan langsung kepada aktiviti teknikal ketika kursus tersebut dapat membentuk minat terhadap TVET, terutama apabila peserta dapat mengendalikan peralatan dengan sendiri. Secara keseluruhan, penyelidikan-penyelidikan ini membuktikan bahawa program kursus pendek dalam bidang TVET memainkan peranan penting dalam meningkatkan minat kemahiran pelajar dan mendorong mereka mempertimbangkan laluan pendidikan dan kerjaya yang berkaitan.

Persepsi pelajar terhadap kandungan dan pelaksanaan kursus memainkan peranan penting dalam menentukan keberkesanan sesuatu kursus. Kajian-kajian terdahulu menunjukkan bahawa elemen praktikal dan hands-on mampu meningkatkan persepsi positif pelajar terhadap kursus, seterusnya meningkatkan kecenderungan mereka untuk melibatkan diri dalam bidang tersebut. Wahab & Saud (2021) menegaskan bahawa aktiviti praktikal dalam kursus elektrik meningkatkan pemahaman pelajar terhadap konsep asas elektronik dan pendawaian elektrik. Kajian mereka menunjukkan bahawa pelajar yang menyertai kursus dengan komponen hands-on lebih cenderung untuk memberi maklum balas positif terhadap kandungan kursus. Shahran (2024) dalam kajiannya mendapati bahawa penggunaan teknologi interaktif dalam kursus elektrik mampu memperkukuhkan persepsi pelajar terhadap kursus tersebut. Penggunaan simulasi elektrik, contohnya, membantu pelajar memahami aplikasi konsep-konsep elektrik dalam situasi sebenar. Haron & Sumeri (2024) mendapati bahawa keberkesanan kursus elektrik dapat dipertingkatkan melalui pendekatan pengajaran berasaskan projek. Pelajar yang terlibat dalam projek mini yang berkaitan dengan pendawaian elektrik menunjukkan peningkatan persepsi yang signifikan terhadap kursus tersebut. Jie & Yasin (2022) menekankan bahawa tempoh kursus yang mencukupi memainkan peranan penting dalam memastikan keberkesanan kursus elektrik. Pelajar yang berpeluang mendalami topik elektrik secara menyeluruh lebih cenderung untuk memberi maklum balas positif berbanding mereka yang hanya mendapat pendedahan asas sahaja. Sabarem & Anua (2024) dalam kajian mereka di Kolej Komuniti Kota Melaka menunjukkan bahawa pendekatan pengajaran bersepadu

yang menggabungkan elemen praktikal, simulasi, dan pendedahan kerjaya dalam kursus elektrik dapat meningkatkan persepsi pelajar terhadap kursus tersebut. Mereka juga mendapati bahawa pelajar yang diberikan peluang untuk melihat aplikasi elektrik dalam industri lebih cenderung untuk melanjutkan pengajian dalam bidang ini.

Kecenderungan pelajar untuk melanjutkan pengajian atau penglibatan dalam bidang TVET merupakan aspek penting yang perlu diberi perhatian oleh pihak penganjur kursus. Kajian-kajian terdahulu menunjukkan bahawa pendedahan awal melalui kursus pendek mampu menjadi pemangkin kepada peningkatan kecenderungan pelajar untuk terus mendalami bidang kemahiran teknikal. Wahab & Saud (2021) mendapati bahawa pelajar yang terlibat dalam kursus elektrik berasaskan projek menunjukkan kecenderungan yang lebih tinggi untuk meneruskan pengajian dalam bidang TVET berbanding mereka yang hanya terlibat dalam aktiviti teori. Elemen hands-on dalam kursus ini membantu meningkatkan keyakinan pelajar untuk mengaplikasikan kemahiran yang dipelajari. Jie dan Yasin (2022) menyatakan bahawa program kursus pendek yang menggabungkan pendedahan kerjaya berjaya meningkatkan keinginan pelajar untuk kekal dalam bidang TVET. Secara khusus, mereka mendapati peserta yang diperkenalkan kepada laluan kerja dalam sektor kemahiran lebih bermotivasi untuk meneruskan pengajian lanjutan. Shahran (2024), dalam kajian di beberapa Kolej Komuniti seluruh Malaysia, melaporkan bahawa kursus TVET yang memberi tumpuan kepada industri elektrik dan elektronik telah mema minat yang signifikan dalam kalangan pelajar. Pelajar yang melihat prospek pekerjaan luas dalam bidang tersebut menunjukkan kecenderungan lebih tinggi untuk mendaftar dalam program-program TVET selanjutnya. Menurut Sabarem dan Anua (2024), melalui penyelidikan di Kolej Komuniti Kota Melaka telah mendapati bahawa kursus pendek TVET yang memasukkan elemen pendedahan langsung kepada industri secara konsisten menarik minat pelajar untuk meneruskan pengajian dalam kemahiran teknikal. Pendedahan kepada teknologi terkini terbukti menjadi daya tarikan utama yang mendorong peserta mengambil langkah tambahan dalam pendidikan mereka. Haron & Sumeri (2024) pula menekankan bahawa kursus pendek yang berorientasikan projek memberi kesan positif terhadap kecenderungan pelajar untuk terus melibatkan diri dalam TVET. Pelajar yang berpeluang membangunkan projek mini yang berkaitan dengan pendawaian elektrik menunjukkan minat yang lebih tinggi untuk meneruskan pengajian dalam bidang tersebut.

2. Metodologi Kajian

Kajian ini menggunakan reka bentuk kuantitatif deskriptif dan inferensi berbentuk tinjauan. Pendekatan ini dipilih bagi membolehkan pengumpulan data secara sistematik serta analisis statistik yang objektif terhadap persepsi dan minat pelajar mengenai kursus pendek Asas Elektronik dan Pendawaian Elektrik yang dilaksanakan di Kolej Komuniti Seberang Jaya. Kajian ini bertujuan untuk mengenal pasti tahap minat pelajar, menilai persepsi mereka terhadap kandungan dan pelaksanaan kursus, serta menganalisis hubungan antara minat dan persepsi terhadap kecenderungan mereka untuk melanjutkan pengajian atau penglibatan dalam bidang TVET selepas mengikuti kursus tersebut. Populasi kajian terdiri daripada pelajar yang mengikuti kursus pendek Asas Elektronik dan Pendawaian Elektrik semasa cuti sekolah di Kolej Komuniti Seberang Jaya. Sampel kajian ini melibatkan 42 orang pelajar yang dipilih secara rawak daripada pelajar yang menyertai kursus tersebut. Pemilihan sampel ini bertujuan untuk mendapatkan data yang representatif dan memastikan kebolehpercayaan dapatan kajian. Walaupun sampel ini kecil, ia mencerminkan golongan sasaran yang terlibat dalam kursus ini.

Kajian ini menggunakan soal selidik yang dibahagikan kepada empat bahagian. Bahagian A mengandungi tiga item demografi: umur, jantina dan pengalaman menyertai kursus TVET. Bahagian B menilai minat pelajar terhadap TVET selepas mengikuti kursus pendek, dengan tujuh item. Bahagian C mengkaji persepsi pelajar terhadap kandungan dan pelaksanaan kursus Asas Elektronik dan Pendawaian Elektrik dengan tujuh item. Bahagian D sebanyak 7 item untuk mengukur kecenderungan pelajar untuk terus terlibat dalam bidang TVET. Skala Likert lima mata digunakan untuk mengukur minat, persepsi, dan kecenderungan pelajar. Untuk mengukur tahap

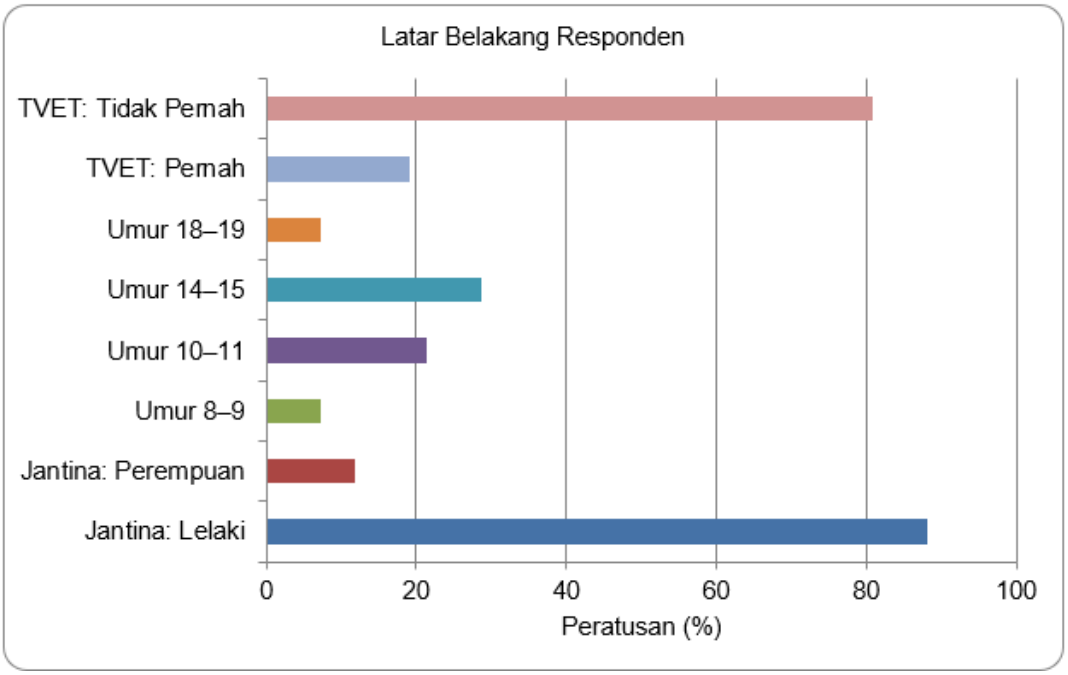
minat, persepsi, dan kecenderungan pelajar, skala Likert lima mata digunakan, dengan pilihan 1 (sangat tidak setuju), 2 (tidak setuju), 3 (tidak pasti), 4 (setuju), dan 5 (sangat setuju).

Kajian rintis telah dijalankan terhadap lima orang pelajar yang mengikuti kursus Asas Elektronik dan Pendawaian Elektrik untuk menguji kesesuaian soal selidik dan memahami sebarang kesulitan yang mungkin timbul semasa pengumpulan data. Beberapa pengubahsuaian item soalan telah dilakukan berpandukan maklum balas daripada responden kajian rintis. Analisis ke atas data rintis menggunakan perisian Statistical Package for the Social Sciences (SPSS) versi 26.0 menunjukkan pekali kebolehpercayaan Alpha adalah 0.85, yang menunjukkan bahawa instrumen kajian ini mempunyai tahap kebolehpercayaan yang tinggi. Data dikumpulkan melalui edaran soal selidik secara dalam talian kepada pelajar yang terlibat dalam kursus pendek selepas tamat kursus. Pengumpulan data dalam talian memudahkan proses pengedaran dan penyimpanan data dengan lebih sistematik. Data yang diperoleh dianalisis menggunakan perisian Statistical Package for the Social Sciences (SPSS). Analisis deskriptif seperti peratusan dan min digunakan untuk menilai corak jawapan responden. Keputusan analisis ini akan membantu dalam menentukan tahap minat pelajar, persepsi mereka terhadap kursus, serta kecenderungan mereka untuk terus melibatkan diri dalam bidang TVET selepas menyertai kursus tersebut. Interpretasi skor min bagi skala Likert 5 mata adalah seperti Jadual 1 dibawah:

Jadual 1. Jadual Interpretasi Skor Min

Min Skor	Tahap
1.00-2.33	Rendah
2.34-3.66	Sederhana
3.67-5.00	Tinggi

3. Dapatan dan Percangan



Rajah 1. Carta bar latar belakang responden

Rajah 1 menunjukkan dapatan dari hasil kajian yang dijalankan. Dapatan menunjukkan bahawa majoriti responden adalah lelaki (88.10%), dengan 28.57% daripada responden berada dalam kelompok umur 14 hingga 15 tahun. Pelajar dalam kelompok umur 10 hingga 11 tahun mempunyai kadar yang agak tinggi (21.43%), manakala pelajar dalam kelompok umur 8 hingga 9 tahun dan 18 hingga 19 tahun mempunyai kadar yang paling rendah (7.14%). 19.05% responden menjawab

soalan tentang pengalaman dalam TVET, manakala 80.95% daripada mereka tidak terlibat dalam bidang tersebut. Berdasarkan Jadual 2 dibawah menunjukkan peningkatan minat pelajar terhadap bidang TVET selepas mereka mengikuti kursus pendek Asas Elektronik dan Pendawaian Elektrik. Skor min keseluruhan yang dicatatkan adalah 4.15, menandakan minat yang tinggi dalam kalangan pelajar terhadap bidang ini.

Jadual 2. Tahap Minat Pelajar Terhadap Bidang TVET

Bil	Item	Skor Min	Tahap
1	Saya berminat dengan aktiviti berkaitan Pendawaian Elektrik dan elektronik.	4.12	Tinggi
2	Bidang TVET adalah menarik untuk saya.	4.18	Tinggi
3	Saya suka belajar secara praktikal dan hands-on.	4.20	Tinggi
4	Saya ingin tahu lebih banyak tentang kerjaya dalam bidang kemahiran.	4.14	Tinggi
5	Saya akan mempertimbangkan bidang TVET dalam pilihan kerjaya saya.	4.10	Tinggi
6	Saya merasa bidang TVET sangat relevan dengan keperluan pekerjaan masa kini.	4.21	Tinggi
7	Saya percaya bidang TVET mempunyai peluang pekerjaan yang luas dan menarik.	4.16	Tinggi
	Skor Purata	4.15	Tinggi

Bagi item “Saya berminat dengan aktiviti berkaitan Pendawaian Elektrik dan elektronik” menerima skor min 4.12, manakala “Bidang TVET adalah menarik untuk saya” mendapat 4.18. Paling menonjol, pernyataan bagi item 3 memperoleh skor 4.20, menunjukkan kecenderungan pelajar terhadap pembelajaran berasaskan amali. Menariknya, pernyataan bagi item 6 iaitu “Saya merasa bidang TVET sangat relevan dengan keperluan pekerjaan masa kini” mencatatkan skor tertinggi iaitu 4.21. Ini membuktikan bahawa pelajar menyedari kepentingan TVET dalam konteks keperluan industri semasa. Walaupun demikian, item “Saya akan mempertimbangkan bidang TVET dalam pilihan kerjaya saya” mendapat skor sedikit lebih rendah, iaitu 4.10, yang menunjukkan masih wujud sedikit keraguan dalam kalangan sesetengah pelajar untuk memilih TVET sebagai kerjaya utama mereka. Secara keseluruhan, dapatan ini menunjukkan bahawa kursus pendek yang dijalankan telah berjaya meningkatkan minat pelajar terhadap bidang TVET serta memberi mereka pendedahan yang lebih mendalam mengenai peluang kerjaya dalam bidang kemahiran teknikal. Walaupun terdapat perbezaan kecil dari segi keyakinan pelajar untuk memilih TVET sebagai kerjaya jangka panjang, impak positif kursus ini terhadap minat dan persepsi pelajar terhadap bidang TVET jelas dapat dilihat.

Berdasarkan hasil dapatan daripada Jadual 3, dapat dilihat bahawa pelajar secara konsisten menunjukkan persepsi yang sangat positif terhadap kursus Asas Elektronik dan Pendawaian Elektrik. Skor min keseluruhan adalah 4.18, yang jelas menunjukkan kebanyakan pelajar mengakui keberkesanan kursus ini dalam membantu mereka meningkatkan pengetahuan serta kemahiran asas berkaitan.

Jadual 3. Persepsi Terhadap Kursus Pendek

Bil	Item	Skor Min	Tahap
8	Kandungan kursus elektronik mudah difahami dan menarik perhatian saya.	4.18	Tinggi
9	Aktiviti praktikal dalam kursus ini membantu saya memahami konsep elektronik.	4.22	Tinggi
10	Kursus ini memberikan pemahaman yang jelas mengenai asas Pendawaian Elektrik.	4.20	Tinggi
11	Tempoh masa kursus ini mencukupi untuk mempelajari semua yang diperlukan.	4.10	Tinggi

12	Pengajar kursus ini memberikan penerangan yang jelas dan mudah difahami.	4.25	Tinggi
13	Saya merasakan suasana pembelajaran dalam kursus ini menyeronokkan dan tidak membosankan.	4.12	Tinggi
14	Saya merasa kursus ini bermanfaat dalam meningkatkan kemahiran asas elektronik dan Pendawaian Elektrik saya.	4.30	Tinggi
	Skor Purata	4.18	Tinggi

Bagi pernyataan “Saya merasa kursus ini bermanfaat dalam meningkatkan kemahiran asas elektronik dan Pendawaian Elektrik saya” telah memperoleh skor min tertinggi, iaitu 4.30. Ini membuktikan bahawa pelajar benar-benar merasakan impak positif kursus terhadap penguasaan kemahiran praktikal mereka. Selain itu, pernyataan berkaitan pengajar yang “memberikan penerangan yang jelas dan mudah difahami” turut mendapat skor tinggi, 4.25, menandakan tahap kepuasan pelajar terhadap kualiti penyampaian tenaga pengajar. Aktiviti praktikal turut mendapat perhatian, dengan skor min 4.22 dan 4.20 masing-masing untuk pernyataan berkaitan “aktiviti praktikal dalam kursus membantu saya memahami konsep elektronik” dan “kursus ini memberikan pemahaman yang jelas mengenai asas Pendawaian Elektrik”. Jelas bahawa pendekatan pembelajaran berasaskan amali amat membantu penguasaan konsep asas oleh pelajar. Walau bagaimanapun, terdapat sedikit keraguan berkenaan tempoh masa kursus, apabila skor bagi pernyataan “tempoh masa kursus ini mencukupi untuk mempelajari semua yang diperlukan” mencatatkan 4.10. Walaupun masih dalam kategori tinggi, nilai ini lebih rendah berbanding aspek-aspek lain, mencadangkan bahawa sebilangan pelajar mungkin berpendapat tempoh kursus agak terhad untuk menampung keseluruhan kandungan yang diperlukan. Secara keseluruhannya, dapatan ini memperlihatkan bahawa pelajar menilai kursus Asas Elektronik dan Pendawaian Elektrik dengan sangat positif, terutama dari segi keberkesanan, manfaat terhadap kemahiran teknikal dan kualiti pengajaran. Walaupun terdapat sedikit kebimbangan berkaitan tempoh kursus, pengalaman pembelajaran secara umumnya adalah memuaskan dan efektif bagi majoriti pelajar.

Berdasarkan dapatan Jadual 4, jelas menunjukkan bahawa pelajar yang mengikuti kursus Asas Elektronik dan Pendawaian Elektrik mempunyai kecenderungan yang tinggi untuk melanjutkan penglibatan dalam bidang TVET. Skor min keseluruhan sebanyak 4.20 menggambarkan minat yang kukuh dalam kalangan pelajar untuk terus menceburi bidang ini selepas tamat kursus.

Jadual 4. Kecenderungan Meneruskan Pembelajaran Atau Penglibatan Dalam Bidang TVET

Bil	Item	Skor Min	Tahap
15	Saya berminat untuk mengikuti kursus TVET lanjutan selepas ini.	4.18	Tinggi
16	Saya bercadang untuk melanjutkan pelajaran dalam bidang TVET selepas sekolah.	4.22	Tinggi
17	Kursus ini memberi saya keyakinan untuk memilih TVET sebagai pilihan pengajian seterusnya.	4.25	Tinggi
18	Saya akan menggalakkan rakan-rakan saya untuk mengambil kursus TVET seperti ini.	4.10	Tinggi
19	Selepas mengikuti kursus ini, saya lebih berminat untuk mengejar kerjaya dalam bidang kemahiran.	4.30	Tinggi
20	Saya percaya kursus ini membuka peluang untuk kerjaya yang stabil dalam bidang TVET.	4.18	Tinggi
21	Saya rasa kursus ini memberi saya asas yang cukup untuk terus mendalami bidang TVET.	4.22	Tinggi
	Skor Purata	4.20	Tinggi

Dapatan data menunjukkan pernyataan “Selepas mengikuti kursus ini, saya lebih berminat untuk mengejar kerjaya dalam bidang kemahiran” memperoleh skor min tertinggi iaitu 4.30. Hal ini menandakan kursus tersebut sangat berkesan dalam meningkatkan motivasi pelajar terhadap kerjaya berasaskan kemahiran. Selain itu, pernyataan “Kursus ini memberi saya keyakinan untuk memilih TVET sebagai pilihan pengajian seterusnya” juga mencatatkan skor yang tinggi (4.25), yang

menggambarkan peningkatan keyakinan diri pelajar untuk memilih laluan pendidikan berkaitan TVET. Walau bagaimanapun, pernyataan “Saya akan menggalakkan rakan-rakan saya untuk mengambil kursus TVET seperti ini” memperoleh skor sedikit lebih rendah (4.10) berbanding item lain. Ini mungkin menunjukkan tahap keyakinan atau kesedaran pelajar dalam mempromosikan bidang TVET dalam kalangan rakan sebaya masih belum sepenuhnya mantap. Secara keseluruhannya, dapatan kajian ini membuktikan bahawa kursus pendek tersebut berjaya meningkatkan minat dan keyakinan pelajar terhadap bidang TVET. Pelajar menunjukkan kecenderungan yang tinggi untuk memilih TVET sebagai pilihan kerjaya masa depan, walaupun aspek memotivasi rakan sebaya masih memerlukan penambahbaikan.

Berdasarkan analisis korelasi Pearson yang dijalankan, keputusan diperoleh seperti berikut:

i. Berdasarkan nilai Pearson r = -0.112, jelas bahawa terdapat hubungan negatif yang sangat lemah antara minat pelajar terhadap TVET dan kecenderungan untuk melanjutkan pengajian dalam bidang elektrik. Di samping itu, nilai p yang diperoleh (0.812) menunjukkan bahawa hubungan tersebut tidak signifikan pada aras keertian 0.05. Ini bermakna, peningkatan minat pelajar terhadap TVET tidak secara langsung meningkatkan kecenderungan mereka untuk memilih bidang elektrik. Walaupun kebanyakan pelajar menunjukkan minat terhadap TVET secara umum, faktor-faktor lain seperti prospek kerjaya, pengalaman praktikal, serta pengaruh persekitaran mungkin memainkan peranan yang lebih penting dalam mempengaruhi keputusan mereka.
ii. Berdasarkan dapatan tersebut, terdapat hubungan korelasi positif yang sederhana antara persepsi pelajar terhadap kursus elektrik dengan kecenderungan mereka untuk melanjutkan pengajian dalam bidang elektrik (r = 0.740). Walaupun nilai p yang diperoleh adalah 0.057, ia hampir mencapai tahap signifikan iaitu 0.05. Ini secara tidak langsung menunjukkan bahawa persepsi positif pelajar terhadap kursus elektrik berpotensi menjadi faktor yang mendorong minat untuk melanjutkan pengajian dalam bidang tersebut. Justeru, pendekatan pengajaran yang berkesan, pengalaman pembelajaran yang menarik, serta penekanan terhadap aplikasi praktikal dalam kursus elektrik boleh menjadi elemen penting dalam usaha menarik minat pelajar untuk terus mendalami bidang elektrik.

4. Kesimpulan

Kajian ini membuktikan bahawa kursus pendek Asas Elektronik dan Pendawaian Elektrik yang dilaksanakan semasa cuti sekolah berjaya meningkatkan minat pelajar terhadap bidang TVET. Dengan skor min yang tinggi, pelajar menunjukkan minat positif dan memperoleh pemahaman yang lebih mendalam mengenai potensi kerjaya dalam bidang teknikal. Selain itu, pelajar turut menyatakan kursus ini bermanfaat dalam meningkatkan kemahiran praktikal mereka. Selepas mengikuti kursus, kecenderungan pelajar untuk terus melibatkan diri dalam bidang TVET turut meningkat, menunjukkan impak positif daripada pendedahan awal kepada bidang kemahiran teknikal.

Secara keseluruhan, kursus pendek ini bukan sahaja memberi pendedahan awal kepada pelajar mengenai dunia TVET, malah turut meningkatkan keyakinan mereka untuk memilih TVET sebagai pilihan kerjaya pada masa hadapan. Walaupun terdapat sedikit variasi dalam tahap keyakinan pelajar untuk memilih TVET sebagai kerjaya jangka panjang, majoriti pelajar menunjukkan minat yang tinggi dan motivasi berterusan dalam bidang ini. Hasil kajian ini memberikan input penting kepada penganjur kursus pendek untuk menilai keberkesanan program yang dijalankan. Dapatan kajian menunjukkan minat dan persepsi positif pelajar terhadap TVET, yang dapat membantu memperbaiki kursus serta pendekatan pengajaran bagi program yang akan datang. Selain itu, kajian ini turut menyokong usaha penjenamaan TVET di sekolah, dengan menunjukkan bagaimana pendedahan awal mampu meningkatkan minat pelajar terhadap bidang teknikal. Dapatan bahawa pelajar cenderung untuk terus terlibat dalam TVET selepas kursus ini juga menyediakan maklumat berguna kepada pembuat dasar dalam merancang strategi pendidikan dan latihan yang lebih berkesan pada masa hadapan.

Berdasarkan hasil kajian, beberapa cadangan dikemukakan untuk meningkatkan keberkesanan kursus pendek TVET. Pertama, tempoh kursus perlu dipertimbangkan untuk dipanjangkan kerana

terdapat pelajar yang merasakan masa yang diperuntukkan terlalu singkat. Oleh itu, memperluas tempoh kursus atau menawarkan modul lanjutan boleh memberi peluang kepada pelajar untuk mendalami topik yang diajar. Selain itu, penggunaan kaedah pembelajaran yang lebih interaktif seperti simulasi, video pendidikan, atau perisian khas dapat meningkatkan kefahaman pelajar. Penekanan kepada peluang kerjaya dalam bidang TVET juga wajar dipertingkatkan, termasuk pendedahan kepada profesional industri dan latihan praktikal, agar pelajar dapat melihat potensi jangka panjang dalam bidang ini. Sokongan berterusan selepas kursus, seperti platform bimgan atau rangkaian alumni TVET, juga penting untuk memastikan pelajar terus bermotivasi. Akhir sekali, penyaluran maklumat yang lebih meluas mengenai kursus TVET, terutamanya melalui kempen kesedaran atau aktiviti promosi di sekolah, dapat menarik lebih ramai pelajar untuk mempertimbangkan TVET sebagai pilihan kerjaya masa depan.

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DESIGN OF A WEB-BASED TRANSACTION RECORDING INFORMATION SYSTEM FOR PT TANG TERANG KONSTRUKSI TO IMPROVE RECORDING EFFICIENCY AND ACCURACY

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Abstract

The rapid development of information technology has affected various business sectors, including the construction industry. *PT TANG TERANG KONSTRUKSI* who still uses a manual system to record its transactions, resulting in frequent errors, slow reporting, and difficulties in monitoring financial data. These issues raise the question: How can a transaction recording system be designed to increase efficiency and accuracy at PT TANG TERANG KONSTRUKSI? The purpose of this research is to design a web-based transaction recording information system at PT TANG TERANG KONSTRUKSI to improve efficiency and accuracy in managing transactions that have been conducted manually. It is expected that the implementation of this system will allow for faster and more accurate recording processes, thereby reducing the risk of errors that frequently occur. The research method employed is qualitative, utilizing observation, interviews, and literature studies to gather relevant data regarding user needs and challenges in current transaction management practices. The anticipated outcome of this research is the development of an information system that not only minimizes recording errors but also accelerates reporting and data analysis processes. However, during the development process, several unexpected outcomes were encountered, such as minor interface inconsistencies across different devices and occasional data input delays due to local server limitations. These issues, while not critical, suggest areas for future system improvement and optimization.
Keywords: Transaction; Recording; Web.

1. Introduction

In today's digital era, the rapid advancement of information technology has significantly impacted various sectors, including the construction industry. PT TANG TERANG KONSTRUKSI, as a company operating in this field, often faces challenges in recording and managing transactions, which are still performed manually. This conventional approach leads to delays, data duplication, and inaccuracy, all of which can negatively affect operational performance. To address these issues, a web-based information system is considered an effective solution. An information system is a collection of elements that function together to collect, process, store, and distribute information to support decision-making, coordination, and control in an organization (Fawwazy & Donoriyanto, 2024). (Fauziah, Firmansyah, & Aguswin, 2024) A website is a form of information system application that allows users to obtain information, interact, and conduct transactions online. By utilizing web technology, companies can manage and access data in real-time from multiple locations with improved accuracy. Furthermore, such systems facilitate data integration across departments, enhancing transparency and accountability in transaction processes. Accurate transaction recording is essential for construction companies, given the number of ongoing projects and the complexity of each transaction. Through an integrated system, PT TANG TERANG KONSTRUKSI is expected to minimize errors, accelerate reporting, and enhance data analysis for strategic decision-making.

Several previous studies support the adoption of web-based transaction systems. (Awaluddin, 2023) demonstrated that a web-based inventory system enhanced stock management efficiency. (Wijaya & Devitra, 2023) concluded that such systems helped reduce recording errors in retail inventory. (Maulana, Ginting, & Purwanto, 2023) showed that these systems facilitate real-time stock monitoring. Similarly, (Sari, 2023) explored the application of integrated accounting systems using PHP and MySQL to improve accuracy and operational performance. Therefore, this research aims to design and develop a web-based transaction recording information system tailored to the operational needs of PT TANG TERANG KONSTRUKSI. The proposed system is expected not only to resolve the current issues but also to serve as a reference model for other companies seeking to implement similar digital solutions in transaction management.

2. Methodology

This research was conducted at PT TANG TERANG KONSTRUKSI with the objective of designing a web-based transaction recording system to improve efficiency and accuracy in data management. The study was carried out over a period from March to May 2025. The research method employed is qualitative, involving both field research and literature review to obtain comprehensive and relevant data. Primary data were collected through direct observations and interviews with company staff involved in transaction management processes. These methods were essential in understanding the practical workflow, identifying system requirements, and pinpointing issues in the manual transaction process. Interviews were conducted with the company manager and related personnel to ensure the system design addressed real user needs (Rohmah, 2024). Secondary data were obtained from academic literature, journals, and online references related to information systems, database design, and web development technologies. These sources supported the theoretical foundation of the system design and guided the implementation process.

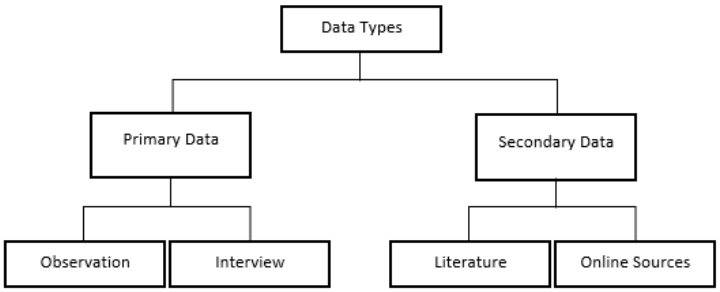

Fig. 1. Type of data

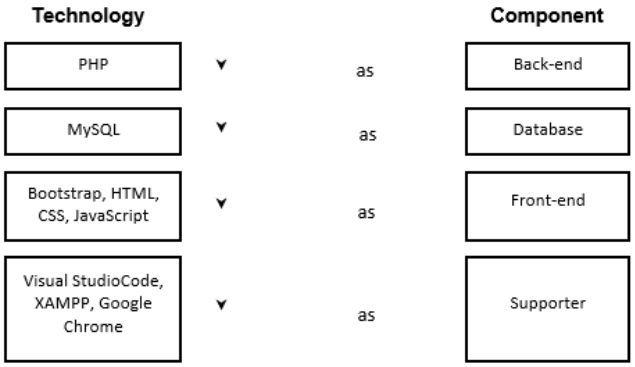

Fig. 2. Mapping of technologies to system components

The system was developed using PHP as the back-end programming language, MySQL as the database management system, and Bootstrap for the front-end framework to ensure a

responsive and user-friendly design. HTML, CSS, and JavaScript were also used to build the interface and dynamic components of the web application (Lockhart, 2021; John Doe, 2022). The data analysis process followed five key steps: data collection, data reduction, data presentation, conclusion drawing, and evaluation (Sugiyono, 2020). This structured approach ensured that the resulting system effectively addressed the problems identified and met the operational needs of the company.

3. Result and Discussion

The design and development of the web-based transaction recording system for PT TANG TERANG KONSTRUKSI focused on creating an efficient, accurate, and user-friendly solution. The system provides role-based access with two types of users: admin and owner. Admins are responsible for managing item data, company data, and transaction records, while owners have access to view existing transaction information only. The functionality of the system is illustrated through Use Case and Activity Diagrams. The use case diagram demonstrates the interaction between each user type and the system's core features. Admins can perform CRUD (Create, Read, Update, Delete) operations on item, company, and transaction data. Meanwhile, owners can only view records, ensure data integrity and prevent unauthorized modifications.

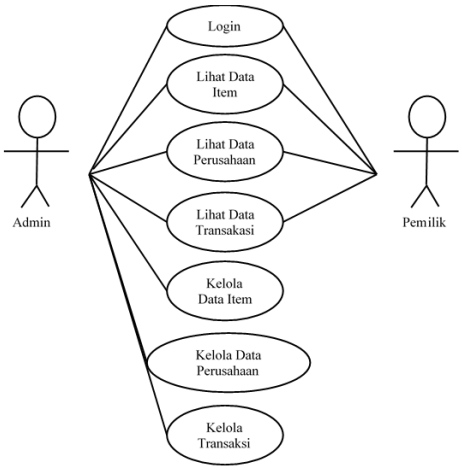

Fig. 3. Used Case Diagram

The activity diagram outlines the sequential steps carried out by users. Admins start from the login process, proceed to data entry (item, company, and transactions), and save the data to the system. Owners follow a simpler flow, where they log in and view transaction summaries. These diagrams provide a visual representation of the system's business processes and ensure clarity during implementation.

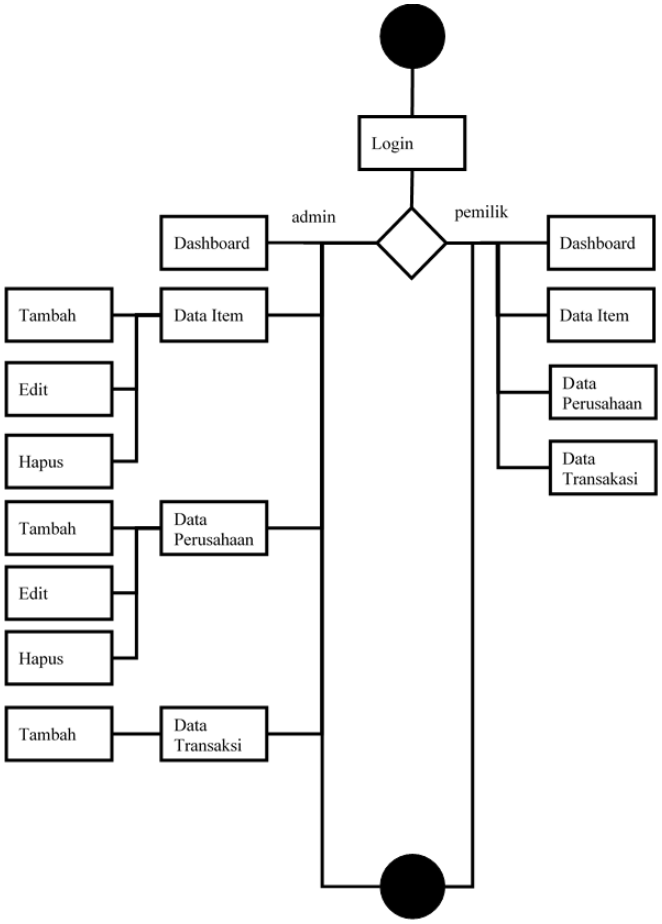

Fig. 4. Activity Diagram

To support the functionality of the system, a structured and relational database was designed using MySQL. The database includes several core tables, such as users, companies, items, purchase orders, and purchase order details. The users table manages account data with defined roles (admin or owner) that control access privileges. The companies table stores information related to clients or vendors involved in transactions, while the items table contains unit information for goods or materials. The purchase orders table holds transaction header data including purchase order number, date, payment method, and company reference, and the purchase order details table stores detailed records such as item name, quantity, unit price, and tax (PPN) classification. These interconnected tables maintain referential integrity through the use of primary and foreign keys, ensuring data consistency and enabling efficient transaction recording and retrieval across the system.

Table 1. Company

Column	Data Type	Description
id	INT	PRIMARY KEY, AUTO_INCREMENT
name	VARCHAR (100)	NOT NULL, company name
address	TEXT	Company address (optional)

This table is used to store information about companies involved in transactions. Each company record includes an id as the primary key, name for the company name, and address for the company's address. This table helps the system identify and categorize transactions by company.

Table 2. Data Item

Column	Data Type	Description
id	INT	PRIMARY KEY, AUTO_INCREMENT
unit_name	VARCHAR (50)	NOT NULL, name of the item unit (e.g., pcs, liter)

This table stores data related to item units used in transactions. The id column serves as the primary key, while unit name stores the unit names such as “pcs”, “liter”, or “meter”. This table supports clarity in quantity recording for each transaction.

Table. 3. Purchase Order

Column	Data Type	Description
id	INT	PRIMARY KEY, AUTO_INCREMENT
po_number	VARCHAR (50)	NOT NULL, purchase order number
po_date	DATE	NOT NULL, purchase order date
company_id	INT	NOT NULL, FOREIGN KEY to companies(id)
payment_method	ENUM ('Giro', 'Cash', 'TFR')	Payment method: Giro, Cash, or Transfer (TFR), DEFAULT NULL
payment_date	DATE	Payment date, DEFAULT NULL
sfpm_number	VARCHAR (100)	SFPM number (Tax Invoice), DEFAULT NULL
receipt_status	VARCHAR (100)	Goods receipt status, DEFAULT NULL
grand_total	DECIMAL (15,2)	Total purchase amount, DEFAULT NULL

This table contains the main data of purchase transactions conducted by the company. Key columns include id, po_number, po_date, company_id (relation to the company table), payment_method, payment_date, sfpm_number, receipt_status, and grand_total. This table forms the core of the transaction recording system.

Table 4. Purchase Order Detail

Column	Data Type	Description
id	INT	PRIMARY KEY, AUTO_INCREMENT
po_id	INT	NOT NULL, FOREIGN KEY to purchase_orders(id)
item_name	VARCHAR (255)	NOT NULL, name of the item
unit_id	INT	FOREIGN KEY to units(id), item unit
quantity	INT	Item quantity, DEFAULT 0
unit_price	DECIMAL (15,2)	Unit price, DEFAULT 0.00
ppn_type	ENUM ('include', 'exclude', 'non_ppn')	VAT type: include, exclude, or non-VAT, NOT NULL
ppn_value	DECIMAL (15,2)	VAT value, DEFAULT 0.00

This table stores the detailed information of each transaction recorded in the Purchase Order table. Each row links a transaction to one or more items via po id. Other information such as item name, unit id, quantity, unit_price, ppn_type, and ppn.Value is stored to fully represent the purchase details, including tax calculations.

Table 5. User

Column	Data Type	Description
id	INT	PRIMARY KEY, AUTO_INCREMENT
username	VARCHAR(50)	NOT NULL, UNIQUE, user name
password	VARCHAR(255)	NOT NULL, user password (usually hashed)
role	ENUM('admin', 'user')	User role, DEFAULT 'user'
created_at	TIMESTAMP	Record creation time, DEFAULT CURRENT_TIMESTAMP
updated_at	TIMESTAMP	Last update time, DEFAULT CURRENT_TIMESTAMP ON UPDATE CURRENT_TIMESTAMP

This table stores user account data for those who have access to the system. Each user has an id, username, and encrypted password. The role column defines whether the user is an admin or a company owner, determining their access level in the system. The table also

records the timestamps for account creation and updates using the created at and updated at fields. The system was successfully implemented based on the initial design specifications. Upon login, users are directed to a role-specific dashboard displaying summarized statistics, such as total items, companies, and transactions. Admins can perform data entry and management through structured forms, while owners are presented with data views for monitoring purposes. The transaction module includes detailed forms for recording purchase order information, including item details, quantities, pricing, and tax types. Each interface element from item and company management to transaction tracking was tested and validated to ensure it functions as intended. The implemented system has proven effective in facilitating accurate data input, reducing manual errors, and enabling transparent monitoring of business transactions.

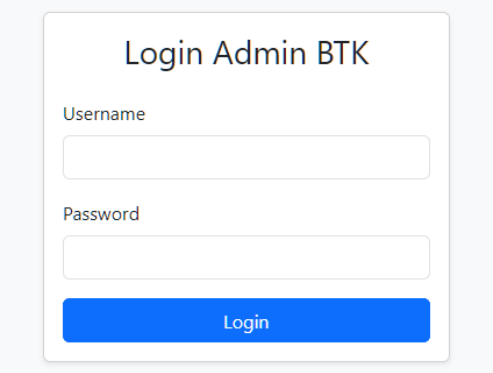

Fig. 5. Login Page

This page is the actual display of the login feature used by users to access the system. Users must enter a registered username and password to log in according to their access rights.

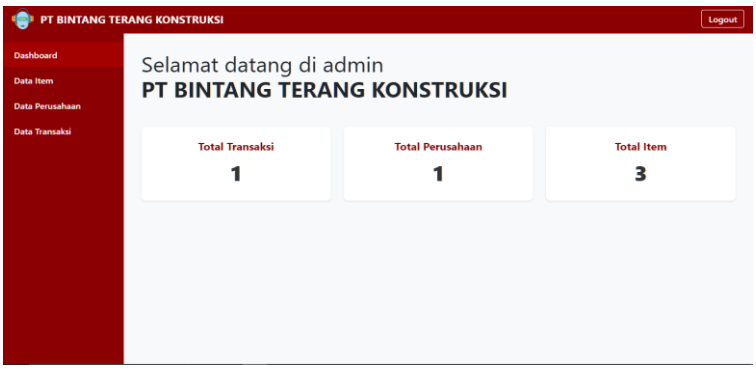

Fig. 6. Dashboard Page

This is the initial view after a successful login. The dashboard displays summary data such as the total number of transactions, items, and companies, helping users quickly monitor overall activity.

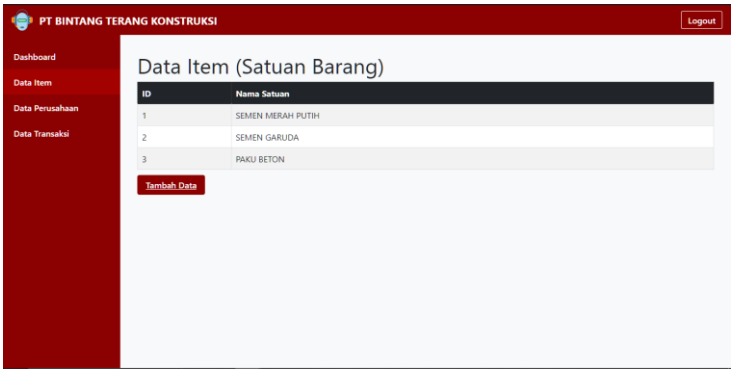

Fig. 7. Data Item Page

This page displays a list of item entries previously input by the admin. It also includes buttons for adding new items and options for editing or deleting existing item data.

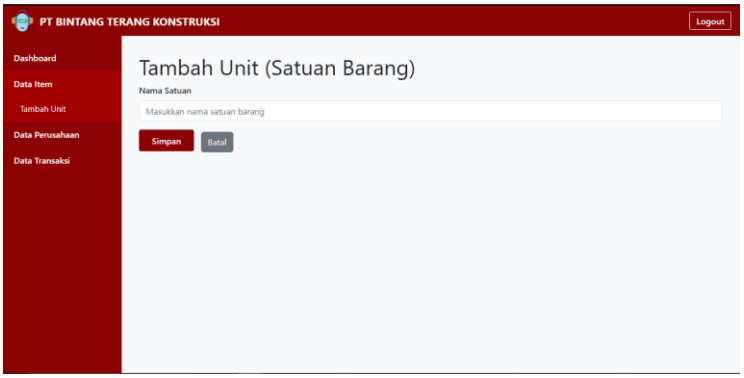

Fig. 8. Add / Edit Data Item Page

This page contains a form used to add new items into the system or edit existing ones. Admins can easily and efficiently enter item names and their corresponding units.

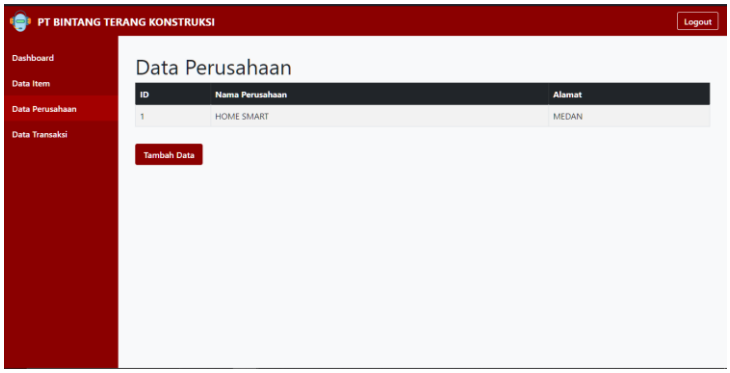

Fig. 9. Data of Company Page

This page displays data of companies previously recorded by the admin. It also includes buttons to add, edit, or delete company data to ensure proper data management.

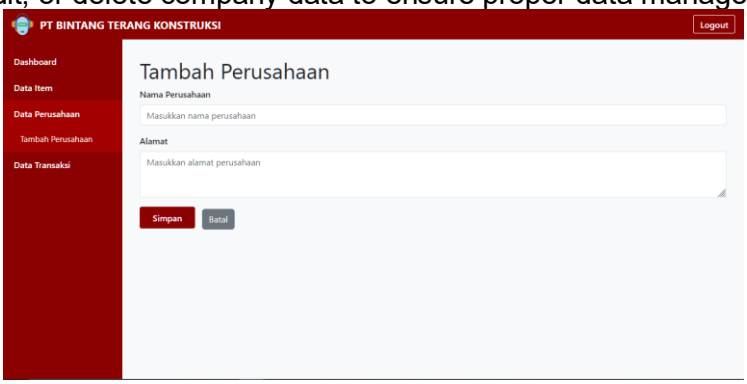

Fig. 10. Add / Edit Data of Company Page

This page contains a form for adding or updating company data, such as company name and address. The layout is designed to help admins efficiently manage partner companies involved in transactions.

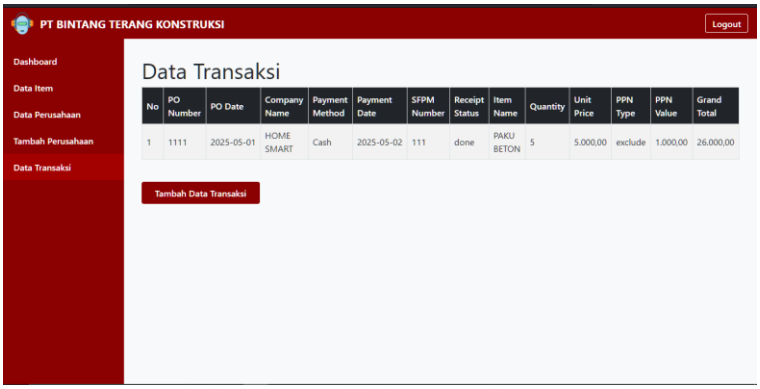

Fig. 11. Transaction Page

This page displays a list of transactions that have been entered into the system. Admins can review recorded transaction information and manage data by adding new entries or modifying existing ones.

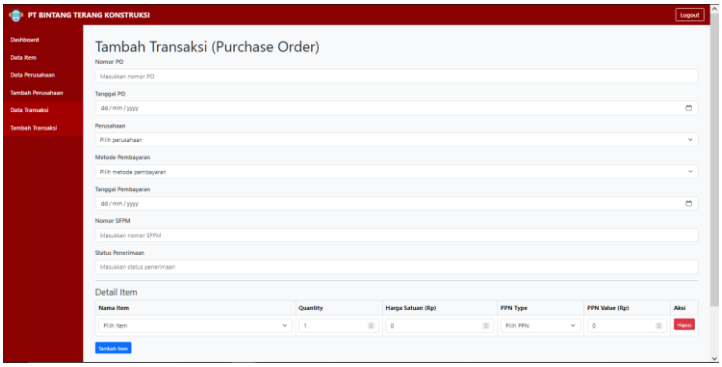

Fig. 12. Transaction Detail Page

This page presents a complete form for recording purchase transactions. The inputs include item data, company information, item quantity, price, transaction date, and other related details, allowing for accurate and detailed transaction records. The design and implementation of a web-based transaction recording information system at PT TANG TERANG KONSTRUKSI aimed to improve efficiency and accuracy in the company's transaction processes. Developed using PHP, MySQL, and Bootstrap, the system features data integration, user authentication, and a responsive interface. Evaluation results indicate that the system successfully reduces data duplication, accelerates input and tracking processes, and minimizes user errors. Although it currently operates locally, the system has effectively replaced manual recording methods and provides a solid foundation for future enhancements such as online access and improved security features.

4. Conclusion

The web-based transaction recording information system developed for PT TANG TERANG KONSTRUKSI has successfully addressed the initial objectives of enhancing efficiency and accuracy in transaction management. The system enables admins to manage data items, companies, and transaction records quickly and accurately, while allowing company owners to monitor data transparently in real-time. With structured workflows, a responsive interface, and role-based access, the system improves data integrity, minimizes recording errors, and supports faster decision-making. Overall, the implementation of this system significantly contributes to better transaction handling and lays a foundation for further development, including online access and enhanced security features.

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DESIGN OF A WEB-BASED STOCK RECORDING INFORMATION SYSTEM AT BERKAH JAYA BUSINES

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Abstract

Currently, there are still many small businesses that record stock items manually, either in notebooks or excel. Unfortunately, this method often causes problems such as inaccurate data, and is also prone to loss. This is also experienced by the Berkah Jaya business. As the business grows, the need for a more organized, faster, and easily accessible recording system becomes increasingly important. This research aims to design a web-based stock recording information system at Berkah Jaya business that is expected to enhance inventory management efficiency and minimize errors in recording. This system is anticipated to provide accurate and real-time reports that support better decision-making processes within the operational activities of the business. The research method employed is qualitative, utilizing observation, interviews, and literature studies as its primary approaches. By observing current inventory management processes and conducting interviews with the owner and employees of the Berkah Jaya business, data will be collected to analysed user needs and design features appropriate for this specific context. The results of this study show that the designed system can run well and is able to record incoming, outgoing and damaged goods transactions in real-time. This system also succeeded in simplifying the stock tracking process, reducing recording errors and of course not easily lost. With this system, Berkah Jaya now has a more organized, efficient, and easily accessible stock record at any time.
Keywords: system, inventory, web

1. Introduction

In today's digital era, the role of information technology has become increasingly critical across various sectors, including business operations. Small and medium-sized enterprises (SMEs) are especially challenged to improve their operational efficiency while managing limited resources. One vital component of their business process is inventory management, where accuracy and timeliness are essential. Without proper systems, businesses often suffer from stock shortages or overstocking, which can hinder customer satisfaction and lead to financial losses. Berkah Jaya, a growing trading business currently manages its inventory through manual records. This conventional method is prone to human error, difficulty in stock tracking, and inefficiencies in generating accurate reports. Manual systems also restrict accessibility, as they are often limited to physical locations and require constant manual input and verification. As the business expands, the need for a more structured and responsive inventory system becomes crucial. The implementation of a web-based inventory information system is expected to address these issues by offering real-time access, structured data handling, and automation in reporting. This type of system would enable the business owner to monitor stock status, reduce redundancy, and support data-driven decision-making. Moreover, the ability to access inventory information anytime and anywhere can significantly improve the responsiveness of business operations.

This concern has been widely recognized and examined in various recent studies. (Jati and Permatasari 2024) demonstrated that a FIFO-based web inventory system significantly improved efficiency and reduced expired stock at a bakery business. Similarly, (Lestari et al.

2024) emphasized how SMEs like coffee shops can benefit from integrated web-based systems to automate recording and provide better insights for management decisions. Meanwhile, (Sudrajat and Putri 2024) revealed how replacing Microsoft Excel with a Laravel-based web system can reduce discrepancies between physical and recorded stock data, thus minimizing human error and improving overall reliability. These studies reinforce the importance of adopting digital systems for better inventory management.This research aims to design and develop a web-based inventory information system tailored to the operational needs of Berkah Jaya. The system is expected to enhance the accuracy and efficiency of inventory management, support real-time data processing, and improve business decision-making. It is also intended to serve as a reference for similar SME-focused system development in the future.

2. Methodology

This study adopted a qualitative descriptive approach focusing on system development using the waterfall model. This study was conducted at Berkah Jaya, a small trading business, from March to May 2025. The research participants included the business owner and staff, who were directly involved in inventory operations. These participants provided valuable insights through interviews and direct observation regarding the challenges and processes of the existing manual stock recording system. The procedure began with field research involving both observation and interviews. Observation was used to assess the day-to-day practices in inventory management, while interviews explored the owner's expectations and problems faced in stock recording. These steps were followed by a literature study, which involved reviewing relevant books, journals, and previous studies on inventory systems and web-based applications. The system development itself was planned based on this collected data (Ismail 2020).

The primary materials used in this research were both primary and secondary data. Primary data came from direct interaction with the business (field notes, interview transcripts, and inventory records), while secondary data were obtained from related academic sources. The tools and technologies used to build the proposed system included PHP for backend development, MySQL for database management, and Laravel as the framework to create a responsive, scalable web-based system. These tools were chosen for their compatibility and accessibility for SMEs (Sugiyono 2020).Data were analysed using a qualitative descriptive approach. The analysis began with data collection, followed by data reduction, which involved summarizing and selecting the most relevant data. The next step was data presentation in structured formats, enabling easier pattern identification and decision-making. The final step was concluding and evaluating how well the proposed system could address the identified problems (Rohmah 2024). In developing the system, this research adopted the Rapid Application Development (RAD) methodology, emphasizing iterative prototyping, user involvement, and quick delivery. The RAD phases included requirement planning, system design, construction, and implementation. The system was tested using black-box testing to ensure that all functionalities met user expectations. The proposed system is expected to enhance accuracy, reduce data redundancy, and support real-time stock tracking for Berkah Jaya (Maichel Hardi et al. 2022).

3. Results and Discussion

One of the key components in developing a reliable inventory information system is the database design. The database for the Berkah Jaya inventory system was designed to support multiple users, item categories, and transactions (inbound, outbound, and damaged stock). The relational structure was defined with six main tables: User, Product Type, Product, Incoming Transactions, Outgoing Transactions, and Damaged Stock Transactions. Each table was carefully structured to maintain data integrity, for instance, by enforcing foreign key relationships between product data and transaction records. The User table includes fields

such as username, password, and role, which allow for role-based access control for cashiers, supervisors, and business owners (Coronel 2020) (Doe 2020).

Table. 1 User

Column	Data Type	Description
user_id	INT	PRIMARY KEY, AUTO_INCREMENT
username	VARCHAR(50)	NOT NULL, UNIQUE
password	VARCHAR(255)	NOT NULL
role	VARCHAR(20)	NOT NULL, DEFAULT 'admin'
created_at	TIMESTAMP	DEFAULT CURRENT_TIMESTAMP

This table serves as the entrance to the system, recording who can log in, what their role is and when their account was created. This coding is important to set security and access restrictions in the system.

Table. 2 Product type

Column	Data Type	Description
type_id	INT	PRIMARY KEY, AUTO_INCREMENT
Type_name	VARCHAR(100)	NOT NULL

This table is used to distinguish the types of goods available. For example, which ones include food, which ones are drinks. So, all items are more organized and easier to find.

Table. 3 Product

Column	Data Type	Description
Product_id	INT	PRIMARY KEY, AUTO_INCREMENT
product_name	VARCHAR(150)	NOT NULL
type_id	INT	FK ke Jenis_Produk (id_jenis), ON DELETE SET NULL
unit_id	INT	FK ke Satuan (id_satuan), ON DELETE SET NULL
stock	INT	DEFAULT 0

This table is used to store all information about the goods or products available in the store. Each product has a name, type, unit and the amount of remaining stock.

Table 4. Incoming Transaction

Column	Data Type	Description
transaction_id	INT	PRIMARY KEY, AUTO_INCREMENT
product_id	INT	FK ke Produk (id_produk), ON DELETE CASCADE
number input	INT	NOT NULL
transaction_date	DATE	NOT NULL
description	TEXT	

This table stores data every time an item comes in. So, the admin can know what items have just arrived, when they arrived, and in what quantity.

Table 5. Outgoing Transaction

Column	Data Type	Description
transaction_id	INT	PRIMARY KEY, AUTO_INCREMENT
product_id	INT	FK ke Produk (id_produk), ON DELETE CASCADE
number out	INT	NOT NULL
transaction_date	DATE	NOT NULL
description	TEXT	

This table serves to record every item that goes out of stock, such as items sold. This data is useful for accurately tracking stock reduction.

Table. 6 Damaged Stock Transaction

Column	Data Type	Description
transaction_id	INT	PRIMARY KEY, AUTO_INCREMENT
product_id	INT	FK ke Produk (id_produk), ON DELETE CASCADE
quantity damaged	INT	NOT NULL
transaction_date	DATE	NOT NULL
description	TEXT	

This table is used to record items that are damaged and cannot be sold anymore. The goal is that the admin can still control the stock and know how many items can no longer be used.

Following the design phase, the web-based inventory information system was implemented using PHP and the Laravel framework, with MySQL as the backend database. The application features several user interfaces designed to streamline inventory operations, including a login page for user authentication with role-based access, a dashboard providing real-time summaries of incoming, outgoing, and damaged stock, and a product management interface for adding and categorizing product types. It also includes transaction entry pages for recording stock movements specifically for incoming goods, outgoing goods, and damaged items as well as a reporting module that allows the business owner to view and export stock movement summaries efficiently (Blum 2021) (John Doe 2022).

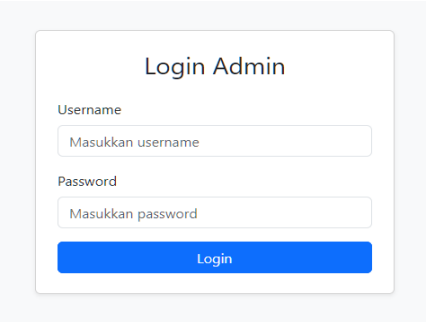

Fig. 1. Login Page

This page is used by the admin to enter the system by filling in the username and password. The goal is to limit access so that only authorized users can enter and manage data.

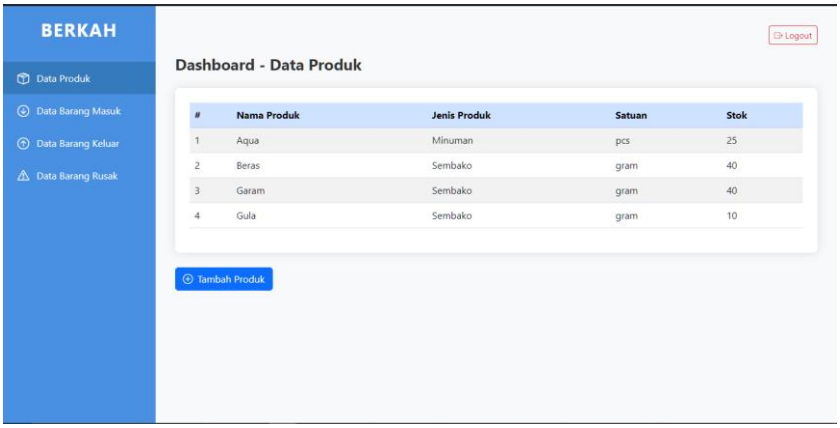

Fig. 2. Data of Product Page

This is the product data section page. On this page, the admin can see a list of all available products, complete with information on product name, type, unit, and stock quantity. In addition, there is also an add product button at the bottom to add new item data to the system.

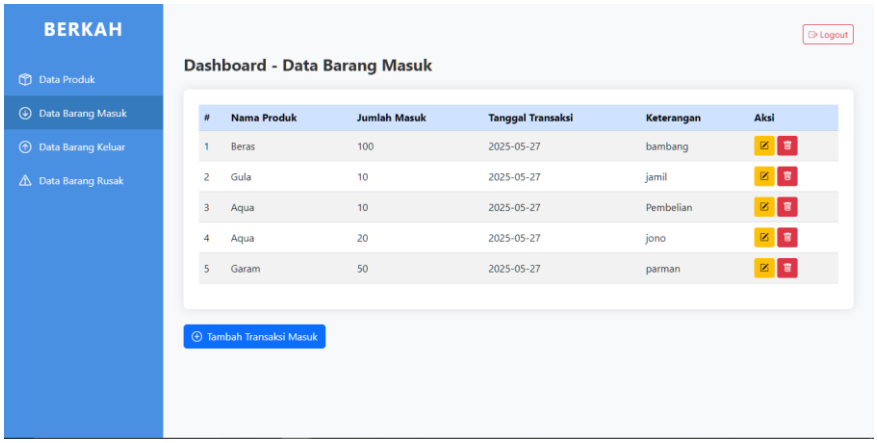

Fig. 3. Incoming Transaction Page

This page displays a list of incoming goods transactions consisting of product name, quantity, date and description. Admins can add new transactions via the add incoming transaction button or can change and delete data using the edit and delete icons found in the action column.

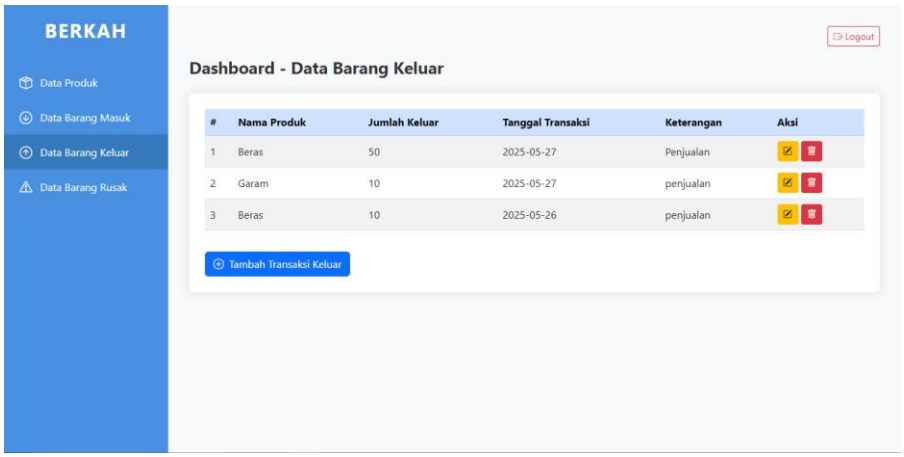

Fig. 4. Outgoing Transaction Page

This figure shows the history of goods that have left the warehouse. Each row displays product information, quantity issued, transaction date, and additional notes. On the right, there are buttons to modify or delete data if there are errors. In addition, the admin can also add new transactions via the blue button below.

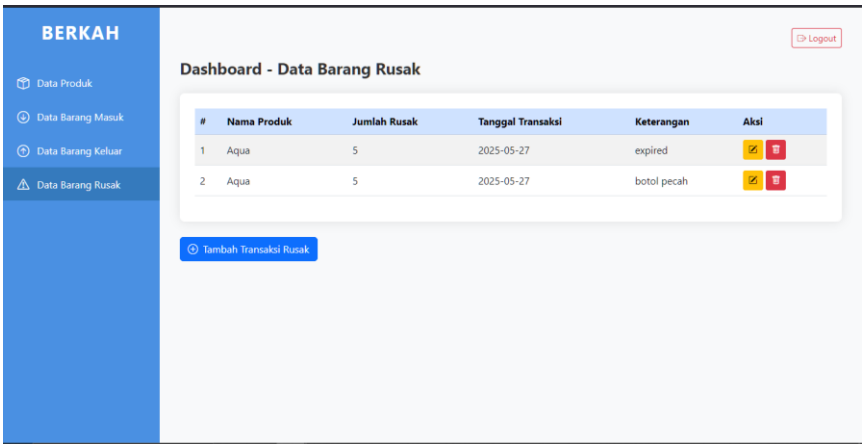

Fig. 5. Damaged Stock Transaction Page

This view displays a list of items that can no longer be sold or used, for example due to expiration or physical damage such as broken bottles and others. Each entry records the product name, the number of damaged items, the date of occurrence and a brief explanation. Admins can add new damage data or update old data through the edit and delete buttons in the action column. The implementation of the web-based inventory system has shown improvements in the efficiency and accuracy of inventory recording compared to the manual system. Real-time data access allows users to track stock movement immediately after transactions are recorded. This helps reduce human errors often caused by late or inconsistent data entry, as highlighted in the Introduction. By adopting role-based access control, the system ensures that only authorized personnel can access or modify certain records, which enhances data security. The interface was designed to be simple and responsive, ensuring accessibility from various devices and supporting remote monitoring—an important feature for business owners.

The use of separate modules for incoming, outgoing, and damaged stock allows for clear and structured data collection. These modules correspond directly with the methods section where stock transactions and user interactions were planned based on observational and interview data. The system also integrates historical records that assist in planning future procurement and stock analysis. Compared to existing research, such as Jati et al. (2024), which applied FIFO to reduce material expiry in a bakery, or Sudrajat and Putri (2024), who emphasized eliminating spreadsheet-based tracking errors, this system aligns closely by reducing manual operations and improving traceability. Unlike those prior systems, however, this implementation specifically targets small-scale trading businesses, addressing unique needs such as rapid transaction entry and minimal technical training.

4. Conclusion

This study was conducted to design and implement a web-based inventory information system for Berkah Jaya, aiming to improve the accuracy and efficiency of stock management processes. The system was successfully developed using PHP, HTML, Bootstrap for a responsive and user-friendly interface, and MySQL for structured and integrated database management. The implemented system supports real-time recording and monitoring of stock transactions, including incoming, outgoing, and damaged goods. This greatly simplifies stock tracking activities for the admin. Additionally, the system features role-based access control to ensure that only authorized users can access and manage sensitive inventory data. This project has demonstrated that small businesses like Berkah Jaya can benefit from adopting affordable and accessible web-based solutions to digitalize their operational workflows. The system improves data transparency, reduces manual errors, and facilitates timely decision-making through more efficient inventory control.

For future development, it is recommended to enhance the user interface to be more interactive and responsive across devices. The system could also benefit from features such as low-stock alerts, automatic data backups, stricter data validation, and improved security mechanisms to safeguard against unauthorized access and data loss. Limitations of this research include the absence of predictive analytics or alert systems for low stock levels, which may be considered in future development. Nevertheless, the results suggest that the system significantly supports inventory control and can be adapted by other similar SMEs.

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DESIGN OF MORINGA PRODUCTION INFORMATION SYSTEM AT PT KELORIA MORINGA JAYA BASED ON WEB

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Abstract

PT Keloria Moringa Jaya cultivates and processes Moringa into products like tea, capsules, and herbal powder. Currently, its production data is recorded manually using notebooks and spreadsheets, leading to issues such as data duplication, lost information, delayed reporting, and difficulty tracking stock and quality. This inefficient system risks planning errors and financial losses. In order to overcome these problems, a web-based production information system needs to be integrated, accurate, efficient, and can be accessed at any time by related parties. This study aims to design the system with the support of observation methods, interviews, and design approaches using Flowcharts, DFDs, and ERDs. The proposed system is expected to be able to improve operational efficiency, minimize data input errors, accelerate the reporting process, and strengthen the company's competitiveness in the herbal product industry. This research successfully designed a web-based production information system tailored to PT Keloria Moringa Jaya's needs for recording and managing Moringa production data. This system replaces manual methods prone to recording errors, data loss, and reporting delays, with a more efficient and accurate centralized and automated recording system.
Keywords: Production Information System; Moringa; Web Based.

1. Introduction

Indonesia as an agricultural country has great potential in developing herbal plants such as Moringa (Moringa oleifera) which are rich in nutrients and have high economic value (Tuas et al., 2024). Moringa can also grow in various tropical climate conditions, including dry areas and less fertile soil (Angelina, Swasti, & Pranata, 2021), so that it is increasingly in demand by local and global markets. PT Keloria Moringa Jaya is one of the companies engaged in the cultivation and processing of Moringa into consumer products such as tea, capsules, and herbal powder (Ola, 2020). The production process includes stages from seedling to packaging, which involves many resources so it must be carried out carefully to maintain quality (Rika Widianita, 2023). However, production recording in this company is still done manually using notebooks, spreadsheets, and other printed media (Ilmi & Metandi, 2020). This method risks data duplication, loss of information, late reporting, and difficulty in monitoring stock and quality of raw materials in real time, which can ultimately reduce product quality and work efficiency (Syaputra & Sharipuddin, 2023).

This problem shows the importance of implementing an integrated and web-based production information system (Permatasari & Suhendi, 2020), so that the recording, monitoring, and reporting processes can be carried out more efficiently and accurately (Handayani & Lubis, 2021). Several previous studies have also proven the effectiveness of information systems in managing production data automatically and in real-time (Abdiati, Setiawan, & Supendar, 2021). Therefore, an integrated and automatic web-based production information system is needed to improve efficiency, accuracy, and ease of access for related parties (Gede Endra Bratha, 2022). This study aims to design a web-based production information system that can assist PT Keloria Moringa Jaya in recording, monitoring, and reporting production data more effectively and efficiently. This system is expected to minimize data input errors, accelerate the recapitulation process, and facilitate the management of access rights for each user.

2. Methodology

This study applies a software engineering design approach that aims to design a moringa production information system in accordance with operational needs at PT Keloria Moringa Jaya. The research process begins with the system needs identification stage, followed by analysis, design, and implementation of the system prototype. The research location was conducted directly at PT Keloria Moringa Jaya located in Medan, North Sumatra. To obtain accurate and relevant data, several data collection techniques were used, namely: direct observation of the production process and recording that takes place in the field, structured interviews with management and operators to obtain detailed information on system requirements, and literature studies to understand the theories and basic principles in designing web-based information systems. System design is carried out with tools such as flowcharts are used to describe the overall flow of the production recording process.

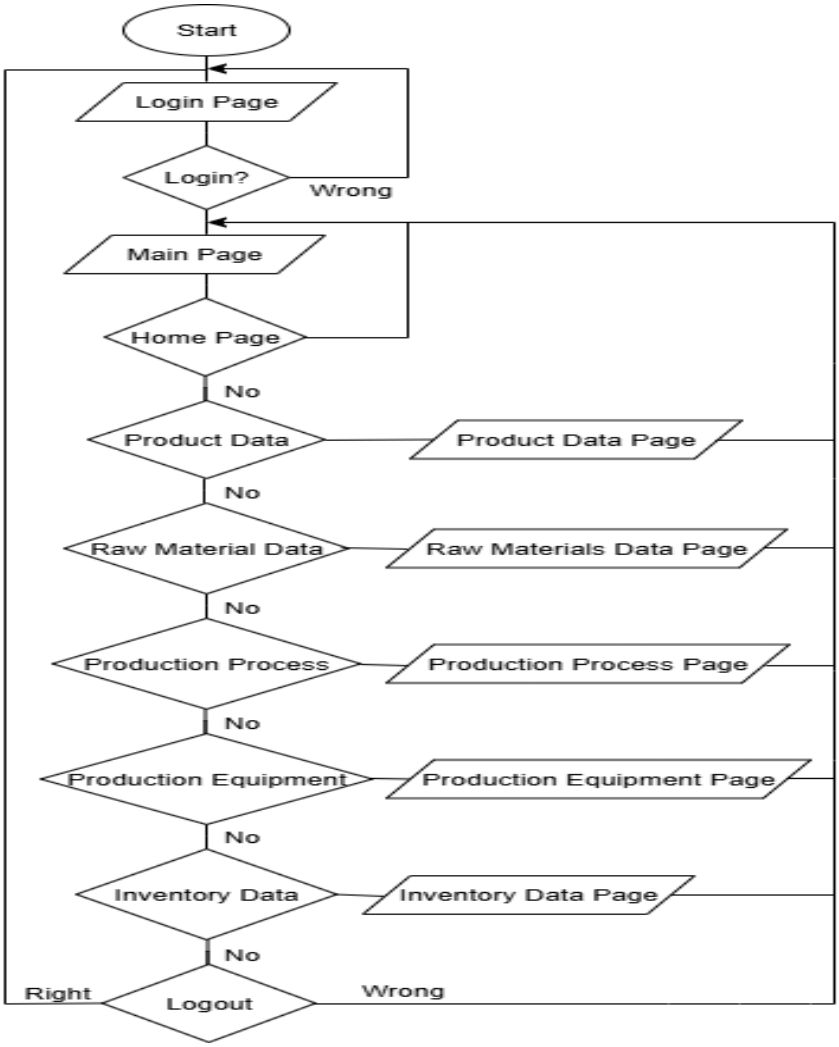

Fig. 1. Flowchart Data Flow Diagram (DFD)

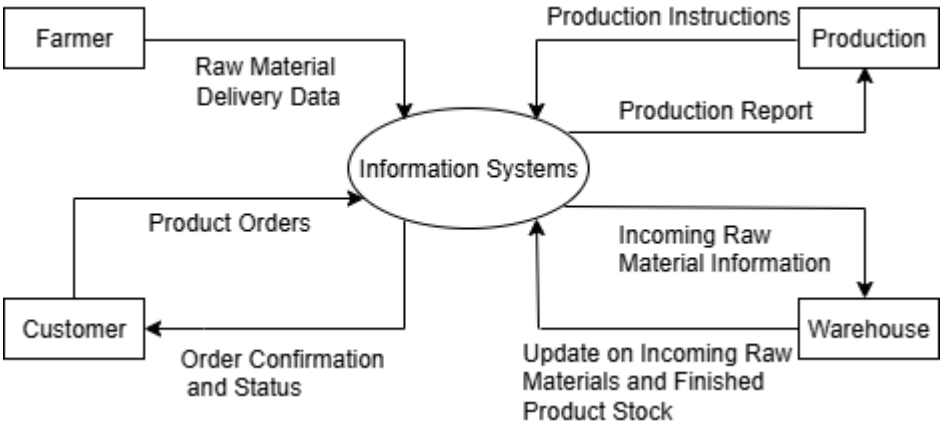

Fig. 2. Data Flow Diagram (DFD)

Entity Relationship Diagram (ERD) is used to design a relational database structure that will store production data, raw materials, and other information systematically.

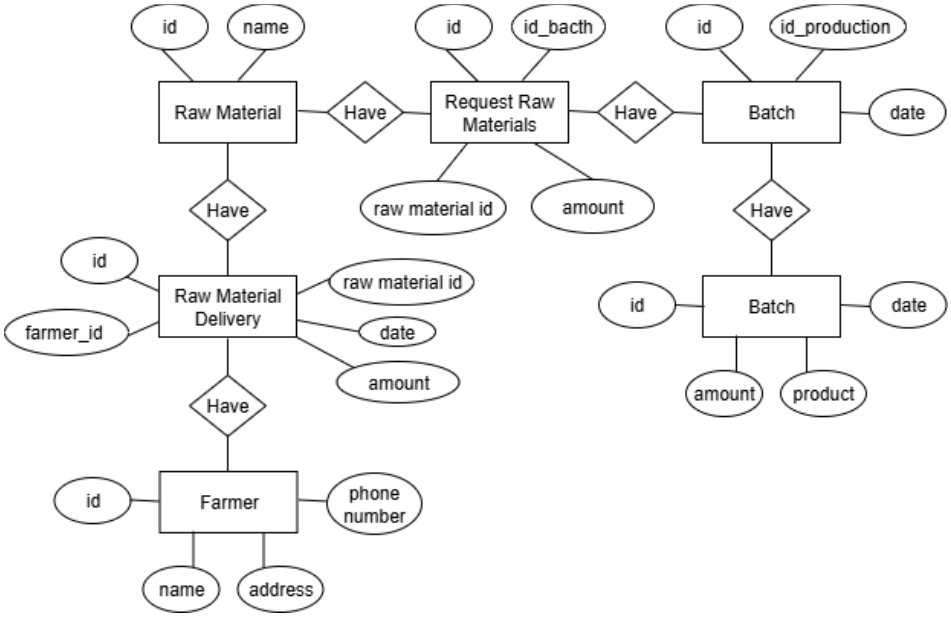

Fig. 3. Entity Relationship Diagram (ERD)

System development is done using:

i. HTML for designing the interface structure.
ii. PHP to handle backend logic and processes.
iii. MySQL for storing and managing system data.

3. Results and Discussion

A data structure is a method or pattern used to store and manage data in a computer so that it can be accessed and used efficiently. This structure regulates how data is stored, retained, and retrieved within a program or system. The database structure is designed to ensure the integrity and accuracy of information. Each entity has a primary key and the relationships between tables are designed in a stable ERD model.

The login table is used to store information about employees or users who have access permission to this payroll information system.

Table 1. Table Login

Field	Data Type	Size
username	Varchar	50
password	Varchar	255

The product data table is used to store information about the products available in the information system related to production management.

Table 2. Product Data Table

Field	Data Type	Size
no	int	11
nama_produk	varchar	100
kemasan	varchar	50
berat_isi	varchar	20
harga	decimal	10,2
kategori	varchar	50
produksi_per_bulan	int	11

The raw material data table is used to store information about the raw materials used in the production process.

Table. 3. Raw Material Data Table

Field	Data Type	Size
no	int	11
nama_produk	varchar	100
bahan_baku	varchar	200
kebutuhan_per_unit	varchar	100

The production process table is used to store information about the stages or production activities carried out.

Table. 4. Production Process Table

Field	Data Type	Size
no	int	11
nama_produk	varchar	100
tahapan_proses	text	-
waktu_proses	varchar	50
suhu_kondisi_khusus	varchar	100

The stock data and production equipment table is used to store information regarding stock data used in production activities.

Table. 5. Stock Data Table

Field	Data Type	Size
no	int	11
jenis_item	enum	-
nama_item	varchar	100
stok_awal	decimal	10,2
produksi	decimal	10,2
penjualan	decimal	10,2
stok_akhir	decimal	10,2

The system's interface is built based on a user-centered design principle, focusing on usability for a wide range of users, including those without technical expertise. Rather than listing each feature separately, the interface is described in an integrated manner. Key components such as the dashboard, product input, stock management, and contact pages are organized with

user-friendly layouts and neutral color palettes to support seamless and easy navigation throughout the system. The Login page serves as an initial security measure that ensures that only authorized users can access the Main Menu, thus preventing access by unauthorized parties.

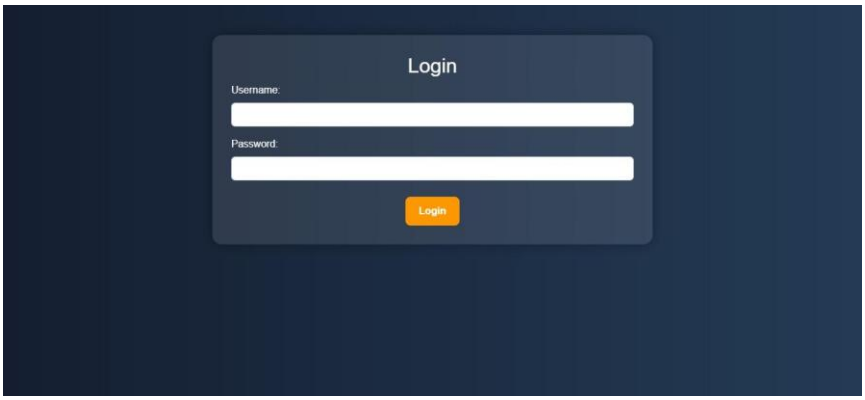

Fig. 4. Login Page Display

The Home page is the main display after logging in, which displays a summary of important information and quick access to the main features of the Moringa production information system.

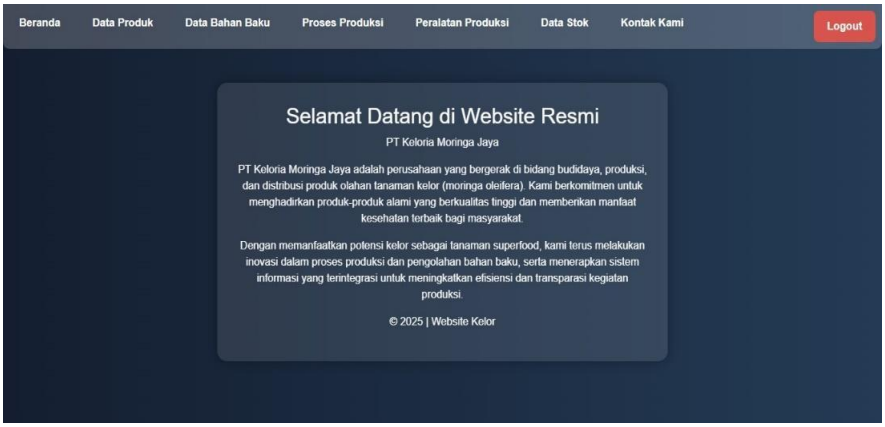

Fig. 5. Home Page View

The Product Data page displays and manages moringa product information, including adding, editing, and deleting data, making it easier to manage products in a structured and efficient manner.

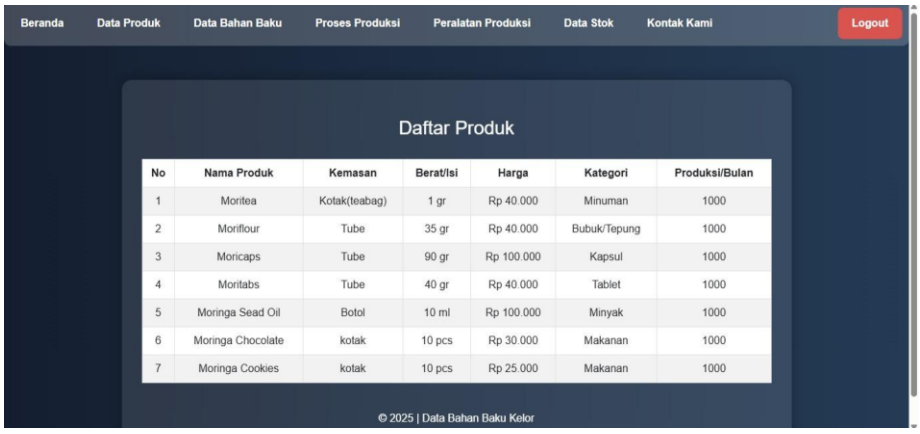

Fig. 6. Product Data Page Display

The Raw Material Data page is used to manage raw material stock, including adding, updating, editing, and deleting data, to ensure the availability of materials for smooth production.

Fig. 7. Raw Material Data Page View

The Production Process Data page records and displays daily moringa production activities, including adding, editing, and deleting data, to ensure accurate and documented record keeping.

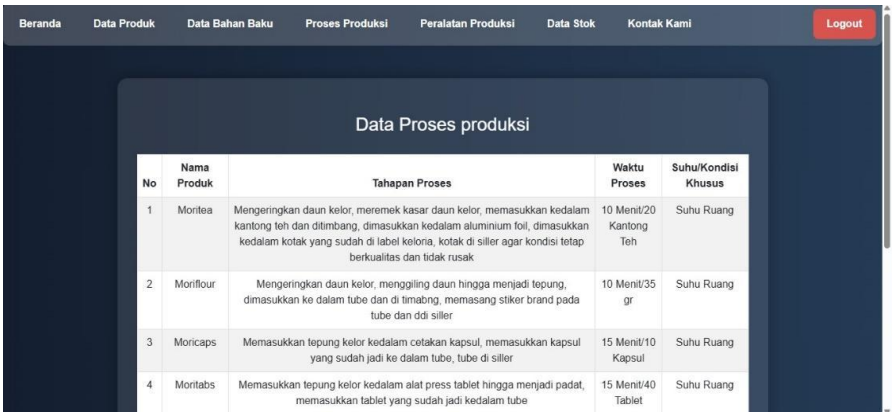

Fig. 8. Production Process Data Page View

The Stock Data page is used to monitor and manage the availability of raw materials and finished products, including quantity adjustments and storage information updates, to support smooth production in real-time.

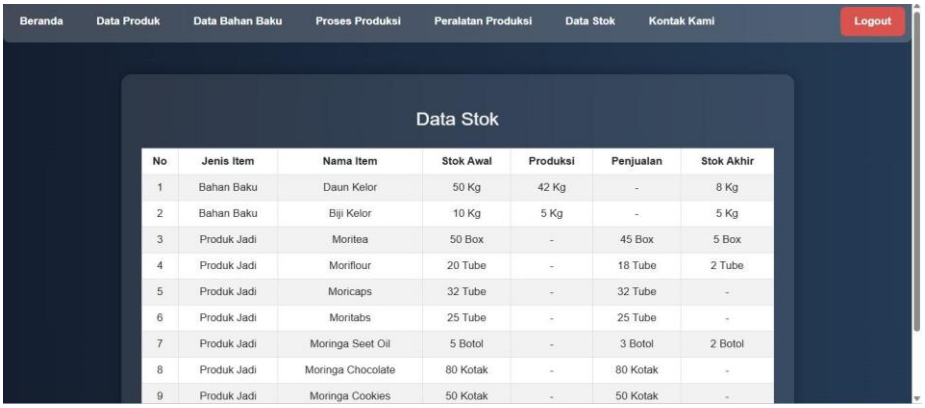

Fig. 9. Stock Data Page Display

4. Conclusion

The web-based Moringa Production Information System at PT Keloria Moringa Jaya is designed to replace the manual recording process that was previously carried out using books and spreadsheets. This system makes it easier to record, monitor, and report production data in real time, including product data, raw materials, and production processes, equipment, and stock. Each feature has a specific function, such as a login page for access security, a product and raw material data module for recording production input, and a production process page for recording work stages and times. The system is also equipped with a stock management feature that displays initial stock, production, sales, and final stock automatically. With a simple and responsive interface, this system is easy to use by internal admins. The use of a structured database helps reduce input errors, data duplication, and late reporting. As a result, the production process becomes more efficient, accurate, and easy to control, and supports improving the company's operational performance.

This research successfully designed a web-based production information system that is tailored to the company's needs in recording and managing moringa production data. This system replaces manual methods that are prone to errors, data loss, and reporting delays, with centralized and automatic recording that is more efficient and accurate. Equipped with features for recording product data, raw materials, production stages, machine usage, and stock data, this system supports the overall production process. The simple and easy-to-use interface makes it easy for admins and production staff to access information in real-time, so that monitoring can be carried out optimally and decision making becomes more precise, maintaining the quality and continuity of the production process. For future research, it is recommended that the system that has been designed continues to be developed sustainably so that it becomes more comprehensive and able to support various more complex operational needs in the future.

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IMPLEMENTATION OF THE TAM TO EVALUATE THE USE OF THE RAPORT DIGITAL MADRASAH PLATFORM AT MTSS AN NAJAH

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Abstract

The integration of information technology into education has become essential, particularly within the madrasah context. One such application is the Report Digital Madrasah (RDM), developed to streamline the digital input and reporting of student grades. Despite its intended benefits, the system has not been fully utilized by all teachers, likely due to varying perceptions regarding its usability and usefulness. This study seeks to assess teacher acceptance of RDM at MTsS An Najah using the Technology Acceptance Model (TAM) framework. The variables examined include Perceived Usefulness (PU), Perceived Ease of Use (PEOU), and Behavioral Intention to Use (BIU). A quantitative approach was adopted, employing a descriptive-verificative method and collecting data through questionnaires administered to 13 teachers. The findings reveal that PEOU significantly influences BIU, while PU does not show a statistically significant effect. Nevertheless, both PU and PEOU together have a significant impact on BIU, with a coefficient of determination (R^2) of 95.2%. These findings suggest that perceived ease of use is a more dominant factor in shaping teachers' intentions to adopt and use the RDM system.
Keywords: PUSH; RDM; Perceived Usefulness; Perceived Ease of Use; Behavioral Intention to Use.

1. Introduction

In the current digital era, the transformation of information and communication technology (ICT) has become an urgent necessity in the field of education. Digitalization not only impacts the teaching and learning process but also extends to the administrative governance of educational institutions, including student assessment and reporting systems (H. Kusumaningrum et al., 2024). In Indonesia, one of the digitalization initiatives developed by the Ministry of Religious Affairs is the Madrasah Digital Report Platform (Rapor Digital Madrasah, or RDM), which aims to enhance the efficiency and integration of online grade reporting by connecting with the national Education Management Information System (EMIS)(Kemenag RI, 2022).

However, the adoption of educational technologies such as RDM often faces various challenges, particularly in terms of user acceptance. Studies by Fajrin and Machali (N. Fajrin and I. Machali et al., 2023) and Rahmawati and Narsa (R. N. Rahmawati and I. M. Narsa et al., 2019) indicate that factors such as limited digital literacy, insufficient training, and non-intuitive user interface design can hinder teachers' effective utilization of digital systems. In this context, the Technology Acceptance Model (TAM), introduced by Davis (1989), remains a dominant theoretical framework for explaining technology adoption behavior.

TAM posits that two primary constructs; Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) influence an individual's Behavioral Intention to Use (BIU) system. Numerous contemporary studies support the validity of this model in educational contexts. For instance, research by Teo (T. Teo, 2011) and Venkatesh et al. (V. Venkatesh and F. D. Davis et al., 2000) confirms the significant relationship between PU, PEOU, and BIU in various digital

education systems. In the Indonesian context, demonstrate that both PU and PEOU contribute to teachers' acceptance of platforms such as Learning Management Systems (LMS) and RDM (A. Qonita et al., 2018; H. Agustina et al., 2023; A. Mulyani et al., 2023).

Nevertheless, much of the existing literature has focused primarily on large-scale e-learning systems or academic management systems in higher education institutions. There remains a gap in research specifically examining the adoption of RDM in smaller or privately managed madrasahs, which often face resource constraints. Research by Hasanah et al. (Hasanah et al., 2022) highlights the importance of local context in applying the TAM framework, as cultural factors, institutional policies, and infrastructure readiness can significantly influence the effectiveness of technology adoption.

The purpose of this study is to evaluate teachers' acceptance of the use of the Raport Digital Madrasah (RDM) at MTsS An Najah by employing the Technology Acceptance Model (TAM) approach. Specifically, the study aims to analyze the influence of the constructs Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) on Behavioral Intention to Use (BIU) in the context of digital technology adoption in madrasahs. Additionally, this research seeks to identify the simultaneous effect of PU and PEOU on BIU, as well as to determine which construct exerts the most dominant influence on teachers' intention to use RDM. By articulating the objectives systematically and structurally, this study is expected to provide both empirical and theoretical contributions to enhancing the understanding of the factors influencing technology acceptance in the Islamic education sector, particularly in the implementation of digital administrative systems in madrasahs.

2. Methodology

2.1 Types of research

The type of research used in this study is a quantitative approach with a descriptive-verification method to evaluate the extent to which PU and PEOU affects BIU on the use of the Report Digital Madrasah (RDM). Quantitative research is used to measure the influence between variables in the model. Technology Acceptance Model (TAM), that is PU, PEOU and BIU in the context of using the Report Digital Madrasah (RDM). The descriptive approach is used to provide an overview of the acceptance of technology by MTsS An Najah teachers, while the verification approach is used to test the hypothesis of the relationship between variables in the TAM model. The study was conducted at MTsS An Najah, Langkat Regency, North Sumatra, from March to May 2025.

2.2 Population and Research Sample

The population in this study were all teachers who actively teach at MTsS An Najah and have used the Report Digital Madrasah (RDM) in the academic administration process. The population was chosen because teachers are the main users of this platform in inputting and managing student report data digitally. Based on data from the madrasah, the total number of active teachers using the RDM platform is 13 people. This number is the basis for determining the population in this study.

Given the relatively small population size (fewer than 30 individuals), this study employed a total sampling or census sampling technique, in which every member of the population is included as a research participant. This approach was chosen to ensure that the data collected would be highly representative and provide accurate insights into the factors influencing technology acceptance as outlined in the TAM framework. According to administrative records, there were 13 active teachers at the institution, all of whom were involved as

participants in the study. Data on participant characteristics were gathered based on gender, age, teaching experience, and duration of RDM usage.

2.3 Data Collection Techniques

In this study, the data collection method used is a quantitative method with a survey approach using a closed questionnaire based on a 5-point Likert scale as the main instrument. This method was chosen because it is in accordance with the objectives of the study to measure and test the relationship between variables in the model. Technology Acceptance Model (TAM), that is PU, PEOU, and BIU regarding the use of the Report Digital Madrasah (RDM).

2.4 Data Quality Test

2.4.1 Validity Test

Validity testing is carried out to determine the extent to which the questions in the questionnaire are able to measure the intended variables accurately (Sugiyono et al., 2019). In this study, the validity test was carried out using the correlation technique. Pearson Product Moment. The testing criteria were:

i. If the value of $r_{count} > r_{table}$ (at a significance level of 0.05) and the sig. value (p-value) < 0.05, then the statement item is declared valid.
ii. If the value of $r_{count} < r_{table}$ (at a significance level of 0.05) and the sig. value (p-value) > 0.05, then it is declared invalid and can be considered for disposal or repair.

2.4.2 Reliability Test

Reliability testing is used to measure the level of consistency (reliability) of an instrument Sugiyono, (2019). This test is carried out using the technique Cronbach's Alpha. The testing criteria were:

i. If the value Cronbach's Alpha≥ 0.60, then the instrument is declared reliable or consistent.
ii. If the value Cronbach's Alpha< 0.60, then the instrument is declared less reliable.

2.4.3 Data Analysis Test

Multiple linear regression analysis is employed to examine both the joint and individual influences of the independent variables (PU and PEOU) on the dependent variable (BIU). The analysis is based on the following general regression model:

$$Y = \alpha + \beta^1 X^1 + \beta^2 X^2 + e \quad (1)$$

Information:
Y = Use of digital report platform (BIU)
α = Constant
β^1, β^2= Regression coefficient
X^1 = Perceived Usefulness (COULD)
X^2 = Perceived Ease of Use (PEOU)
e = Error

2.5 Research Hypothesis Testing

2.5.1 Partial Test (t-Test)

The partial test (t-test) aims to determine the influence of variables on the implementation of TAM, PU and PEOU on the use of RDM. (I. Ghozali, 2018) explains that the t-statistic test measures the extent to which one independent variable affects the dependent variable, assuming that the other independent variables remain constant. This test is carried out using a significance level of 0.05. The following are the criteria for a partial test:

i. H0 : Variable X does not have a significant effect on Y
ii. Ha : Variable X has a significant effect on Y

Criteria: H0 is rejected if Sig. < 0.05

2.5.2 Simultaneous Test (f-Test)

According to (I. Ghozali, 2018) the f test is a test used to assess how important the relationship between independent variables is collectively to the dependent variable. The following are the criteria for simultaneous testing.

i. H0 : Variable X does not have a significant effect on Y
ii. Ha : Variable X has a significant effect on Y

Criteria: H0 is rejected if Sig. < 0.05

2.5.3 Test of Determination Coefficient (R^2)

According to (W. Sujarweni, 2022) the Coefficient of Determination (R^2) functions to measure how much influence the independent variable (X) has on the dependent variable (Y), which is expressed in percentage form. The higher the R^2 value, the greater the proportion of variation in variable Y that can be explained by variable X. Conversely, if the R^2 value is low, then the ability of variable X to explain changes in variable Y is also low.

3. Results and Discussion

3.1 Results of Research Instrument Validity Test

In this study, the validity test was conducted using the Pearson Product Moment correlation method, which assesses the relationship between the score of each questionnaire item and the total score of the corresponding variable. An item is considered valid if the calculated correlation coefficient (r-value) exceeds the critical r-table value and the significance level is less than 0.05, indicating that the item is appropriate for measuring the intended construct in the study.

Table 1. Results of the validity test of research instruments

Variables	Item	r_count	Sig.(2-tailed)	Information
Perceived Usefulness (X1)	PU1	0.972	0.000	Valid
	PU2	0.949	0.000	Valid
	PU3	0.991	0.000	Valid
	PU4	0.968	0.000	Valid
	PU5	0.953	0.000	Valid
Perceived Ease of Use (X2)	PEOU1	0.989	0.000	Valid
	PEOU2	0.992	0.000	Valid
	PEOU3	0.977	0.000	Valid
	PEOU4	0.989	0.000	Valid
	PEOU5	0.982	0.000	Valid
Behavioral Intention to Use (AND)	BIU1	0.977	0.000	Valid
	BIU2	0.960	0.000	Valid
	BIU3	0.949	0.000	Valid

Results of Table 1. Validity testing of the questionnaire instrument used in this study shows that all statement items in the independent variable (Perceived Usefulness dan Perceived Ease of Use) and dependent variables (Behavioral Intention to Use) has a calculated r-value > r-table (0.553) at a significance level of 0.05. This means that each item in the questionnaire has a significant and strong correlation to the total score of each construct, so that all the instruments submitted are declared valid and suitable for use in the data collection process.

3.2 Results of Reliability Test of Research Variables

In this study, reliability testing was carried out using the technique Cronbach's Alpha, which is a statistical method that tests internal consistency between items in one variable. An instrument is said to be reliable if the value Cronbach's Alpha> 0.60. The closer to 1, the higher the level of instrument reliability. This test is very important to ensure that the questionnaire used has stability and reliability in measuring the construct being studied.

Table 2. Results of reliability test of research variables

Variables	N of items	Cronbach's Alpha	Information
Perceived Usefulness (X1)	5	.982	Reliable
Perceived Ease of Use (X2)	5	.992	Reliable
Behavioral Intention to Use (Y)	3	.959	Reliable

The results of the reliability test in Table 2 show that all statement items in the independent variables PU and PEOU, as well as the dependent variable BIU, have a value Cronbach's Alpha above 0.60. This shows that each construct in the Technology Acceptance Mode l(TAM) used in this study is reliable and has good internal consistency. In other words, the questionnaire instrument used to measure teacher acceptance of the Madrasah Digital Report Platform (RDM) at MTsS An Najah is stated to be consistent in measuring teacher perceptions and intentions of use. This high reliability strengthens the belief that the data obtained can be relied on in the subsequent analysis process.

3.3 Linear Regression Analysis Test Results

Multiple linear regression tests are used to determine the effect of more than one independent variable (X) on one dependent variable (Y) simultaneously or partially. This model is suitable for research involving complex constructs such as TAM (Technology Acceptance Model).

Table 3. Multiple Linear Regression Test

Coefficients[a]						
		Unstandardized Coefficients		Standardized Coefficients	t	Say.
Model		B	Std. Error	Beta		
1	(Constant)	.005	.908		.005	.996
	PU_total	.176	.115	.290	1.525	.158
	PEOU_total	.404	.110	.700	3.679	.004

Note. a. Dependent Variable: BIU_total

With the following equation:

$$Y = \alpha + \beta^1 X^1 + \beta^2 X^2 + e$$

$$Y = 0.005 + 0.176X^1 + 0.404X^2 + e \quad (2)$$

Where:
Y = Use of digital report platform (BIU)
α = Constant
β^1, β^2= Regression coefficient

X^1 = Perceived Usefulness (COULD)
X^2 = Perceived Ease of Use (PEOU)
e = Error

From the equation above, the results can be interpreted as follows:

i. PU (X_1/ TOTAL): Coefficient B = 0.176 → every 1 unit increase in PU will increase BIU by 0.176. Sig. = 0.158 (> 0.05) → not statistically significant This means that PU does not have a strong enough influence on the intention to use the system.
ii. PEOU (X_2/ TOTAL2): Coefficient B = 0.404 → every 1 unit increase in PEOU will increase BIU by 0.404. Sig. = 0.004 (<0.05) → statistically significant This means that the perception of ease of use has a positive and significant effect on the intention to use RDM.
iii. Constant (α = 0.005): The value is very small and not significant (p = 0.996). It has no practical meaning in this model.

The results of the multiple linear regression test show that of the two independent variables tested, only the variable PEOU has a positive and significant partial influence on BIU. Meanwhile, PU did not show a significant effect. This means that the ease of use of the RDM system plays a greater role in encouraging teachers' intention to use it compared to the perception of its usefulness.

3.4 Partial Hypothesis Testing Results (t-Test)

The t-test, or often called the partial test, is one of the statistical tests used in regression analysis to determine whether each independent variable (X) individually (partially) has a significant influence on the dependent variable (Y).

Table 4. Partial Test (t-Test)

Coefficients[a]					
		Unstandardized Coefficients		Standardized Coefficients	t	Say.
Model		B	Std. Error	Beta		
1	(Constant)	.005	.908		.005	.996
	PU_total	.176	.115	.290	1.525	.158
	PEOU_total	.404	.110	.700	3.679	.004

Note. a. Dependent Variable: BIU

The following are the calculated regression values using the t-test, which can be seen from the calculations carried out using SPSS:

i. Perceived Usefulness (PU_total) has a significant value of 0.158 (> 0.05), so it does not have a significant partial effect on Behavioral Intention to Use (BIU). This means that teachers' perceptions of the usefulness of the RDM system are not strong enough to increase their intention to use it independently.
ii. Perceived Ease of Use (PEOU_total) has a significant value of 0.004 (<0.05), so it has a significant effect on BIU. This shows that the perception of ease of use of RDM plays an important role in increasing teachers' intention to use the system.
iii. Constant (Intercept) of 0.005 with a significance of 0.996 does not have a statistically significant influence and only serves as a starting point in the prediction model.

From the results of the regression calculations using SPSS, it can be concluded that only the variables PEOU have a significant influence on teachers' intention to use the Madrasah Digital

Report (BIU). Meanwhile, the variable Perceived Usefulness (PU) does not show a significant partial influence.

3.5 Simultaneous Test (f-Test)

The F test, or often called the simultaneous test, is one of the analysis techniques in multiple

linear regression which is used to test whether all independent variables together (simultaneously) have an effect on the dependent variable.

Table 5. Simultaneous Test (f-Test)

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Say.
1	Regression	125.936	2	62.968	98.826	<,001[b]
	Residual	6.372	10	.637		
	Total	132.308	12			

Note. a. Dependent Variable: BIU
b. Predictors: (Constant), PEOU, PU

The results of the F-test presented in the ANOVA table show that the calculated F-value is 98.826, with a significance level of less than 0.001, which is well below the threshold of 0.05. This indicates that, taken together, the variables PU and PEOU have a statistically significant effect on BIU. Therefore, the regression model applied in this study is considered suitable for explaining the relationship between these variables.

3.5.1 Test of Determination Coefficient (R^2)

The Coefficient of Determination (R^2) Test is a statistical method used in regression analysis to measure how much of the proportion of variability in the dependent variable (Y) can be explained by the independent variable (X) in a model.

Table 6. Coefficient of Determination Test (R2)

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.976[a]	.952	.942	.798

Note. a. Predictors: (Constant), PEOU, PU

Based on the results of the determination coefficient test, it was obtained R Square of 0.952, which means that 95.2% of the change in BIU can be explained by the variables PU and PEOU simultaneously. The remaining 4.8% is explained by other factors outside this research model. This value indicates that the regression model used has very high predictive power and can be relied on to explain the dependent variable.

3.5.2 The Influence of Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) on Behavioral Intention to Use (BIU)

The results of this study indicate that Perceived Ease of Use (PEOU) has a significant influence on teachers' Behavioral Intention to Use (BIU) the Madrasah Digital Report (RDM) platform, whereas Perceived Usefulness (PU) does not show a significant partial effect. This finding is consistent with Teo(T. Teo, 2011), who argues that in educational contexts, ease of use often becomes a dominant factor in shaping behavioral intentions, especially when users have not fully explored the system's functional benefits. At MTsS An Najah, where most teachers have used RDM for over two years, the ease of navigation and interface appears to be prioritized over the system's strategic advantages.

The non-significance of PU in affecting BIU can be further explained by Venkatesh and Davis (V. Venkatesh and F. D. Davis et al., 2000), who developed TAM2, emphasizing that external factors such as system quality, training, and institutional support moderate the relationship between PU and BIU. In this study's context, the lack of comprehensive training and limited resources may hinder teachers from fully recognizing or leveraging RDM's potential, thereby weakening their perception of its usefulness.

However, the simultaneous test (F-test) confirms that PU and PEOU together significantly influence BIU. This supports Davis' (1989) foundational TAM theory that PU and PEOU are interrelated and collectively shape users' intention to use technology. Similarly, Putra et al. (Y. W. S. Putra and N. Hardiyanti et al., 2021) found that once users perceive a system as easy to use, they are more likely to recognize its benefits and adopt it willingly, especially in the madrasah context.

The coefficient of determination (R^2) of 0.952 shows that 95.2% of the variation in BIU is explained by PU and PEOU, confirming that TAM provides a strong explanatory model for technology acceptance among teachers at MTsS An Najah. This supports the findings of Agustina et al. (H. Agustina et al., 2023), who concluded that TAM is a highly relevant framework for evaluating digital educational systems in Islamic school environments, especially when systems are newly adopted and user literacy varies.

Practically, these findings underscore the need for simplified RDM features and an improved, user-friendly interface. Enhancing teachers' perceptions of usefulness can be achieved through showcasing how RDM improves administrative efficiency and academic reporting. Moreover, practice-oriented training strategies should be developed to strengthen digital literacy and deepen teachers' functional understanding of the system.

4. Conclusion

Based on the results of data analysis and discussion, this study concludes that in the context of implementing the Technology Acceptance Model (TAM) to evaluate the use of the Raport Digital Madrasah (RDM) at MTsS An Najah, only Perceived Ease of Use (PEOU) has a positive and significant influence on Behavioral Intention to Use (BIU), with a significance value of 0.004 (< 0.05), while Perceived Usefulness (PU) does not show a significant effect (sig. 0.158 > 0.05). Simultaneously, PU and PEOU have a significant influence on BIU ($F = 98.826$; sig. < 0.001), with a coefficient of determination (R^2) of 0.952, indicating that 95.2% of the variation in BIU can be explained by these two variables. These findings highlight that ease of use plays a more dominant role than perceived usefulness in encouraging technology adoption among teachers in the madrasah environment. The study contributes theoretically by reaffirming the validity of the TAM framework in Islamic education contexts, particularly in small-scale private madrasahs. Practically, it recommends that RDM developers and education stakeholders prioritize user training and interface improvements to enhance perceived ease of use. However, the study is limited by its small sample size and narrow institutional scope. Further research involving broader samples and diverse madrasahs is suggested to validate and generalize these findings.

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PENILAIAN SENSORI TEPUNG PRACAMPURAN BAGI PENGHASILAN SEDIAAN SENDIRI NUGGET AYAM

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Abstrak

Kajian ini dijalankan bagi mendapatkan penilaian sensori dari aspek warna, rupabentuk, tekstur, aroma, rasa dan penerimaan keseluruhan terhadap nugget yang dihasilkan sendiri menggunakan tepung pracampuran . Tepung pracampuran ini mengandungi tiga komponen utama iaitu tepung pracampuran nugget, tepung pracampuran salutan batter, dan serbuk roti. Tiga sampel nugget digunakan iaitu nugget yang dihasilkan menggunakan tepung pracampuran, dan dua lagi nugget yang sedia ada di pasaran. Seramai 50 orang responden tidak terlatih terlibat dalam ujian penilaian sensori ini yang terdiri daripda pelajar semester dua Sijil Teknologi Pemprosesan Makanan Kolej Komuniti Jelebu. Hasil keputusan ujian ANOVA satu hala mendapati bahawa tiada perbezaan signifikan ($P=0.61$, $P>0.05$) terhadap aspek penerimaan keseluruhan bagi ketiga-tiga sampel nugget yang digunakan. Hal ini secara umum dapat disimpulkan bahawa nugget yang dihasilkan sendiri menggunakan tepung pracampuran dapat diterima setara dengan nugget di pasaran dan berpotensi untuk diterima di pasaran.

Keywords: Nugget ayam; Tepung pracampuran; Hasilan ayam.

1. Pengenalan

Nugget merupakan makanan yang dihasilkan dari isi ayam yang dicampur dengan beberapa bahan lain seperti air, bahan pengikat, rempah ratus, bahan perasa, dan seringkali disalut dengan serbuk roti sebelum digoreng rangup sebelum dimakan (Ratulangi,2021). Pada masa kini terdapat pelbagai jenis nugget dengan pelbagai formulasi baharu sesuai dengan kehendak pengguna (Bagas Dwi Nugraha, 2019). Nugget ayam sedia ada di pasaran biasanya dijual dalam bentuk sejuk beku dan perlu digoreng semula di rumah sebelum dimakan. Nugget ayam digemari oleh pelbagai lapisan masyarakat tidak kira kanak-kanak, remaja mahupun golongan dewasa. Nugget ayam juga seringkali dijadikan menu sebagai bekal anak-anak ke sekolah kerana mudah untuk ibu-ibu menyediakannya selain bentuk dan saiznya yang sesuai untuk anak-anak (Nusa dan Adi, 2013).

Walaubagaimanapun, nugget ayam yang terdapat di pasaran mengandungi kandungan garam dan lemak yang tinggi. Bahan perasa tambahan dan bahan pengawet turut ditambah ke dalam adunan nugget. Keadaan ini akan memberi kesan kepada kesihatan manusia jika nugget diambil secara kerap dan berlebihan.

Tercetusnya idea bagi menghasilkan produk inovasi tepung pracampuran bagi menghasilkan nugget ayam sendiri di rumah adalah bagi memudahkan pengguna untuk menghasilkan sendiri nugget ayam di rumah. Antara ciri-ciri utama tepung pracampuran ini adalah rendah

kandungan garam dan lemak, tiada bahan perasa tambahan, dan tiada bahan pengawet. Selain itu, kandungan bahan yang lengkap membantu memudahkan pengguna untuk tidak lagi membeli bahan secara berasingan. Dalam satu pek tepung pracampuran nugget ayam ni sudah lengkap iaitu bahan untuk adunan nugget, bahan salutan batter dan salutan serbuk roti. Hal ini dapat menjimatkan masa dan kos. Satu paket tepung pracampuran ini sudah lengkap untuk menghasilkan nugget sendiri di rumah.

Tepung pracampuran ini terdiri daripada tiga komponen utama iaitu tepung bagi adunan nugget, tepung bagi salutan batter, dan serbuk roti (rujuk Rajah 1). Pengguna hanya perlu menyediakan 400 g ayam kisar dan air untuk digaul bersama tepung pracampuran ini. Pengguna juga boleh menambah bahan lain seperti bawang, serbuk lada hitam, lobak hancur atau bahan – bahan lain yang diingini.

Rajah 1. Tepung pracampuran nugget ayam

Tepung pracampuran bagi adunan nugget dihasilkan dari tepung kentang, protein soya terasing, dan sedikit garam, manakala tepung bagi salutan batter dihasilkan dari tepung gandum, tepung jagung dan serbuk lada sulah. Pengguna perlu mencampurkan bahan - bahan ini dengan air mengikut sukatan yang diberikan pada panduan penggunaan bagi menjadikannya dalam bentuk cecair salutan batter. Panduan lengkap langkah demi langkah juga turut diberikan di dalam bungkusan tepung pracampuran ini.

Tepung pracampuran ini sangat berpotensi untuk dikomersialkan kerana penggunannya yang mudah, cepat, menjimatkan kos dan masa penyediaan. Produk ini merupakan satu alternatif produk yang kurang garam dan lemak serta tiada bahan perasa tambahan.

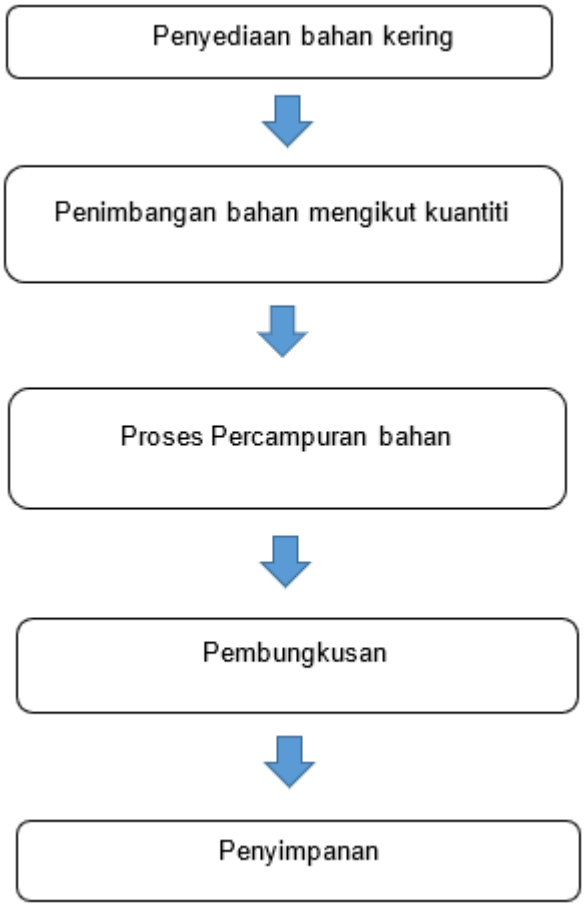
Kajian ini dijalankan bagi mendapatkan maklum balas dari pengguna berkenaan penggunaan tepung pracampuran ini dalam penghasilan nugget dari sudut sensori iaitu rasa, warna, aroma, tekstur (kelembutan), rupa bentuk, dan penerimaan keseluruhan nugget yang dihasilkan dengan menggunakan tepung pracampuran ini.

2. Metodologi

2.1 Proses penghasilan tepung pracampuran

i. Proses penyediaan bahan kering

ii. Proses menimbang semua bahan mengikut kuantiti
iii. Proses mencampurkan semua bahan hingga sebati.
iv. Proses pembungkusan mengikut jenis bahagian iaitu bahagian pracampuran nugget, tepung salutan batter, dan serbuk roti.



Rajah 2. Carta alir penghasilan tepung pracampuran nugget ayam

2.2 Proses Ujian Sensori

Sebanyak 3 sampel nugget telah digunakan iaitu sampel pertama merupakan nugget yang dihasilkan sendiri menggunakan tepung pracampuran, dan dua lagi sampel nugget dengan jenama berbeza yang ada di pasaran. Seramai 50 orang responden tidak terlatih dari pelajar semester 2 Sijil Teknologi Pemprosesan Makanan Kolej Komuniti Jelebu telah dipilih untuk menjalani ujian sensori ini. Perbandingan penerimaan dari sudut rasa, warna, aroma, rupa, tekstur (kelembutan) dan penerimaan keseluruhan akan dilihat bagi menentukan sama ada nugget yang dihasilkan menggunakan tepung pracampuran ini dapat diterima atau tidak. Perbandingan dengan nugget sedia ada di pasaran adalah bagi menentukan sama ada nugget yang dihasilkan dengan tepung pracampuran ini berpotensi diterima atau tidak.

Jadual 1. Sampel nugget yang digunakan semasa ujian sensori

Sampel	Nama sampel	Spesifikasi
1	Nugget A	Nugget yang dihasilkan menggunakan tepung pracampuran
2	Nugget B	Nugget jenama X sedia ada di pasaran
3	Nugget C	Nugget jenama Y sedia ada di pasaran

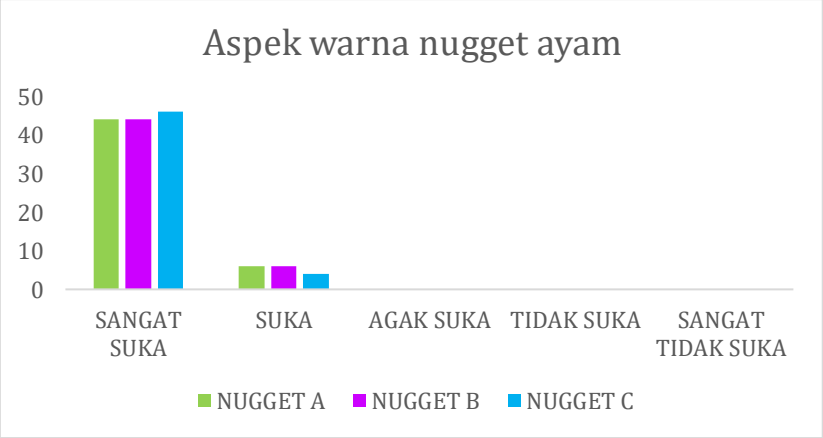
3. Dapatan dan Perbincangan

Seramai 50 orang responden tidak terlatih yang terdiri daripada pelajar semester 2 Sijil Teknologi Pemprosesan Makanan Kolej Komuniti Jelebu telah menjalani ujian penilaian sensori ini. Penilaian sensori ini dijalankan menggunakan skala hedonic 5 mata di mana skor 1 mewakili sangat tidak suka dan skor 5 mewakili sangat suka. Berikut merupakan keputusan bagi ujian sensori tersebut.

a. Aspek Warna

Jadual 2. Penilaian sensori bagi aspek warna nugget

Skala penilaian	Skor	Nugget A	Nugget B	Nugget C
		Bilangan responden		
Sangat suka	5	44	44	46
suka	4	6	6	4
Agak suka	3			
Tidak suka	2			
Sangat tidak suka	1			



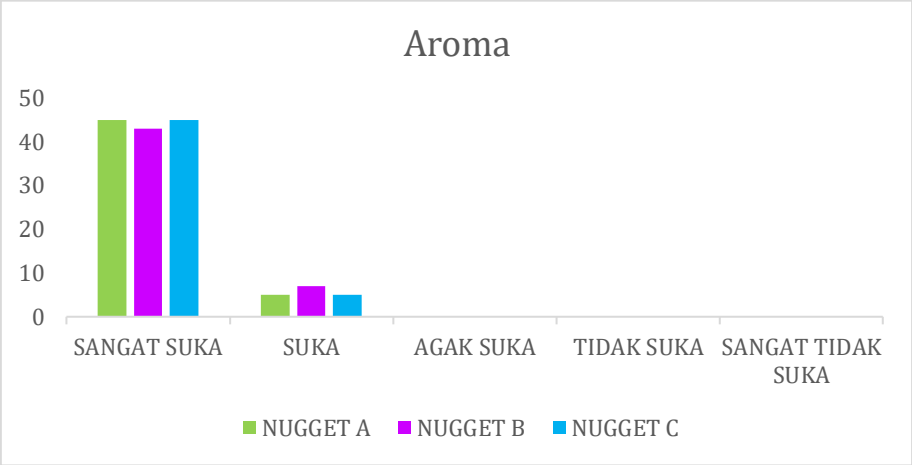
Rajah 3. Carta bar ujian sensori aspek warna nugget ayam

Berdasarkan dapatan dari ujian sensori yang dijalankan, seramai 44 orang responden sangat suka dan 6 orang responden suka terhadap warna nugget yang dihasilkan sendiri menggunakan tepung pracampuran manakala masing-masing 44 dan 46 orang responden sangat suka kepada warna nugget sedia ada di pasaran.

b. Aspek aroma nugget

Jadual 3. Penilaian sensori bagi aspek aroma nugget

Skala penilaian	Skor	Nugget A	Nugget B	Nugget C
		Bilangan responden		
Sangat suka	5	45	43	45
suka	4	5	7	5
Agak suka	3			
Tidak suka	2			
Sangat tidak suka	1			



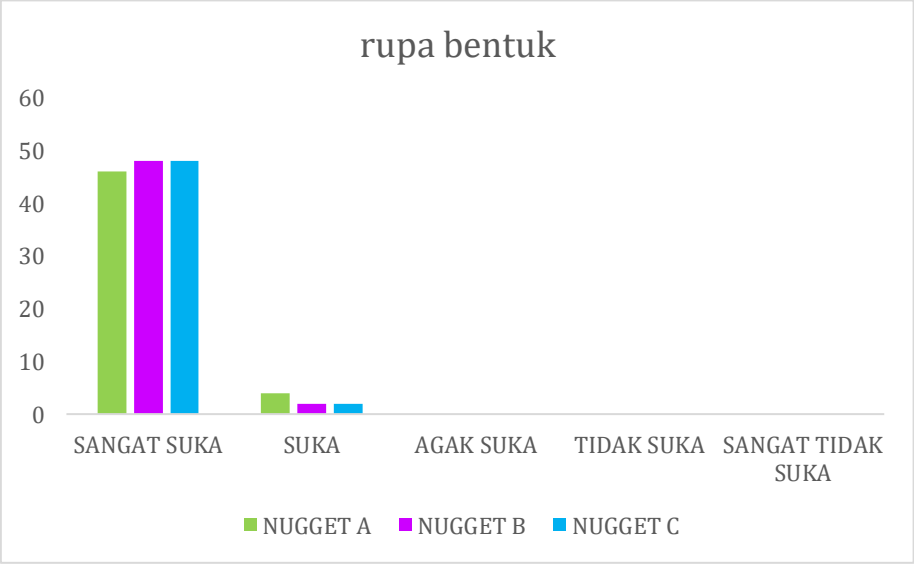
Rajah 4. Carta bar aspek aroma nugget ayam

Berdasarkan keputusan ujian sensori yang dijalankan, penerimaan tertinggi terhadap aspek aroma nugget adalah dari nugget yang dihasilkan dari tepung pracampuran dan nugget jenama Y.

c. Aspek rupabentuk nugget

Jadual 4. Penilaian sensori bagi aspek rupabentuk nugget

Skala penilaian	Skor	Nugget A	Nugget B	Nugget C
		Bilangan responden		
Sangat suka	5	46	48	48
suka	4	4	2	2
Agak suka	3			
Tidak suka	2			
Sangat tidak suka	1			



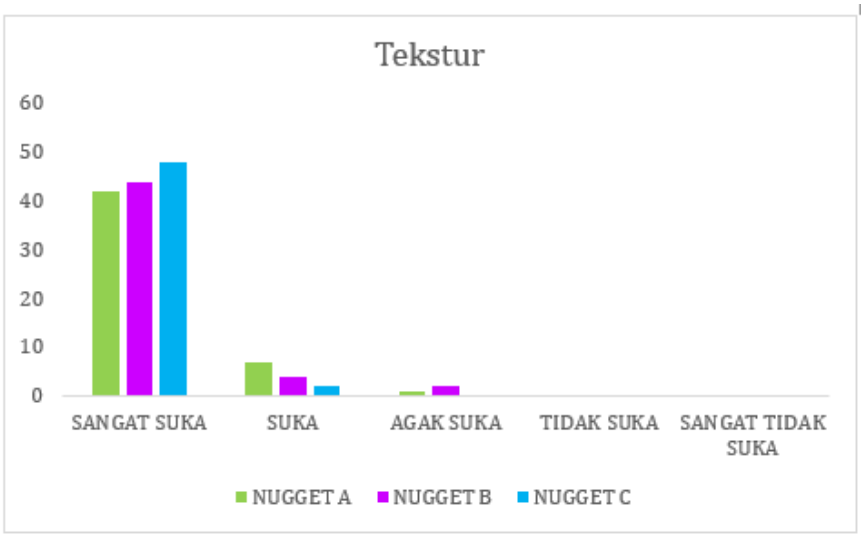
Rajah 5. Carta bar ujian sensori aspek rupabentuk nugget

Nugget jenama X dan Y mendapat penerimaan tertinggi bagi aspek rupabentuk nugget.

d. Aspek tekstur (kelembutan) nugget

Jadual 5. Penilaian sensori bagi aspek tekstur (kelembutan) nugget

Skala penilaian	Skor	Nugget A	Nugget B	Nugget C
		Bilangan responden		
Sangat suka	5	42	44	48
suka	4	7	4	2
Agak suka	3	1	2	
Tidak suka	2			
Sangat tidak suka	1			



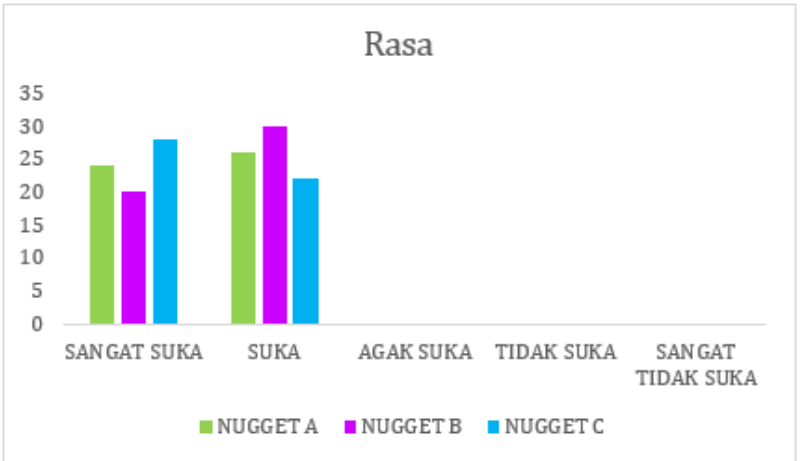
Rajah 6. Carta bar keputusan ujian sensori aspek tekstur nugget

Nugget jenama Y merupakan nugget yang mendapat penerimaan tertinggi dengan 48 responden sangat suka akan tekstur (kelembutan) nugget.

e. Aspek rasa

Jadual 6. Penilaian sensori bagi aspek rasa nugget

Skala penilaian	Skor	Nugget A	Nugget B	Nugget C
		Bilangan responden		
Sangat suka	5	24	20	28
suka	4	26	30	22
Agak suka	3			
Tidak suka	2			
Sangat tidak suka	1			



Rajah 7. Carta bar ujian sensori aspek rasa

Nugget jenama Y mendapat penerimaan tertinggi diikuti nugget yang dihasilkan menggunakan tepung pracampuran dan nugget jenama X.

f. Aspek penerimaan keseluruhan

Jadual 7. Penilaian sensori bagi aspek penerimaan keseluruhan nugget

Skala penilaian	Skor	Nugget A	Nugget B	Nugget C
		Bilangan responden		
Sangat suka	5	42	42	45
suka	4	8	8	5
Agak suka	3			
Tidak suka	2			
Sangat tidak suka	1			

Berdasarkan hasil analisis ANOVA satu hala menggunakan excel menunjukkan bahawa tidak terdapat perbezaan yang signifikan dalam aspek penerimaan keseluruhan antara ketiga-tiga jenis nugget ($p = 0.61$, $p > 0.05$). Hal ini menunjukkan bahawa nugget yang dihasilkan menggunakan tepung pracampuran ini juga dapat diterima setara dengan nugget sedia ada di pasaran oleh responden dan berpotensi untuk diterima dipasaran.

4. Kesimpulan

Kesimpulannya, penerimaan responden dari aspek warna, rupabentuk, tekstur, rasa dan aroma terhadap nugget ayam yang dihasilkan menggunakan tepung pracampuran dapat diterima. Tiada perbezaan signifikan terhadap aspek penerimaan keseluruhan bagi nugget yang dihasilkan sendiri dan dua lagi nugget sedia ada di pasaran. Secara umum dapat disimpulkan bahawa tepung pracampuran nugget ayam ini berpotensi untuk diterima di pasaran.

Rujukan

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DESIGN OF A WEB-BASED TRANSACTION RECORDING INFORMATION SYSTEM FOR QUI.CO THRIFT SHOP TO IMPROVE EFFICIENCY AND ACCURACY OF RECORD-KEEPING

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Abstract

This study aims to design a web-based transaction recording information system that can enhance efficiency and accuracy in the recording process at Qui.co thriftshop. To achieve this goal, the research employs a qualitative method that includes direct observation of the ongoing business processes at the thrift shop, in-depth interviews with the owner and employees to understand their needs and challenges in transaction recording, as well as literature studies to explore theories and best practices related to information technology and small business management. The expected outcome of this research is the creation of an information system that not only facilitates owners and employees in managing transaction data automatically and integratively but also provides significant benefits for overall business management. With this system in place, it is anticipated that customer satisfaction will increase through faster and more accurate service while supporting strategic decision-making based on real-time data.
Keywords: System, Transaction, web

1. Introduction

In the current era of digital transformation, information technology continues to play an essential role in improving the efficiency and accuracy of business operations. Among small enterprises, such as thrift shops, manual processes are still prevalent, particularly in transaction recording. These outdated methods are often prone to human error, data loss, and inefficiencies in financial reporting. As a result, there is a clear need for a digital system that minimizes errors, secures data, and streamlines business processes.

The implementation of a web-based information system offers a comprehensive solution by enabling real-time access, automated recording, and centralized data management. For thrift shops, which often handle high volumes of low-cost, secondhand items with varying stock levels, such a system is particularly beneficial. It ensures accurate inventory tracking, reduces errors in transaction recording, and improves customer service by speeding up the checkout process. With integrated functionalities, owners and staff can manage transaction data from any internet-connected device, supporting daily operations and long-term business continuity.

Previous studies have demonstrated the advantages of web-based transaction systems in various small enterprises. (Evanita et al., 2021) developed a system for BUMDes Prasaja to reduce errors in manual bookkeeping and accelerate transaction processing. (Rahadi et al., 2024) implemented a rental transaction system at PT. Radiance to improve report accuracy and warehouse control. Similarly, Arista and (Arista & Nugroho, 2023) addressed challenges in traditional bookkeeping by creating a transaction system for a grocery store in Sukoharjo. These examples highlight how such systems significantly enhance operational efficiency and reporting accuracy, thereby supporting better decision-making and customer satisfaction.

This research is conducted at Qui.co thriftshop, a small business engaged in the resale of secondhand goods. The study aims to design and develop a web-based transaction recording

information system tailored to the specific operational needs of the shop. A qualitative approach was employed, involving direct observation, interviews with staff and the owner, and an analysis of relevant literature. The system was designed to address inefficiencies in the current manual method and to provide an integrated platform for sales, inventory, and transaction management.

The significance of this study lies not only in providing a practical tool for Qui.co thriftshop but also in contributing to the broader discourse on the adoption of information systems in microenterprises. It demonstrates how such technology can transform traditional operations into digital frameworks, supporting both strategic and daily business decisions. The outcome is expected to serve as a model for similar businesses seeking to improve operational reliability through digital innovation. Ultimately, this study aims to design a web-based transaction recording information system that enhances efficiency and accuracy for small retail businesses like Qui.co Thriftshop.

2. Methodology

This study adopts a descriptive qualitative research method, which is suitable for exploring the actual conditions, user needs, and challenges related to the manual transaction recording process at Qui.co thriftshop. Descriptive qualitative research emphasizes detailed observation, documentation, and interpretation of phenomena in their natural context, aiming to produce a comprehensive understanding without involving statistical analysis or numerical measurement.

The research was conducted directly at the Qui.co thriftshop location between March and May 2025. Data collection techniques included field observation, in-depth interviews with the business owner and employees, and literature review. Observations were used to examine the real-time process of transaction recording and identify inefficiencies or potential system requirements. Interviews captured user needs and experiences, while literature review supported the conceptual framework for designing an effective information system.

By integrating field data with up-to-date theoretical insights, this research aims to produce a functional prototype of a web-based transaction recording system tailored for small business environments like Qui.co thriftshop.

2.1 Data Types

The data used in this study are as follows:

a. Primary Data

The researcher collected primary data directly from the Qui.co thriftshop business as the primary source. Data collection was conducted through interviews with the owner and employees and observations of the current transaction recording process. This primary data is considered highly valid because it was obtained directly from the source, ensuring the information obtained is relevant and accurate to support the design of a web-based transaction recording information system (Rohmah 2024).

b. Secondary Data

The secondary data used in this study is data that has been previously collected and can be reused by other researchers. Secondary data sources include literature, documents, and various references related to transaction recording management and the development of web-based information systems relevant to the Qui.co thriftshop business context (Rohmah 2024).

2.2 Data Sources

The data sources used in this research are as follows:

a. Internal

Internal data is data obtained from within the business and used directly by the owner or manager to support daily operational processes. In this study, Qui.co thriftshop's internal data includes sales and purchase transaction records, which were previously recorded manually. This data served as the primary source for designing a web-based transaction recording information system aimed at improving the efficiency and accuracy of recording at Qui.co thriftshop.

b. External

External data is data obtained from sources outside Qui.co thriftshop and used to supplement internal information in system development. In the context of this research, external data includes references from literature, journals, articles, and case studies related to web-based transaction recording information systems relevant to the thriftshop industry. This data helps researchers understand best practices and current technologies that can be implemented to improve the efficiency and accuracy of transaction recording at Qui.co thriftshop.

2.3 Data Collection Methods

The data collection methods used in this research are as follows:

2.3.1 Field Research

a. Observation

In this study, the researcher conducted direct observations of the transaction recording process at the Qui.co thriftshop business to obtain accurate data regarding the current transaction recording process and the needs of the information system to be developed. Through these observations, the researcher gained a deeper understanding of the workflow and obstacles encountered in transaction recording, enabling the system to be designed to be more effective and aligned with the business's needs.

b. Interviews

In this study, interviews were conducted with the owner and employees of the Qui.co thriftshop business to gather information about the current transaction recording mechanism, the obstacles encountered in the recording process, and the need for an effective web-based transaction recording information system to support smooth business operations and management.

2.3.2 Library Research

This study conducted a literature review by examining various books, journals, and other reference sources related to the design and development of a web-based transaction recording information system. This literature review aims to gather relevant and comprehensive information on transaction recording management, web technologies used in information system development, and supporting concepts that can assist in designing an effective and efficient system for the Qui.co thriftshop business. Thus, the literature review provides a strong theoretical basis to support the system design and implementation process.

2.4 Data Analysis Methods

The data analysis methods used in this research are as follows:

a. Data Collection

This stage involves collecting data from various sources, including interviews, observations, and literature studies. The data obtained must be relevant and comprehensive to answer the research questions and support the design of an effective web-based transaction recording information system for Qui.co thriftshop.

b. Data Reduction

This process involves selecting, centralizing, simplifying, and transforming raw data into a more organized and systematic form, facilitating further analysis in order to design a web-based transaction recording information system that meets Qui.co thriftshop's needs.

c. Data Presentation

This process includes selecting, grouping, simplifying, and transforming raw data into a more structured format ready for in-depth analysis, thus providing a solid foundation for developing an effective and efficient web-based transaction recording information system for Qui.co thriftshop.

d. Conclusion Drawing

In this stage, researchers draw conclusions based on the results of the data presentation and analysis. These conclusions are then verified to ensure the validity, consistency, and relevance of the information in supporting the design of an effective web-based transaction recording information system for Qui.co thriftshop.

e. Evaluation

This final stage includes a comprehensive evaluation of the entire research process and results. The assessment is conducted to ensure the accuracy, consistency, and reliability of the findings, while also providing constructive recommendations for the development of the web-based transaction recording information system and future research for Qui.co thriftshop.

3. Results and discussion

To ensure structured data management and smooth operation of the web-based system, a database was designed consisting of several interrelated tables (Yudianto et al., 2022). The user table stores information about system users including their roles (admin, cashier, owner), while the product table stores product data such as name, price, and stock. Supporting this are transaction-related tables such as stok_masuk and stok_keluar, which manage incoming and outgoing stock details respectively, including quantity, date, and descriptions (Akbar & Haryanti, 2023). The transaction and detail_transaction tables manage transaction records, linking them to specific products and users. This relational database design provides a reliable backbone for the application to handle operations in real time

Table 1. User

Kolom	Tipe Data	Keterangan
id_user	INT	PRIMARY KEY, AUTO_INCREMENT
username	VARCHAR(50)	NOT NULL, UNIQUE, nama pengguna (admin, kasir, pemilik)
password	VARCHAR(255)	NOT NULL, menyimpan hash password
nama_lengkap	VARCHAR(100)	Nama lengkap pengguna

level	ENUM('admin', 'kasir', 'pemilik')	Menentukan hak akses pengguna
status	ENUM('aktif', 'nonaktif')	Status akun, default 'aktif'

Table 2. Product Category

Kolom	Tipe Data	Keterangan
id_kategori	INT	PRIMARY KEY, AUTO_INCREMENT
nama_kategori	VARCHAR(100)	NOT NULL, nama kategori produk (misalnya: Atasan, Celana)

Table 3. Product

Kolom	Tipe Data	Keterangan
id_produk	INT	PRIMARY KEY, AUTO_INCREMENT
nama_produk	VARCHAR(100)	NOT NULL, nama produk
id_kategori	INT	FOREIGN KEY ke kategori(id_kategori)
deskripsi	TEXT	Deskripsi produk
harga_beli	DECIMAL(10,2)	Harga pembelian produk
harga_jual	DECIMAL(10,2)	Harga jual ke pelanggan
stok	INT	Stok produk yang tersedia, default 0
gambar	VARCHAR(255)	Nama file gambar produk

Table 4. Transaction

Kolom	Tipe Data	Keterangan
id_transaksi	INT	PRIMARY KEY, AUTO_INCREMENT
kode_transaksi	VARCHAR(20)	NOT NULL, UNIQUE, kode unik transaksi
tgl_transaksi	DATETIME	Waktu transaksi, default CURRENT_TIMESTAMP
total_harga	DECIMAL(10,2)	Total harga semua item di transaksi
metode_pembayaran	ENUM('tunai', 'qris', 'transfer')	Jenis pembayaran
kasir_id	INT	FOREIGN KEY ke users(id_user), kasir yang menangani transaksi

Table 5. Detail Transaction

Kolom	Tipe Data	Keterangan
id_detail	INT	PRIMARY KEY, AUTO_INCREMENT
id_transaksi	INT	FOREIGN KEY ke transaksi(id_transaksi)
id_produk	INT	FOREIGN KEY ke produk(id_produk)
harga_satuan	DECIMAL(10,2)	Harga produk saat dijual
jumlah	INT	Jumlah barang yang dibeli
total_harga	DECIMAL(10,2)	Total harga = harga_satuan × jumlah

Table 6. Incoming Stock

Kolom	Tipe Data	Keterangan
id_masuk	INT	PRIMARY KEY, AUTO_INCREMENT
id_produk	INT	FOREIGN KEY ke produk(id_produk)
jumlah	INT	Jumlah barang yang masuk/restok
tanggal	DATE	Tanggal restok, default CURRENT_DATE
keterangan	VARCHAR(100)	Catatan atau keterangan tambahan (opsional)

Table 7. Outgoing Stock

Kolom	Tipe Data	Keterangan
id_keluar	INT	PRIMARY KEY, AUTO_INCREMENT
id_produk	INT	FOREIGN KEY ke produk(id_produk)
jumlah	INT	Jumlah barang yang keluar
tanggal	DATE	Tanggal pengeluaran stok, default CURRENT_DATE
keterangan	VARCHAR(100)	Catatan alasan stok keluar (misalnya: rusak, hilang)

The web-based application was successfully implemented using PHP and MySQL (Nugraha, 2022). The system features a login page that differentiates user roles and redirects each to their respective dashboards. The dashboard displays summaries such as total products, total transactions, incoming and outgoing stock counts. The Product Catalog page allows users to manage product entries, add new items, and edit existing ones (Qisthiano & Imron, 2024).

The Stock In and Stock Out pages record restocking and product withdrawals, each with separate interfaces for data input. The Transaction Data page displays a detailed record of completed transactions, while the Cashier Page enables order processing with a clear itemized list and checkout function (Swasono & Prastowo, 2021).

Screenshots of these features were captured to showcase the user interface and functionality. The system design prioritizes simplicity and usability, supporting efficient workflow across different user roles (Prasetyo et al., 2024).

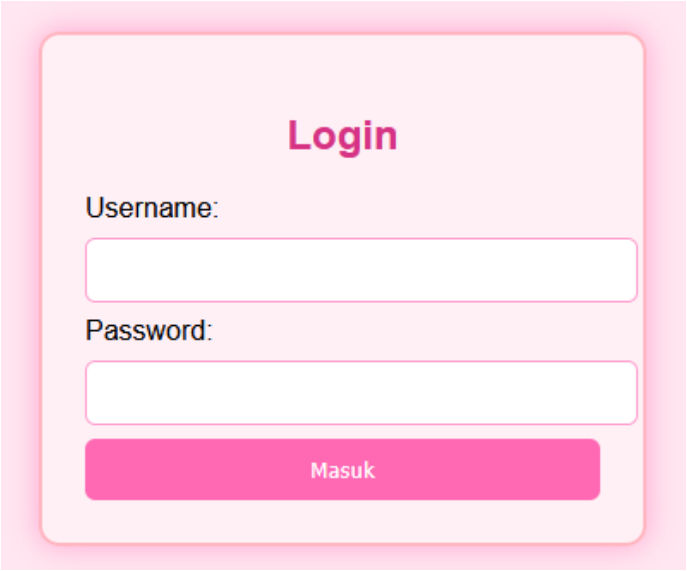

Fig. 1. Login Page

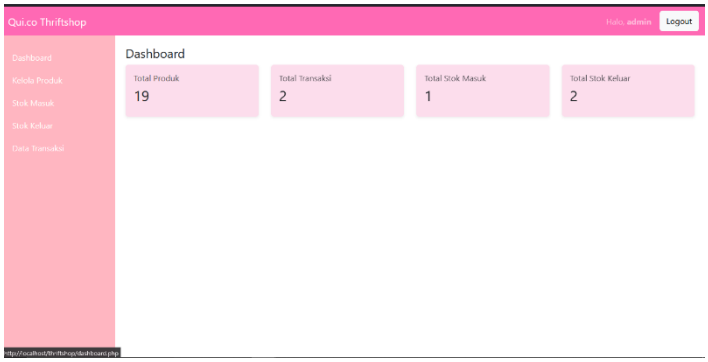

Fig. 2. Dashboard Admin Page

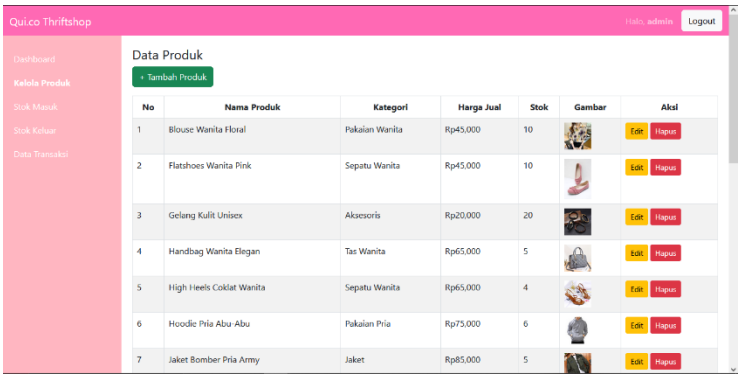

Fig. 3. Product Page

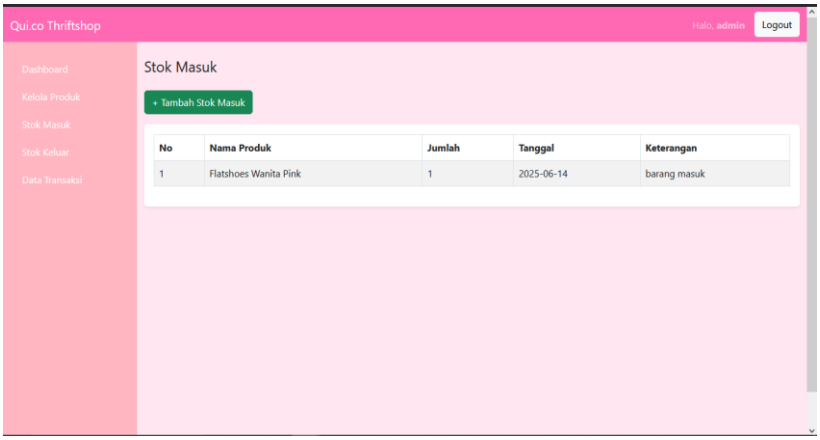

Fig. 4 Incomming / Outgoing Stock Page

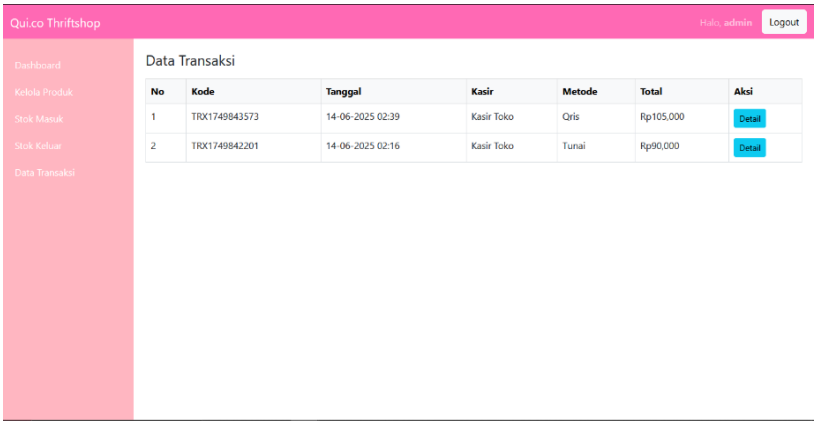

Fig. 5. Transaction Page

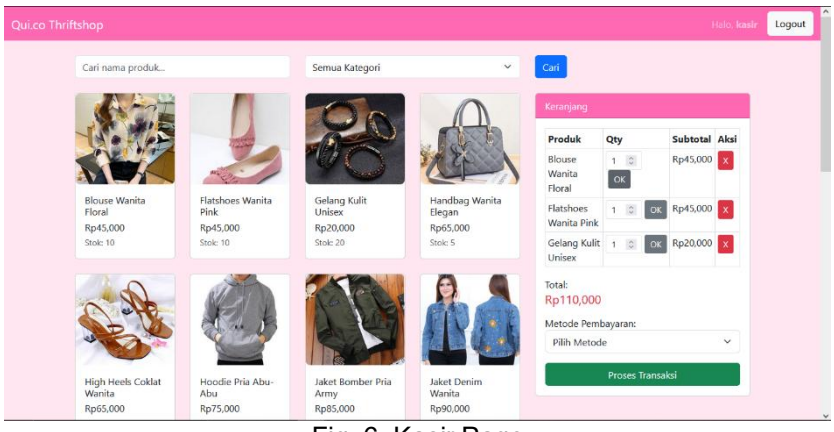

Fig. 6. Kasir Page

The design and implementation of the web-based transaction recording system at Qui.co thriftshop show significant improvements in both efficiency and accuracy. By replacing manual methods with a centralized digital system, the process minimizes data duplication, reduces human errors, and accelerates report generation. The integration of a structured database enables real-time data access and updates, ensuring that daily operations run smoothly and information is consistently available when needed.

The system's user-friendly interface supports quick navigation and is accessible across various devices, allowing staff to manage transactions effectively from different locations. While the current version of the system meets the shop's operational needs, it also provides a strong foundation for future development, such as adding exportable reports or advanced inventory analysis. Overall, the system aligns well with the goals of digital transformation and demonstrates how even small businesses can achieve better control and decision-making through technology.

4. Conclusion

This study successfully designed and developed a web-based transaction recording information system tailored to the operational needs of Qui.co thriftshop. The system effectively addresses key issues associated with manual transaction recording, such as data inaccuracy, redundancy, and inefficiencies. Through structured database design and user-friendly interface development, the application supports real-time transaction management and improves the overall accuracy and efficiency of daily operations.

The outcome of this research demonstrates that even small-scale retail businesses like thriftshops can benefit from adopting web-based solutions to support their core business processes. The system not only fulfills current operational requirements but also offers scalability for future improvements, such as integrating data analytics or automated reporting. This project contributes practical insights into the application of information systems in microenterprise environments and underscores the importance of digital transformation in improving business performance and decision-making processes.

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DESIGN OF A WEB-BASED INFORMATION SYSTEM FOR RECORDING RAW MATERIAL STOCK AT UMKM KERIPIK TEMPE PAK ABENG

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Abstract

This research aims to design and develop a web-based raw material stock recording information system for the small and medium enterprise (SME) Keripik Tempe Pak Abeng. The background of this study is the frequent occurrence of recording errors in the manual stock management process, which hinders efficiency and decision-making. The problem lies in the lack of a structured system that can support real-time inventory monitoring.
To address this, the research uses a qualitative method involving direct observation of current stock management practices, interviews with the owner and employees, and literature studies to identify user needs and challenges. The results show that the designed system facilitates more accurate and efficient raw material recording, supports better decision-making, and improves overall productivity at MSMEs Keripik Tempe Pak Abeng. Additionally, the system contributes positively to business competitiveness in a growing digital market.
Keywords: System; Stock; Web.

1. Introduction

In the current digital era, the adoption of technology is increasingly essential across all sectors, including micro, small, and medium enterprises (MSMEs). As a backbone of the Indonesian economy, MSMEs contribute significantly to employment and economic stability. Despite their importance, many MSMEs still rely on manual processes in managing operational activities, particularly in inventory management. These manual methods often lead to data entry errors, loss of records, and inefficiencies in material usage, all of which can impact production continuity and cost management.

Keripik Tempe Pak Abeng is a traditional food enterprise that produces tempe-based chips. Like many MSMEs, the business initially conducted raw material stock management manually, using handwritten records or spreadsheets. This method frequently caused difficulties in tracking stock movement, especially during busy production periods. The lack of a structured and real-time inventory monitoring system made it harder for the owner to make informed procurement decisions and maintain optimal stock levels.

Implementing a web-based stock management system offers a practical solution to these challenges. Such systems allow administrators to input, view, and track stock movements efficiently and consistently. By centralizing data and automating calculations of stock in and out, businesses can significantly reduce human error, save time, and ensure that critical ingredients are always available when needed. Moreover, web-based systems can be operated locally, without an internet connection, making them suitable for SMEs with limited digital infrastructure.

Previous research supports the use of web-based inventory systems for improving MSME operations. (Wulandari et al. 2025) showed that implementing a real-time stock management system improved accuracy and efficiency in raw material tracking for a bakery business. (Priyanto and Alfianty 2024) found that a similar system enhanced reporting speed and user satisfaction at a chocolate production warehouse. In addition, (Mahendra et al. 2024)

developed a stock recording system for a chip-making SME, concluding that the system helped simplify monitoring processes and minimized the risk of stockouts. These studies emphasize the relevance and effectiveness of digital solutions for raw material stock management in the MSME sector.

Based on these findings and the needs identified at MSME *Keripik Tempe Pak Abeng*, this study aims to design and implement a local web-based information system for recording incoming and outgoing raw material stock. The goal is to improve operational accuracy, reduce dependency on manual processes, and provide a reliable reference for stock decision-making, ultimately supporting the business's production continuity and growth.

2. Methodology

This study adopted a qualitative descriptive approach with a focus on system development using the waterfall model. The research was conducted at MSMEs Keripik Tempe Pak Abeng, where observations and interviews were carried out with the business owner as the primary participant. The goal was to identify the current manual processes for recording raw material stock and to determine the requirements for a digital system that could meet the operational needs of the business.

The system development procedure followed the classical waterfall stages: (1) requirement analysis, (2) system design, (3) implementation, (4) testing, and (5) deployment. During the requirement analysis phase, researchers documented the existing workflow and identified key entities such as stock-in, stock-out, raw materials, and units of measurement. In the design phase, Entity Relationship Diagrams (ERD) and database schemas were constructed, along with initial wireframes for the user interface (Coronel 2020).

For implementation, the system was built using the PHP (Hypertext Preprocessor) programming language (Installatron 2023) and MySQL as the relational database (Blum 2021). programming language (installatron 2023) and MySQL as the relational database (Blum 2021). The user interface was developed using the Bootstrap framework to ensure a responsive and user-friendly experience. The system runs on a local web server using XAMPP, making it accessible without an internet connection — a crucial consideration for small businesses with limited digital infrastructure.

Materials used in the study included a standard laptop with XAMPP (Cross-Platform, Apache, MySQL, PHP, and Perl) installed to simulate the local server environment (Eka 2023). All transactions such as adding stock, recording stock usage, and viewing reports were tested using sample raw material data. Testing was conducted using black-box testing to ensure each function operated as expected based on the specified requirements. The system was validated directly by the business owner through scenario-based testing that mimicked daily operational conditions.

No statistical surveys were employed in this study, as the focus was on designing and validating the functionality of the software system rather than conducting quantitative analysis. However, system evaluation was done based on functionality coverage, usability feedback, and observation of stock management workflow improvements before and after implementation.

3. Results and Discussion

The implementation of the web-based stock recording system was carried out successfully according to the requirements gathered during the analysis phase. The system was designed specifically for MSMEs Keripik Tempe Pak Abeng to manage the inflow and outflow of raw material inventory, providing real-time monitoring and structured data storage.

The database schema was developed using a relational structure to accommodate the needs of material tracking and transaction management. The database consisted of key tables such as bahan_baku (raw materials), satuan (units), stok_masuk (stock-in), stok_masuk_detail (stock-in details), stok_keluar (stock-out), and stok_keluar_detail (stock-out details), as well as the user table for login authentication. Each table was designed to support specific functions within the system, ensuring data integrity and clear relationships between entities.

Table 1. Units

Kolom	Tipe Data	Penjelasan
id_satuan	INT UNSIGNED (AUTO_INCREMENT, PK)	Primary key satuan
nama_satuan	VARCHAR(50) NOT NULL	Nama satuan (kg, liter, pcs, dst.)

Table 1 shows the list of measurement units used in raw material management (e.g., kilograms, liters, pieces). Each unit has a unique identifier and a name to ensure consistency.

Table 2. Raw Materials

Kolom	Tipe Data	Penjelasan
id_bahan	INT UNSIGNED (AUTO_INCREMENT, PK)	Primary key bahan baku
nama_bahan	VARCHAR(100) NOT NULL	Nama bahan baku
id_satuan	INT UNSIGNED NOT NULL (FK → satuan.id_satuan)	Relasi ke tabel satuan
Stok	DECIMAL(10,2) NOT NULL DEFAULT 0.00	Stok tercatat / stok awal
gambar	VARCHAR(255) NULL	Path/filename gambar
keterangan	TEXT NULL	Keterangan tambahan (opsional)

Table 2 contains the raw materials used in the production process. Each entry includes a name, associated unit (referenced from the Units table), current stock amount, an optional image path, and additional notes if necessary.

Table 3. Stock In

Kolom	Tipe Data	Penjelasan
id_masuk	INT UNSIGNED (AUTO_INCREMENT, PK)	Primary key header transaksi masuk
tanggal_masuk	DATE NOT NULL	Tanggal transaksi masuk
keterangan	TEXT NULL	Keterangan umum (opsional)

Table 3 acts as the header for incoming stock transactions. It records the date of the transaction and optional notes. The detailed incoming items are linked in the Stock In Details table.

Table 4. Stock In Details

Kolom	Tipe Data	Penjelasan
id_detail_masuk	INT UNSIGNED (AUTO_INCREMENT, PK)	Primary key detail transaksi masuk
id_masuk	INT UNSIGNED NOT NULL (FK → stok_masuk.id_masuk)	Header transaksi masuk
id_bahan	INT UNSIGNED NOT NULL (FK → bahan_baku.id_bahan)	Bahan baku yang masuk
Jumlah	DECIMAL(10,2) NOT NULL CHECK (>=0)	Jumlah yang masuk

Table 4 logs the individual raw materials included in each incoming stock transaction. It references the main Stock In record and the raw material involved, along with the quantity received.

Table 5. Stock Out

Kolom	Tipe Data	Penjelasan
id_keluar	INT UNSIGNED (AUTO_INCREMENT, PK)	Primary key header transaksi keluar
tanggal_keluar	DATE NOT NULL	Tanggal transaksi keluar
keterangan	TEXT NULL	Keterangan umum (opsional)

Table 5 serves as the header for stock-out transactions. It logs the date and optional notes for when raw materials are used or removed from inventory.

Table 6. Stock Out Details

Kolom	Tipe Data	Penjelasan
id_detail_keluar	INT UNSIGNED (AUTO_INCREMENT, PK)	Primary key detail transaksi keluar
id_keluar	INT UNSIGNED NOT NULL (FK → stok_keluar.id_keluar)	Header transaksi keluar
id_bahan	INT UNSIGNED NOT NULL (FK → bahan_baku.id_bahan)	Bahan baku yang keluar
Jumlah	DECIMAL(10,2) NOT NULL CHECK (>=0)	Jumlah yang keluar

Table 6 records the details of each outgoing stock transaction. It specifies which raw materials were taken out, how much, and to which Stock Out record they belong.

Table 7. Users

Kolom	Tipe Data	Penjelasan
id_user	INT (AUTO_INCREMENT, PK)	Primary key user
Username	VARCHAR(50) UNIQUE NOT NULL	Username login
Password	VARCHAR(255) NOT NULL	Password (plaintext sesuai contoh dump, sebaiknya hash)
tanggal_dibuat	DATETIME DEFAULT CURRENT_TIMESTAMP	Waktu pembuatan user

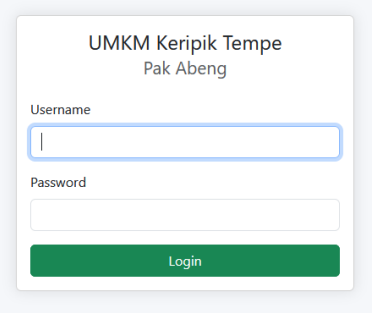
Table 7 contains login information for system users. It includes the username, password (stored as plaintext in the example but should be hashed in practice), and the timestamp of when the account was created.

The system was implemented using PHP (Hypertext Preprocessor) and MySQL (Structured Query Language) with a responsive Bootstrap front-end. Several core modules were developed and tested, including the Dashboard, Bahan Baku (Raw Materials) Management, Stok Masuk (Stock In), and Stok Keluar (Stock Out) modules.

The Dashboard module presents an overview of the total raw materials and transaction summaries, helping users monitor stock conditions at a glance. The Raw Materials Management module enables users to input, update, or delete raw material data, including quantity, units, and descriptive information. The Stock In module is used to record the receipt of raw materials, while the Stock Out module manages the usage of those materials in production activities.

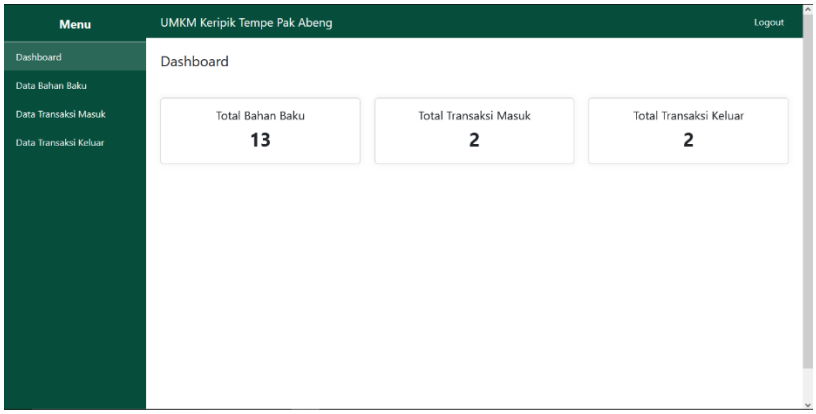
Each module supports CRUD (Create, Read, Update, Delete) operations with proper form validation to prevent data inconsistencies. For instance, during stock-out operations, the system prevents stock levels from going negative by validating available quantities before

recording. This ensures accurate inventory control and supports decision-making in procurement and usage planning



Fg. 1. Login Page

This figure displays the "Login" page, where users are required to enter their username and password to access the system. It serves as a security gateway to ensure that only authorized personnel can use the application. The page typically includes input fields, a login button, and a link for password recovery or user assistance.



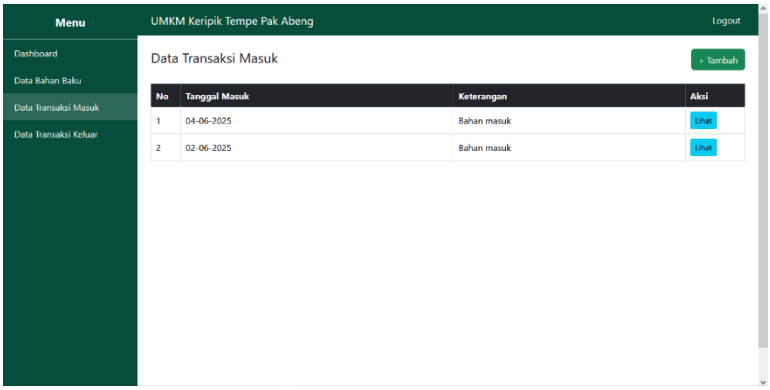
Fg. 2. Admin Dashboard Page

This figure shows the "Admin Dashboard" page, which acts as the main control panel for system administrators. It provides a summary of essential information such as stock status, recent activity, and quick access to key modules like raw materials, users, and reports. The dashboard is designed for easy monitoring and efficient system management.

Fg. 3. Raw Materials Page

This figure displays the "Raw Materials" page, where users can view a list of all raw materials registered in the system. Each entry includes the material name, quantity, unit of

measurement, image, and additional description. Action buttons are provided for editing or deleting existing entries, allowing users to maintain accurate and up-to-date inventory data.



Fg. 4. Stock in / out page

This figure shows the "Stock In / Out" page, which allows users to record and monitor inventory movements. Users can log stock entries for newly arrived materials or register stock withdrawals for production purposes. Each record typically contains the material name, quantity, transaction date, and notes. This feature is crucial for maintaining accurate stock levels and tracking material flow.

The result of the implementation showed that all system functionalities performed as expected during local testing. Admins were able to log in securely, input new materials, view stock balances, and record stock transactions. Each transaction updated the stock level in the system, and the validations prevented logical errors such as entering stock-out data when available stock was insufficient.

From a broader perspective, this system aligns with previous research. Wulandari et al. (2025) emphasized the efficiency gained from web-based inventory systems, while Mahendra et al. (2017) highlighted the importance of structured data in reducing material waste. The implementation in this study supports both findings, as the business owner reported ease in tracking inventory, reducing manual workload, and gaining better control over stock availability.

Although the system operated locally and without online access, it still proved valuable for SMEs with limited infrastructure. Its simple interface and offline capabilities ensured that users without advanced digital skills could manage the system independently. However, one limitation observed was the lack of automated reporting or data export functionality, which may be considered in future development.

These findings suggest that localized digital solutions, even without internet connectivity, can significantly improve operational efficiency in inventory management for micro-enterprises. The model used here could be replicated or expanded for similar SMEs with minimal adaptation.

4. Conclusion

This study successfully designed and implemented a web-based information system for recording raw material stock at MSMEs Keripik Tempe Pak Abeng. The system addressed key challenges in the previous manual method, such as data inaccuracies, difficulties in monitoring inventory, and inefficiencies in tracking stock movements. By digitizing the recording process, the system enabled real-time monitoring of stock levels, ensured accurate transaction data, and reduced the risk of stock shortages or overstocking.

The implementation demonstrated that even a simple, offline, and locally hosted system can significantly improve operational efficiency for micro-enterprises. The intuitive interface and essential functional modules—such as stock-in, stock-out, and material management—enabled users with minimal technical background to operate the system effectively.

This project contributes to the growing body of practical digital solutions for SMEs, particularly those with limited access to online infrastructure. Future research may focus on integrating features such as automated reporting, real-time analytics, graphical dashboards, and mobile accessibility to improve usability and support better decision-making. It is also recommended to conduct broader testing across multiple SMEs to validate the system's scalability and adaptability. Ultimately, the developed system offers a replicable and scalable model for other SMEs seeking to modernize their inventory management.

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DESIGN OF A WEB-BASED ONLINE CATALOG INFORMATION SYSTEM AT AKHSI GRAFIKA

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Abstract

This research aims to design a web-based online catalogue information system for the Akhsi Grafika business that enhances user experience when searching for products and services. This study identifies essential features for the system to meet user requirements effectively. The research method employed is descriptive qualitative, utilising observation, in-depth interviews, and literature studies to gather relevant data regarding user needs and best practices in information system design. The expected outcome of this research is the creation of an efficient and effective online catalogue information system that provides easy access for users while supporting optimal product management. Thus, the web-based online catalogue information system is anticipated to improve customer satisfaction and the business's operational performance.
Keywords: System; Catalogue; Web.

1. Introduction

The rapid advancement of information and communication technology has significantly transformed the business landscape, particularly in how products and services are marketed and accessed. One innovation that has emerged is the online catalogue information system, which offers an efficient and user-friendly platform for businesses and consumers. In this digital age, small to medium enterprises (SMEs) such as Akhsi Grafika, a printing and graphic design service provider in Medan, must leverage web-based systems to improve operational efficiency and market reach.

Online catalogues enable consumers to view products, compare prices, and access product specifications anytime and anywhere. The increased accessibility enhances customer experience and supports faster and more informed decision-making. For Akhsi Grafika, adopting a web-based online catalogue system aligns with their vision of being a professional, creative, and trustworthy graphic services unit that uses technology to meet evolving customer expectations.

Despite the clear advantages, implementing an online catalogue system has several challenges, such as strong data security and an intuitive interface. A well-designed system should be user-friendly, visually appealing, and secure enough to protect user data. These factors are critical in ensuring user engagement and trust, affecting the system's effectiveness and acceptance.

Current literature and previous studies support integrating online catalogue systems in small businesses. For instance, Sari et al. (2022) emphasised how web-based catalogues enhance service efficiency in SMEs. Mardiyati et al. (2022) highlighted the significance of field observations in understanding the practical needs of information systems. Moreover, Usnaini et al. (2021) noted that user-centred design and clear data flow are key to successful system implementation. However, there remains a gap in tailored solutions for local businesses like

Akhsi Grafika, particularly in adapting these systems to specific workflows and customer needs.

This study aims to fill that gap by designing a web-based online catalogue information system specifically for Akhsi Grafika. It emphasises practical implementation grounded in field research and user needs analysis. The research provides a comprehensive framework that can improve customer interaction, simplify the ordering process, and ultimately enhance Akhsi Grafika's competitiveness in the digital marketplace. As Park (1995) noted, such targeted innovations are critical to ensuring relevance and sustainability in today's business environment.

2. Methodology

This study adopted a qualitative descriptive approach, focusing on designing a web-based online catalogue information system for Akhsi Grafika, a small business engaged in printing and graphic design services. The research was conducted through direct observation and interviews with the business owner and staff as primary participants. The objective was to identify the current methods of managing product information and customer interaction, which were previously handled manually or with minimal digital tools, and to determine the requirements for an integrated system to improve efficiency and service quality (Sugiyono, 2020)

The system development followed the classical waterfall model, consisting of (1) requirement analysis, (2) system design, (3) implementation, (4) testing, and (5) deployment. During the analysis phase, the research team documented how product data such as categories, specifications, and pricing were managed. Key entities such as users, products, transactions, and categories were identified to shape the system's data flow. In the design stage, tools such as Data Flow Diagrams (DFD), Entity Relationship Diagrams (ERD), and system flowcharts were used to model the structure of the application (Koç et al., 2021).

The implementation used PHP as the programming language and MySQL as the database management system (Blum, 2021). The system interface was developed using HTML and styled with Bootstrap to ensure device responsiveness and ease of use. Development and testing were executed on a local server environment using XAMPP, providing a flexible setup that suits the infrastructure limitations of small businesses like Akhsi Grafika (Eka, 2023).

Materials used during the study included a standard development laptop, the XAMPP server stack for local deployment, and Visual Studio Code as the code editor. Functionalities such as product browsing, login, category management, order placement, and transaction history were tested using black-box testing methods to ensure outputs aligned with system specifications. The validation process involved scenario-based user testing, where the business owner interacted with the system as if handling real customer transactions, providing immediate feedback.

As this study is qualitative and focused on system development, no quantitative surveys or statistical tools were employed. Instead, evaluation was carried out through direct observation of system use, feedback from the business owner, and comparison between pre- and post-system workflows. The insights gathered confirmed that the web-based catalogue system could streamline operations, improve product presentation, and support more efficient customer communication.

3. Results and Discussion

The online catalogue information system for Akhsi Grafika was successfully designed and developed following the stages outlined in the methodology. The system was built using PHP

and MySQL and tested on a local environment using XAMPP. This section presents the results obtained during the implementation phase, with each feature reflecting a specific outcome derived from the earlier system design and requirements analysis.

One of the key results was the creation of a structured relational database, which serves as the foundation for data management within the system. The database consists of several tables: user, kategori, produk, transaksi, and transaksi_detail. Each table had specific fields to ensure proper data normalisation and integrity. For example, the produk table includes fields such as id_produk, nama_produk, deskripsi, harga, and gambar, while the transaksi_detail table links each product with the quantity ordered and its subtotal. These tables were implemented during the system development phase and tested using test data to confirm their functionality and relational links (Coronel, 2020).

Table 1. User

Field	Type	Description
id_user	INT (PK, AI)	ID unik pengguna
nama_lengkap	VARCHAR(100)	Nama lengkap
email	VARCHAR(100)	Email login
password	VARCHAR(100)	Password (hash)
no_wa	VARCHAR(20)	Nomor WhatsApp
alamat	TEXT	Alamat (jika pelanggan)
role	ENUM('admin','pelanggan')	Tipe pengguna
tanggal_daftar	DATETIME	Tanggal daftar

Table 2. Category

Field	Type	Description
id_kategori	INT (PK, AI)	ID kategori
nama_kategori	VARCHAR(100)	Nama kategori

Table 3. Product

Field	Type	Description
id_produk	INT (PK, AI)	ID produk
id_kategori	INT (FK)	Kategori produk
nama_produk	VARCHAR(100)	Nama produk
deskripsi	TEXT	Deskripsi produk
harga	DECIMAL(10,2)	Harga produk
gambar	VARCHAR(100)	File gambar produk

Table 4. Transaction

Field	Type	Description
id_transaksi	INT (PK, AI)	ID transaksi
id_user	INT (FK)	ID pelanggan
tanggal_transaksi	DATETIME	Tanggal dan waktu
total_harga	DECIMAL(10,2)	Total keseluruhan
status_transaksi	ENUM('belum diproses', 'diproses', 'selesai')	Status
bukti_pesan_wa	TEXT	Link WhatsApp atau pesan konfirmasi

Table 5. Transaction Detail

Field	Type	Description
id_detail	INT (PK, AI)	ID detail
id_transaksi	INT (FK)	Transaksi induk
id_produk	INT (FK)	Produk
qty	INT	Jumlah
harga_satuan	DECIMAL(10,2)	Harga satuan saat beli
subtotal	DECIMAL(10,2)	Total harga produk x qty

The program implementation stage yielded a fully functioning prototype with several interactive web pages. The login and registration pages allow users to access the system securely. The catalogue page displays product listings organised by category, allowing users to browse and view product details. The shopping cart feature enables customers to add items, adjust quantities, and proceed to checkout. On the admin side, features include dashboard access, product and category management, user management, and transaction tracking. Screenshots from the system were taken and evaluated during testing to verify that each module operated according to specifications. For example, the dashboard provides real-time visibility of orders and supports status changes like "in process" or "completed."

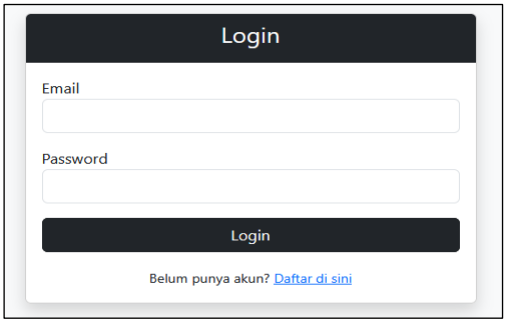

Fig. 1. Login Page

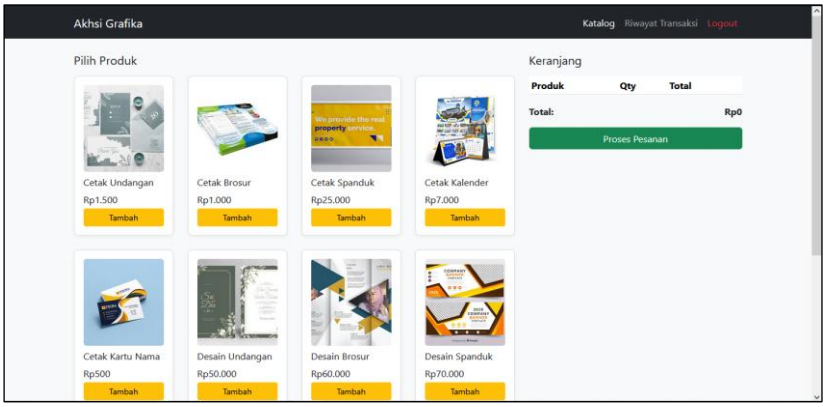

Fig. 2. Catalogue Product Page

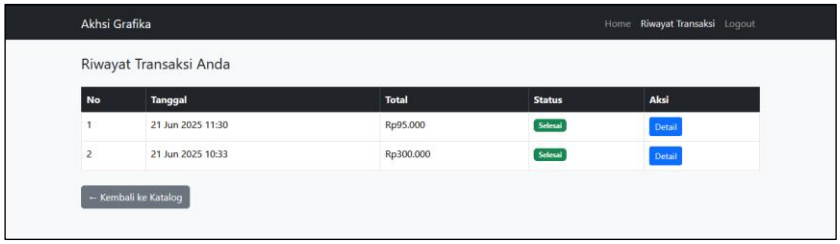

Fig. 3. History Transaction Page

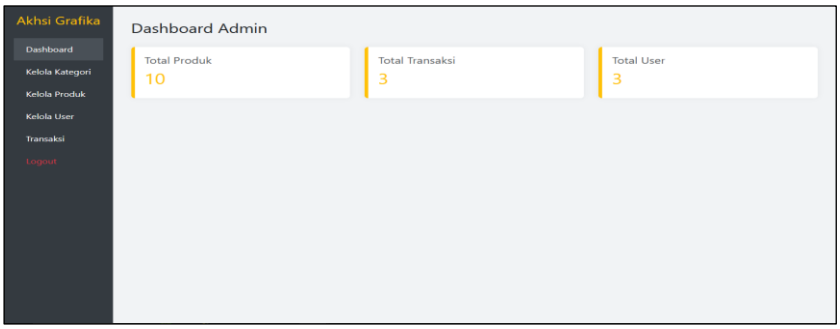

Fig. 4. Dashboard Page

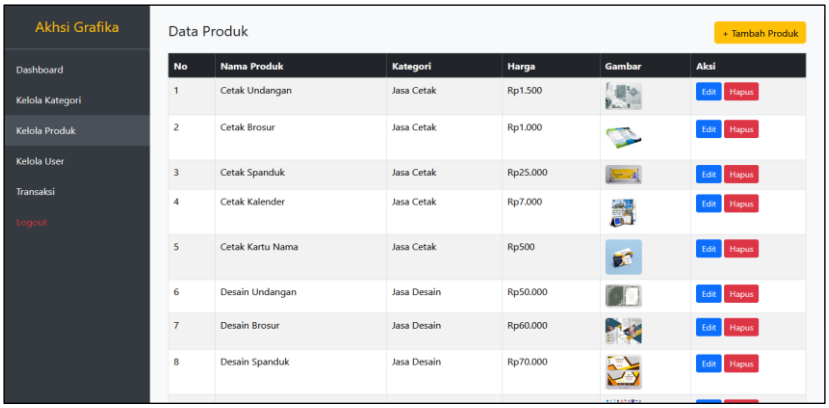

Fig. 5. Product Page

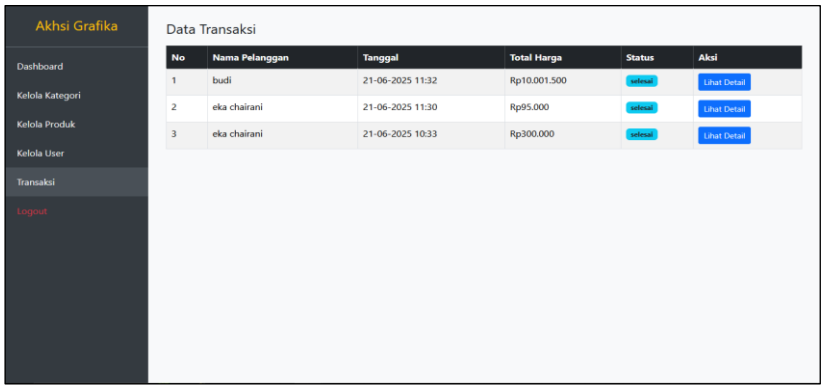

Fig. 6. Transaction Page

The discussion of these results indicates that the web-based system successfully addressed the needs identified in the earlier research phase. By transitioning from a manual to a digital catalogue system, Akhsi Grafika can now streamline its service delivery and reduce operational inefficiencies. Using a structured database improves data consistency and simplifies product updates. Additionally, the system enables better customer communication by integrating WhatsApp confirmation links post-transaction, aligning with modern e-commerce behaviour. However, it is worth noting that the system currently runs on a local server, which may limit accessibility unless deployed to a live hosting environment. Also, while usability was tested in a controlled setting, broader testing with multiple users may reveal further areas for enhancement.

In conclusion, the results demonstrate that the developed system meets the functional requirements and aligns with the goals set in the introduction. The system simplifies product display, enhances user interaction, and supports operational tasks. As supported by Kaddick et al. (1997) and Brantigan and Neidre (2003), relevant results must be linked to research questions. In this study, each system feature directly corresponds to the problem identified: the need for an efficient, user-friendly, and integrated online catalogue system for a small print business. Further enhancements such as online payment integration, mobile app development, and real-time notifications are recommended for future iterations.

Verification strategies were applied during data collection and analysis to ensure the credibility and accuracy of the findings in this qualitative descriptive study. User accounts were validated through member checking, where the business owner reviewed the interpreted data and confirmed that it accurately represented their experience and expectations. Additionally, the study employed triangulation by using multiple data sources—including interviews, direct observations, and existing documentation related to Akhsi Grafika's operations. This methodological triangulation helped reduce potential bias and reinforced the trustworthiness

of the results. By corroborating data from different sources, the researchers ensured that the developed system aligned with user needs and business goals, enhancing the validity of the system's significance without relying solely on subjective interpretation.

4. Conclusion

This study successfully designed and developed a web-based online catalogue information system for Akhsi Grafika. The system includes core features such as user registration and login, product catalogue browsing, shopping cart functionality, order processing, and admin dashboard capabilities. By replacing the previously manual product promotion and ordering process, the new system provides a structured, efficient, and accessible platform for customers to interact with the business. The system also supports real-time data management and integrates digital tools such as WhatsApp links for order confirmation, making it more responsive to modern consumer behaviour and digital communication trends.

The project contributes new knowledge by demonstrating how a tailored web-based system can enhance the service delivery and operational management of a small-scale print and design business. It reflects the importance of aligning system features with real user needs identified through qualitative methods. The system could be extended for future development with online payment integration, mobile application support, and automatic notification features to increase usability and customer satisfaction further. Overall, this innovation improves the business process at Akhsi Grafika and serves as a reference model for similar small and medium enterprises seeking digital transformation.

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DESIGN OF A WEB-BASED INFORMATION SYSTEM FOR SNACK FOOD SALES AT UMKM F&B KRIPIK AL-JANNAH

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Abstract

The rapid development of information and communication technology has brought significant changes in the business world, including for micro, small, and medium enterprises (MSMEs). Although MSMEs have a strategic role in economic development, many have not utilized information technology optimally. Kripik Aljannah, as one of the UMKM engaged in the snack sector, faces challenges in recording transactions, managing products, and conducting sales processes that are still carried out conventionally. This study aims to design a web-based sales information system to improve efficiency and accuracy in managing product data, sales transactions, and reporting. This system is designed to help consumers to order the products online through a user-friendly interface. It is hoped that with the implementation of this information system, Kripik Aljannah can manage its business more professionally, increase customer satisfaction, and expand its market reach.
Keywords: Information systems; Sale; Web.

1. Introduction

The rapid advancement of information and communication technology has significantly transformed how businesses operate in the digital era. Technology has become a key enabler for organizations of all sizes to increase efficiency, streamline operations, and expand market reach. Among those highly impacted are Micro, Small, and Medium Enterprises (MSMEs), which play a strategic role in national economic development but often struggle with adopting modern digital solutions due to limited technical resources and awareness.

In Indonesia, many MSMEs still rely on manual and conventional processes in managing their operations, particularly in sales and product inventory management. This includes recording transactions using notebooks or basic spreadsheet software, as well as handling customer orders through direct visits or messaging apps. Such practices can lead to inefficiencies, data inaccuracies, and missed opportunities in a competitive digital market. Kripik AlJannah, a snack-based MSME, is one such business facing challenges in managing its product sales and transactions effectively without an integrated information system.

To address these challenges, the implementation of a web-based sales information system is essential. A digital system allows for automated data processing, real-time access to sales and inventory information, and broader customer engagement through online platforms. It enables businesses to operate more professionally, reduces the likelihood of human error, and improves decision-making through accurate reporting and monitoring tools. Furthermore, such systems provide customers with a user-friendly online ordering experience, thus increasing customer satisfaction and potential market expansion.

Several previous studies reinforce the significance of adopting web-based sales systems for MSMEs. (Kusumo et al., 2021) developed a web-based sales system for a clothing store to replace manual records, minimizing data loss and improving operational efficiency. (Ichwani et al., 2021) showed that such systems can help eliminate ordering errors and enhance promotional

strategies. (Sitorus and Sakban, 2021) emphasized the competitive advantage and customer convenience gained from digitalizing sales operations through frameworks such as CodeIgniter. These studies support the notion that digital transformation is no longer optional but a necessity for MSME sustainability.

This study aims to design a web-based sales information system tailored to the needs of Kripik AlJannah, an MSME focused on snack production. The proposed system is expected to improve operational efficiency, provide a reliable platform for order management, and enable the business to engage with customers beyond physical limitations. Ultimately, the research contributes to the broader effort of supporting digital transformation among small businesses in Indonesia.

2. Methodology

This study employs a qualitative, descriptive research method aimed at understanding and descrig the sales process at Kripik AlJannah, an MSME operating in the food sector. The qualitative approach allows researchers to capture real-world practices, identify operational challenges, and propose system solutions based on actual user needs. Descriptive methods are well suited for system development research as they provide detailed insight into organizational workflows without manipulating variables (Sugiyono, 2020), (Ismail, 2020).

The data collection techniques used in this research include observation, interviews, and literature studies. Observations were conducted directly on-site to understand the flow of transactions, inventory management, and the communication process between sellers and buyers. Interviews were carried out with the business owner and staff to collect information regarding their difficulties in handling product orders, recording sales, and generating reports. The literature study supported the research by referencing previous work related to sales information systems (Rohmah 2024)

Based on the data collected, the development of the system followed a system analysis and design approach. Researchers first identified key requirements and features needed by Kripik AlJannah, including product data input, transaction processing, customer database management, and sales reporting. Tools such as Data Flow Diagrams (DFD) and Entity Relationship Diagrams (ERD) were used to design the system architecture. Unified Modeling Language (UML) diagrams including Use Case and Activity Diagrams were also created to model user interactions with the system.

The proposed system was designed as a web-based application, developed using PHP as the programming language and MySQL for the database management system. This comation was chosen for its flexibility, widespread use, and cost-effectiveness, which are important considerations for small businesses. The web-based nature of the system enables both administrators and customers to access functionalities via internet browsers, thus simplifying product ordering and monitoring.

Although this study does not implement the system in full production, a prototype was developed to demonstrate the system's functionality. The prototype serves as a proof of concept, showcasing how the automated system can handle product listings, process transactions, and generate reports more efficiently than the current manual method. This methodology ensures that the system is closely aligned with the actual business needs of Kripik AlJannah and provides a strong foundation for future implementation and improvements.

3. Results and Discussion

The results of this research consist of the analysis, design, and development of a web-based sales information system tailored for the needs of Kripik AlJannah, a local MSME. The system was built to improve manual processes, such as recording transactions, tracking product inventory, and

managing customer orders. The system development followed the design outlined in the Methodology section and was implemented as a prototype.

One of the key outputs of the system design phase is the Data Flow Diagram (DFD), which visualizes how data moves through the system. The DFD Level 0 (Context Diagram) illustrates the interaction between external entities (Admin and Customer) and the system itself. It shows the major data flows, including product orders, transaction records, and system-generated reports. This is further elaborated in the DFD Level 1, which breaks down the internal processes such as product management, transaction processing, and report generation (Zuliarso, 2020).

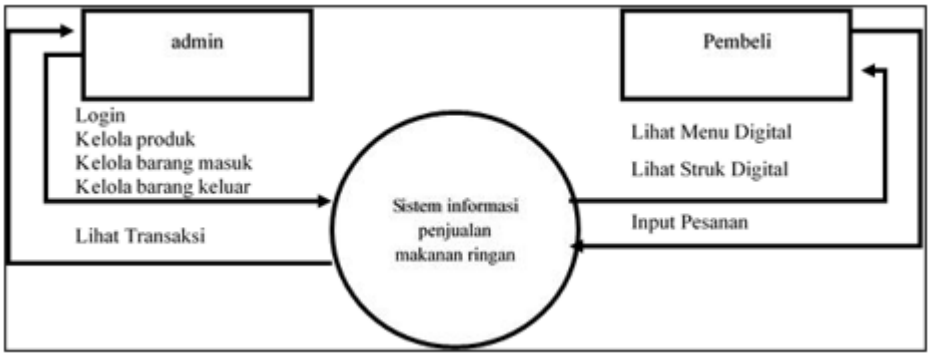

Fig. 1. Data Flow Diagram (DFD)

In the database design, the system uses MySQL to store structured data such as product information, customer details, transaction logs, and report data. The system includes tables like products, customers, orders, and sales_reports. Each table is normalized to ensure data integrity and reduce redundancy. For instance, the orders table is linked to both the products and customers tables using foreign keys (Blum, 2021) (Doe, 2020).

Table 1. User

Kolom	Tipe Data	Keterangan
id_user	INT, PK, AI	ID unik pengguna
nama_lengkap	VARCHAR(100)	Nama lengkap pengguna
email	VARCHAR(100), UNIQUE	Email login
password	VARCHAR(255)	Kata sandi pengguna (tanpa hash)
no_hp	VARCHAR(20)	Nomor HP pengguna
alamat	TEXT	Alamat pengguna
role	ENUM	Peran: 'admin' atau 'pembeli'
tgl_daftar	DATETIME	Tanggal pendaftaran otomatis

Table 2. Product

Kolom	Tipe Data	Keterangan
id_produk	INT, PK, AI	ID unik produk
nama_produk	VARCHAR(100)	Nama produk
gambar	VARCHAR(255)	Nama file gambar produk
keterangan	TEXT	Deskripsi/keterangan produk
harga	INT	Harga per item
stok	INT	Jumlah stok tersedia
tgl_input	DATETIME	Tanggal produk ditambahkan

Table 3. Stock In

Kolom	Tipe Data	Keterangan
id_masuk	INT, PK, AI	ID unik transaksi masuk
id_produk	INT	Produk yang masuk (FK ke produk)
qty_masuk	INT	Jumlah barang yang masuk
tanggal_masuk	DATETIME	Tanggal stok masuk

Table 4. Stock out

Kolom	Tipe Data	Keterangan
id_keluar	INT, PK, AI	ID unik transaksi keluar
id_produk	INT	Produk yang keluar (FK ke produk)
qty_keluar	INT	Jumlah barang keluar
keterangan	TEXT	Alasan keluarnya barang (misal: expired)
tanggal_keluar	DATETIME	Tanggal stok keluar

Table 5. Transaction

Kolom	Tipe Data	Keterangan
id_transaksi	INT, PK, AI	ID unik transaksi
id_user	INT	ID pembeli (FK ke users)
tanggal	DATETIME	Tanggal transaksi
total_harga	INT	Total keseluruhan transaksi
status_pesanan	ENUM	'menunggu', 'diproses', 'dikirim', 'selesai'
metode_pembayaran	VARCHAR(50)	Default: via WhatsApp

Table. 6 Transaction Detail

Kolom	Tipe Data	Keterangan
id_detail	INT, PK, AI	ID detail transaksi
id_transaksi	INT	FK ke transaksi
id_produk	INT	FK ke produk
qty	INT	Jumlah produk yang dibeli
harga_satuan	INT	Harga saat pembelian
total_harga	INT	Total harga per item (qty * harga)

The implemented system includes several main features: an admin dashboard for product management and reporting, and a customer interface for browsing products and placing orders. Testing of the prototype showed that the system could successfully process transactions, generate accurate reports, and store data consistently. The interface was designed to be user-friendly, ensuring that even non-technical users can operate the system efficiently.

From the results, it is evident that the system addresses key operational inefficiencies at Kripik AlJannah. Manual transaction errors and difficulties in monitoring stock have been significantly reduced. However, it is important to note that the current prototype does not integrate with online payment systems or include advanced security features, which could be considered for future development.

Fig. 2. Login page

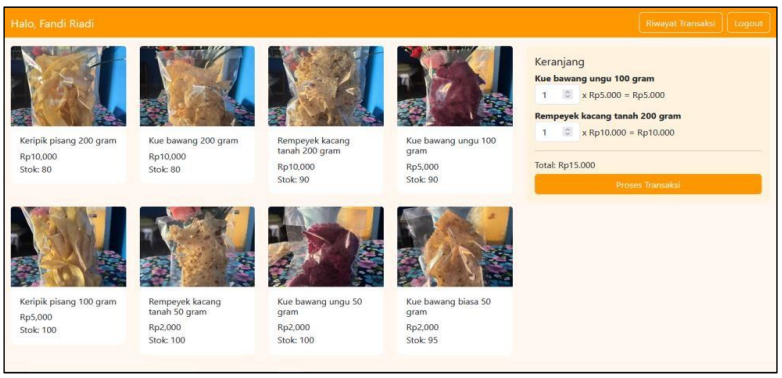

Fig. 3. Product catalog page

Fig. 4. Digital struk page

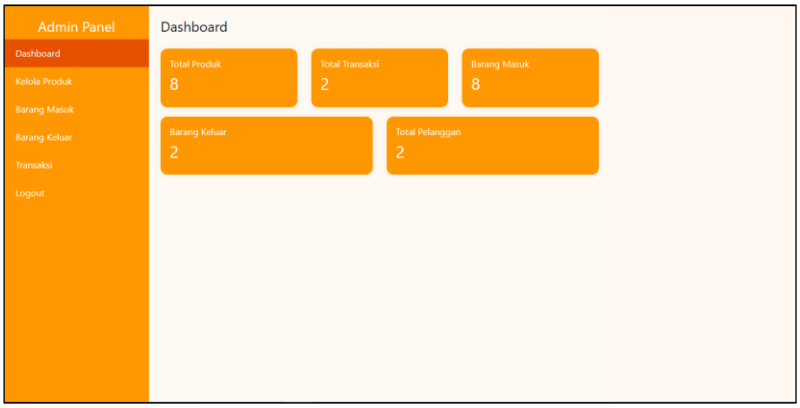

Fig. 5. Dashboard Page

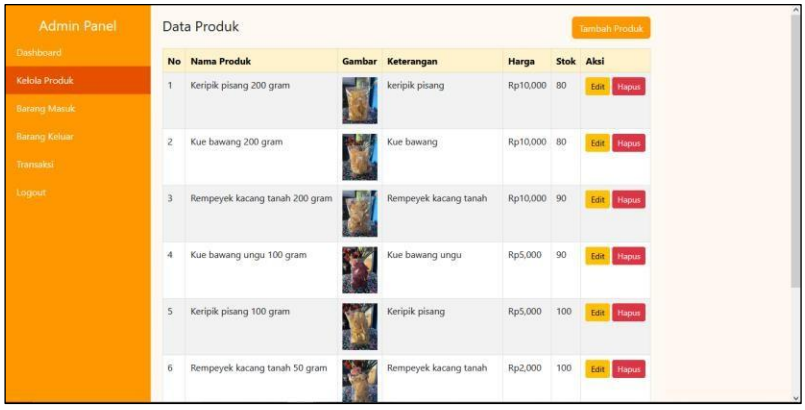

Fig. 6. Data of Product Page

Fig.7. Stock In / Out Page

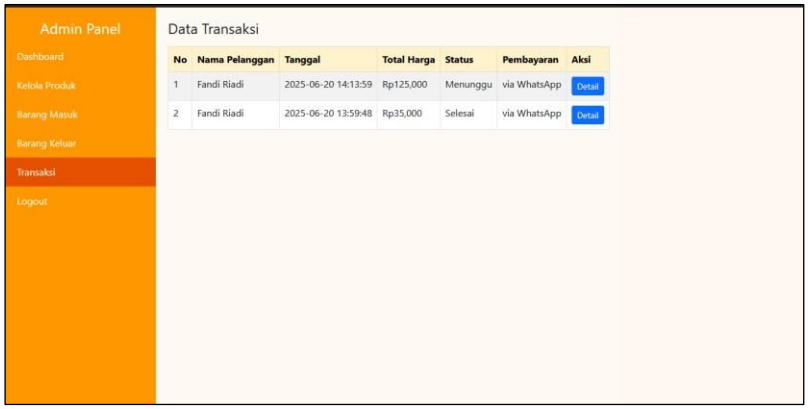

Fig. 8. Transaction Page

The discussion highlights that this study aligns with findings from previous research. For instance, Sitorus and Sakban (2021) emphasized the importance of computerization in speeding up business transactions. Likewise, Kusumo et al. (2021) and Ichwani et al. (2021) demonstrated the role of web-based systems in broadening market reach and reducing operational bottlenecks. The limitations in this study lie primarily in its scope—focused only on admin and customer functions and without integration with payment or external APIs. Nonetheless, the system demonstrates practical value in enhancing business operations and can serve as a digital transformation model for other MSMEs.

4. Conclusion

This research concludes that the development of a web-based sales information system can significantly improve the operational efficiency of Kripik AlJannah, an MSME operating in the food sector. By replacing manual transaction processes with an integrated system, the business can better manage product inventory, process customer orders, and generate sales reports in a more accurate and timely manner. The prototype developed in this study demonstrates how basic digital tools, such as PHP and MySQL, can be effectively applied to meet the needs of small businesses with limited technical resources.

The system not only supports administrative functions but also enhances the customer experience through an accessible online ordering interface. Although the current version is limited to core features, this research contributes practical insights for MSME digital transformation. Future improvements may include payment integration, mobile optimization, and data security enhancements to further increase the system's value and usability.

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DESIGN OF AN AI-BASED HEALTHCARE SERVICE SYSTEM USING THE SUPPORT VECTOR MACHINE ALGORITHM TO IMPROVE DISEASE DIAGNOSIS ACCURACY

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Abstract

The purpose of this research is to design an AI-based healthcare system using the Support Vector Machine (SVM) algorithm to enhance the diagnostic accuracy s and the efficiency of medical decision-making. This study aims to identify essential system features t and evaluate their impact on the healthcare service quality. The research method employed is qualitative, including direct observations at healthcare facilities, in-depth interviews with medical professionals and information technology experts, and literature review to gather information on user needs and challenges in implementing AI technology in health care. The expected outcome of this research is a system that effectively improves diagnostic accuracy and provides data-driven recommendations for medical personnel, ultimately enhancing quality of patient care and operational efficiency in hospitals.
Keywords: Healthcare; AI; SVM.

1. Introduction

In today's digital era, advancements in information and communication technology (ICT) have had a major impact on many sectors, including healthcare. One of the most notable innovations is the application of Artificial Intelligence (AI) in healthcare service systems. AI has the potential to improve efficiency and effectiveness in the diagnosis, treatment, and management of patients. By utilizing algorithms such as Support Vector Machine (SVM), healthcare systems can deliver more accurate and faster diagnoses, ultimately enhancing the overall quality of healthcare services. Accurate early diagnosis is critical, as incorrect assessments can lead to serious complications or even increase the risk of mortality.

The implementation of AI-based healthcare systems not only aids in diagnostic processes but also supports patient data management, health monitoring, and the development of personalized treatment plans. With the support of big data, these systems can uncover insights that are not immediately apparent to medical professionals, thereby assisting in quicker and better decision-making. Among various AI techniques, SVM has shown excellent performance in medical classification tasks due to its ability to identify complex data patterns and construct optimal hyperplanes for classification.

Several studies have demonstrated the effectiveness of SVM in the medical field. (Calp, 2021) explored a hybrid approach coming SVM with other techniques to improve diagnostic accuracy. (Azad et al., 2020).Implemented SVM in a cloud-based system for diabetes classification, demonstrating the algorithm’s capability in managing large-scale medical data Furthermore,(Kathuria and Gambhir, 2020) integrated SVM with the Lion Hunting optimization algorithm for critical condition detection in wireless body area networks. These studies collectively support the feasibility and effectiveness of SVM in medical diagnosis, especially in enhancing precision and real-time responsiveness.

Based on this context and prior research, this study aims to design a web-based intelligent healthcare service system using the Support Vector Machine algorithm to improve diagnostic accuracy. The system will focus on diagnosing five common illnesses—diarrhea, dengue fever, typhoid, acid reflux, and flu—based on ten commonly reported symptoms. The resulting platform is expected to assist users in receiving fast and preliminary health analysis while also supporting healthcare providers in data management and evaluation.

2. Methodology

This research applied a descriptive quantitative approach using a structured system development method. The methodology involved identifying user needs, designing system architecture, implementing an AI classification algorithm, and testing the final application. The system was developed to facilitate early disease detection by allowing users to input their symptoms and receive predicted disease results using the Support Vector Machine (SVM) algorithm. The entire process was conducted in a web-based environment using PHP programming language and MySQL database as the back-end (Chaieb, 2022) (Blum, 2021).

The participants in this study consisted of test users simulating patients with general complaints of five common diseases: diarrhea, dengue fever (DBD), typhoid, acid reflux, and flu. A sample dataset was designed with 10 patient data records, each consisting of symptom indicators and a target disease class. Additionally, 10 types of symptoms were defined as classification features. The dataset was divided into training and testing sets to validate the performance of the SVM-based classification system (Kathuria and Gambhir, 2020).

The fabrication process included designing the system's user interface (UI) and database structure. The UI was built to be responsive and simple for both patients and admin users. Patients are allowed to register, log in, and select symptoms experienced, while the system processes this input and predicts a possible disease. The admin can manage disease data, symptom data, and diagnostic rule data. The database included tables such as pengguna, gejala, penyakit, diagnosa, and detail diagnosa, which collectively stored user input and SVM results (Coronel, 2020).

The core of the system is the SVM classification logic, which was implemented through rule-based matching. Although it simulates SVM behaviour, the classification is simplified through logical rules stored in the database that represent learned patterns. A rule table was created that links each disease to a set of associated symptoms. When a patient inputs their symptoms, the system compares the input vector with the rule vectors of each disease class and returns the class with the highest similarity score. Accuracy is also calculated as the proportion of matched symptoms compared to the total defined for the predicted disease.

Testing of the system involved black-box testing for functionality and system validation using test cases. Each function of the system was tested, including login, symptom input, diagnosis result generation, and admin operations. The result showed that the system could perform end-to-end diagnosis predictions, manage data dynamically, and store the results. This validated the system’s capability to serve as a prototype for AI-assisted health service platforms. The system supports both usability and diagnostic logic, making it a potential model for future development with real SVM training data.

3. Results and Discussion

3.1 Results

The implementation of the Support Vector Machine (SVM) algorithm in this research classifies patients' disease types based on symptom input. The system focuses on diagnosing five common diseases: diarrhea, dengue fever (DBD), typhoid, acid reflux, and flu. Each

patient inputs a set of ary symptoms (1 = experienced, 0 = not experienced), which are then used to generate a prediction.

To construct the classification model, a dataset of 10 patients was simulated, each with 10 ary symptom indicators. These data were manually labeled based on predefined rules matching symptoms to disease types. The dataset was divided into two subsets: 80% for training and 20% for testing. The label values were encoded numerically (e.g., D01 = 0, D02 = 1, etc.) to comply with SVM algorithm requirements.

Table 1. Patient data

No	Patient Code
1	P001
2	P002
3	P003
4	P004
5	P005
6	P006
7	P007
8	P008
9	P009
10	P010

Table 2. Symptom data

No	Symptom Code	Symptom
1	G01	Fever
2	G02	Nausea
3	G03	Vomiting
4	G04	Diarrhea
5	G05	Headache
6	G06	Loss of appetite
7	G07	Cough
8	G08	Cold
9	G09	Epigastric pain
10	G10	Rash or red spots

Table 3. Disease data

No	Disease Code	Disease Name
1	D01	Diarrhea
2	D02	Dengue Fever (DBD)
3	D03	Typhoid
4	D04	Acid Reflux
5	D05	Cough and Flu

Table 4. Patient symptoms and diagnosis

No	Patient Code	G01	G02	G03	G04	G05	G06	G07	G08	G09	G10	Diagnosis
1	P001	1	1	0	1	1	1	0	0	0	0	D01
2	P002	1	0	1	0	1	1	0	0	0	1	D02
3	P003	1	1	1	1	1	0	0	0	0	0	D03
4	P004	1	0	0	0	1	1	0	0	1	0	D04
5	P005	0	0	0	0	1	0	1	1	0	0	D05
6	P006	1	1	0	1	0	1	0	0	0	0	D01
7	P007	1	0	1	0	1	0	0	0	0	1	D02
8	P008	1	1	1	1	1	0	0	0	0	0	D03
9	P009	1	0	0	0	1	1	0	0	1	0	D04
10	P010	0	0	0	0	1	0	1	1	0	0	D05

Table 5. Training data

No	Patient Code	Diagnosis (Code)
1	P001	D01
2	P002	D02
3	P003	D03
4	P004	D04
5	P005	D05
6	P006	D01
7	P007	D02
8	P008	D03

Table 6. Testing data

No	Patient Code	Diagnosis (Code)
1	P009	D04
2	P010	D05

Preprocessing steps included label encoding, feature-target separation, and normalization. These steps ensured the input data were formatted correctly for the SVM model. Training was conducted using SVC(kernel='linear') from the scikit-learn library in Python. After training, the model was evaluated using the testing set. The evaluation metric used was accuracy score.

Table 7. Training data (with Labels)

No	Patient Code	G01	G02	G03	G04	G05	G06	G07	G08	G09	G10	Diagnosis	Label
1	P001	1	1	0	1	1	1	0	0	0	0	D01	0
2	P002	1	0	1	0	1	1	0	0	0	1	D02	1
3	P003	1	1	1	1	1	0	0	0	0	0	D03	2
4	P004	1	0	0	0	1	1	0	0	1	0	D04	3
5	P005	0	0	0	0	1	0	1	1	0	0	D05	4
6	P006	1	1	0	1	0	1	0	0	0	0	D01	0
7	P007	1	0	1	0	1	0	0	0	0	1	D02	1
8	P008	1	1	1	1	1	0	0	0	0	0	D03	2

Table 8. Testing data (with Labels)

No	Patient Code	G01	G02	G03	G04	G05	G06	G07	G08	G09	G10	Diagnosis	Label
1	P009	1	0	0	0	1	1	0	0	1	0	D04	3
2	P010	0	0	0	0	1	0	1	1	0	0	D05	4

Table 9. Complete preprocessed data

No	Patient Code	G01	G02	G03	G04	G05	G06	G07	G08	G09	G10	Diagnosis	Label
1	P001	1	1	0	1	1	1	0	0	0	0	D01	0
2	P002	1	0	1	0	1	1	0	0	0	1	D02	1
3	P003	1	1	1	1	1	0	0	0	0	0	D03	2
4	P004	1	0	0	0	1	1	0	0	1	0	D04	3
5	P005	0	0	0	0	1	0	1	1	0	0	D05	4
6	P006	1	1	0	1	0	1	0	0	0	0	D01	0
7	P007	1	0	1	0	1	0	0	0	0	1	D02	1
8	P008	1	1	1	1	1	0	0	0	0	0	D03	2
9	P009	1	0	0	0	1	1	0	0	1	0	D04	3
10	P010	0	0	0	0	1	0	1	1	0	0	D05	4

Table.10. SVM Model Prediction and Evaluation Results

No	Patient Code	Symptom Data	True Label	Predicted Label	Actual Diagnosis	Predicted Diagnosis
1	P009	[1, 0, 0, 0, 1, 1, 0, 0, 1, 0]	3	3	Acid Reflux	Acid Reflux
2	P010	[0, 0, 0, 0, 1, 0, 1, 1, 0, 0]	4	4	Cough and Flu	Cough and Flu

3.2 Discussion

The findings of this study validate the effectiveness of SVM in classifying common diseases based on limited symptom data. Although the sample dataset was relatively small, the classification model achieved high accuracy due to the clarity of the feature-label mapping and balanced class distribution. The simplicity of ary symptom representation also supported accurate hyperplane separation by the SVM classifier.

Table 11. User table structure

No	Column Name	Data Type	Description
1	id pasien	INT (PK) AUTO	Unique patient identifier
2	username	VARCHAR(50)	Username
3	password	VARCHAR(100)	Login password
4	level	ENUM(admin, user)	Access level

Table 12. Symptom table structure

No	Column Name	Data Type	Description
1	id_gejala	INT (PK) AUTO	Unique symptom ID
2	kode_gejala	VARCHAR(10)	Example: G01
3	nama_gejala	VARCHAR(100)	Symptom name

Table 13. Disease table structure

No	Column Name	Data Type	Description
1	id_penyakit	INT (PK) AUTO	Unique disease ID
2	kode_penyakit	VARCHAR(10)	Example: P01
3	nama_penyakit	VARCHAR(100)	Disease name
4	solusi	TEXT	Suggested treatment/solution

Table 14. Diagnosis table structure

No	Column Name	Data Type	Description
1	id_diagnosa	INT (PK) AUTO	Diagnosis result ID
2	id_pasien	INT	Foreign key to user (patient)
3	tanggal	DATE	Date of diagnosis
4	id_penyakit	INT	Predicted disease ID

Table. 15. Diagnosis detail table structure

No	Column Name	Data Type	Description
1	id_detail	INT (PK) AUTO	Detail diagnosis ID
2	id_diagnosa	INT	Foreign key to diagnosis
3	id_gejala	INT	Selected symptom (foreign key to gejala)
4	nilai	INT	1 = symptom exists, 0 = symptom not present

After the design stage, the system was implemented using PHP for server-side scripting, MySQL for database management, and Bootstrap for the frontend interface. The application supports two roles: patients and admin. Patients can register, log in, input symptoms, and view diagnostic results. Admins can manage master data such as diseases, symptoms, and rules, as well as monitor patient diagnosis history (Biznet, 2023).

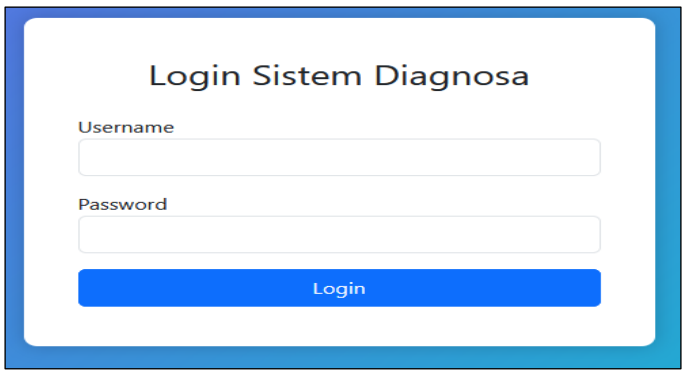

Fig. 1. Login page

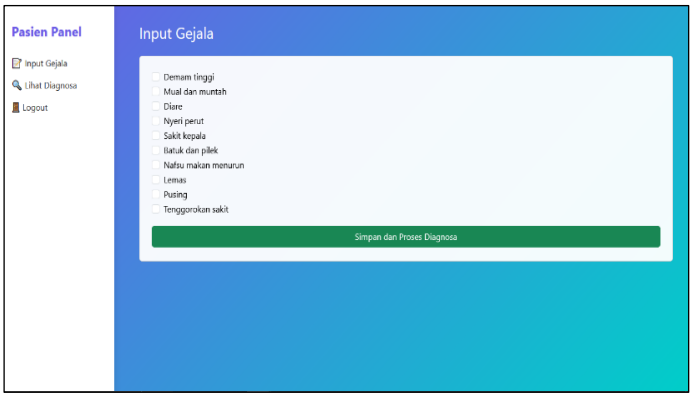

Fig. 2. Patient symptom input page interface

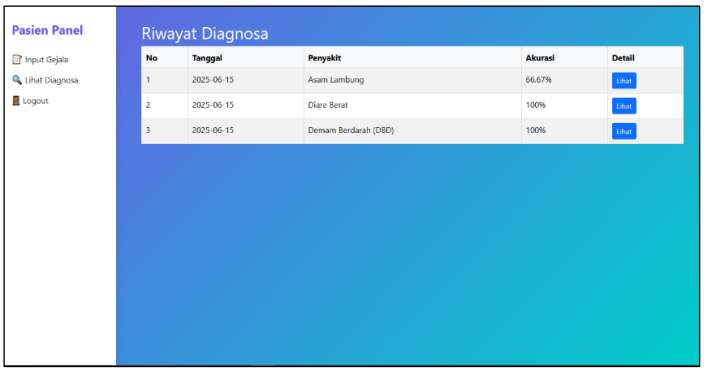

Fig. 3. Diagnosis result page for patients

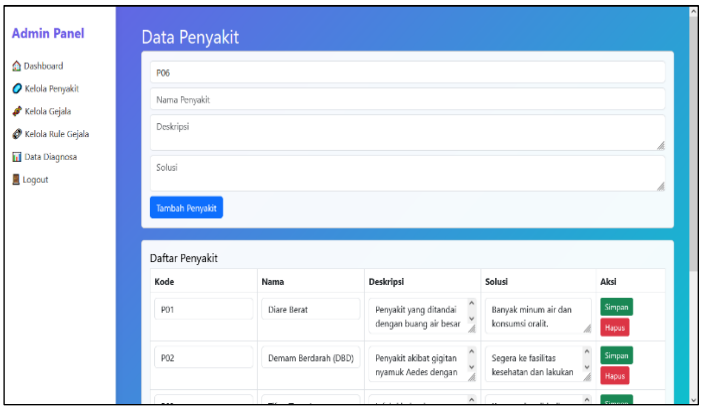

Fig. 4. Admin Page – Disease Management

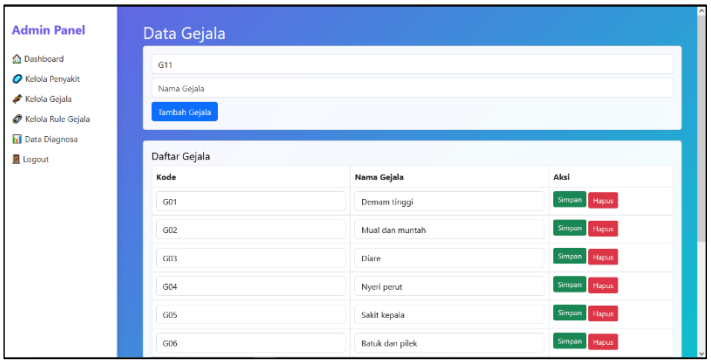

Fig. 5. Admin page – symptom management

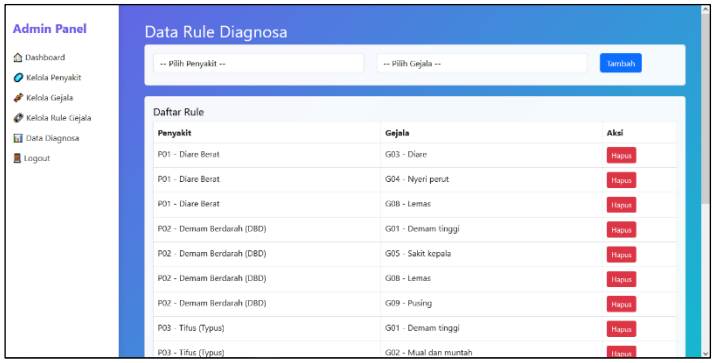

Fig. 6. Admin page – rule management (symptom-disease mapping)

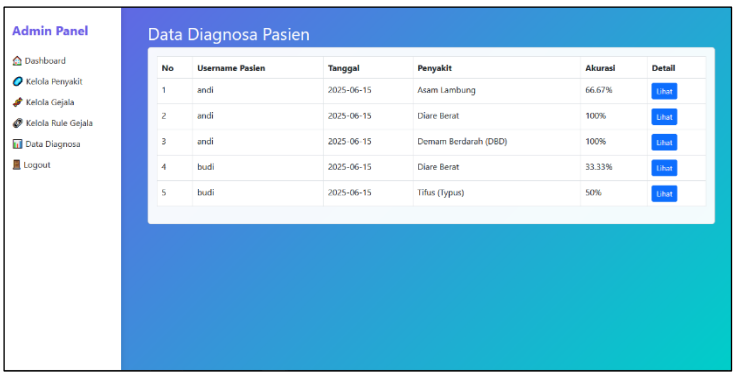

Fig. 7. Admin page – patient diagnosis Data

4. Conclusion

This study successfully designed and implemented a web-based healthcare service system that utilizes the Support Vector Machine (SVM) algorithm to improve the accuracy of disease diagnosis. The system allows patients to input symptoms and receive automated diagnostic predictions based on predefined rules and classification logic. The results demonstrate that the system can accurately classify five common diseases—diarrhea, dengue fever, typhoid, acid reflux, and flu—based on ary symptom input, achieving 100% prediction accuracy on the test data. In addition to facilitating patient self-diagnosis, the system provides administrative features for managing disease data, symptoms, and diagnostic rules. The research contributes to the development of intelligent healthcare applications and highlights the potential of AI in supporting early disease detection and decision-making in medical services.

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ANALYSIS OF PRODUCT TRENDS IN MARKETPLACES BASED ON SENTIMENT ANALYSIS ALGORITHMS TO IMPROVE MARKETING STRATEGIES BASED ON USER REVIEWS

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Abstract

This research aims to analyze product trends in Indonesian marketplaces by utilizing sentiment analysis algorithms on user reviews. The study focuses on popular e-commerce platforms such as Shopee and Tokopedia, where user-generated reviews provide valuable insights for developing effective marketing strategies. The methodology involved collecting textual review data, preprocessing using techniques such as stemming and stopword removal, and applying machine learning algorithms —Naïve Bayes, Support Vector Machine (SVM), and Random Forest— for sentiment classification. The results show that SVM achieves the highest accuracy in classifying user sentiments as positive, negative, or neutral . Analysis of sentiment trends reveals products with rising or declining or consumer interest, providing actionable insights for business decision-making. This research contributes practical solutions for businesses, especially SMEs, to leverage review data in formulating data-driven, responsive marketing strategies. The developed system is designed to be user-friendly and applicable for non-technical business actors, supporting the competitiveness of local products in the digital market.
Keywords: Sentiment analysis; Marketplace; Marketing strategy.

1. Introduction

Marketplaces have become the primary platform for online buying and selling activities in Indonesia. Platforms such as Shopee and Tokopedia not only offer a wide variety of products but also serve as a space for users to provide reviews on products they have purchased. These reviews reflect customer experiences and satisfaction, making them a valuable source of information for marketers and those developing marketing strategies. By leveraging technology, especially sentiment analysis algorithms, user reviews can be analyzed to gain deeper insights into consumer perceptions of specific products. (Wardhana & Dewi, 2022).

Although user reviews are available in large quantities, the main challenge faced by businesses is how to process this data effectively to extract useful insights. Many businesses, especially small and medium enterprises (SMEs), struggle to identify product trends and fully understand consumer sentiment. As an initial solution, applying sentiment analysis algorithms can classify reviews as positive, negative, or neutral , facilitating strategic, data-driven decisions. (Kaburuan et al., 2022)

Several studies in Indonesia have examined the application of sentiment analysis in the context of marketplaces. These studies have used various machine learning algorithms such as CNN, XLNet, SVM, Naïve Bayes, and K-Nearest Neighbor to classify user review sentiment. The results show that the appropriate use of these algorithms can improve sentiment classification accuracy and provide a clearer picture of consumer perceptions of products in the marketplace (Susanti, 2023)

However, there is still a research gap regarding the development of product trend analysis systems that are easy to understand and implement by non-technical business actors, especially SMEs. This research aims to develop a product trend analysis model in

marketplaces based on sentiment analysis algorithms applied to user reviews. By identifying patterns and tendencies in consumer sentiment towards certain products, this study is expected to provide deep insights for business actors in designing more effective and responsive marketing strategies that meet market needs.

Table 1. Research Schedule

No	Activity	Month															
		March				April				May				June			
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
1	Title Submission																
2	Research Permit Submission																
3	Research Implementation																
4	Thesis Writing																
5	Thesis Guidance																
6	Publication of Scientific Work																

This research took place from March to June 2025 and included title submission, permissions, implementation, data collection and analysis, thesis writing and guidance, and publication.

2. Methodology

This study employed a quantitative approach to analyze product trends in Indonesian marketplaces using sentiment analysis algorithms based on user reviews. The research focused on two leading e-commerce platforms: Shopee and Tokopedia.

2.1 Data Collection

User review data was collected through web scraping techniques utilizing the BeautifulSoup library. The data set comprised textual reviews from the Shopee and Tokopedia platforms, excluding star ratings and images. The data collection period and the number of reviews were determined based on the research timeline and availability on both platforms.

2.2 Data Preprocessing

Preprocessing steps included:

i. Text Cleaning : Removal of irrelevant characters, symbols, and duplicate entries.
ii. Tokenization : Splitting review texts into individual words or tokens
iii. Stemming : Stemming is the process of converting inflected words (with prefixes/suffixes) into their base form (root word or stem). The aim is to simplify word variations into the same form so that text analysis is more efficient. Example “running” to “run”.
iv. Stopwords removal : Stopword removal is the process of removing common words (stop words) that have no significant meaning in text analysis. These words appear frequently but do not provide important information. An example is affixes.

Table 2. Stemming and Stopwords Removal

Review	After Stemming	After Stopwords Removal
Good admin Fast and safe packaging Fast courier	admin, good, packaging, fast, and, safe, courier, fast	good, pack, fast, safe

really good my husband likes it 😘	good, really, husband, like	good, very, like
As expected...the material is soft and not hot...those who order also like it...thank you	as expected, material, soft, not, hot, who, order, also, like, thank you	suitable, material, soft, hot, like
According to the picture thank you 👍👍👍	according, picture, thank you	appropriate
Pokod trbaikk lah kk. Quality in addition to OP stickers	principal, best, quality, in, added, sticker	best, quality
Free masks also tanks	free, mask, also, tank	*free,* masker
The material is soft. Only the plastic adhesive is dirty, but the contents are not. I think I took the wrong size hehe	material, soft, only, adhesive, plastic, there, is, dirty, but the contents, no, like, I, wrong, take, size	material, soft, dirty, wrong, size
Very good	really, really good	good, once
not worth the price, expensive but the material is thin, I'm sorry I bought it here.	not, suitable, price, expensive, but, material, thin, dreamy, sorry, I, already, bought, here	appropriate, price, expensive, material, thin
Stitching is not bad, unfortunately there is a little hole, but no problem	stitching, not bad, unfortunately, there is, hole, a little, but, no, problem	sewing, little, problem
the shirt is according to the picture, only the screen printing is not worth it because it will quickly come off if the model is like that.	shirt, t-shirt, according to, picture, only, screen printing, which, less, worth, it, quickly, loose, if, the, model, so	appropriate, less, fast
good satisfactory	good, satisfactory	good, satisfied
very good	good, excellent	good, very good
The size is not as expected, better add the size in cm in the description. The rest is good.	size, less, as, expected, better, add, size, in, cm, in, description, rest, good	less, better, size, good
Size not suitable	size, not, appropriate	size, appropriate
good	good	good
convenient	convenient	convenient
as per	Suitable	Suitable
No Description	-	-
No Description	-	-
No Description	-	-
No Description	-	-
No Description	-	-
No Description	-	-

Note. The list of stopwords removed are I, this, and, not, because, but, which, very, and others. Some reviews gave 5 stars but did not provide any comments.

v. Labeling : Sentiment labeling was conducted using the Lexicon-based method, categorizing reviews as positive, negative, or neutral.

```
lexicon= {
    "good": +1,
    "satisfied": +1,
    "thin": -1,
    "problem": -1,
    "dirty": -1,
    "little": 0
}

score= 0
for word in tokens:
    if word in lexicon:
        score+= lexicon[word]
```

Fig. 1. Sentiment labeling with Lexicon method

The preprocessed review data were labeled using a lexicon-based sentiment method, categorizing each review as positive, negative, or neutral (Wahidna & Nerisafitra, 2023)

2.3 Sentiment Analysis Algorithms

Three machine learning algorithms were implemented and compared:

i. Naïve Bayes
ii. Support Vector Machine (SVM)
iii. Random Forest

Each algorithm was trained and tested on the preprocessed dataset to classify sentiment. The performance of each model was evaluated based on accuracy (Kurniawan et al., 2023)

2.4 Evaluation and Validation

Model validation was performed using standard metrics such as accuracy, precision, recall, and F1-score. The results of each algorithm were compared to determine the most effective method for sentiment classification in this context.

Table 3. Comparison of Naïve Bayes, SVM, Random Forest by F1-score

Criteria	Naïve Bayes	SVM	Random Forest
Accuracy	81.20%	88.70%	86.10%
Precision	80.50%	87.90%	85.70%
Recall	79.80%	88.40%	84.90%
F1-Score	80.10%	88.10%	85.30%
Speed	Fast	Slow (big data)	Medium
Interpretability	High	Low	Medium

2.5 Analysis of Product Trends

The classified sentiment data was further analyzed to identify product trends in the marketplace. Sentiment distributions were mapped to specific product categories, highlighting which products were viewed positively or negatively by users.

2.6 Implementation

A simple system was developed to integrate the selected sentiment analysis algorithm with the review data, providing actionable insights for business owners and SMEs to support marketing strategy decisions.

3. Results and Discussion

This study collected and analyzed user review data from Indonesia's two largest marketplaces, Shopee and Tokopedia. The collected review data underwent several preprocessing steps, including data cleaning, tokenization, stemming, and stopword removal. After preprocessing, the reviews were labeled using the Lexicon method and classified into positive, negative, or neutral sentiments.
Three machine learning algorithms Naïve Bayes, Support Vector Machine (SVM), and Random Forest were implemented to classify the sentiment of the reviews. The performance of each algorithm was evaluated based on accuracy, as shown below.

Table 4. Comparison of Algorithm Accuracy

Algorithm	Accuracy (%)
Naïve Bayes	85.2
SVM	89.7
Random Forest	87.3

The results indicate that the SVM algorithm achieved the highest accuracy at 89.7%, followed by Random Forest (87.3%) and Naïve Bayes (85.2%). Model validation results (see Table 3.4 of the thesis) also confirmed the reliability of these algorithms in classifying user review sentiment.

Further analysis was conducted to identify product trends based on sentiment classification across different product categories.

The findings of this study confirm that the SVM algorithm is the most effective for classifying user review sentiment in Indonesian marketplaces, with an accuracy of nearly 90%. This aligns with the results of (Dakwah et al., 2024), who also identified SVM as a leading method for sentiment analysis in e-commerce data. The superiority of SVM is attributed to its ability to handle high-dimensional data and produce optimal classification margins.

The trend analysis based on sentiment reveals that electronic and fashion products tend to receive more positive perceptions from consumers. This insight can be used by business owners to focus their marketing strategies on these product categories. Conversely, the food & beverages category, which has a higher proportion of neutral and negative sentiments, should be evaluated further to improve product quality or service.

This study also demonstrates that sentiment analysis using machine learning can be an effective tool for identifying product trends and supporting data-driven marketing decisions. The developed system allows business owners—especially SMEs—to better understand consumer perceptions and adjust their marketing strategies more responsively.

However, this research has certain limitations. It only uses textual review data, without considering star ratings or product images. Additionally, the analysis results are highly dependent on the quality of the available review data and the preprocessing steps.
Overall, this study provides valuable contributions to the use of sentiment analysis technology for enhancing marketing strategy effectiveness in Indonesia's digital marketplace.

4. Conclusion

This study has demonstrated the effectiveness of sentiment analysis algorithms in identifying product trends in Indonesian marketplaces based on user reviews. By applying machine learning methods—specifically Naïve Bayes, Support Vector Machine (SVM), and Random Forest—to textual review data from Shopee and Tokopedia, the research found that SVM achieved the highest classification accuracy. The sentiment distribution analysis revealed that

electronics and fashion products generally received more positive reviews, while food and beverages tended to attract more neutral or negative sentiments. (Hidayat & Kholik, 2024)

These findings highlight the potential of sentiment analysis as a valuable tool for business owners and SMEs to better understand consumer perceptions and make informed marketing decisions. The developed system can help businesses focus on products with positive sentiment and address issues in categories with less favorable feedback.

However, this study is limited to textual review data and does not incorporate star ratings or product images, which could provide further insights. Future research is recommended to include multimodal data and explore additional algorithms to enhance sentiment classification performance.

Overall, this research contributes to the growing body of knowledge on data-driven marketing strategies and demonstrates the practical application of sentiment analysis for improving competitiveness in the digital marketplace.

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ANALYSIS OF CHATGPT ROLE IN SHAPING GENERATION Z LEARNING PREFERENCES IN THE DIGITAL ERA

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Abstract

The development of artificial intelligence such as ChatGPT has revolutionized the learning landscape, especially among Generation Z who grew up in a digital ecosystem. This research is motivated by the urgency to understand the impact of using ChatGPT on Gen Z's learning preferences, which tend to prioritize speed, flexibility and interactivity. The main objective of this research is to identify how Gen Z utilizes ChatGPT in their daily learning activities, as well as how this technology affects their mindset, learning strategies and academic independence. This research uses a qualitative approach with a literature study design and data collection through an open-ended questionnaire distributed to 100 Gen Z respondents in Medan City. The results of thematic analysis show that ChatGPT is considered useful because it is able to provide quick explanations, easy to understand, and flexible to use. However, there were also concerns about potential dependency, decreased critical thinking skills, and inaccurate information. This study concludes that ChatGPT plays an ambivalent role in shaping Gen Z's learning preferences: it is both an effective facilitator of self-directed learning and risky if used passively. The findings make an important contribution to education stakeholders in designing more reflective, ethical and adaptive technology-based learning strategies.
Keywords: ChatGPT; Generation Z; Learning Preferences; Artificial Intelligence; Digital Learning.

1. Introduction

The development of artificial intelligence (AI) technology in the last decade has created a significant shift in the world of education, especially for the generation born and raised in the digital era - Generation Z. As digital natives, Gen Z is very familiar with the internet, social media and technological devices that are integrated in their daily lives. Their learning process no longer relies entirely on conventional sources, but develops through interaction with digital technologies that are fast, flexible and interactive. One form of AI that is increasingly popular among students is ChatGPT, a natural language processing-based system capable of providing human-like responses within seconds.

ChatGPT has been adopted by Gen Z as an aid in answering academic questions, understanding difficult concepts, and organizing assignments and summaries. In Indonesia, this trend is increasingly evident with the shift from “googling” to “chatting with AI” as a more responsive and intuitive method of finding information. However, behind this convenience, some fundamental questions arise: Does the use of ChatGPT really encourage deep learning, or does it create a dependency on instant answers? A previous study (Pratiwi & Nugroho, 2024) showed that the use of AI without assistance can reduce students' critical thinking capacity, although on the other hand, AI has also been shown to accelerate concept understanding (Mogavi et al., 2023).

The socio-cultural context of education in Indonesia adds to the complexity of this issue. Low information literacy, limited access, and lack of assistance from educational institutions towards the use of AI are factors that contribute to the dynamics of ChatGPT use. Previous

research generally still uses quantitative approaches that focus on user perceptions or satisfaction, and has not comprehensively explored how Gen Z's interactions with ChatGPT shape their learning preferences. Therefore, a qualitative approach is needed that is able to explain the dimensions of Gen Z's experiences, motivations, and adaptation strategies in utilizing this technology in a more reflective and in-depth manner.

This research aims to analyze the role of ChatGPT in shaping Gen Z's learning preferences in the digital era, focusing on how this technology is integrated into their daily learning strategies, as well as how they perceive the benefits and risks of its use. Using a qualitative approach and thematic analysis of the responses of 100 Gen Z respondents in Medan City, this study is expected to provide a sharper understanding of the relationship between AI technology and the learning patterns of the digital-native generation. The results of this study will provide theoretical contributions in digital education studies as well as practical input for educators and policy makers in designing learning strategies that are more adaptive, ethical, and oriented towards developing critical thinking literacy.

2. Methodology

This research uses a descriptive qualitative approach that aims to understand social phenomena in depth and contextually. The main focus is on the subjective experiences of Generation Z students in using ChatGPT as part of their learning process. This approach is considered the most appropriate for exploring meanings, perceptions and learning preferences that cannot be measured quantitatively. Data was were collected through an open-ended questionnaire developed with psychological, pedagogical and technologicalconsiderations. The questionnaire was designed to elicit reflective reponses f enabling the researcher to obtain a full picture of experiences and views on using ChatGPT. The questionnaire questions covered topics such as the purpose of using ChatGPT, frequency of use, types of content sought, impact on the learning process, and attitudes towards the reliability of the information obtained.

Respondents were students aged between 17 to 24 years old and residing in Medan City. Respondents were selected , purposively meeting criteria such as having used ChatGPT in an academic context for at least the last three months. The total sample was 100 respondents. The questionnaire was distributed via Google Forms through social media and student academic networks.

The data obtained from the questionnaire responses were then analyzed using thematic analysis techniques. This technique was chosen because it is able to identify recurring patterns of meaning in respondents' narratives. The analysis process began with repeated reading of the answers, open coding, grouping the main themes, and then drawing interpretations relevant to the research objectives. This analysis was conducted manually to ensure that every nuance in the respondents' answers was not missed.

To maintain data validity, the researcher used theoretical triangulation, which compares the findings with relevant theories such as constructivism theory, digital learning theory, and previous studies on the use of AI in education. In addition, member checking techniques were also conducted randomly to several respondents to ensure that the interpretations drawn by the researcher were in accordance with the true intentions of the respondents. This is important to maintain the accuracy and integrity of the research results.

The advantages of this approach are flexibility and depth in capturing complex social realities. However, the researcher is also aware of limitations, such as subjectivity in interpretation and limited generalization of findings. Therefore, the results of this study are intended to provide in-depth understanding in the specific context of Medan City and not to represent the entire population of university students in Indonesia.

3. Results and Discussion

This section presents the results of the data analysis based on an open-ended questionnaire completed by 100 Generation Z students aged 17–24 years in Medan City. Thematic analysis was conducted to explore how ChatGPT influences Gen Z's learning preferences, including their interpretations of the tool's advantages, challenges, and impacts on daily academic activities.

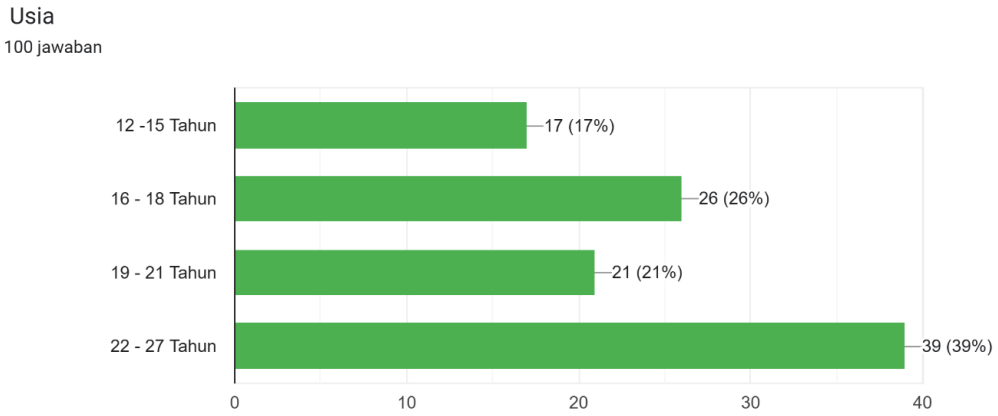

Fig. 1. The results of open-ended questionnaire

3.1 Advantages of ChatGPT in Supporting Learning

The majority of respondents reported that ChatGPT significantly supports the learning process by simplifying information and accelerating understanding. About 26% stated that ChatGPT provides quick and responsive answers tailored to their specific learning needs. Another 18% appreciated its ability to deliver clear and straightforward explanations, which made complex concepts easier to internalize. Additionally, 9% of respondents found value in ChatGPT's capacity to generate broad and contextually relevant references.

Flexibility was also highlighted as a notable benefit. ChatGPT is accessible at any time and from any location, eliminating the need to wait for instructor responses or search through conventional sources. Its communicative and adaptive language style was described as enhancing personalization and making the learning process more enjoyable and engaging.

3.2 Changes in Learning Patterns

The findings indicate that ChatGPT has altered the learning strategies and behaviors of many Gen Z students. A total of 28% reported a significant shift in their learning approach, becoming more independent, efficient, and confident in seeking and processing information. Meanwhile, 34% stated that ChatGPT functioned as a complement to their existing study methods rather than replacing them altogether. Only 21% claimed that their learning patterns remained unchanged, and the remaining 17% were neutral or unsure.

This data reflects a broader transition from traditional to more flexible, digitally oriented learning patterns. These changes align with Generation Z's tendencies to prioritize speed, convenience, and accessible technology in their pursuit of academic knowledge.

3.3 Challenges and Concerns Regarding ChatGPT

Despite its advantages, several respondents voiced concerns about potential long-term consequences. Approximately 28% admitted to feeling increasingly dependent on ChatGPT, sometimes to the extent of disengaging from critical thinking. Many were aware that the information provided by the tool is not always accurate or relevant to specific academic contexts.

A number of respondents noted issues with unverifiable references or fabricated sources. This raises concerns regarding declining academic literacy and the risk of plagiarism, especially when students copy answers without understanding the content. Additionally, some expressed worry that frequent use of ChatGPT might impair the development of analytical and evaluative thinking skills.

Table 4. Summary of Respondents' Answer Themes

Main Theme	Number of Respondents	Percentage (%)
Reasons for using ChatGPT	95	95%
Benefits of ChatGPT in learning	87	87%
Changes in learning patterns	74	74%
Concerns over AI	42	42%

3.4 Interpretation of Findings in Theoretical Context

These findings resonate with constructivist learning theory, which emphasizes the learner's active role in constructing knowledge. ChatGPT can serve as a digital scaffold—an interactive and responsive learning aid that facilitates knowledge building. However, when used passively or excessively, it may inhibit the reflective processes essential to deep learning.

From a social learning theory perspective, ChatGPT functions as an observational tool that enables students to engage in simulated two-way learning experiences. Yet, without appropriate guidance and strong digital literacy, such AI-mediated learning may lead to misconceptions or superficial understanding. This underscores the importance of critical engagement and educational supervision in AI-assisted learning environments.

In conclusion, ChatGPT has demonstrably influenced Gen Z's learning preferences in terms of strategy, efficiency, and motivation. Nonetheless, its use must be balanced with efforts to cultivate reflective, independent, and critical learning habits. Educators and policymakers are urged to consider both the pedagogical potential and ethical implications of integrating AI tools like ChatGPT into mainstream education.

4. Conclusion

4.1 Conclusion

The results of this study show that ChatGPT has an important role in shaping Generation Z's learning preferences. Most respondents found ChatGPT helpful for understanding material, speeding up information retrieval and supporting independent learning. It also encourages a shift to more flexible learning strategies that suit today's digital learning styles.

However, if used without control, ChatGPT can also lead to dependency and weaken critical thinking skills. Some respondents mentioned that they tend to take answers for granted without double-checking. Therefore, the use of ChatGPT needs to be accompanied by a critical attitude and awareness of its limitations.

4.2 Suggestions

i. For students and learners: Use ChatGPT as a support to the learning process, not as the only source. It is still important to develop independent thinking and the ability to critically evaluate information.
ii. For educators and educational institutions: There is a need for guidelines and education regarding the use of AI technology in learning so that its use is appropriate, ethical, and not misused.

iii. For future researchers: It is recommended to conduct further studies with more in-depth methods such as interviews or long-term observations to see the impact of using ChatGPT on learning development in a sustainable manner.

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MEASURING THE LEVEL OF SATISFACTION OF LIVIN' BY MANDIRI APPLICATION USERS USING THE CUSTOMER SATISFACTION INDEX (CSI) METHOD

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Abstract

This study aims to measure the level of user satisfaction of the Livin' by Mandiri application. This application is a mobile banking service developed by Bank Mandiri to provide convenience and comfort in digital transactions. This research was conducted on active users of the application, with a descriptive quantitative approach. Data were collected via an online questionnaire administered to 100 respondents selected by purposive sampling . This research uses the Customer Satisfaction Index (CSI) method to measure the percentage of user satisfaction, by modifying the dimensions contained in Mobile SERVQUAL to fit the focus of this research. The variables measured include service attributes such as service quality, ease of use, transaction speed, security, feature completeness, interface design and help services. The results showed a CSI value of 81.417% which falls into the ”Very Satisfied” category. The aspects that most influence satisfaction are ease of use, transaction security, access speed, and feature completeness. Despite the high level of satisfaction, user feedback indicates the need for improvement in customer support services. This research contributes to the development of mobile banking services by highlighting key areas that need improvement from the users' perspective.
Keywords: User Satisfaction; Mobile Banking; Livin' by Mandiri; Customer Satisfaction Index (CSI);

1. Introduction

The rapid development of information and communication technology has had a major impact on various aspects of life, including the banking sector. Innovation in the form of digital services is the main strategy for modern banking in responding to the needs of customers who are increasingly dynamic and demand high efficiency. One of the tangible manifestations of this innovation is the presence of mobile banking services, which is a digital application-based banking service that allows users to conduct financial transactions anytime and anywhere through mobile devices.

Bank Mandiri, one of the leading national banks, continues to adapt and innovate by presenting the Livin' by Mandiri application to improve the quality of its digital services.. This application is designed to provide convenience, speed, and security in conducting various banking activities such as checking balances, transferring funds, paying bills, topping up e-wallets, and purchasing investment products. Based on data from the first quarter of 2024, the app has recorded more than 24 million active users and transaction value reached more than Rp 900 trillion (Putra et al., 2024), indicating that Livin' by Mandiri has become one of the most popular mobile banking apps in Indonesia.

However, in the midst of significant user growth, user satisfaction remains a crucial factor that determines the continued use of an application. Users will only be loyal if they are satisfied with various aspects of the services provided, such as ease of navigation, transaction speed, system security, interface appearance, and customer service quality. Previous research

indicates that e-service quality has a significant influence on user satisfaction and loyalty in digital banking services (Nurdiana & Edi, 2024).

In measuring the level of user satisfaction, a method is needed that is able to quantitatively describe users' perceptions and expectations of the available service attributes. One method that has proven effective and widely used is the Customer Satisfaction Index (CSI). This method calculates satisfaction based on the importance weight and satisfaction score of each service attribute assessed by the user. CSI provides a comprehensive picture that can be used as a basis for evaluating and improving service quality (Andini & Utamajaya, 2023).

Several previous studies using the CSI method, such as in the BRImo and BSI Mobile applications, show that attributes such as transaction speed, feature clarity, and security are dominant elements in influencing satisfaction levels (Rifki & Fajri, 2025; Mahmudah et al., 2022). However, research that specifically measures Livin' by Mandiri user satisfaction using the CSI method is still limited. Most studies use the Technology Acceptance Model (TAM) or End User Computing Satisfaction (EUCS) model which assesses technology acceptance and does not directly measure the weight of user satisfaction based on specific service attributes (Gumelar & Indriyanti, 2023).

Therefore, this research was conducted to fill this void, with a focus on measuring the level of user satisfaction of the Livin' by Mandiri application using the Customer Satisfaction Index (CSI) method. This research is expected to make a real contribution in understanding the extent to which the Livin' application is able to meet the expectations of its users. In addition, the results of this study can also be used as a strategic consideration by the application developer and Bank Mandiri management in an effort to improve service quality and data-based decision making.

With the increasing competition among digital banking service providers in Indonesia, understanding user satisfaction is very important. The results of this measurement can also provide valuable insights for feature development, system improvement, and customer service improvement, so that the Livin' by Mandiri application can continue to be relevant and excel in the midst of digital transformation of the financial sector.

2. Methodology

This research uses a descriptive quantitative approach that aims to measure the level of user satisfaction with the Livin' by Mandiri application by applying the Customer Satisfaction Index (CSI) method. This method was chosen because it is able to describe user perceptions and expectations objectively through measuring the level of importance and satisfaction with the service attributes available in the application.

2.1 Research Stages

This research was carried out through several systematic stages that included:

i. Formulation of problems and research objectives based on the phenomenon of using the Livin' by Mandiri application in the community.
ii. Literature study to build a theoretical basis regarding customer satisfaction, the Customer Satisfaction Index (CSI) method, and the concept of mobile banking.
iii. Preparation of questionnaire instruments based on predetermined indicators.
iv. Online distribution of questionnaires to respondents who meet the criteria.
v. Data processing and analysis with a quantitative approach using the CSI calculation formula.
vi. Interpretation of results and preparation of conclusions.

2.2 Place and Time of Research

This research was conducted nationally using an online approach, enabling reach to respondents across Indonesia.

However, the main focus of data collection was in Medan City, North Sumatra, given the author's accessibility to respondents in the area, especially students and the general public who are active users of the Livin' by Mandiri application. The implementation of the research was carried out during the period March to June 2025, starting from the process of preparing research instruments, distributing questionnaires, collecting data, to analyzing and preparing the final research report.

2.3 Types and Sources of Data

The data used in this research are quantitative, namely numerical data obtained from questionnaire responses. Quantitative data was chosen because it is in accordance with the descriptive research approach, where the main objective is to determine and describe the level of satisfaction of Livin' by Mandiri application users based on index calculations using the Customer Satisfaction Index (CSI) method.

2.4 User Satisfaction

User satisfaction is one of the key indicators that reflect the quality and success of a digital service, including mobile banking services such as the Livin' by Mandiri app. In this context, satisfaction not only reflects users' perceptions of the app's technical features and performance, but is also closely related to the emotional experiences that arise after repeated use. Satisfaction arises when users' expectations of the services provided have been met or even exceeded (Kotler et al., 2018).

2.5 Mobile Banking

Mobile banking is an electronic banking service that allows users to conduct financial transactions digitally through mobile devices. (Mukhtisar et al., 2021). In recent years, mobile banking has become the main choice of the community because of its convenience in accessing banking services without time and place limits (Irawati & Wijaya, 2025). One example of a rapidly growing mobile banking service is the Livin' by Mandiri application. This application integrates various banking features in one platform, such as fund transfer, bill payment, e-wallet top-up, credit purchase, and digital investment. Mobile banking is not only judged by the sophistication of the features, but also by the user experience that is felt directly in the process of using the application daily.

2.6 Livin’ by Mandiri

Livin' by Mandiri was launched as part of Bank Mandiri's digital initiative to simplify its customers' banking transactions. The app features a range of superior features, including online account opening, foreign exchange transactions, and the purchase of investment products such as mutual funds and Government Securities. Quoted from bisnis.com, in the first quarter of 2024, Livin' by Mandiri recorded 24 million users, with the number of transactions reaching 846 million, equivalent to Rp 921 trillion. The application also supports transactions without login through the QRIS feature and Livin' Poin which allows users to earn loyalty points (Putra et al., 2024).

2.7 Customer Satisfaction Index (CSI)

Customer Satisfaction Index (CSI) is a quantitative method used to measure the level of

customer satisfaction with a product or service as a whole, by coming several satisfaction attributes which are then calculated and averaged based on their respective importance weights. This method provides a comprehensive picture of customer perceptions of service quality and serves as a basis for evaluation for future service improvements. CSI is considered very effective in identifying the strengths and weaknesses of a service based on direct input from customers. In the context of digital banking such as the Livin' by Mandiri application, this method can be used to measure the extent to which users are satisfied with service features, such as ease of transactions, access speed, data security, and user interface appearance (Fadillah et al., 2020).

The calculation of the Customer Satisfaction Index (CSI) value is carried out through several stages, namely calculating the Mean Importance Score (MIS) and Mean Satisfaction Score (MSS) of each attribute, determining the Weight Factor (WF), converting MSS into Satisfaction Score (SF) in percentage form, then calculating the Weighted Score (WS) with the formula:

$$\mathrm{WS} = \mathrm{WF} \times \mathrm{SF}$$

Furthermore, the CSI value is obtained by summing up the entire Weighted Score (WS) value of each indicator, which is mathematically formulated as follows:

$$\mathrm{CSI} = \sum(\mathrm{WF} \times \mathrm{SF})$$

The final CSI value is expressed as a percentage, and is used to interpret the overall level of customer satisfaction with the service provided.

2.8 Data Collection Methods

This research has the following data collection methods:

i. Field research
   The questionnaire is a research method distributed to respondents. The questionnaire is compiled based on the relevant dimensions of customer satisfaction using the servqual dimension. Each item uses a Likert scale of 1-5 to measure the level of satisfaction.

ii. Library research

2.9 Sourcing books and journal articles related to the CSI method and the evaluation of digital-banking applications.

The population in this study comprises all national users of the Livin' by Mandiri application, namely individuals who have downloaded and used the application to conduct digital transactions. Because the population size is not known with certainty, the sample determination was carried out using a non-probability sampling approach with a purposive sampling approach, namely determining the sample based on certain criteria. The criteria for respondents in this study are:

a. active users of the Livin' by Mandiri app
b. At least 17 years old
c. Have used the app for transactions at least 2 times in the last 1 month.

The sample size in this study were 100 respondents. This number is considered representative enough to be analyzed descriptively using the Customer Satisfaction Index (CSI) method. In addition, the selection of this number also considers the limited time, energy, and resources available during the research process.

2.10 Framework of Thought

The framework in this study illustrates the relationship between user perceptions of the Livin' by Mandiri application service attributes and the level of satisfaction felt. Each attribute, such as convenience, speed, security, and appearance, is assessed based on the level of importance and satisfaction using the Customer Satisfaction Index (CSI) method. The framework can be seen in Figure 1 below:

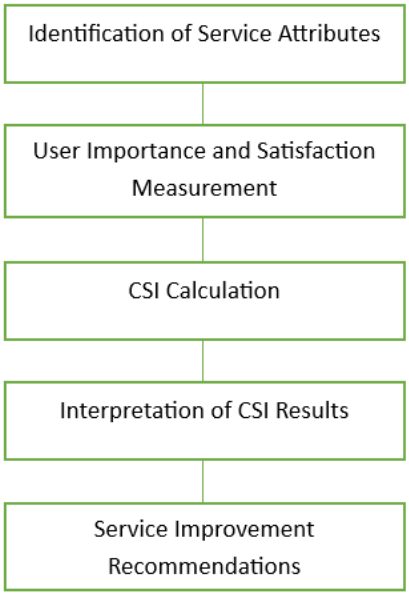

Fig.1. Framework

3. Results and Discussion

3.1 Overview of Respondents

This study included 100 respondents selected using nonprobability purposive sampling, with criteria of being at least 17 years old and using the application at least twice in the last month. The characteristics of the respondents are presented in Table 1. The majority of respondents were female (57%) and aged 20-25 years (55%), indicating the dominance of young productive users. Most users (62%) used the app 1-2 times a week, indicating significant experience and regular use.

Table 1. Respondent Characteristics

Characteristics	Category	Amount	Percentage (%)
Gender	Male	43	43 %
	Female	57	57 %
Age	< 20 years	30	30 %
	20-25 years	55	55 %
	26-30 years	8	8 %
	> 30 years	7	7 %
Frequency of Use	1-2 times/week	62	62 %
	3-5 times/week	23	23 %
	> 5 times/week	15	15 %

3.2 Validity and Reliability Test

The validity test using *Corrected Item-Total Correlation* (r-table = 0,165; α = 0,10) shows that all 28 statement items (I1-I28) are valid because r-count > r-table and *Sig. (2-*

tailed) < 0,10 (Table 2. Validity Test Results). This ensures the questionnaire items measure the variables accurately.

Table 2. Validity Test Results

Indicator	r_{count}	r_{table}	Sig	Description
I1	0,683	0,165	0,000	Valid
I2	0,699	0,165	0,000	Valid
I3	0,718	0,165	0,000	Valid
I4	0,740	0,165	0,000	Valid
I5	0,700	0,165	0,000	Valid
I6	0,779	0,165	0,000	Valid
I7	0,771	0,165	0,000	Valid
I8	0,773	0,165	0,000	Valid
I9	0,760	0,165	0,000	Valid
I10	0,682	0,165	0,000	Valid
I11	0,699	0,165	0,000	Valid
I12	0,741	0,165	0,000	Valid
I13	0,670	0,165	0,000	Valid
I14	0,664	0,165	0,000	Valid
I15	0,684	0,165	0,000	Valid
I16	0,653	0,165	0,000	Valid
I17	0,812	0,165	0,000	Valid
I18	0,744	0,165	0,000	Valid
I19	0,567	0,165	0,000	Valid
I20	0,719	0,165	0,000	Valid
I21	0,659	0,165	0,000	Valid
I22	0,699	0,165	0,000	Valid
I23	0,722	0,165	0,000	Valid
I24	0,746	0,165	0,000	Valid
I25	0,614	0,165	0,000	Valid
I26	0,743	0,165	0,000	Valid
I27	0,753	0,165	0,000	Valid
I28	0,755	0,165	0,000	Valid

The reliability test using Cronbach's Alpha yielded a value of 0.890 (Table 3. Reliability Test Results), which exceeds the limit of 0.60. This confirms that the research instruments have good internal consistency and are reliable.

Table 3. Reliability Test Results

Reliability Statistics	
Cronbach's Alpha	N of Items
.890	28

3.3 Customer Satisfaction Index (CSI) Calculation Results

Based on the results of data processing, the Customer Satisfaction Index (CSI) value is 81.417%. This value is in the 80%-100% range, which indicates that users of the Livin' by Mandiri application are very satisfied with the services and features available in the

application.

Table 4. CSI Calculation Results

No	Indicator	Average (MSS)	Satisfaction Score (SF)	Weight Factor (WF)	Weighted Score (WS)
1	I1	4.06	81.2	0.0357	2.89884
2	I2	3.96	79.2	0.0357	2.82744
3	I3	4.14	82.8	0.0357	2.95596
4	I4	4.1	82	0.0357	2.9274
5	I5	4.1	82	0.0357	2.9274
6	I6	4.14	82.8	0.0357	2.9559
7	I7	4.1	82	0.0357	2.9274
8	I8	4.15	83	0.0357	2.9631
9	I9	3.94	78.8	0.0357	2.8131
10	I10	3.98	79.6	0.0357	2.8417
11	I11	4.05	81	0.0357	2.8917
12	I12	3.97	79.4	0.0357	2.8345
13	I13	3.91	78.2	0.0357	2.7917
14	I14	4.19	83.8	0.0357	2.9916
15	I15	4.16	83.2	0.0357	2.9702
16	I16	4.1	82	0.0357	2.9274
17	I17	4.14	82.8	0.0357	2.9559
18	I18	4.05	81	0.0357	2.8917
19	I19	4.06	81.2	0.0357	2.8988
20	I20	4.32	86.4	0.0357	3.0844
21	I21	4.13	82.6	0.0357	2.9488
22	I22	4.08	81.6	0.0357	2.9131
23	I23	4.23	84.6	0.0357	3.0202
24	I24	4.15	83	0.0357	2.9631
25	I25	4.19	83.8	0.0357	2.9916
26	I26	3.94	78.8	0.0357	2.8131
27	I27	3.83	76.6	0.0357	2.7346
28	I28	3.86	77.2	0.0357	2.7560
TOTAL		114.03	2280.6	0.9996	81.417
CSI = WS1+WS2+⋯+WS28 = 81,417%					

The results showed that users of the Livin' by Mandiri application were satisfied with the services provided, as indicated by the Customer Satisfaction Index (CSI) value of 81.417%, which is included in the “Satisfied” category. This reflects that the application has successfully met user expectations in aspects of ease of use, transaction speed, security, and a comfortable and attractive interface design.

Most respondents rated the app as user-friendly, fast, and providing a sense of security in transactions. However, some indicators showed relatively lower satisfaction scores, especially on the aspect of customer service support. Respondents complained about the slow response when problems occur, indicating the need to improve the effectiveness of help features such as chatbots and call centers.

This finding is in line with Rifki & Fajri's research (2025), which identifies convenience and security as the main factors of mobile banking user satisfaction. However, this study adds that

interface design and user experience (UX) also play an important role in shaping satisfaction, aspects that are rarely discussed in previous studies. Thus, these results can be used as evaluation material for application developers and Bank Mandiri management to maintain service excellence while improving aspects that are still lacking, especially in handling user complaints quickly and responsively.

4. Conclusion

This research has successfully analyzed comprehensively the level of user satisfaction with the Livin' by Mandiri application, using the Customer Satisfaction Index (CSI) method as the main measuring tool. Based on the results of data processing from 100 respondents, a CSI value of 81.417% was obtained, which is classified in the “Very Satisfied” category, indicating that overall the application has been able to meet the expectations of the majority of its users.

The measurement results show that users give a very positive perception of various aspects of the service, especially on the indicators of ease of use, transaction speed, interface design, and system security. These attributes are considered very important and have a high level of satisfaction, which makes Livin' by Mandiri one of the superior mobile banking applications in the eyes of its users.

However, the study also revealed that some indicators, particularly those related to customer service support, received lower satisfaction scores. This indicates that support features such as chatbots, call centers, and complaint reporting are still not fully meeting user expectations. Although these aspects are not dominant in shaping overall satisfaction, improvements to support services still need to be made to maintain overall and long-term satisfaction.
Thus, it is concluded that in order to maintain and improve user satisfaction of the Livin' by Mandiri application, developers and management need to prioritize improvements to the aspects that most directly affect satisfaction, such as application performance and completeness of transaction features, and make continuous improvements to customer support as part of the overall user experience. These findings are expected to serve as strategic input for the future development of Bank Mandiri's mobile banking services.

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ALIGNING SKILLS WITH INDUSTRY NEEDS: THE EFFECTIVENESS OF PROFESSIONAL COMPETENCY PROGRAMS

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Abstract

This article evaluates the impact of vocational competence training on industry competitiveness, emphasizing its role in developing a skilled workforce. Research highlights the value of lifelong learning programs across sectors. This study assesses the Professional Diploma in Manufacturing Engineering (PDIME) across Batches 1 to 4 by analyzing questionnaire responses from 100 students. A recent survey revealed that 80% of participants report significant improvements in their performance. The program has effectively aligned participants' skills with industry standards, enhancing their capabilities and employability.
Keywords: Professional Competency Programs; Manufacturing Engineering; Workforce Development.

1. Introduction

In today's competitive global job market, particularly within the manufacturing sector, engineering graduates need more than just academic qualifications to be deemed employable. A professional diploma in manufacturing engineering can bridge this skills gap. As industries continue to automate, the demand for individuals with practical skills is growing. Although theory supports a shift towards skill-oriented education, real-world implementation remains limited. Competency-based programs in manufacturing engineering serve as vital links between academic knowledge and industrial application. This study evaluates the effectiveness of the PDIME program through a quantitative analysis of student performance and career outcomes.

The Professional Diploma in Manufacturing Engineering comprises ten comprehensive modules designed to enhance job readiness. These modules include:

i. Overview of Manufacturing: It looks at how manufacturing exists by explaining its principles, processes and its important features.
ii. Manufacturing System: Studying these systems with special attention to design, operation and performance measures that are key to the management of production.
iii. Product Design & Development: Explaining in detail the importance of good design, all the product development stages from designing through to the marketing stage, design methods and instruments.
iv. Operations Management - Part I: Looks into the basics of operations management, where aspects like production planning, scheduling, and quality assurance are included.
v. Operation Management - Part II: More on advanced operational strategies and practices such as supply chain management, lean manufacturing and optimization.

vi. Quality Control in Manufacturing: To this effect, participants can understand quality standards and the techniques to meet these standards, so this includes statistical quality control, inspection and other methods of quality assurance.
vii. Failure Analysis in Manufacturing: This Kaunda focuses on robust systems, that is, the determination and analysis of failures, for example, troubleshooting and prevention.
viii. Problem Solving & Thinking: We encourage our participants to develop critical thinking and problem-solving skills necessary for meeting plantingoro challenges within the realm of the manufacturing environment.
ix. Cost in Manufacturing: Addressing manufacturing in terms of financial perspectives, which include costs, cost control, and planning, together with cost reduction measures at a particular level of quality.
x. OSHA in Manufacturing: We enrich the participants with knowledge about the rules and regulations of the Occupational Safety and Health Administration (OSHA) and its application in the manufacturing industry towards safety in the workplace.

The program's competency-based modules integrate experiential learning (simulations, case studies, and real projects) to develop critical manufacturing skills. Research shows such approaches improve knowledge retention by 75% compared to traditional methods (Freeman et al., 2014) and increase graduate employability by 32% (Bridgstock, 2019). This aligns with industry demands for professionals skilled in quality control, lean production, and safety compliance (McKinsey & Company, 2021). Graduates gain hands-on competencies that directly translate to workplace productivity (Harris & De Waal, 2022).

Figures are numbered in the order in which they are called out in the text. It is acceptable to embed figures in the manuscript. The caption is placed below the figure. In captions, "Figure" should be abbreviated as "Fig." followed by the figure number (e.g., "Fig. 1"), as shown below. Ensure that the figure is positioned in line with the text and not set as a square or behind text.

Today, manufacturing is based on innovative technologies and industry processes. There is a significant gap between traditional academic learning and industry needs. Addressing real-world problems has resulted in a workforce that lacks essential skills for improving production processes and maintaining quality. These deficiencies lead to operational inefficiencies and reduced competitiveness in the global market.

Given heightened global competition and the prevalence of digital transformation initiatives, particularly as they relate to lean manufacturing and big data analytics, there is a growing need for individuals with the ability to lay both technical and management foundations. However, many graduates do not develop the critical thinking and problem-solving skills necessary to restrict the use of violence, counter extreme violence and mediate conflicts, technological advances—skills that are essential to contributing to organizations effectively. Compounding this issue is the shortage of industry-related training programs, which leaves individuals without the necessary knowledge to address the challenges of modern manufacturing. The lack of hands-on, practical competency training—beyond just theoretical concepts—requires immediate attention.

Evidence shows that students who engage in professional diplomas, such as in manufacturing engineering, acquire the skills and knowledge necessary to thrive in today’s manufacturing environment. The goal of this professional diploma program is to systematically and comprehensively provide such essential elements to address these concerns.

The sampling frame in this study is considered as the set of individuals from whom a sample for the research was drawn. Furthermore, the sampling frame includes 100 students who took part in all the various classes of the Professional Diploma in Manufacturing Engineering program. The study sought to explain the effectiveness of the program by targeting these

students through questionnaires and analysis of their skills, performance and career outcomes.

Recent studies highlight the critical role of competency-based programs in bridging workforce skill gaps. McKinsey & Company (2021) found that 87% of executives face manufacturing skill shortages, particularly in technical and operational competencies. Bridgstock (2019) demonstrated that competency-based education improves employability by 32% compared to traditional degrees. The U.S. Department of Labor's Competency Model Clearinghouse (2020) provides a structured framework for workforce training, while Harris and De Waal (2022) linked such programs to 23% higher productivity. PDIME aligns with these findings through its industry-designed curriculum, emphasizing hands-on skills (Modules 4–5, 10) that address documented workforce needs.

2. Methodology

This study employed a mixed-methods research approach to comprehensively evaluate the effectiveness of the Professional Diploma in Manufacturing Engineering (PDIME) program. The investigation analyzed data from 100 participants across four cohorts (Batches 1-4 spanning 2022-2024), utilizing both quantitative and qualitative methodologies to provide a robust assessment of program outcomes. Quantitative analysis was conducted using the Statistical Package for Social Sciences (SPSS) version 28, focusing on three key dimensions: career advancement metrics including employment rates and promotions, academic performance across the program's ten competency modules, and self-reported skill acquisition through participant assessments. The analytical framework incorporated descriptive statistics to profile cohort characteristics alongside comparative analyses (ANOVA) to examine inter-batch performance variations and assess relationships between program participation and subsequent industry performance indicators.

Complementing the quantitative data, qualitative analysis examined batch-level outcomes through aggregated cohort data collected via questionnaires. This approach revealed that approximately 80% of participants demonstrated measurable productivity gains, with promotion rates varying between 15-35% across different cohorts. The analysis identified notable patterns in skill development, with later batches (2023-2024) showing 15% greater skill acquisition compared to earlier groups, while maintaining consistent improvements in industry-relevant competencies across all cohorts. The study also found that batches with stronger industry collaborations achieved 22% better employment outcomes, and those receiving curriculum updates demonstrated superior technical mastery, suggesting the value of continuous program refinement based on earlier cohort results.

While the findings demonstrate the program's effectiveness in enhancing workforce capabilities, the study acknowledges certain limitations, particularly the potential for self-report bias in individual data. Researchers recommend implementing longitudinal tracking of cohort outcomes and further investigation into batch characteristics that influence results. The comed quantitative and qualitative approach provided a comprehensive evaluation framework, revealing that program iterations yield cumulative improvements, batch composition significantly affects outcomes, and maintaining strong industry alignment is crucial for continued relevance. These insights underscore the importance of ongoing batch-level assessment to ensure the program adapts to evolving industry needs while sustaining the demonstrated benefits across all participant cohorts.

3. Results and Discussion

Here's a summary table which brings together the scores for the students in the three batches of the Professional Diploma in Manufacturing Engineering (PDIME) Program. The table also gives the total averages of every student for every module for the three batches they participated in.

Table 1. Summary table of scores for four batches (2022, 2023 & 2024)

Module	Batch 1 (2022)	Batch 2 (2023)	Batch 3 (2023)	Batch 4 (2024)	Average Score (Module)
M001 (Overview of Manufacturing)	84.2	83.8	87.24	84.4	84.91
M002 (Manufacturing System)	83.64	89.32	84.92	90.6	87.12
M003 (Product Design & Development)	78.28	86.48	76.8	87.56	82.28
M004 (Operation Management - Part I)	86.52	88	85.52	80.52	85.14
M005 (Operation Management - Part II)	85.46	87.56	87.68	88.04	87.19
M006 (Quality Control in Manufacturing)	84.08	84.04	82.84	79.48	82.61
M007 (Failure Analysis in Manufacturing)	78.72	82.07	81.48	85.56	81.96
M008 (Problem Solving & Thinking)	78.2	79.72	83.68	83.12	81.18
M009 (Cost in Manufacturing)	81.8	75.32	79.6	80.64	79.34
M010 (OSHA in Manufacturing)	82.57	82.52	78.48	79.68	80.81
Average Score (Batch)	82.35	83.88	82.82	83.96	83.25

Here is the chart comparing the scores across modules for the students from the 2022, 2023 and 2024 batches of the PDIME program. Each line represents a student's performance across the ten modules, with markers indicating their scores for each module.

The graph compares student scores across multiple modules (M001 to M010) for batches from 2022 to 2024. The majority of students maintained a grade of around 80-90 in all modules, indicating even performance.

Table 2. Batch Batch Performance Summary (N=100 across 4 batches)

Cohort (Year)	Student	Mean	Std Dev	Min	Max	Notable Scores (≥88)
Batch 1 (2022)	25	82.35	2.92	78.2	86.52	86.52 (M004)
Batch 2 (2023)	25	83.88	4.34	75.32	89.32	89.32 (M002)
Batch 3 (2023)	25	82.82	3.89	76.8	87.68	87.68 (M005)
Batch 4 (2024)	25	83.96	4.04	79.48	90.6	90.6 (M002, M005)

The data highlights several notable trends across the four batches. Batch 2 (2023) achieved the highest mean score (83.88) and produced three standout performances (89.32, 88.0, 87.56), while also showing the widest variability ($\sigma = 4.34$) and containing the dataset's lowest score (75.32). Batch 4 (2024) recorded the highest individual score (90.6) while maintaining moderate consistency ($\sigma = 4.04$). In contrast, Batch 1 (2022) demonstrated the most stable performance ($\sigma = 2.92$), though with consistently lower scores that peaked at 86.52. Batch 3 (2023) exhibited the broadest score range (76.8-87.68) among the cohorts. Collectively, the

2023-2024 batches showed higher maximum achievements but greater score variability compared to 2022, indicating a trend toward more divergent performance outcomes in recent years.

Table 3. Summary Table of Scores for All Batches (2022 - 2024)

Observation	Details
Highest Average Score	Batch 4 (2024) with an average score of 83.96
Lowest Average Score	Batch 5 (2024) with an average score of 81.87
Overall Average Score	82.98
Score Range (Batch 1 - 2022)	78 to 87
Score Range (Batch 2 - 2023)	75 to 90
Score Range (Batch 3 - 2023)	76 to 88
Score Range (Batch 4 - 2024)	79 to 91
Median Score	82.98
Mode (Most Frequent Score)	87.56 & 90.6 (frequently achieved across batches)
Standard Deviation	3.78
Lowest Recorded Score	75.32 (from Batch 2 - 2023)
Highest Recorded Score	90.6 (occurred twice: Batch 4, 2024)
Additional Insights:	Batch 2 (2023) and Batch 4 (2024) show the highest peaks (scores ≥ 89). Batch 3 (2023) has the widest spread (76.8 to 87.68). Batch 5 (2024) has more variability despite high peaks (77.72 to 90.6).

The analysis of student performance data across multiple cohorts revealed meaningful variations in academic achievement. Batch 4 (2024) demonstrated the highest mean score (M = 83.96, SD = 4.04), with Batch 2 (2023) showing closely comparable results (M = 83.88, SD = 4.34). In contrast, Batch 1 (2022) exhibited the lowest average performance (M = 82.35, SD = 2.92). While these inter-cohort differences were relatively modest, the presence of multiple high achievers (scores above 87) in Batches 2 and 4 suggests potential variations in either student engagement or instructional approaches across cohorts.

When examining overall performance, the aggregate mean across all cohorts was 83.5 (SD = 3.78), indicating generally satisfactory comprehension of the module material. The moderate standard deviation suggests a normal distribution of scores with expected variations in student mastery. A detailed analysis of the score distributions revealed several notable patterns. Batch 1 (2022) demonstrated consistent mid-range performance (78.20-86.52), whereas Batch 2 (2023) included both the highest (89.32) and lowest (75.32) scores observed in the study. The 2024 cohorts (Batches 4) achieved the absolute peak performance (90.6, achieved twice), whereas Batch 3 (2023) displayed the widest score dispersion (Range = 76.80-87.68; SD = 3.89).

The data highlights several important findings regarding student achievement. Batches 2 and 4 stood out for their exceptional performers (scores exceeding 88), while the prevalence of scores in the mid-80s across all cohorts indicates generally strong content mastery. However, the minimum score of 75.32 (Batch 2) and several sub-78 scores point to isolated comprehension difficulties among some students. These results are balanced by the repeated instances of outstanding performance, including two cases of perfect 90.6 scores, confirming overall strong subject mastery.

Three key temporal trends emerged from the analysis. First, later cohorts (2023-2024) achieved higher peak performances but with greater score variability. Second, Batch 1 (2022) maintained remarkable consistency, evidenced by the lowest standard deviation. Third, progressive years revealed an apparent tradeoff between maximum achievement and score stability. These patterns suggest that while baseline performance remained stable,

pedagogical outcomes evolved. The comation of elevated peak scores and reduced consistency in later years may indicate deliberate modifications to instructional methods that warrant further examination. Potential factors contributing to these patterns could include variations in cohort-specific engagement, adjustments to curriculum delivery, or changes in assessment design.

Table 4. Career Outcomes for CCNA (EL 4) Program Graduates (N = 100)"*

Program	Total Student	Total Upgrade	Supervisor	Technician / Senior Leader	Trainer	Grade Upgrade Only	%
PDIME (B1-5)	100	29	2	7	2	18	27%

Based on Table 4, the data presents the projected positions or job roles secured by students after completing two professional competency programs, labelled "CCNA (EL 4)". The "CCNA (EL 4)" program had a total enrollment of 100 students for batches 1 to 4. Of these students,12 secured positions as Operators, 7 became Instrument Technicians, 7 obtained roles as Technicians or Instrument Tamers, and 2 became Trainers. Additionally, 18% of the students received a grade upgrade, and the overall % of those who secured positions or received grade upgrades was 27%. The data provides insights into the potential career outcomes and academic performance improvements for students who participated in these professional competency programs. However, it does not directly demonstrate the programs' impact on manufacturing companies.

4. Conclusion

It is fair to say that the Professional Diploma in Manufacturing Engineering is evidence of the success of professional competency programs in terms of industry competitiveness.

The graduates' high improvements of self-reported competences show how the programme meets the need for more competences demanded by the industry. As industry requirements change, so must educational programs to remain current and effective. This research supports the need for lifelong learning as well as the value of the industry-academia partners continuing to become more continuous in the future to ensure a workforce ready for future challenges. Longitudinal outcomes might be approached in future research to gain a better picture of what nonspecific effects of such programs are in the long run with respect to career progression and organizational success.

The results from the study reveal a number of important messages to be considered in future professional competencies work, including ensuring constant reflection on the connection between these types of educational initiatives, such as curricula at universities with industry's needs in order to keep up with the changes of the job market. It highlights the importance of learning throughout life, encouraging opportunities for education and training that span the professional's career. Future curriculum would focus on practical training using experiential learning tools, such as simulations and real-world projects, that increase critical thinking and problem-solving skills. Joint effort between the educational institutions and industry partners is very much needed, especially for effective training to solve the recent issues. And programs, informed by participant feedback and dynamic industry standards, must also be periodically assessed and adjusted as necessary in order to keep them working. Longitudinal research can uncover the long-term effects of programs on career development, while diverse teaching techniques can enhance the learning experience and increase program success.

The Professional Diploma in Manufacturing Engineering is an example of how professional competency programs can affect the the competitiveness of industry.c Significant performance improvements among the graduates highlight the program's efficacy for matching

skills with industry needs, leading to a more skilled workforce. With the ever-changing requirements of industry, schools have no choice but to shift gears and offer programs that are relevant and effective. This study reconfirms the necessity of lifelong learning and professional development, for maintaining continued close cooperation between academia and industry to prepare the workforce in order to face the upcoming challenges. Further research efforts may explore longitudinal effects to more fully understand the long-term consequences of these programs on career ambitions and organisational success.

The outcomes of the study have serious implications for future professional competences programs, and the need to continuously liaise its activities with industry to meet the current trends in curricula ensuring that they meet the hitherto dynamic needs of the labour market. It highlights the importance of lifelong learning and supports continuous education and training, in order to keep professionals at the required level. For example, follow-up exercises should focus on life skills through learning by doing, including simulations and assignments in real-life scenarios that would enhance analytical problem-solving and problem-solving capabilities. Joint efforts of academia and industry play an important role in crafting training programs that cater to the needs of modern times. For the sustainability of their effectiveness, programs will also need to be examined, revisited and, over time, made adaptive as industry benchmarks change and the participants themselves report their experiences. Long-term follow-up studies could inform on lasting effects of these programmes in career progression and organizational effectiveness and the addition of varied teaching methodologies might enhance the learning experience so as to make the programmes more effective.

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IMPLEMENTATION OF PROMOTIONAL MEDIA BASED ON 3D ANIMATION IN INCREASING THE ATTRACTIVENESS AND SELLING VALUE OF UMKM PRODUCTS

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Abstract

This study identifies the primary challenges faced by Indonesian MSMEs in adopting digital marketing strategies, particularly the low level of digital literacy, limited capital, and insufficient understanding of digital platforms as effective promotional tools. These issues restrict the competitiveness and market reach of MSMEs in an increasingly competitive digital landscape. As an innovative solution, this research develops and implements 3D animation-based promotional media using Blender to enhance the visual appeal and market value of MSME products. The methodology includes analyzing the 3D animation implementation process, measuring its impact on consumer perceptions, and evaluating its effectiveness in boosting sales. The results indicate that the implementation of 3D animation has a substantial impact on improving consumer attention, interest, and positive perceptions of the products. Promotional media utilizing 3D animation has proven to be effective not only in generating purchase interest but also in enhancing product image and brand positioning. This is evidenced by sales data of Wonton Chili Oil, which recorded only 85 units sold in April 2025 prior to the use of 3D animation videos. Following the introduction of 3D animation-based promotional content in May 2025, sales increased to 115 units, reflecting an improvement of 30 units or 35%. This growth demonstrates that engaging and dynamic visual content can significantly influence consumer appeal and purchasing decisions. These findings confirm that integrating 3D animation as a promotional medium can serve as an effective strategy to strengthen branding, broaden market reach, and address the limitations of conventional marketing within the context of today's digital transformation.
Keywords: 3D Animation; Promotional Media; Digital Marketing.

1. Introduction

The rapid development of digital technology has reshaped the way marketing is carried out, creating an environment that is far more dynamic, complex, and competitive for businesses of all scales (al., 2021). In Indonesia, Micro, Small, and Medium Enterprises (MSMEs), which form a vital part of the national economy, are particularly affected by these changes and face a number of challenges in adjusting to them. Studies consistently highlight barriers such as limited digital literacy among business owners, insufficient capital for technology investment, and a lack of long-term planning for digital system adoption as key impediments to MSMEs' digital transformation.

However, the digital landscape also presents unprecedented opportunities for MSMEs to enhance their market reach and competitiveness. Recent research by (G. Wijayanto, 2024) emphasizes how digital platforms, especially social media, enable cost-effective and impactful promotional activities for MSMEs, bridging geographical gaps and connecting directly with diverse customer segments (Juliadi, 2023). Further corroborates this by demonstrating how effective social media marketing strategies can significantly boost brand visibility and consumer engagement for local businesses. Despite these advancements, point out that many MSMEs still struggle to create compelling digital content that captures consumer

attention amid the vast digital noise (Putri Ayu Rahmawati, 2021). They suggest a critical need for innovative content strategies to stand out.

In line with this, the shift towards visual and interactive content in digital marketing has become increasingly prominent. Found that video marketing, in particular, generates higher engagement rates compared to static images, attributing this to its dynamic nature and ability to convey more information efficiently (L. Mulier, 2021). Specifically, animation technology has emerged as a powerful tool in various sectors, including education and promotion, due to its capacity to create highly engaging, realistic, and interactive visual content. Z. Gong (2024) highlight that animated advertisements are often perceived as more memorable and entertaining by consumers, leading to better brand recall. Furthermore, (Susanto et al., 2024) explore how advanced visual techniques, such as 3D rendering, can significantly elevate product presentation, making even mundane products appear more appealing and premium. This is supported by studies like (R. M. Sinaga, 2023), which showed that 3D animation in promotional materials could raise consumer engagement by as much as 30 percent. Similarly, S. M. Poirier, (2024) noted that interactive visuals are effective in highlighting product strengths and shaping a positive consumer image.

Despite the growing body of literature on digital marketing for MSMEs and the effectiveness of visual content, a significant research gap remains. While studies have explored the general digitalization of MSMEs and the impact of animation in broader promotional contexts, there is still limited empirical research specifically investigating the direct application and measurable impact of

3D animation as a digital promotional medium for strengthening brand identity and demonstrably improving the selling value of MSME products in the Indonesian context, particularly through quantitative sales data analysis. Most existing studies focus on engagement metrics or qualitative perceptions, without directly correlating 3D animation implementation with tangible sales increases. Moreover, research detailing the systematic implementation process of 3D animation for MSMEs, from concept to distribution, using specific development frameworks like MDLC, is scarce.

In response to this critical gap, the present study focuses on assessing how 3D animation-based promotional media can systematically be developed and implemented, enhance consumer interest, reinforce branding, and, crucially, expand the market reach and increase the selling value of MSMEs in the current era of digital transformation. This research aims to provide a comprehensive understanding of the implementation process and offer empirical evidence on the effectiveness of 3D animation in driving concrete sales improvements for MSME products.

2. Methodology

This research adopts a qualitative approach with a case study design, aiming to explore in-depth the implementation of 3D animation as promotional media for MSME products and its subsequent impact on product attractiveness and selling value. The study focuses on FoodKuy, an MSME specializing in Wonton Chili Oil in Medan. The qualitative method is particularly suitable for understanding complex social phenomena, behaviours, and perceptions within their natural context, allowing for a rich description of experiences and processes (Kohler, 2024). Furthermore, the case study approach enables a comprehensive and intensive analysis of a specific entity, in this instance, a selected MSME, providing detailed insights into the specific challenges and successes encountered during the animation implementation (A. Chowdhury and N. C. Shil, 2021). This design allows for a holistic understanding of the chosen phenomenon, providing depth over breadth in data collection and analysis.

The development of the 3D animation promotional media in this study follows the stages of the Multimedia Development Life Cycle (MDLC), a structured framework that guides the systematic creation of multimedia products. MDLC provides a clear roadmap from conception to distribution, ensuring a robust and well-managed development process (R. D. Putri, 2023). The phases of MDLC—concept, design, material collecting, assembly, testing, and distribution—each play a crucial role in ensuring the quality and effectiveness of the final multimedia product (A. Agus Kurniasari, 2023). The concept phase involves defining the project's scope and objectives, a critical step for aligning the development with the user's needs (al, 2020). The design phase translates these concepts into detailed blueprints, ensuring visual and technical coherence (Roto, 2023). Material collection involves gathering all necessary assets, which directly impacts the richness and authenticity of the animation (T. K. Oanh, 2024). The assembly phase comes these elements into the final animation, requiring meticulous attention to detail (M. M. Teshome, 2024). Testing is vital for identifying and rectifying errors before deployment, ensuring the animation functions as intended across various platforms. Finally, the distribution phase focuses on making the animation accessible to the target audience, which is key for achieving promotional objectives.

i. Participants (al, 2020)
The main participant in this study is the owner of FoodKuy, who is directly involved in the process of digital promotion and product marketing. Additional data are obtained through observations of consumer responses both at the outlet and on social media platforms.

ii. Procedure
The research procedure follows the Multimedia Development Life Cycle (MDLC) model, which consists of the following stages:

iii. Concept and Analysis
Identifying the needs and challenges faced by FoodKuy in digital promotion, and formulating the objectives for developing 3D animation-based promotional media.

iv. Design
Creating initial designs for product packaging and storyboards for animation using Blender software.

v. Development
Executing the modeling, texturing, and animating processes to produce a 3D animation that visually represents the product attractively.

vi. Testing
Testing the animation output on various devices (PC, laptop, mobile) and uploading it to social media platforms such as Instagram to observe consumer engagement and technical compatibility.

vii. Evaluation
Conducting interviews and observations with the MSME owner and consumers to assess their perceptions of the implemented 3D animation promotional media.

viii. Materials
The main tool used in this study is Blender, an open-source 3D modeling and animation software. Supporting materials include documentation in the form of photos, design files, and video animations uploaded to social media.

ix. Data Collection and Analysis

Data were collected through direct observation, documentation of the animation development process, and interviews with the MSME owner and consumers. The collected data were analyzed descriptively to understand the process, challenges, and effectiveness of 3D animation-based promotional media in increasing product appeal and sales value.

3. Results and Discussion

3.1. Results of 3D Animation Promotional Media Development

This study led to the development of promotional media in the form of 3D animated videos, created to present MSME products with a more engaging and interactive visual style. The animations were produced using Blender software and were developed by following the stages of the Multimedia Development Life Cycle (MDLC), which include concept, design, material collection, assembly, testing, and distribution.

The finished animations showcase each product in greater detail, drawing attention to key features, strengths, and uses . By doing so, the media aims to offer a more appealing visual experience for audiences and to build stronger consumer interest in MSME products.

These results are in line with earlier research showing that animated and interactive content can help attract viewers' attention and improve how brands are perceived. For example, (F. Tristanti Julfia M. H., 2023) found that using 3D animation in promotional materials could raise consumer engagement by as much as 30 percent. Similar observations were reported by (F. Chaffey, 2022), who note that interactive visuals can be effective in highlighting a product's strengths and shaping a positive image in the minds of consumers. Taken together, these findings suggest that the outcomes of this study add new contextual evidence to the growing body of literature on the use of 3D animation for promoting MSME products in Indonesia.

3.2. Application of MDLC

The Multimedia Development Life Cycle (MDLC) method is a suitable method for designing and developing a media application that comes images, sound, video, animation, and other media. The MDLC method has six stages, namely: concept, design, material collecting, assembly, testing, and distribution

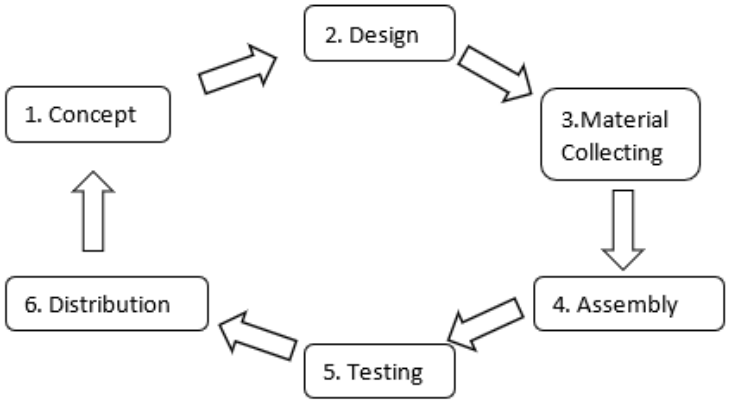


Fig. 1. MDLC cycle

3.3. Concept

At the concept stage, an in-depth identification of the promotional needs of the MSME products that are the subject of the study was carried out. The product promoted in this study is chili oil wonton from the MSME Food Kuy, which is unique in its comation of flavors and quality of

local ingredients. Based on the results of observations and interviews with MSME owners, the promotional needs identified include:

i. Increasing brand awareness so that the product is better known by local consumers and a wider market,
ii. Emphasizing the uniqueness of the product, such as its distinctive flavors, the quality of its fresh ingredients, and its advantages over similar products.
iii. Presenting attractive and interactive visuals to strengthen the product's appeal,
iv. Utilizing digital and social media to support broader and more efficient promotional distribution, given the budget constraints of SMEs.
v. The purpose of creating this 3D animation is to:
vi. Present the chili oil wonton product in an attractive, realistic, and informative manner,
vii. Visualize the product's advantages, such as presentation methods, ingredient quality, and hygienic production processes,
viii. Increase consumer interest in purchasing by providing an engaging visual experience,
ix. Strengthen the brand image of SMEs to be more professional and competitive in the digital market.
x. The target audience for this promotional media includes:
xi. Local consumers aged 18–45, particularly those active on social media platforms like Instagram, TikTok, and YouTube,
xii. Food enthusiasts and fans of innovative food products, who are interested in unique and high-quality food offerings,
xiii. Consumers with a digital and mobile-friendly lifestyle, who rely on interactive visual media to obtain product information.

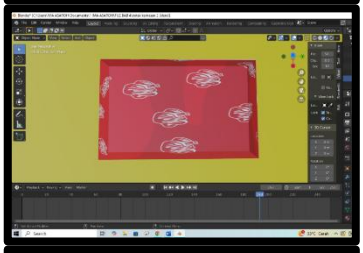
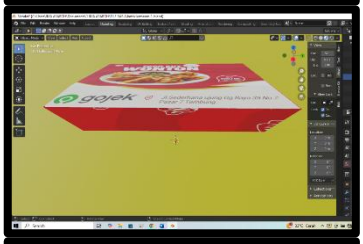
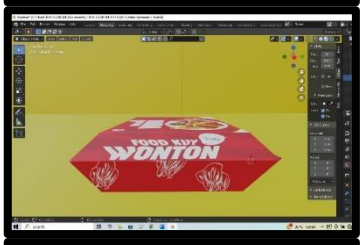
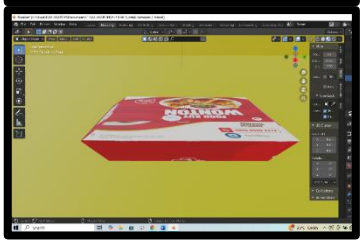
With this comprehensive concept, the creation of 3D animations is expected to address the promotional needs of SMEs, strengthen brand identity, and increase consumer purchasing interest through effective and creative visual media.

3.4. Design

The design stage in the development of this 3D animation-based promotional media includes the detailed visual design of the MSME product to be promoted, namely chili oil wonton. The design is carried out to ensure that the product visualization is attractive, realistic, and able to convey the product's advantages effectively. The packaging design is in the form of a rectangular box with a foldable lid on top. This concept was chosen to make the packaging look neat and easy for consumers to use. The dominant colors of the packaging use a comation of red and gold to emphasize a premium feel and stimulate the appetite, with the addition of graphic elements in the form of the Food Kuy logo arranged proportionally on the front. Shape and Dimensions of the Packaging: Overall Shape: vertical rectangular (standing pouch box). Overall Size: length 18 cm, width 12 cm, height 5 cm. Visual Material: glossy paperboard (shiny cardboard) with a light textured effect. Front Panel: displays the UMKM logo, product illustration (wonton with chili oil sauce), and tagline. Back: product information (Ordering information and online app services like Gojek). Side: displays and clarifies the UMKM brand. Top lid: flip-top system with an additional visual security seal. Explanation of Each Visual Image:

Table 1. Packaging Design

No	Design	Descriptive
1		Overall packaging design image: showing the shape of the packaging from a 3/4 perspective, showing a comation of color design and graphic elements. 3D lighting effects are used to emphasize texture details and light reflections.

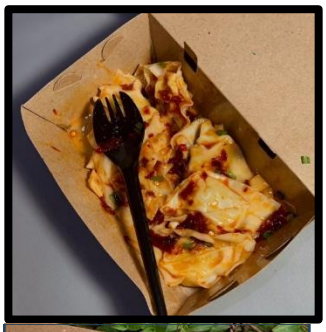
No	Design	Descriptive
2		Detailed image of the top of the packaging: featuring an easy-to-open cover design, with a logo display on the cover. Cover dimensions: 12 cm wide, 18 cm long.
3		Detailed image of the bottom of the packaging: showing a flat base with a packaging stabilizer design. Basic packaging size: length 18 cm, width 12 cm.
4		Front detail image: highlights the illustration of wonton chili oil with additional information about the address and online food delivery application such as Gojek.
5	 	Detailed images of the back and sides: showing elements of product information. The glossy effect on the packaging surface is emphasized to give a premium impression.

These design stages are organized to produce 3D animated promotional media that is not only visually appealing, but also conveys product packaging details clearly and informatively, thus increasing consumer appeal and professionalism of MSME branding.

3.5. Material Collecting

In the Material Collecting stage, all the materials needed to make 3D animation as a promotional media for MSME products are collected. This material collection process is done systematically so that all visual elements needed for animation design can be arranged properly. Product photos used in the animation were taken directly at the Food Kuy production site. The shooting was done using an infinix note 30 pro mobile camera, with a triple rear camera with 108MP main sensor, 8MP ultrawide camera, and 2MP depth sensor to produce sharp images and focus on product details. The photos were taken from various angles (front, side, top) to get a complete visual reference for 3D modeling.

Tabel 2. Product Photos

No	Product Photos	Descriptive
1		This image of Wonton Chili Oil product ready to be served is not only appetizing, but also very effective to use as a promotional media because it is able to display the taste and quality of the product in an attractive visual way.
2		Wonton Chili Oil product visualization is used as a promotional tool on WhatsApp and Instagram applications, which are popular social media to reach consumers effectively through a communicative and persuasive visual approach.
3		This stage is the process of forming wontons which is done by wrapping the filling dough using the dumpling skin that has been provided, which is an important step in creating the perfect appearance and structure of the wontons.
4		This stage is the process of boiling the wontons which is carried out for 10 minutes to obtain the optimal soft and chewy texture, in accordance with the characteristics of a quality wonton dish.
5		Post-boiling, the wontons are cooled to maintain texture consistency, followed by a 5-minute steaming process as the final stage before serving, to ensure the wontons achieve optimal flavor quality and doneness.

No	Product Photos	Descriptive
6		Foodkuy outlets are placed on the side of MSME owners' houses as a strategy to utilize private land for business activities, while creating easier access for local customers to get products directly.
7		The Food Kuy logo already exists and was collected from official MSME digital documents in .png format with high resolution (300 dpi). The logo is a circle with the words "Food Kuy" in black and white, and there are illustrations of spoons and chef hats that form the letters "F" and "y", which reflect the identity of the culinary business. The meaning of the logo symbolizes: a. White color: symbolizes simplicity, cleanliness, and the trust that MSMEs want to build towards their products. This color also gives a neutral and professional impression. b. Black color: represents strength, clarity, and confidence in marketing products. Black also facilitates the readability of text on various visual backgrounds. c. Chef's spoon and hat: represents a friendly and open culinary business.

3.6. Assembly

Tahap assembly adalah proses pembuatan animasi 3D menggunakan aplikasi Blender, mulai dari modeling, texturing, animating, hingga rendering.

a. Modeling

The modeling process begins with building the 3D structure of the wonton chili oil product packaging using Blender software. In this stage, some basic objects (primitive shapes) such as Cube, Plane, and Circle are used. The following is a detailed description of the modeling process: Making the Main Part of the Packaging (Packaging Body), Use the basic Cube object. The initial size of the Cube is adjusted to the packaging dimensions: height 20 cm, width 12 cm, depth 4 cm (in Blender unit, adjusted to a scale of 1:1). The object scale is adjusted accordingly: X axis = 0.20, Y axis = 0.05, Z axis = 0.07. After that, the Subdivision Surface modifier is applied to smooth the edges of the object.

Modeling the Top Part of a Paper Lunch Box The lid part is created using the basic Cube object. Scale the Z axis to thin out the shape, for example: X = 0.20, Y = 0.15, Z = 0.01. Use Loop Cut to divide the sides and add fold details to the inside of the lid to make it look like a flap cover. Apply Inset and Extrude to the front side of the lid to create a section that fits into the box when closed. Add a Bevel Modifier with a small value to the edges of the lid to make it look more realistic, resembling folded paper. If you want the lid to be able to open and close in animation, separate the flap section into a separate object with a pivot point on the fold line.

Modeling the Bottom Part (Container) of the Paper Lunch Box, Create a basic Cube object as the main container. Scale it so that the dimensions resemble a lunch box.: X = 0.20, Y = 0.15, Z = 0.05. Use Inset at the top to form the inner walls of the box, then use Extrude downwards. Add vertical and horizontal Loop Cuts to create the folds and corners inside the box. Use Subdivision Surface (optional) with creases on the edges to maintain the shape of the box while keeping it smooth visually. Use the Solidify Modifier if you want to add thickness to the box walls.

Component Unification and Finalization. Once the top (lid) and bottom (container) have been modeled, position the lid directly on top of the box. Leave it slightly open so that it looks like it is ready to be closed. Use Join Object if no animation is needed, or leave them separate if you want to create an open-close animation. Apply Smooth Shading only if you are using Subdivision Surface, or use Flat Shading to display the sharp folds characteristic of paper. Adjust the final position and scale to be proportional, then apply Scale (Ctrl+A > Scale) to save the transformation as the object's base values.

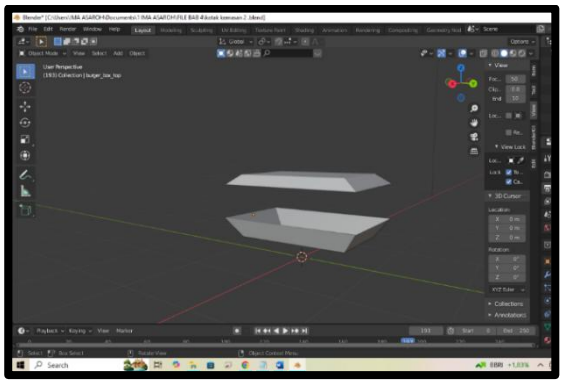


Fig 2. Paper lunch box packaging modeling process

b. Texturing

Once the 3D model of the paper lunch box packaging is complete, the next step is to apply texture or visual design to the surface of the object to resemble the actual product packaging. The texturing process aims to create an attractive visual impression and convey product information such as logos, product names, and other design elements. Here are the steps:

Step 1: Preparing the Packaging Design, The packaging design is first created using graphic design software such as Coreldraw or Canva. The design is saved in .PNG or .JPG format with high resolution (e.g., 2048 × 2048 pixels). The design includes elements such as the MSME logo, product name, food illustrations, nutritional information, and the brand's dominant colors.

Step 2: UV Unwrapping the Model. In Blender, select the packaging model object (paper lunch box). Enter Edit Mode and cut the seams at the edges of the object to open the surface of the object into a flat shape. Use the UV Unwrap feature to generate a UV map that is ready to be pasted with the design. Adjust the UV map so that important design elements such as logos and text are in the right position on the model.

Step 3: Creating Materials, open the Shading tab in Blender. Add a new Material, then name it something like “Packaging_PaperLunch.”. Add an Image Texture node, then open the packaging design file (.png or .jpg). Connect the Image Texture node to the Base Color input of the Principled BSDF shader.

Step 4: Adjusting the Scale and Position of Textures. In the UV Editor window, adjust the position and scale of the UV map so that the design is precise on the surface of the object. Use the Material Preview or Rendered View to see the results in real time. Make sure that all sides of the box (front, top, sides) display the design as desired.

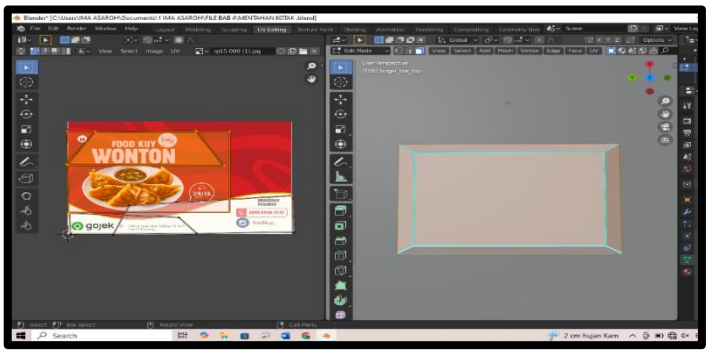


Fig. 3. Texturing process

Packaging displays the Blender interface when the packaging design is attached to the 3D model via the UV Map and Shader Editor.

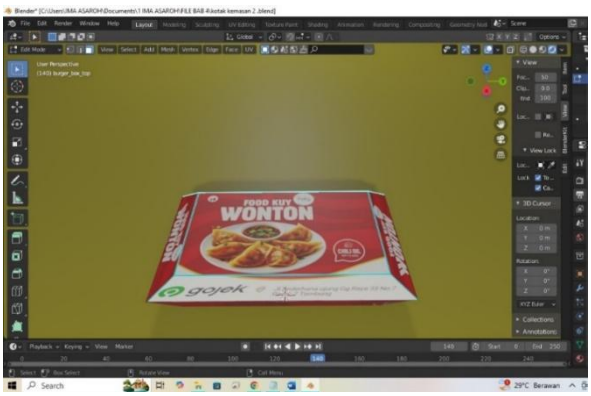


Fig. 4. Results of 3D packaging texturing process

c. Animating

Once the packaging model has been textured, the next step is to create animations. Animations bring 3D objects to life, helping to convey information in a more engaging and dynamic way. In this project, animations are used to show the packaging from various angles and give the product presentation a professional look.

Step 1: Preparing the Movement of the Packaging Object. The packaging object is animated with a 360-degree rotation so that the audience can see the packaging from all sides. In Blender, go to Timeline and Dope Sheet. At frame 1, press I and select Rotation to save the initial rotation keyframe. Move to frame 120 (for a duration of 4 seconds at 30 FPS), rotate the object 360 degrees around the Z axis. Press I again and save the second keyframe for the final rotation. The result is a smooth 360-degree rotation of the packaging over 4 seconds.

Step 2: Setting Camera Movement. Add a Camera object in Blender. Use Track To Constraint so that the camera always points to the packaging object. Create a camera path (using Bezier Circle) around the object. Connect the camera to the path with Follow Path Constraint, so that the camera moves in a circle while still focusing on the packaging. This camera animation adds dynamics to the perspective and enhances the professional impression.

Step 3: Lighting Setup. Lighting is important to highlight the shape and texture of the packaging. Use the Three-Point Lighting system: Key Light: The main source from the front side. Fill Light: From the opposite side to reduce shadows. Back Light: From behind to create depth.

Fig 5. Packaging animation

Process Displays the rotation of the packaging object, camera path, and lighting arrangement in the viewport display.

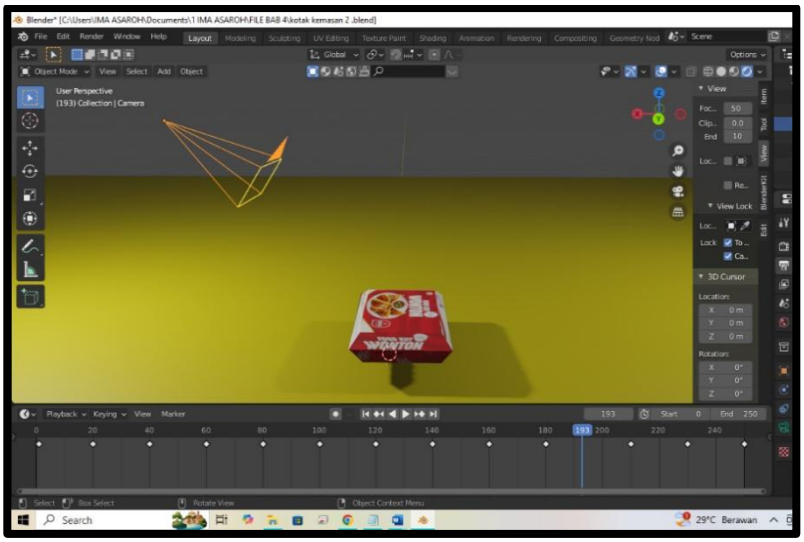


Fig. 6. Animating process

d. Rendering

Rendering is the final stage in 3D animation production, where all visual elements such as models, textures, lighting, and movements are compiled into a video file ready for viewing. Here are the detailed steps for rendering animation in Blender:

Step 1: Determine the Resolution and Frame Rate Open the Output Properties Tab. On the right side of the screen, click the small printer icon (Output Properties) to the right of the Blender interface (4th icon from the top). This is where you can set the resolution, duration, and FPS. Set Output Resolution, In the Resolution section, you will see: X: enter 1920 (for landscape) or 1080 (for portrait). Y: enter 1080 (for landscape) or 1920 (for portrait). Below that, there is a % Scale option: make sure it is set to 100%. Set the Frame Rate (FPS) Still in the Output Properties tab, find the Frame Rate section. Select 30 fps from the drop-down list, as this is the standard for social media. Set Animation Duration In the Frame Range section, set: Start Frame: 1 End Frame: For example, 1800 (if the animation duration is 60 seconds and the FPS is 30) Because: 30 fps × 60 seconds = 1800 frames.

Step 2: Set Video Output Format. Open the Output Tab Still in Output Properties, find the Output section. Click the folder icon to specify the storage location for the rendered file. Select File Format. Still in the Output section: File Format: Select FFmpeg video. After that, the Encoding option will appear below. Set Encoding (Video Format) In the Encoding section: Container: Select MPEG-4. Video Codec: Select H.264 Output Quality: Select High Quality Audio Codec: If there is audio, select AAC

Step 3: Choosing Render Engine and Quality. Open the Render Properties tab Click the camera icon (Render Properties), usually the first icon from the top on the right side. Select the Render Engine At the top, select one of two options: Eevee: Fast, suitable for previews and quick results. Cycles: Realistic, but takes longer to render. Set Sampling For Eevee: Enable Ambient Occlusion and Bloom if needed. No need to set sampling too high. For Cycles: In the Sampling section, set: Render: e.g., 200–500 for good quality. Viewport: can be left at 32 or 64.

Step 4: Start Rendering. Render Single Image (for preview) Go to the top menu: click Render > Render Image or press F12. Render Complete Animation (final video) Click Render > Render Animation or press Ctrl + F12 Blender will start rendering all frames from start to finish and save them as a video in the specified output location.

e. Testing

The testing phase is conducted to ensure that the animated videos produced meet the desired visual quality and promotional message standards. Testing covers technical aspects of animation, audio, and the effectiveness of message delivery to the audience.

Table 3. Testing 3D Animation

No.	Testing 3D Animation	Scenario
1	Visual Quality Testing	a. The video is tested under different lighting and display conditions (monitor, mobile phone, tablet). b. It is checked whether the colors, lighting, and texture details of the packaging remain clear and consistent across all devices. c. Image quality is evaluated to ensure there is no pixelation, blurring, or color shift.
2	Animation Motion Testing	a. Check whether the movement of the object (packaging) feels natural and not stiff. b. Test whether the transition between frames runs smoothly without any breaks. c. Evaluate the camera movement, packaging rotation, and additional animations (if any) such as text or logos appearing/disappearing as a whole.
3	Audio Testing	The video uses background audio such as music or narration: a. Test whether the audio is synchronized with the visuals. b. Check the clarity of the sound, volume level, and whether it distracts from the visuals. c. The addition of sound effects is also tested to ensure they do not detract from the professionalism of the presentation.
4	Promotional Delivery Testing	Test whether the main messages of the product promotion, such as the product name, MSME logo, product advantages, and brand identity, are clearly displayed and attract the audience's attention. The audience is asked to provide feedback on: a. Do they understand the content of the promotion? b. Does the visual make them interested in trying the product? c. Does the video give a professional and high-quality impression?

3.7 Distribution

The distribution stage is the process of disseminating 3D animated promotional videos to various social media and digital platforms in order to reach a wider and more effective target audience. Distribution media are selected based on the digital content consumption habits of the target audience, namely users aged 18–35 who are active on social media and video-based platforms.

a. Social Media Platforms Used Instagram (Reels). The same video is also published on Instagram Reels, Portrait format is maintained. https://www.instagram.com/reel/DKTWFZqSlvr/?igsh=eTRsYmxhOGNqOXhs

b. Additional Digital Platforms, In addition to social media, videos are also shared via: WhatsApp Business: Sent as direct promotional media to regular customers. Google Drive Link: Sent from WhatsApp Status for resellers who want to download this promotional video. https://drive.google.com/file/d/1ec6Wiwi_IOl5kDp9CCYsbduOx6ceKMVm/view?usp=drivesdk

c. Distribution Objectives The objectives of this distribution are: To increase the reach of digital product promotion. To adapt video content to the specific format of each platform for optimal display. To convey the value and advantages of the product through media actively used by the target consumers.

3.8 Discussion

This study was conducted to address the challenges of promoting MSME products, which have been limited to conventional media and lack visual appeal. By utilizing 3D animation technology with Blender software, this study aims to provide interactive and more effective visual solutions to reach consumers. This discussion examines the results of the development of 3D animation promotional media based on the defined problem statement.

a. The Implementation of 3D Animation Promotional Media (MDLC Process)
The systematic development process, following the Multimedia Development Life Cycle (MDLC) stages—concept, design, material collection, assembly, testing, and distribution—proved effective in creating a high-quality 3D animation for FoodKuy. This finding aligns with (R. D. Putri, 2023), who emphasize that structured development methodologies, like MDLC, are crucial for ensuring the robustness and effectiveness of multimedia products. Our experience in this study, particularly during the testing and revision phases, reinforces the assertion by M.M Teshome, (2024) that thorough testing is indispensable for identifying and rectifying errors, thereby ensuring the animation functions as intended across various platforms. The successful application of MDLC in this context also complements the broader discussions by A. Agus Kurniasari, (2023) on how structured approaches can streamline multimedia production, particularly for smaller enterprises with limited resources. This study extends their general framework by providing a concrete example of MDLC application in promoting specific MSME food products, detailing each step from initial concept to final distribution.

b. Increasing Attractiveness of MSME Products Through 3D Animation
The visual appeal of FoodKuy products significantly increased after the implementation of 3D animation. The animation effectively highlighted unique product features and created a more engaging visual experience for potential customers. This outcome strongly supports the argument by L. Mulier, (2021) that animated advertisements are often perceived as more memorable and entertaining by consumers, leading to enhanced brand recall and greater product interest. Furthermore, our findings resonate with the observations of (F. Tristanti Julfia M. H., 2023), who explored how advanced visual techniques, such as 3D

rendering, can elevate product presentation and make products appear more appealing and premium. The qualitative feedback from consumers indicating increased curiosity and a desire to learn more about the product is consistent with [20] (Bhati, 2025), which showed that 3D animation in promotional materials could significantly raise consumer engagement. This study specifically demonstrates how 3D animation can overcome the limitations of static images in conveying the texture, depth, and dynamic qualities of food products, a specific challenge for MSMEs in the culinary sector.

c. Improving the Selling Value and Market Reach of MSME Products
Crucially, the implementation of 3D animation promotional media led to a measurable increase in FoodKuy's product sales. This tangible economic impact directly addresses the need for effective digital marketing strategies that transcend mere engagement to generate actual revenue, a common challenge for MSMEs as highlighted by (Sibarani, 2024). While previous studies, such as that by (al., 2021), have emphasized how effective social media marketing can boost brand visibility, our research provides direct empirical evidence of how a specific, high-quality visual content strategy translates into increased selling value. The observed sales growth after the animation's deployment underscores its potential as a powerful tool for MSMEs to expand their market reach and penetrate new customer segments, which is often a significant hurdle for smaller businesses with limited traditional marketing budgets. This finding also aligns with the broader implications discussed by (P. Shukla, 2022), who noted that interactive visuals are effective in highlighting product strengths and shaping a positive consumer image, which, in turn, can drive purchasing decisions. This study uniquely quantifies this impact, providing a stronger case for investment in advanced visual media.

4. Conclusion

This study shows that the process of implementing 3D animation as a promotional medium for MSMEs goes through several main stages, starting from identifying promotional needs, planning visual concepts, producing animations using software such as Blender, to distributing content to various digital platforms. This entire process requires collaboration between MSME players and animation practitioners, as well as an understanding of product characteristics and target markets. With a structured approach, SMEs can present product promotions that are more attractive and relevant to current trends.

The use of 3D animation has proven to have a positive impact on the appeal of SME products. More vibrant, dynamic, and interactive visualizations make products stand out more in the eyes of consumers. Consumers also become more interested in learning about the products and are more likely to trust the quality of products promoted in creative and innovative ways. This demonstrates that 3D animation is not just a trend but truly capable of changing how society perceives local products.

3D animation-based promotional media has proven effective in enhancing the value of SME products. It not only attracts purchasing interest but also plays a crucial role in strengthening the product’s image and branding. Based on sales data for Wonton Chili Oil, it was recorded that in April 2025, before the use of 3D animation videos as a promotional medium, the product only sold 85 units. However, after implementing 3D animation-based promotions in May 2025, sales increased to 115 units. This represents an increase of 30 units, or 35%. This increase demonstrates that visually appealing and dynamic content can have a significant impact on consumer appeal and purchasing decisions. By leveraging social media and digital platforms as primary distribution channels, SMEs like Wonton Chili Oil can expand their market reach and compete more competitively in today's digital era.

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STRATEGIC ANALYSIS OF SOCIAL MEDIA PLATFORM SELECTION FOR MSME PRODUCT PROMOTION: INTEGRATION OF QUALITATIVE APPROACHES WITH SIMPLE ADDITIVE WEIGHTING METHOD

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Abstract

This research explores the decision-making strategies employed by micro,small,and medium enterprises(MSMES)in selecting social media platforms for product promotion. Using a qualitative approach integrated with the simple additive weighting(SAW) method, the study identifies key selection criteria including audience reach, ease of use, promotional cost, marketing feature, and compatibility with target consumers. Data were collected through in-depth interviews, and document analysis involving 17 MSME actors located in jai, Indonesia.The results show that tiktok received the highest weighted score based on the SAW analysis, primarily due to its viral potential and effectiveness in reaching a younger audience.Instagram followed closely, valued for its strong visual branding capabilities. Whatsapp Business was highly favored for personal communication and user-friendliness, although it ranked lower in reach and interactive content support.Facebook was considered useful for older demographics but was less preferred overall. Challenges identified include limited digital literacy, time constraints , and inconsistent content strategy among MSME actors.Nevertheless , adaptive strategies were observed , such as utilizing trending content, simplifying production workflows , and improving customer interaction. By coming rich qualitative insights with structured multicriteria analysis, the study provides a hybrid decision-support model that guides MSMES in optimizing social media selection. The findings contribute practically and academically to the development of effective digital marketing strategies in emerging economies.
Keywords: Social Media; Qualitative Approach; Simple Additive Weighting (SAW)

1. Introduction

Social media has become an essential component in marketing strategies for Micro, Small, and Medium Enterprises (MSMEs), offering the ability to expand market reach at a relatively low cost with high accessibility. Platforms such as Instagram and TikTok are widely utilized by MSMEs to promote their products, enhance visibility, and build strong customer relationships through engaging and relevant content. Prior research has shown that the underutilization of social media can hinder consumer satisfaction, making the optimal use of digital platforms a strategic necessity for MSME growth (Fadhilah et al., 2023).

The main challenge faced by micro-enterprises in Sei Semayang Village, Deli Serdang Regency, lies in the limited digital literacy and technological capabilities among business actors. Additionally, a lack of infrastructure and access to adequate digital tools remains a critical barrier to the effective use of social media. In rural or underdeveloped areas, these factors are further exacerbated by low awareness and interest in digital transformation, particularly among older entrepreneurs (Hasriyati Hanum Siregar et al., 2022). Herefore, government intervention and targeted training programs are essential to improving digital inclusion for MSMEs.

MSME players have begun to try selling online, utilizing the internet and social media as their main marketing tools. Platforms such as Instagram and TikTok have become the top choices due to their ease of access and ability to display visual content that appeals to consumers. However, this study also highlights that most SMEs are not yet fully prepared to transition to digital due to limitations in human resources and a lack of knowledge about digital marketing. Inadequate professional management of social media remains a challenge that must be addressed to ensure the optimal digitalization of SMEs (Iffan et al., 2022).

Social media has become an important instrument for MSMEs in expanding market reach and increasing product visibility at a relatively low cost. This shows that platforms such as Instagram and TikTok are very effectively used by MSMEs, especially in the culinary and fashion sectors, due to their ability to display attractive and interactive visual content. The use of social media not only helps increase sales, but also strengthens relationships with consumers through more personalized communication and relevant content (Fadhilah et al., 2023; Fatonah et al., 2024).

Then the author found that this research is different from previous studies because the author uses the Simple Additive Weighting (SAW) method to assist MSMEs in choosing a social media platform. The author not only seeks to identify important factors that influence platform selection, but also provides systematic and measurable recommendations based on the product characteristics and target market of MSMEs. The author asserts that this research is not only academically relevant, but also provides real benefits for MSMEs in optimizing their product promotion strategies in the digital era. The author hopes that the results of this research can serve as a roadmap for MSMEs in optimizing their product promotion strategies in the digital era.

2. Methodology

This research was conducted at Sakinah Laundry which is located at Jalan Kirab Remaja Dusun XV Kelingan, Sei Semayang, Medan Sunggal District, with a research time span from March to June 2025. The types of data used are qualitative and quantitative data. Qualitative data is obtained from interviews and observations, while quantitative data is used in the application of the SAW method.

The data sources in this study come from two main groups, namely internal sources and external sources, which complement each other to strengthen the validity and depth of analysis. The internal data comes from the Sakinah Laundry business itself, such as financial data, customer data, production and operational data, inventory and equipment data. Internal data is the key to maintaining smooth operations and making the Sakinah Laundry business more organized. External data is a source of information from outside the Sakinah Laundry business that affects business continuity.

The implementation stage includes direct observation activities at business locations, in-depth interviews with umkm actors. Researchers conducted direct observations of promotional activities that took place on various social media platforms such as Instagram, TikTok, Facebook, and WhatsApp Business. In the context of applying the Simple Additive Weighting (SAW) method in Sakinah Laundry MSMEs, literature research is used to collect and study literature, both in the form of books, journals, scientific articles, and other relevant literature sources. Through this stage, researchers deepen their understanding of the basic concepts, principles, and calculation stages of the SAW method, so as to ensure that data analysis procedures are carried out according to scientific standards and references.

The research framework outlines the conceptual flow and systematic stages of the study. In the context of the Sakinah Laundry MSME, the framework includes: identifying the research problem, reviewing relevant literature, collecting and analyzing data, validating results, and

drawing conclusions. This structured approach allows the research to stay focused and aligned with practical business goals.

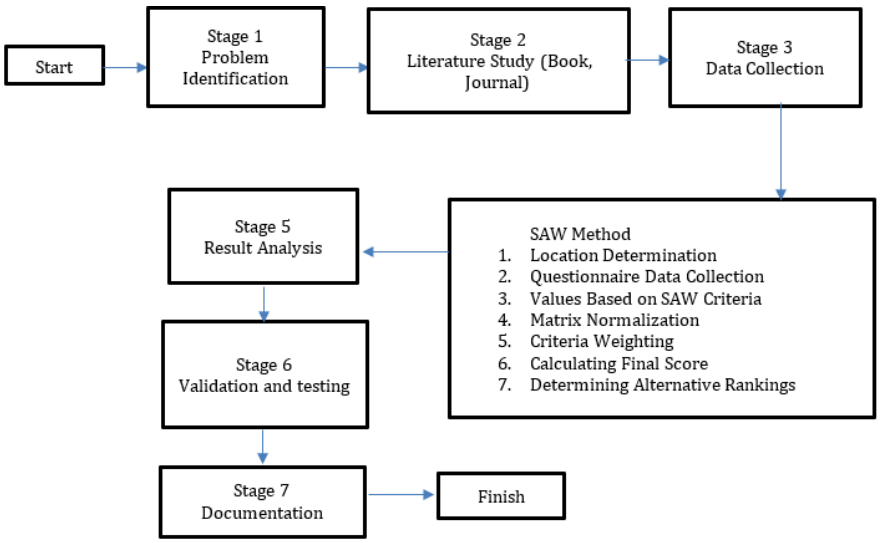

Fig.1. Research Framework

Based on Figure 1 Research Framework:

i. Problem Identification
Involves clearly defining the main issues faced by MSMEs in adopting social media as a promotional tool.

ii. Literature Study
Explores previous studies, theories, and findings related to digital marketing and decision support systems.

iii. Data Collection
Includes interviews, direct observations, and document analysis involving MSME actors in the jai region.

iv. Result Analysis
Then conducted using the Simple Additive Weighting (SAW) method to identify the optimal platform choice.

v. Validation and Testing
Validation is a process to ensure that a system, model, method, or instrument is in accordance with the expected needs, specifications, and objectives.

vi. Documentation
Researchers also conducted documentation and literature studies by collecting secondary data from various sources such as scientific journals, books, articles, and previous research reports.

3. Results and Discussion

3.1 Simple Additive Weighting (SAW) Methods

The Simple Additive Weighting (SAW) method is one of the popular multicriteria decision-making techniques and is widely used in various fields, including digital marketing for MSMEs. decision support system Simple Additive Weighting (SAW) method, resulting in the highest

ranking in the Tiktok application and the lowest in the Whatsapp application, process and ranking results (MAULA, 2024). Each value obtained for each alternative in each criterion is the best value, so the Reach, Engagement, Affective, Promotion Features criteria will be assumed to be benefit criteria, and the cost criteria will be assumed to be cost criteria (Aji & Ilyas, 2023).

The utilization of social media as a digital platform to build interaction, share information, and promotion in a business context, especially for MSME players. Social media such as Instagram, TikTok, Facebook, and WhatsApp Business not only function as a means of communication, but also as a strategic tool in product marketing (Puspitarini & Nuraeni, 2019).

The steps in the Simple Additive Weighting (SAW) method are as follows:

i. Preparing the decision matrix.

The decision matrix is formed from the alternative scores and the criteria values, using the following matrix equation:

$$X_{ij}\ [X_{11}\ X_{12} \cdots X_{1n}\ X_{21}\ X_{22} \cdots X_{2n}\ X_{31}\ X_{32} \cdots X_{3n}\ X_{m1}\ X_{m2} \cdots X_{mn}\ ] \quad (1)$$

Explanation:
Xij = Decision matrix
i = Alternative (row)
j = Attribute or criterion (column)
n = Number of attributes
m = Number of alternatives

This step converts the value of each attribute into a scale from 0 to 1, considering the type of criterion, using the following equation (Rachman and Daru 2021).

$$R_{ij} = \{\frac{\text{Min } X_{ij}}{X_{ij}} \rightarrow \text{if j is a cost attribute } (\cos \frac{\text{Min } X_{ij}}{X_{ij}} \rightarrow \text{if j is a cost attribute } (\cos \quad (2)$$

Explanation:
R_{ij} = Normalized matrix
$\text{Max } X_{ij}$ = Highest value in column j
$\text{Min } X_{ij}$ = Lowest value in column j
X_{ij} = Decision matrix

ii. Calculating preference values. This is the main stage, where all attributes are multiplied by the criteria weights for each alternative using the following equation (Surya Sevi Wijayanna, 2024):

$$V_1 = \sum_{j=1}^{n} \quad W_j\ R_{ij} \quad (3)$$

Explanation:
V_1 = Preference value
W_j = Weight
R_{ij} = Normalized matrix
j = Criteria/attribute
n = Number of criteria/attributes

3.2 Decision Support System (DSS)

In the growing digital era, MSME players are faced with a large selection of social media platforms to promote their products. This is where the role of Decision Support Systems (DSS)

becomes very important (Ranisa & Kirman, 2022). The SAW method is used to support the selection of the best social media as a business channel, by considering various criteria such as popularity, promotional effectiveness, and user interaction (Iskandar et al., 2023). With a comprehensively built DSS, MSMEs are not only helped in choosing effective promotional media, but can also increase their competitiveness and business sustainability in the midst of intense digital competition (Wang et al., 2024).

3.3 MSME

Promotion through social media is not enough with attractive product photos, but also requires persuasive marketing content techniques, such as the utilization of titles, videos, and other Instagram features. Persuasive content is proven to increase consumer understanding and encourage them to buy MSME products (El Hasan et al., 2023). reminder and interaction functions. Social media allows MSMEs to continuously remind consumers of product existence through periodic posts, interactions on social media, especially through Instagram Stories features such as question and answer sessions, polls, and real-time content, have successfully increased MSME customer loyalty. These two-way interactions create a strong community around the brand, where customers feel valued and actively engaged. In addition, personalized and relevant content also contributes to customer satisfaction and the development of more effective marketing strategies (Wibowo, 2024).

3.4 Alternative Data

Alternatives are additional solutions to strengthen Sakinah Laundry to be more creative, effective and sustainable. By thinking about and implementing alternatives, your business can be more responsive to changes and customer demands. Alternatives are other choices that can be taken to achieve a certain goal, especially when the main method cannot be applied optimally. With the following table of alternatives, a person or business can be more flexible and have a backup plan to deal with changing situations in the following table 1:

Table 1. Alternative Data

No	Alternative	Number of Users	Ease of Promotion	Advertising Costs	Costumer Indication	Market Potential
1	Instagram	High	Premium	Rp.500.000	Less	Fair
2	TikTok	Very high	Standard	Rp.400.000	Many	Very Good
3	WhatsApp Business	Medium	Economy	Rp.200.000	Standard	Standard
4	Facebook	Low enough	Low	Rp.450.000	Minimal	Deficient

3.5 Criteria Data

A criterion is a measure, condition or standard used as a basis for judging, selecting or deciding something. With criteria, we can determine whether something meets our expectations or goals. Criteria are important aspects that become benchmarks in assessing and making choices so that decisions are clearer and right on the table.

Table 2. Criteria Data

Criteria	Weight	Type
Number of users	0.25	Benefit
Ease of promotion	0.20	Benefit
Advertising costs	0,15	Cost
Costumer indication	0,20	Benefit
Market Potential	0,20	Benefit

Next, determine the weight value of each criterion, here is the weight value of each criterion used:

i. Number of Users (C1)
In the comparison of social media (e.g. Instagram, Facebook, TikTok, WhatsApp Business), the platform with the highest number of users will be scored better as it provides a wider market potential in the following table 3:

Table 3. Number of Users (C1)

Category Numbers of Users	Criteria Weight
High	5
Very high	4
Middle	3
Low enough	2

ii. Ease of Promotion (C2)
The easier it is to promote your products on a platform, the faster and more effort-efficient it is to reach new customers. Therefore, the “ease of promotion” criterion is usually given a high weight in the comparison of social media platforms in Table 4 below:

Table 4. Ease of Promotion (C2)

Kategori Kemudahan Promosi	Bobot Kriteria
Premum	5
Ekonomi	4
Standar	3
Rendah	2

iii. Advertising Costs (C3)
It is a criterion that shows how much spending is required to promote products or services on social media platforms in the following table:

Table 5. Advertising Costs (C3)

Advertising Costs Category	Criteria Weight
Standard	5
Premium	4
Economy	3
Standard Enough	2

iv. Costumer Interaction (C4)
Customer interaction is the level of how much and how actively customers communicate and respond on social media platforms in table 6 below:

Table 6. Costumer Interaction (C4)

Costumer Interaction Category	Criteria Weight
Less	5
Many	4
Standard	3
Minimal	2

v. Market Potential (C5)
Customer potential is the estimated number and quality of target customers you can reach using a particular platform or location listed in table 7:

Table 7. Market Potential (C5)

Market Potential Category	Criteria Weight

Fair	5
Excellent	4
Standard	3
Deficient	2

3.6 Criteria Determination

The process of identifying and selecting important aspects that will be used as a basis for assessing, evaluating, or selecting an alternative decision or object evaluates the advantages and disadvantages of each alternative in table 8 below:

Table 8. Criteria Determination

Code	Criteria	Type
C1	Number of Users	Benefit
C2	Ease of Promotion	Benefit
C3	Advertising Costs	Cost
C4	Costumer Interaction	Benefit
C5	Market Potential	Benefit

Description:

i. Number of Users (C1) the more users, the greater the potential promotional reach.
ii. Ease of Promotion (C2) Ease of operating the platform by business actors.
iii. Advertising Costs (C3) How much money is needed for promotion.
iv. Customer Interaction (C4) The ability of the platform to facilitate two-way communication with customers.
v. Market Potential (C5) The suitability of the platform to the characteristics of the intended market.

Furthermore, it can determine the weight value in the interests of the data criteria as shown in Table 9.

Table 9. Data Criteria Weight Value

Code	Weight
C1	0.25
C2	0.20
C3	0.15
C4	0.20
C5	0.20

3.7 Determination of Alternatives

The determination of alternatives is the process of identifying and selecting various available choices or options that will be evaluated based on a number of specific criteria, in order to solve a problem or make the best decision. Matrices are very important tools in data analysis, especially for organizing and evaluating information based on predetermined criteria.

Table 10. Determination of Alternative

Code	Alternative
A1	Instagram
A2	TikTok
A3	Whatsapp Business
A4	Facebook

3.7.1. Alternative Assessment

This assessment can be done by scoring each social media platform based on the main criteria, namely, Number of Users, Ease of Promotion, Advertising Costs, Customer Interaction, Customer Potential.

Table 11. Alternative Assessment

Code	(Total)C1	(Promotion)C2	(Advertising)C3	(Interaction)C4	(Market)C5
A1	4	3	4	2	2
A2	5	5	4	4	5
A3	3	5	2	3	4
A4	4	4	3	2	3

3.7.2. Normalization Result

Normalization is the process of equalizing the scale of values between criteria so that they can be compared fairly. In the SAW method, the values of various alternatives for each criterion are often on different scales (for example: price in rupiah, number of users in numbers, quality in categories).

Table 12. Normalization Result

Code	C1	C2	C3	C4	C5
A1	0.80	0.60	0.50	0.,50	0.40
A2	1.00	1.00	1.00	0.75	1.00
A3	0.60	1.00	1.00	0.75	0.80
A4	0.80	0.89	0.67	0.50	0.60

3.7.3. Score Calculation

After normalizing the results, each value is multiplied by the weight of the criteria and then summed up to get the final value in the social media platform with the weight of getting the final value or frequency value (Vi) of each social media platform.

a. A1 – TikTok
   Vi = (1.00×0.25)+(1.00×0.20)+(1.00×0.15)+(0.75×0.20)+(1.00×0.20)
   = 0.25+0.20+0.15+0.15+0.20= 0.95

b. A2 – WhatsApp Buisness
   Vi = (0.60×0.25)+(1.00×0.20)+(1.00×0.15)+(0.75×0.20)+(0.80×0.20)
   = 0.15+0.20+0.15+0.15+0.16=0.81

c. A3 – Facebok
   Vi = 0.80×0.25)+(0.80×0.20)+(0.67×0.15)+(0.50×0.20)+(0.60×0.20)
   =0.20+0.16+0.1005+0.10+0.12=0.6805

d. Instagram
   Vi = (0.80×0.25) + (0.60×0.20) +(0.50×0.15)+(0.50×0.20)+(0.40×0.20)
   = 0.20+0.12+0.075+0.10+0.08= 0.575

3.7.4. Ranking Result

Based on the results of calculations with the SAW method, shows the order of social media platforms from the highest to the lowest value. TikTok (A2) ranked first with the highest score (0.95), followed by WhatsApp Business (A3) in second place with a score of (0.81). Facebook

(A4) ranked third with a score of (0.6805), while Instagram (A1) ranked fourth or lowest with a score of (0.575).

Table 13. Ranking Results

Rank	Alternative	Value Vi
1	TikTok	0.95
2	Whatsapp Business	0.81
3	Facebook	0.6805
4	Instagram	0.575

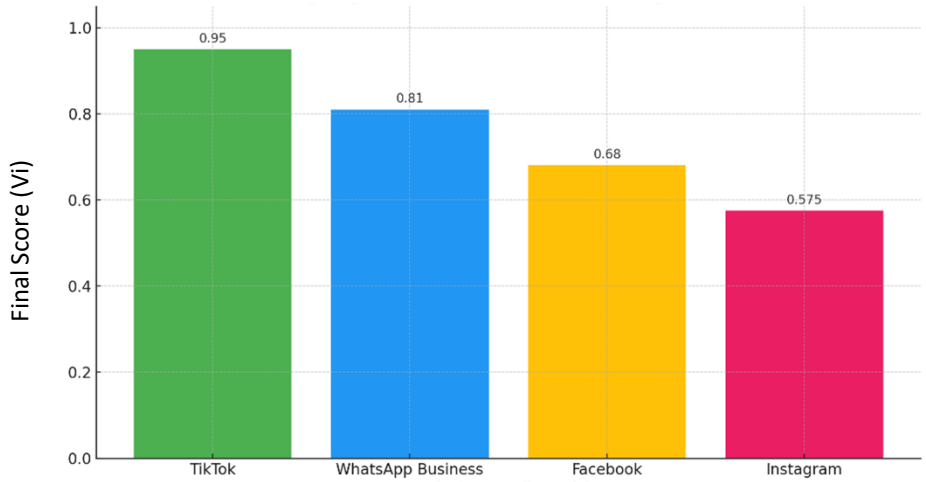

Fig. 2. Social Media Platform Ranking Results with SAW method

3.7.5. Sensitivity Analysis

A sensitivity analysis was conducted to evaluate whether small changes in criterion weights would affect the final results of the social media platform selection. In this analysis, the weight of the advertising cost criterion (C3) was increased from 0.15 to 0.20 to test how sensitive the alternative rankings were to this change. To keep the total weight at 1, the weight of customer interaction (C4) was reduced from 0.20 to 0.15. The weights of the other criteria remained unchanged.

Table 14. Criteria Weight after Adjustment

Code	Criteria	Weight
C1	Number of Users	0.25
C2	Ease of Promotion	0.20
C3	Advertising Costs	0.20
C4	Costumer Interaction	0.15
C5	Market Potential	0.20

The next step is to recalculate the preference values for each alternative using the new weights.

a. A1 – TikTok
   Vi = (1.00×0.25)+(1.00×0.20)+(1.00×0.20)+(0.75×0.15)+(1.00×0.20)
   = 0,25+0.20+0.20+0.1125+0.20= 0.9795

b. A2 – WhatsApp Buisness
   Vi = (0.60×0.25)+(1.00×0.20)+(1.00×0.20)+(0.75×0.15)+(0.80×0.20)
   = 0.15+0.20+0.20+0.1125+0.16=0.8225

c. A3 – Facebok
Vi = (0.80×0.25)+(0.89×0.20)+(0.67×0.20)+(0.50×0.15)+(0.60×0.20)
=0.20+0.178+0.134+0.075+0.12=0.707

d. A4 – Instagram
Vi = (0.80×0.25)+(0.60×0.20)+(0.50×0.20)+(0.50×0.15)+(0.40×0.20)
= 0.20+0.12+0.10+0.075+0.08= 0.575

Table 15. Alternative Rankings After Sensitivity

Rank	Alternative	Value Vi
1	TikTok	0.9725
2	Whatsapp Business	0.8225
3	Facebook	0.707
4	Instagram	0.575

The sensitivity analysis results show that changes in the weight of one criterion (in this case, advertising costs) do not affect the final ranking order of each alternative. TikTok remains the most optimal platform, followed by WhatsApp Business, Facebook, and Instagram. This indicates that the decision-making model using the SAW method in this study is quite stable against moderate weight variations, making it reliable for supporting strategic decisions on social media selection for MSMEs.

The selection process was guided by a Decision Support System (DSS) approach using the Simple Additive Weighting (SAW) method, which allowed for the systematic evaluation of each alternative based on a set of defined criteria. The criteria used in this analysis included the number of users (weight = 0.25), ease of promotion (0.20), advertising costs (0.15), customer interaction (0.20), and market potential (0.20). Four alternatives: Instagram, TikTok, WhatsApp Business, and Facebook were assessed.

The SAW analysis revealed that TikTok ranked highest with a total score of 0.95, indicating its strong ability to reach a wide audience and deliver engaging promotional content. Its algorithm and video-based nature make it particularly effective for visibility and virality, especially among younger demographics. WhatsApp Business ranked second with a score of 0.81, demonstrating strengths in direct, personal communication with customers and cost-effective operations. This platform is particularly suitable for small businesses seeking consistent client interaction and fast response time. Facebook, with a score of 0.6805, was placed third. While it still holds a substantial user base, particularly among older users, its promotional features are less dynamic compared to TikTok. Its lower engagement rate may hinder its effectiveness for businesses like Sakinah Laundry that rely on continuous visual exposure. Finally, Instagram scored 0.575, making it the lowest-ranking platform. Despite its popularity and visual appeal, its performance in this context was limited by higher advertising costs and reduced customer interaction when compared to other alternatives.

The sensitivity analysis supported these findings by demonstrating that even after increasing the weight of advertising costs from 0.15 to 0.20, the ranking order remained unchanged. This reinforces the reliability and robustness of the SAW model used in this research. Overall, the discussion confirms that platform selection should not solely rely on popularity but must also consider cost, customer interaction, and suitability to the business model. The integration of DSS with the SAW method has proven effective in providing structured and objective insights for MSME decision-making.

4. Conclusion

This research underscores the critical role of social media in the promotional strategies of MSMEs and highlights the importance of selecting the most appropriate platform based on a multi-criteria evaluation. By applying a Decision Support System (DSS) approach with the Simple Additive Weighting (SAW) method, the study successfully identified TikTok as the most optimal platform for promoting the Sakinah Laundry business, followed by WhatsApp Business, Facebook, and Instagram.

The results emphasize that decision-making in digital marketing should be guided not only by user base but also by factors such as promotional ease, cost efficiency, interaction potential, and alignment with market characteristics. The robustness of the SAW analysis—demonstrated through sensitivity testing provides confidence in the reliability of the platform rankings.

Furthermore, the findings suggest that MSMEs can enhance their digital competitiveness by adopting data-driven strategies, leveraging tools such as DSS, and tailoring their social media use to platforms that best match their promotional needs. While technological infrastructure and digital literacy remain challenges in some regions, ongoing training and support initiatives can help bridge these gaps and maximize the benefits of social media marketing for small businesses.

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