



جامعة تكنولوجى مارا
UNIVERSITI
TEKNOLOGI
MARA

JOHOR INTERNATIONAL INNOVATION, INVENTION COMPETITION AND SYMPOSIUM
2024
JIIICaS

PROCEEDINGS OF JOHOR INTERNATIONAL INNOVATION INVENTION COMPETITION AND SYMPOSIUM 2024 (JIIICaS 2024)



*“Flourish and Nurturing Sustainable
Innovation for a Prosperous Nation”*

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e ISBN: 978-967-0033-25-9

**Published in Malaysia by
Universiti Teknologi MARA Cawangan Johor
Kampus Pasir Gudang
81750 Masai**



Preface

In the name of Allah, the Almighty who gives us the enlightenment, the truth, the knowledge and with regards to Prophet Muhammad (peace be upon him) for guiding us to the straight path. We thank to Allah for giving us guidance and strength to write this e-book.

This e-book compiles the extended abstracts that submitted to Johor International Innovation Invention Competition and Symposium 2024 (JIICaS2024), where JIICaS2024 is a virtual platform for all creative minds to share and present their invention and innovation. Each abstract gives a brief background on the innovation or project.

We hope that this e-book will help the readers to get to know the innovation done by the students and get some ideas to develop future innovation products.



Foreword Rector



Assalamualaikum warahmatullahi Wabarakatuh,
Salam Sejahtera, Salam Malaysia MADANI and
Salam UiTM Dihatiku.

In the name of Allah, the Most Gracious, the Most Merciful.

It is a great honor to welcome you to the Johor International Innovation, Invention, Competition, and Symposium 2024 (JIICaS 2024). This event

connects various disciplines, focusing on education and engaging educators, students, researchers, and innovators from all walks of life.

Innovation is not just about ideas; it demands perseverance, creativity, and determination to turn those ideas into reality. The remarkable projects showcased today highlight the dedication and spirit of all participants. Initiatives like this not only explore new technologies but also cultivate skills and leadership among our youth. At Universiti Teknologi MARA (UiTM) Johor Branch, we are fully committed to fostering a dynamic culture of innovation, promoting the commercialization of new products, and encouraging meaningful collaborations with industry and society.

As we celebrate this event, I would like to extend my heartfelt gratitude to all sponsors, judges, the College of Computing, Informatics and Mathematics, UiTM Pasir Gudang Campus as the event organizer, as well as to the researchers and participants for their hard work in making this event a success. Let us continue striving for innovation and excellence. May the ideas presented today inspire us and lay the groundwork for future achievements.

Thank you.

Associate Professor Dr. Saunah Zainon
Rector
Universiti Teknologi MARA (UiTM)
Johor Branch



Foreword Assistant Rector



Assalamualaikum Warahmatullahi Wabarakatuh,
Salam Sejahtera, Salam Malaysia MADANI and UiTM
Dihatiku.

All praises and thanks to Allah SWT for granting us the opportunity to organize and participate in the Johor International Innovation, Invention, Competition, and Symposium 2024 (JIICaS 2024).

I would like to extend my deepest appreciation to the College of Computing, Informatics and Mathematics (KPPIM), Universiti Teknologi MARA (UiTM) Johor Branch, Pasir Gudang Campus for successfully hosting this event for the second time.

This initiative not only fosters a culture of innovation within Johor and Malaysia but also highlights local expertise and ingenuity. With 544 entries from schools and higher learning institutions, the hybrid format encourages diverse participation, providing a platform for sharing innovations.

I am sincerely grateful to all participants—your dedication is key to this event's success. Special thanks go to the organizing committee, sponsors, and everyone involved. May this event inspire valuable insights and lead to future innovations and successes. Let us continue nurturing creativity for a brighter and more prosperous tomorrow.

Thank you.

Dr. Siti Khadijah binti Alias
Assistant Rector
Universiti Teknologi MARA
Pasir Gudang Campus



Preface Program Director



Assalamualaikum warahmatullahi wabarakatuh,
Salam Sejahtera, Salam Malaysia MADANI, and Salam
UiTM Dihatiku.

Alhamdulillah, we express our heartfelt gratitude to Allah SWT for the successful organization of the Johor International Innovation, Invention, Competition, and Symposium 2024 (JIICaS 2024). With great enthusiasm and a shared sense of purpose, we delve into this year's

theme of "Flourish and Nurture Sustainable Innovation for a Prosperous Nation."

This event serves as a crucial platform for fostering innovation and collaboration among students, educators, and researchers. Since its inception in 2017 as the Innovation, Design, Exploration in Arithmetics & Sciences (IDEAS) Competition, JIICaS has evolved significantly, welcoming participants from primary, secondary, and higher education institutions. It has now reached an international level, attracting participants from Indonesia and Brunei. This remarkable growth reflects the dedication and hard work of everyone involved.

On behalf of the organizing committee, I extend our heartfelt thanks to all participants. We look forward to continuing this journey and hope JIICaS remains a premier event for innovators to exchange ideas. We hope to see everyone again at JIICaS 2025.

Finally, a sincere thank you to my committee members for your hard work and unwavering commitment in making this event a success.

Thank you.

Dr. Hajah Norbaiti Tukiman
Program Director

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(A-ST007) DEVELOPING MICRO-CREDENTIALS FOR SOCIAL SECURITY: A COMPREHENSIVE OVERVIEW

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ABSTRACT

In an era where the dynamics of social security systems are increasingly complex and pivotal to individual financial stability, there arises a critical need for innovative educational solutions. "Developing Micro-Credentials for Social Security: A Comprehensive Overview" introduces a groundbreaking approach aimed at transforming how individuals' access, understand, and leverage social security information for their benefit. This initiative is not just about imparting knowledge; it's about fostering a culture of informed decision-making and proactive financial planning. Social security, a fundamental component of the social safety net in many countries, is often perceived as intricate and inaccessible by the general public. The consequences of this perception are far-reaching, affecting individuals' ability to make informed decisions about their retirement, disability benefits, and more. Recognizing this gap, our product seeks to demystify social security through an innovative educational model that leverages the power of micro-credentials. These micro-credentials are designed to break down complex information into manageable, learnable segments that cater to a wide range of learning needs and preferences. This initiative is timely and relevant. As populations age and the future of social security systems becomes a hot topic of debate, the need for widespread public understanding and engagement has never been more critical. "Developing Micro-Credentials for Social Security" is not just an educational tool; it's a means to empower individuals, enhance public discourse, and contribute to the sustainable development of social security systems worldwide. In this comprehensive overview, we will delve into the objectives, novelty, practicality, and usefulness of our product. We aim to showcase how micro-credentials can transform the landscape of social security education, making it more accessible, engaging, and effective for all.

Keywords: Micro-Credentials, Social Security, Self-Directed Learning, Education, UiTM

1.0 INTRODUCTION

The introduction of micro-credentials in the realm of social security education represents a significant shift from traditional learning paradigms. It acknowledges the diverse backgrounds and capabilities of learners, offering a flexible, personalized learning journey. By providing concise, targeted information through a digital platform, we aim to make learning about social security accessible to everyone, regardless of their prior knowledge or experience with the subject.

2.0 OBJECTIVE

The primary objective of this innovation is to evaluate and enhance the effectiveness of micro-credentials as tools for self-directed learning in the field of social security. The innovation aims to increase learner autonomy, competence, and readiness in managing social security needs, while also contributing to broader societal benefits through enhanced financial literacy and preparedness.

3.0 METHODOLOGY

The micro-credential framework was developed using a competency-based approach, focusing on practical skills essential for managing social security systems.

Objective(s) of the Product: The primary objective of our product, "Micro-Credentials for Social Security," is to revolutionize the way individuals engage with and understand social security systems. By breaking down complex social security information into digestible, micro-credential courses, we aim to empower users with the knowledge and skills necessary to navigate their social security benefits effectively. This initiative seeks to enhance public awareness, improve personal financial planning, and foster a more informed citizenry regarding social security policies and practices.

Novelty of the Product: Our product introduces an innovative approach to learning and engagement with social security systems through the use of micro-credentials. Unlike traditional educational resources, our micro-credentials are designed to be concise, focused, and highly relevant to the immediate needs of individuals. This modular learning approach allows users to select and complete courses tailored to their specific interests or requirements, ranging from basic understanding of social security benefits to more advanced topics such as investment strategies for retirement planning. The novelty lies in the customization and flexibility of the learning modules, combined with a digital badge certification system that acknowledges and rewards users' progress and expertise.

Practicality of the Product: The practicality of our product is evident in its user-friendly design and accessibility. Developed with a focus on ease of use, the micro-credentials can be accessed via a web-based platform or mobile application, allowing users to learn at their own pace and convenience. The courses are structured to facilitate short, engaging learning sessions that can easily fit into busy schedules. Additionally, the integration of interactive elements, real-life case studies, and expert insights ensures that the learning experience is both practical and applicable to real-world scenarios. This practical approach not only enhances learning outcomes but also encourages continuous engagement with the content.

Usefulness of the Product: The usefulness of our micro-credentials for social security extends beyond individual learning to have a broader societal impact. By demystifying social security and making information more accessible, we aim to improve financial literacy and preparedness among the population. This is particularly crucial in a landscape where social security systems are becoming increasingly complex, and the need for informed decision-making is more important than ever. For individuals, the knowledge gained through our micro-credentials can lead to better financial planning, increased confidence in managing retirement funds, and a more secure financial future. For society, an informed citizenry is better equipped to engage in discussions and decisions regarding the future of social security systems.

The courses are delivered through a flexible and accessible online platform, allowing learners to engage at their own pace. Features include customizable learning paths, real-time feedback, and recognized credits. The practical application of this framework

is supported by a thorough analysis of participant feedback, which has shown high levels of satisfaction and effectiveness.

Table 1: Micro-Credential Features and Benefits

Feature	Description	Benefit
Customizability	Learners can tailor courses to their needs	Increases relevance and engagement
Accessibility	Available online, anytime, anywhere	Facilitates continuous learning
Recognized Credits	Acknowledged by academic and professional bodies	Enhances employability and credibility

4.0 RESULTS

The implementation of micro-credentials has led to significant advancements in social security education. Participants reported substantial improvements in knowledge acquisition and confidence levels, with 87% strongly agreeing that the content was delivered engagingly and 88% expressing high overall enjoyment. The novelty of this innovation lies in its ability to provide precise, scalable, and flexible learning opportunities that directly address the evolving needs of the workforce. The program's success has been recognized through various academic and professional channels, highlighting its impact and potential for further development.

5.0 CONCLUSION

The introduction of micro-credentials in social security education represents a significant step forward in fostering self-directed learning and enhancing societal benefits. The positive outcomes and feedback underscore the program's effectiveness and its alignment with the broader goals of sustainable national prosperity. The continued support and recognition from institutions like UiTM and innovation platforms further validate the innovation's importance and potential for widespread application. In conclusion, "Micro-Credentials for Social Security" represents a forward-thinking solution to the challenges of engaging with and understanding social security. Through its innovative design, practical learning approach, and broad usefulness, our product stands to make a significant contribution to individual and societal well-being.

(A-ST008) SMART MAILBOX NOTIFICATION SYSTEM

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ABSTRACT

Even in this day of technology, the postman still delivers mail, packages, and messengers to our homes. Due to certain factors, such as courier services, packages cannot be sent via email or by any other electronic means. In place of the more conventional method of checking their mailbox, many find it convenient to be aware of the messages the user receives. Customers are searching for a better option that will keep them alert every time a mail delivery arrives because official letters are growing in popularity as a corresponding tool worldwide. Modern electrical technology is incorporated into these conventional mailboxes as a better solution. The Smart Mailbox Notification System integrates advanced technology to provide users with real-time alerts upon the arrival of new mail. The system operates through an IR sensor as the input, detecting infrared radiation emitted by mail within the mailbox. Upon detection, the Arduino UNO R3 microcontroller processes the data and triggers three outputs: an LED indicator, a buzzer for audible alerts, and a GSM module for mobile notifications. The system's functionality is orchestrated by Arduino's program, using the Arduino IDE. Communication between the Arduino and GSM module is facilitated through AT command codes, ensuring efficient SMS alerts to the user's mobile phone. The result is an immediate "Mail Detected!" notification from the GSM module when the IR sensor detects the mail. This system provides information on an automated notification system that is effective and efficient, incorporating cutting-edge technology to improve user comfort and communication effectiveness.

Keywords: Smart Mailbox, Arduino, Notification System, GSM module

1.0 INTRODUCTION

In a world where convenience and security intersect, the Smart Mailbox Notification System offers a reliable solution for managing mail deliveries. This innovative system alerts users as soon as mail arrives, providing real-time notifications and peace of mind. By incorporating sensors and alerts, it minimizes the risk of missed deliveries and unauthorized access to mailboxes.

Mailbox notification systems have become essential tools for enhancing mail delivery services' ease and security. These systems typically include a sensor to detect mail delivery, an alert mechanism to notify recipients, and a power source, usually a battery. They deter theft by promptly alerting households to mail deliveries and ensure timely retrieval of time-sensitive packages and documents. This is especially beneficial for those in rural areas or with distant mailboxes, as well as for communal housing complexes and businesses with outdoor mailboxes.

The primary goal of installing a mailbox notification system is to improve mail delivery's convenience and security. This project aims to notify individuals immediately when mail is placed in their mailbox, reducing the need for frequent checks. The system also allows users to monitor their mailbox status remotely, preventing missed obligations like utility bills. As technology advances, integrating mailbox notification systems with smart home technologies will provide even greater functionality and control for businesses and households.

2.0 OBJECTIVE

The objectives of the Smart Mailbox Notification System are:

- i. To detect the presence of mail using an infrared (IR) sensor.
- ii. To inform the user of the arrival of mail by sending a notification message to their phone via a GSM module.
- iii. To notify those inside the house of the mail in the mailbox using a buzzer.

3.0 METHODOLOGY

This chapter delves into a comprehensive exploration of the methodology adopted for this project, with a primary emphasis on elucidating the hardware and software utilized to enhance user convenience within the system.

Figure 3.1 illustrates the utilization of the Arduino UNO R3 in this project, highlighting the use of the 5V Output, Ground, and Digital pins 4, 5, 6, and 7. The GSM module, equipped with a SIM card, sends SMS alerts when the Arduino detects mail via the IR sensor. The module's Tx and Rx pins connect to Arduino pins 5 and 6, while Vcc and Gnd connect to power and ground. The buzzer, connected to pin 4 and ground, emits a sound to alert users, ideally placed near the front door. The IR sensor, connected to the 5V supply, ground, and pin 7, detects mail and signals the Arduino.

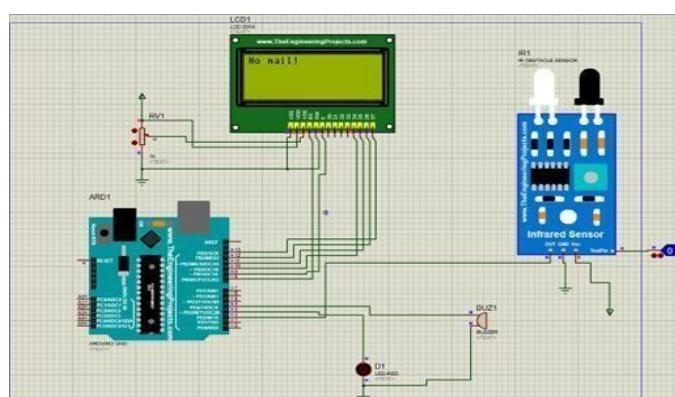


Figure 3.1: Circuit diagram of Smart Mailbox Notification System

Figure 3.2 shows the block diagram of the system, which includes one input and three outputs. The IR sensor detects infrared radiation from mail and sends this signal to the Arduino UNO R3, which processes the data using C++ code written in the Arduino IDE. The Arduino then triggers three outputs: an LED that lights up, a buzzer that

sounds to alert those inside the house, and a GSM module that sends notifications to the homeowner's mobile phone.

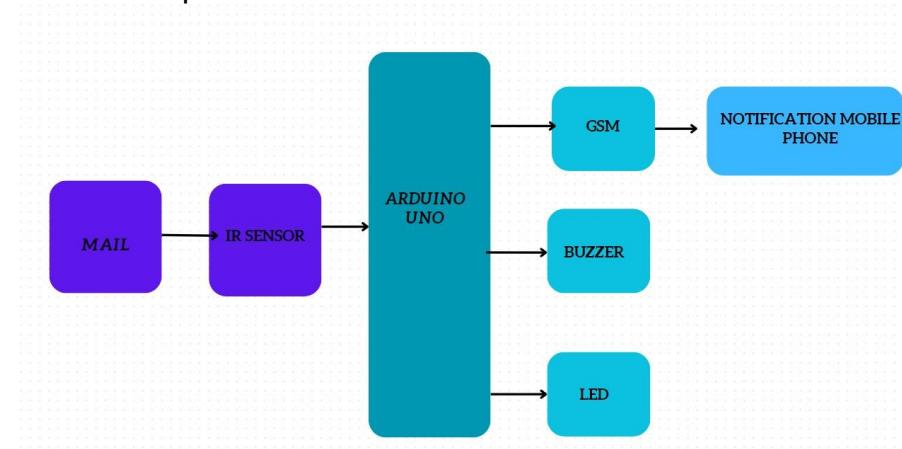


Figure 3.2: Block diagram of Smart Mailbox Notification System

4.0 RESULTS

4.1 Simulation Result

In this system, an infrared (IR) sensor detects the presence of mail and triggers three outputs: an LED, a buzzer, and a GSM module. The IR sensor, with its VCC, GND, and analog pins, signals the Arduino UNO R3 upon mail detection. In the "mail detected" state, the Arduino processes the signal and activates the GSM module to send a notification to the user's phone, illuminates a green LED, and sounds a buzzer. In the "no mail detected" state, none of these outputs are activated. Figures 4.1 and 4.2 illustrate these two scenarios: the system's response when mail is detected and when it is not. In this system, an infrared sensor acts as the input, detecting mail presence. The sensor has three pins: VCC, GND, and analogue. This input triggers three outputs an LED, a buzzer, and a GSM module. The system operates in two states which is mail detected, and no mail detected.

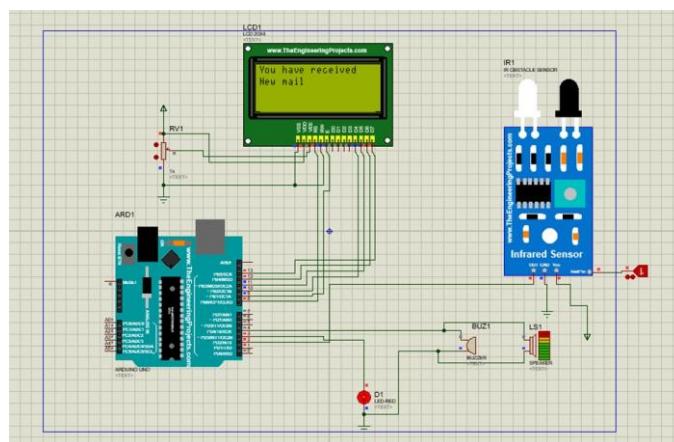


Figure 4.1: Simulation when the mail is detected.

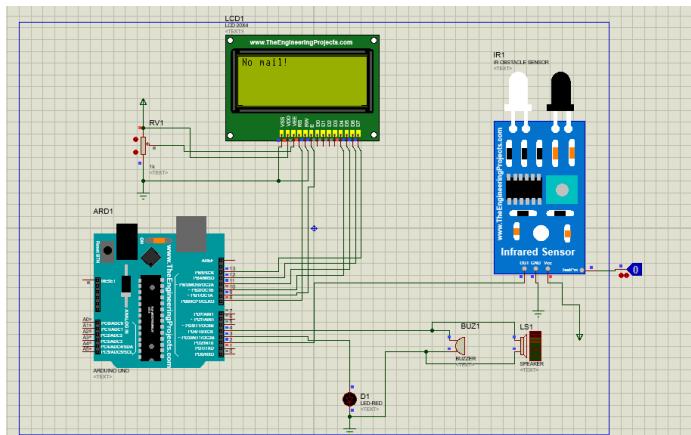


Figure 4.2: Simulation when there is no mail detected.

4.2 Hardware Result

When a letter is inserted, the IR sensor detects it and triggers the system to send a "Mail Detected!" message to the user's phone via the GSM module, as shown in Figure 4.3.



Figure 4.3: Hardware result

Table 1: Data analysis simulation and hardware result

Simulation				Hardware			
IR sensor	LED	Buzzer	LCD Display	IR sensor	LED	Buzzer	Actual Incoming Notification
1	ON	ON	'Mail detected'	ON	ON	ON	Notify
0	OFF	OFF	'No Mail'	OFF	OFF	OFF	Not notify

1	ON	ON	'Mail detected'	ON	ON	ON	Notify
0	OFF	OFF	'No Mail'	OFF	OFF	OFF	Not notify
1	ON	ON	'Mail detected'	ON	ON	ON	Notify
0	OFF	OFF	'No Mail'	OFF	OFF	OFF	Not notify
1	ON	ON	'Mail detected'	ON	ON	ON	Notify
0	OFF	OFF	'No Mail'	OFF	OFF	OFF	Not notify
1	ON	ON	'Mail detected'	ON	ON	ON	Notify
0	OFF	OFF	'No Mail'	OFF	OFF	OFF	Not notify

Table 4.1 Shows further information which contains all the gathered data after doing 5 tested results simulation and hardware data. The objective for this project is sending out the notification to the user when the letter is inserted. In theory of simulation when the mail inserted IR sensor will detect the mail as input, LED and Buzzer will turn ON and the LCD will display "Mail Detected". Next, for the no mail inserted the IR sensor, LED and Buzzer will turn off and LCD will display "No Mail". For the Hardware result, IR sensor will detect the mail when mail inserted, LED and Buzzer will turn ON, GSM Module will send message to the user phone.

5.0 CONCLUSION

In conclusion, the integration of both software and hardware in the Smart Mailbox Notification System successfully meets all the project's objectives. The IR sensor effectively detects incoming mail, triggering alerts through a buzzer and an LED for immediate household notifications, and sending SMS alerts to users' phones for remote updates. This system proves to be a valuable technological solution, especially for residents in high-rise buildings or those with distant mailboxes, by offering enhanced convenience, security, and the ability to monitor mail remotely for prompt responses.

(A-ST010) THE EFFECT OF GROWTH PLANT IN VERTICAL FARMING STRUCTURE

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ABSTRACT

Vertical farming has emerged as a sustainable solution to agricultural challenges, offering efficient resource utilization and increased crop yields. In this study, a prototype was created using PVC pipes and local materials, occupying a space area of 0.16 m² and accommodating 32 plants with dimensions of 1.7 m height, 0.4 m width, and 0.4 m length. Over a 30-day observation period, spinach consistently grew with leaf sizes averaging 6 cm, lengths of 20 cm, and 10 leaves per pot. Temperature, electrical conductivity, and pH level were investigated, with spinach showing suitable average temperature (25.5°C to 26.7°C), electrical conductivity (1.35 mS/cm), and slightly acidic pH (6.3). This research significantly contributes to the fields of vertical farming and sustainable urban agriculture.

Keywords: Vertical farming, plant, temperature, electrical conductivity, pH level

1.0 INTRODUCTION

Vertical farming is a groundbreaking way of growing crops in vertically stacked layers, mostly in controlled indoor spaces like warehouses or high-rise buildings (Olabimpe, 2024). Unlike traditional farming, which requires large areas of land, vertical farming makes the most of vertical space, leading to higher crop yields per square meter (Lee, Y.Y. et., al 2024). This method of farming uses advanced technologies like hydroponics, aeroponics, and aquaponics to provide plants with water, nutrients, and light in a controlled setting (Birkby, 2016 and Olabimpe, 2024). It comes with several benefits, such as saving water, reducing the need for pesticides, and cutting down on transportation costs and carbon emissions from food distribution. Additionally, vertical farming can help tackle food security issues, especially in crowded cities where there's not enough land for traditional farming (Kouloumprouka et., al 2024, Sugiyanto, and Pirdo 2024). However, it also has challenges like high upfront costs, energy use, and the need for technical expertise (Arcasi et., al 2024, Carotti et., al 2024. and Zhang, et., al 2024). Despite these challenges, ongoing technological advancements and growing interest in sustainable agriculture are fueling the growth of vertical farming as a promising solution to meet the food needs of our ever-expanding global population. In vertical farming, controlling plant growth involves controlling various factors like temperature, light, water, and carbon dioxide levels (Sugiyanto et., al 2024).

2.0 OBJECTIVE

There are three objectives in these studies. (1) To design and fabricate the vertical farming method. (2) To measure the performance of the growth plant by temperature, electrical conductivity, and pH parameters. (3) Observation of the plant's growth in physical dimensions such as leaf length, counts, and size of leaf diameter.

3.0 METHODOLOGY

A flow chart of the methodology of the whole process is illustrated in Figure 1. The process of design and fabrication known as the final prototype used PVC material that has a 10 cm diameter pipe that can accommodate 32 net pots inside. Figure 2 display the required vertical farming sizes.

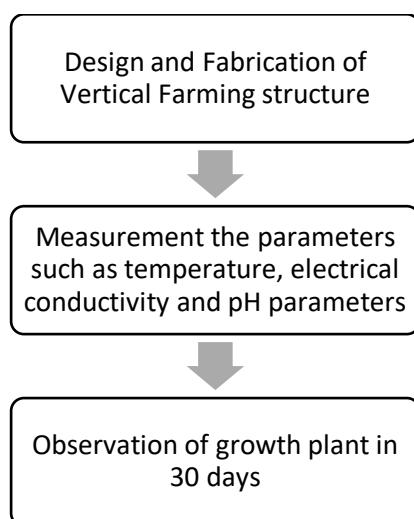


Figure 1: Methodology of vertical farming system

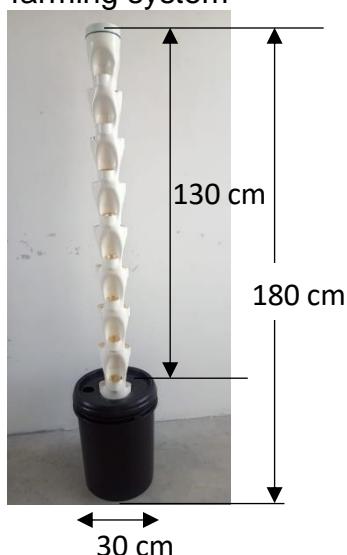


Figure 2: Vertical farming dimension

4.0 RESULTS

4.1 Effect of physically growth plant

In the vertical farming system, spinach thrived in the outdoor environment, displaying its characteristic white blooms, vibrant green stalks, and slender leaves. Throughout

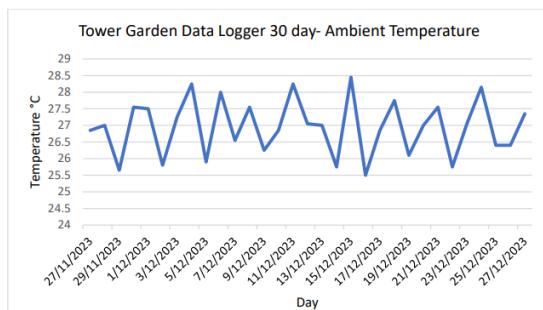
a 30 day growth period, crucial growth parameters like plant length, leaf count, and leaf diameter were monitored twice daily at 9 a.m. and 6 p.m., as outlined in Table 1. Additionally, pH levels, water temperature, and nutrient concentrations were measured daily using portable meters to ensure optimal growing conditions.

Table 1: Measurement of spinach in 30 days

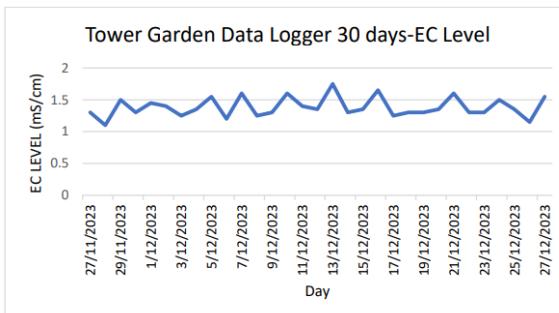
Criteria	Leaves counts	Leaves length (cm)	Leaves diameter(cm)
Minimum	4	10	2
Maximum	10	20	6
Average	7	15	4
Reference	± 7	± 20	± 6

4.2 Effect of temperature, electrical conductivity (EC), and pH level of growth plant

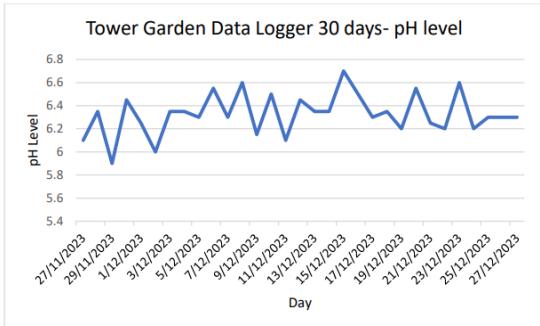
In Figure 3(a), the morning temperature for growing spinach was recorded at 25.7°C between 9 and 11 a.m. However, the temperature rose to 28.3°C from 12 to 2 p.m., reaching its highest point in the afternoon. By 6:00 p.m., the nighttime temperature had decreased to 27°C. It's essential to note that the combination of lower humidity and higher afternoon temperatures could potentially hinder spinach development. The electrical conductivity (EC) values for the 30-day vertical farming trial, depicted in Figure 3(b), remained relatively stable, ranging from 1.1 to 1.8 mS/cm, with an average of 1.35 mS/cm. Figure 3(c) illustrates the pH levels, which ranged from 5.8 to 6.8, averaging 6.3 throughout the trial period. These consistent pH readings indicate ideal pH regulation for optimal plant development, which is crucial for maintaining stable conditions, minimising plant stress, and maximising nutrient availability.



(a)



(b)



(c)

Figure 3: Parameters effect of plant growth. Figure 3(a) effect of temperature, Figure 3(b) effect of EC level and Figure 3(c) effect of pH level

5.0 CONCLUSION

In summary, the project focused on developing a prototype for vertical farming, accommodating 32 plants, and successfully yielded spinach harvests comparable to traditional farming methods. This highlights the potential of small-scale vertical farming to increase local food production, particularly in cities sustainably. Looking forward, advancements in technology like HVAC, LED lighting, and the Internet of Things provide opportunities to improve autonomy and productivity in vertical farming systems, paving the way for continued innovation and expansion in this promising field.

ACKNOWLEDGMENTS

This study receives support from the Ministry of Higher Education Malaysia and Universiti Teknologi MARA, Pulau Pinang Branch, Permatang Pauh Campus

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(A-ST011) POTENTIAL OF GOJI BERRIES (*LYCIUM BARBARUM*) FRUITS AS NATURAL ANTIOXIDANT MEDICINE

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ABSTRACT

Lycium barbarum, a species of the Solanaceae family known as goji berries is attributed to various health benefits such as immune system, eye health and reduced cholesterol due to bioactive compounds. The research focused on *L. barbarum* fruits for their phytochemical and antioxidant property. Phytochemicals were extracted using hexane, ethyl acetate and methanol through the cold maceration method. The result shows that the highest percentage yield was methanol extract with 2.5%. Phytochemical screening affirmed the presence of alkaloids, saponins, terpenoids, phenols, flavonoids, and glycosides. Antioxidant activity was evaluated through DPPH assay. Methanol extract demonstrated strong radical scavenging activity with an IC₅₀ value of 76.61 µg/mL. In conclusion, this study shows that the extracts of *L. barbarum* contain medicinally bioactive compounds and have the potential as an antioxidant agent(s) that may benefit human health.

Keywords: *Lycium barbarum*, Solanaceae, Extraction, Phytochemical, Antioxidant

1.0 INTRODUCTION

Natural product is substances that originate from animals, plants and microorganisms. New therapeutic compounds have been comes from nature due to the tremendous chemical diversity found in various species of plants. Since the beginning of the 20th century, extraction or powder of medicinal plant has been used as the main active ingredient in medicinal products because they are considered a powerful source of drugs that have no side effects when applied to patients (Brown *et al.*, 2010). *Lycium barbarum* which belongs to Solanaceae family is a species primarily valued for its edible fruits, commonly referred to as goji berries, a deciduous shrub thrives in regions such as China, Tibet, and various other parts of Asia (Shahrajabian *et al.*, 2020). Numerous studies have emphasized the positive effects of goji berries on antioxidant, anti-tumor, antimicrobial, hypoglycemic, anti-mutagenic and anti-aging. Additionally, goji berries are known for their high content of phenolic compounds, including flavonoids and phenolic acids, which contribute to their antioxidant properties and potential health benefits (Nazirah *et al.*, 2014). In this study, the phytochemical screening was done on *L. barbarum* extracts in order to detect the presence of secondary metabolites and demonstrate the antioxidant activity of goji berries.

2.0 OBJECTIVE

This study aims to extract phytochemicals from the dried *L. barbarum* using different polarity of solvents such as ethyl acetate, hexane and methanol. Phytochemical screening has been done to identify the presence of phytochemicals from the extracts of *L. barbarum*. Besides, the antioxidant activities of *L. barbarum* extracts were also demonstrated by using DPPH (2,2-diphenyl-1-picrylhydrazyl) methods.

3.0 METHODOLOGY

Plant Extraction

The fruits of *L. barbarum* were dried and ground into fine powder. It has been weighed and extracted sequentially with *n*-hexane, ethyl acetate and methanol. The extracts were filtered through a filter paper and concentrated using rotary evaporator to obtain the crude extract.

Phytochemical Screening

Chemical tests for the screening and identification of bioactive chemical constituents such as alkaloids, flavonoids, phenols, saponins, terpenoids, glycosides, steroids and tannins on *L. barbarum* extracts were carried out by using a standard procedure (Lei *et al.*, 2021).

Antioxidant Assay

DPPH radical scavenging assay was utilized to determine the antioxidant activity of *L. barbarum* with some modifications (Donno *et al.*, 2015). Each sample (1.0 mg) was dissolved in methanol (1 mL) to obtain a stock solution with a concentration of 1000 µg/mL. A series of diluted solutions were prepared from the stock solution with methanol starting from 1000, 500, 250, 125, 62.5, 31.3, 15.63 and 7.81 µg/mL. The sample solutions with various concentrations (0.2 mL) were mixed with 3.8 mL of methanolic DPPH solution (50 µM). The mixture was incubated for 30 minutes at room temperature in the dark. After 30 minutes, the absorbance of the reaction mixture was recorded at 517 nm.

4.0 RESULTS

Extraction of sample

The crude extracts of *L. barbarum* from the extraction process were weighed using an analytical balance. The percentage and yield of each extract were calculated. Table 1 below shows the result of sample extraction of different solvents. Methanol demonstrated the highest percentage yield at 2.5%, indicating effective extraction of a diverse range of polar compounds. Ethyl acetate exhibited moderate efficiency with a percentage yield of 1.32%, while hexane showed a relatively lower yield of 1.12%, suggesting lower solubility of non-polar compounds in this solvent.

Table 1: Result of sample extraction.

Extract	Weight of ground sample (g)	Weight of crude extract (g)	Percentage yield (%)
Hexane	196	2.20	1.12
Ethyl Acetate	192	2.54	1.32
Methanol	186	4.66	2.50

Phytochemical screening of *L.barbarum*

L. barbarum has been reported to contain many active compounds. In this study, phytochemical screening was carried out to detect the presence of secondary metabolites in n-hexane, ethyl acetate and methanol. Moreover, phytochemical screening confirmed the presence of various bioactive compounds in goji berries, including alkaloids, saponins, terpenoids, phenols, flavonoids, and glycosides. These compounds contribute to the potential health benefits associated with goji berries. Table 2 shows the result of the phytochemical analysis of those extracts.

Table 2: Phytochemical screening of *L. barbarum*

Test	Crude extract			Observation
	n-Hexane	Ethyl Acetate	Methanol	
Alkaloid	+	+	+	Reddish brown
Flavonoid	-	+	+	Light yellow
Phenol	-	+	+	Dark green
Terpenoid	-	+	+	Brown
Saponin	-	+	+	Frothing
Glycoside	-	+	+	Greenish yellow

Key: presence (+), absence (-)

Antioxidant Activity

The DPPH radical scavenging assay was employed to evaluate the antioxidant properties of *L.barbarum*. The data on the DPPH radical scavenging activity of hexane, ethyl acetate, and methanol extracts from *L. barbarum* fruits, along with the standard antioxidant, ascorbic acid, is presented in Table 3. Methanol extract demonstrated strong radical scavenging activity with an IC₅₀ value of 76.61 µg/mL. Ethyl acetate extract presented significant DPPH radical scavenging activity with an inhibition rate of 89.80% at 1000 µg/mL with a corresponding IC₅₀ value of 135.03 µg/mL. Hexane extract was not determined for the IC₅₀ in this experiment as the sample inhibition at 1000µg/mL is less than 50%.

Table 3: DPPH radical scavenging of the extract of *L. barbarum*

Extract	% Inhibition at 1000µg/mL	IC₅₀ (µg/mL)
n-Hexane	45.30 ± 0.97	ND
Ethyl acetate	89.80 ± 0.83	135.03 ± 0.96
Methanol	94.56 ± 0.55	76.61 ± 0.35
Ascorbic acid	98.04 ± 0.85	10.40 ± 0.21

Data present mean ± standard deviation of three replicate experiments;
ND- not determined

5.0 CONCLUSION

The phytochemical screening has revealed there are many secondary metabolites in *L. barbarum* fruit extract such as alkaloid, flavonoid, saponin, phenol, terpenoid and glycoside. Meanwhile, the antioxidant study revealed that the ethyl acetate and methanol extracts demonstrated notable DPPH radical scavenging activity, with methanol exhibiting higher potency (IC₅₀ 76.61 µg/mL). The results showed that the extract of *L. barbarum* has the potential as an antioxidant agent for medicinal purposes.

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(A-ST014) OPTIMIZING BOILER SYSTEM EFFICIENCY: A SIMULINK-BASED ANALYSIS OF DRUM AND REHEATER PERFORMANCE

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ABSTRACT

State Space Models represent a cornerstone of innovative problem-solving in the realm of dynamical systems. This study aims to assess the performance of the drum and reheat within a boiler system using Simulink, recognizing the critical need for balanced water flow to avoid detrimental impacts on system compartments. The objectives involve resolving water level regulation issues in the drum and reheat via State Space Models (SSM), integrating Fuzzy State Space Models (FSSM) for precise output parameter estimation, and simulating uncertain model parameters for the drum and reheat. MATLAB programming facilitated data analysis, while Simulink enabled simulation, revealing that both the reheat and drum exhibit similar flow patterns, initially increasing before stabilizing. Consequently, this deeper understanding not only facilitates innovation but also unlocks hidden potentials that theoretical analysis alone cannot uncover. This pioneering approach sets a new standard for innovative problem-solving in boiler system optimization, guaranteeing safety and reliability in operation.

Keywords: SSM, FSSM, Boiler, Drum, Reheater, Simulink

1.0 INTRODUCTION

A State Space Model, an advanced probabilistic graphical model, illustrates the relationship between hidden state variables and observed measurements, encompassing both discrete and continuous data. Pioneered in the 1960s by the field of control engineering, this versatile framework finds extensive applications across disciplines such as engineering, statistics, material science, and control theory, effectively addressing the complexities of dynamical systems. The other type of State Space Model is the Kalman State Space Model. The Kalman State Space Model, or Kalman filter, is widely used in academic research as it approximates dynamic systems. The system uses mathematical equations to show its current state and temporal progression. Control, signal processing, and navigation use the Kalman filter extensively. Moreover, the drum plays a critical role in boiler systems by converting water into steam. It acts as a reservoir, ensuring a consistent water supply to the boiler tubes for steam production. With precision, the drum regulates water levels, ensuring only dry steam enters the superheater for optimal heating. Meanwhile, strategically positioned post-high-pressure turbine, the reheat takes on a pivotal role by reheating steam from the turbine's initial stages as it enhances the power plant's thermal efficiency. This process enables greater steam expansion in the turbine, extracting maximum energy before condensation, thus revolutionizing energy extraction in boiler systems.

2.0 OBJECTIVE

1. Revolutionize water level regulation in the drum and reheat by pioneering advanced State Space Models (SSM).
2. Elevate output parameter estimation accuracy through cutting-edge integration of Fuzzy State Space Models (FSSM) into the system.
3. Pioneer groundbreaking simulations of uncertain model parameters for the drum and reheat components, pushing the boundaries of predictive modeling in boiler system innovation.

3.0 METHODOLOGY

3.1 STATE AND OUTPUT EQUATION OF DRUM SYSTEMS

$$\begin{pmatrix} m_{dL} \\ x_{D1} \end{pmatrix} = \begin{pmatrix} -\frac{V_{dw}}{V_L} & 0 \\ 0 & -\frac{V_{dw}}{V_L} \end{pmatrix} \begin{pmatrix} m_{dL} \\ x_{D1} \end{pmatrix} + \begin{pmatrix} 1 & 1-x \\ h_e & (1-x)h_{wr} \end{pmatrix} \begin{pmatrix} W_e \\ W_r \end{pmatrix}$$

Figure 1 State Equation of Drum Systems

$$\begin{pmatrix} h_w \\ w_d \end{pmatrix} = \begin{pmatrix} 0 & \frac{1}{V_L \rho_w} \\ \frac{V_{dow}}{V_L} & 0 \end{pmatrix} \begin{pmatrix} m_{dL} \\ x_{D1} \end{pmatrix}$$

Figure 2 Output Equation of Drum Systems

3.2 STATE AND OUTPUT EQUATION OF REHEATER SYSTEMS

$$\begin{pmatrix} T_{rh} \\ X_{RH} \end{pmatrix} = \begin{pmatrix} -\frac{K_{rh}W_{ro}^{0.8}}{M_rC_{rh}} & 0 \\ \frac{K_{rh}W_{ro}^{0.8}}{V_{rh}} & -\frac{W_{ro}}{V_{rh}\rho_{rh}} \end{pmatrix} \begin{pmatrix} T_{rh} \\ X_{rh} \end{pmatrix} + \begin{pmatrix} \frac{1}{M_rC_{rh}} & 0 & \frac{K_{rh}T_r}{M_rC_{rh}W_{ri}^{0.2}} \\ 0 & \frac{W_{ri}}{V_{rh}} & -\frac{K_{rh}T_r}{V_{rh}W_{ri}^{0.2}} \end{pmatrix} \begin{pmatrix} Q_{rs} \\ h_{ri} \\ W_{ri} \end{pmatrix}$$

Figure 3 State Equation of Reheater Systems

$$\begin{pmatrix} P_{ro} \\ T_r \end{pmatrix} = \begin{pmatrix} 0 & R_r \left[\frac{h_{ro} - h_{ref} + C_{pr}T_{ref}}{h_{ro}C_{pr}} \right] \\ 1 & 0 \end{pmatrix} \begin{pmatrix} T_{rh} \\ X_{RH} \end{pmatrix}$$

Figure 4 Output Equation of Reheater Systems

3.3 FUZZY STATE SPACE MODELS TO EUCLIDEAN N-SPACE

Reheater Matrices Order

$$A_{2 \times 2}, B_{2 \times 2}, C_{2 \times 2} \quad k = 12$$

$$S^*{}_4 = \left[a_{11}, a_{12}, a_{21}, a_{22}, 0, 0, 0, 0, 0, \frac{1}{M_s C_{rh}}, 0, \frac{w_{ri}}{V_{rh}}, 0, 0, 0 \right]$$

Drum Matrices Order

$$A_{2 \times 2}, B_{2 \times 2}, C_{2 \times 2} \quad k = 12$$

$$S^*{}_5 = \left[\frac{V_{dow}}{V_L}, 0, 0, \frac{V_{dow}}{V_L}, 0, 0, 0, 0, 0, 1, (1-x), h_e, (1-x)h_{wr}, 0, 0 \right]$$

4.0 RESULTS

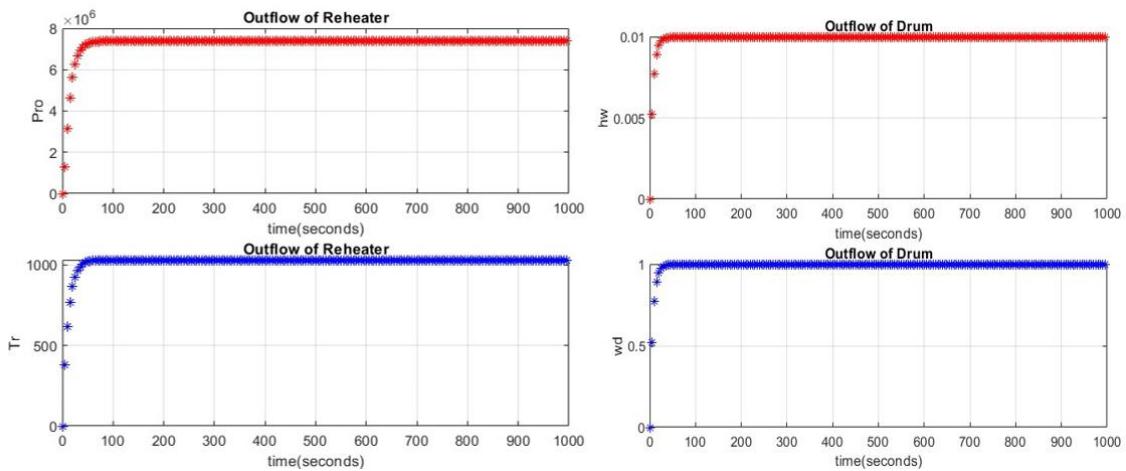


Figure 5 Outflow of Drum and Reheater Systems

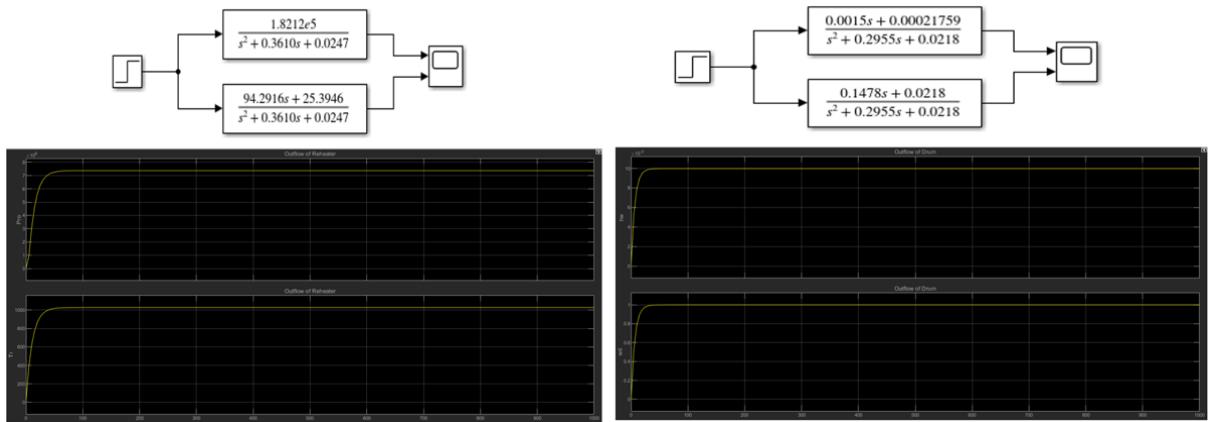


Figure 6 Outflow of Drum and Reheater Systems Via Simulink

5.0 CONCLUSION

This study has unveiled insights into the outflow levels from both the drum and reheater components of the boiler system. The compelling discovery of a congruent pattern between system operation and outflow underscores a remarkable synergy, suggesting an optimized operational paradigm. This finding not only validates the operational efficacy of the boiler's component system but also paves the way for innovative strategies in system optimization. By aligning operational performance with outflow dynamics, our study sets a new standard for efficiency in boiler technology, driving forward the frontier of sustainable energy solutions.

(A-ST015) SHOE RACK WITH DRYER FUNCTION

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ABSTRACT

Malaysia's climate has an almost uniform temperature, high humidity and a lot of rain leads many people struggle to dry their shoes, especially on rainy days. While there are many shoe racks on the market, there are few options that can both store and dry shoes simultaneously. This project's main objectives are twofold: first, to design a shoe rack with a built-in dryer function, and second, to analyze the mechanical systems involved in its implementation. By achieving these goals, the project aims to help people dry their shoes quickly, solving the problem of damp shoes especially on rainy days. SolidWorks software was used to design and analyze this product whereas welding and screws technique was utilized to connect the frame. The heating coil, fan and iron wire mesh were used as a drying function for the shoe rack. As a result, the shoe rack will store and dry shoes simultaneously without negatively impacting the environment. This shoe rack saves time and shortens the drying process, making it an ideal solution for those in need of quick shoe drying, especially on rainy days.

Keywords: Shoe Rack, Dryer Function, Shoe

1.0 INTRODUCTION

Malaysia's climate, characterized by consistent temperatures, high humidity, and frequent rainfall, often makes it difficult for people to dry their shoes, particularly on rainy days. Although there are many shoe racks available, few can both store and dry shoes at the same time. This project aims to address this issue with two main objectives: designing a shoe rack with an integrated dryer and analyzing the mechanical systems required for its implementation. By achieving these goals, the project seeks to provide a quick solution for drying shoes, especially during rainy weather, without harming the environment. This innovative shoe rack will save time and expedite the drying process, making it an ideal solution for those needing fast shoe drying.

2.0 OBJECTIVE

The goal of this project is to create a device to help people dry their shoes quickly, solving the problem of damp shoes especially on rainy days. Thus, the objective of this project is to design an efficient shoe rack with dryer function and analyze its mechanical systems.

3.0 METHODOLOGY

Figure 1 shows the product of the shoe rack with dryer function. The steps to use the shoe rack with dryer function device are as follows:-

1. Insert the electric plug into the wall socket. Turn on the socket as shown in Figure 2.
2. Insert the shoes into the shoe rack as shown in Figure 3.
3. Close the door after inserting the shoes. Turn on the machine and turn the timer to run the shoe dryer as shown in Figure 4.
4. If the timer has done, take out the shoes. If the shoes do not fully dry repeat step 2



Figure 1: Product of shoe rack with dryer function



Figure 2: Switch on the socket to turn on the shoe rack



Figure 3: Insert the shoes into the shoe rack



Figure 4: Close the shoe rack's door and run the timer

4.0 RESULTS

The device's innovation is expected to save time and shorten the drying process, making it an ideal solution for those in need of quick shoe drying, especially on rainy days. Also, this device will store and dry shoes simultaneously without negatively impacting the environment

5.0 CONCLUSION

This project successfully created a shoe rack with a dryer function that will help people dry their shoes quickly, solving the problem of damp shoes on rainy days without negatively impacting the environment. The shoe rack also will save time and shorten the drying process, making it an ideal solution for those in need of quick shoe drying, especially on a rainy day.

(A-ST016) AQUAWATER: AN IOT APPLICATION FOR AQUARIUM WATER QUALITY MONITORING

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ABSTRACT

The Aquawater mobile application represents a significant advancement in aquarium management by integrating IoT technology to monitor and control water quality through sensors. Traditional aquarium maintenance often involves labour-intensive tasks such as manual water sampling and frequent water changes, which are essential for the well-being of aquatic life. Aquawater addresses these challenges by offering a mobile application that tracks key water quality parameters, including pH levels, turbidity, and temperature, delivering real-time data directly to the user. This app not only simplifies the monitoring process but also facilitates maintenance tasks, such as water replacement, through convenient features like button-activated and program-based timers. By automating these processes, Aquawater minimizes the risk of exposure to harmful organisms and ensures a healthier environment for aquarium inhabitants. Developed using the Mobile Application Development Life Cycle (MADLC), the application has been proven effective in both monitoring and maintaining water quality. Detailed analysis demonstrates its ability to enhance user convenience while supporting the optimal conditions for aquatic life. Furthermore, the project highlights the benefits of incorporating sensors and real-time data analysis into the application, ultimately showcasing the potential of IoT solutions in addressing everyday challenges. The Aquawater mobile application not only enhances user experience but also underscores the value of IoT in creating innovative and efficient tools for routine tasks, offering a smarter approach to aquarium care.

Keywords: IoT, aquarium monitoring, mobile application

1.0 INTRODUCTION

Maintaining appropriate water quality in an aquarium is essential for fostering a thriving and visually appealing aquatic ecosystem while safeguarding the health and longevity of its inhabitants. Regular monitoring, timely water changes, and the use of effective filtration systems are critical practices in aquarium husbandry that help mitigate issues arising from suboptimal water conditions. Poor water quality can severely impact the growth and immune systems of aquatic organisms, increasing their vulnerability to diseases such as bacterial, fungal, and parasitic infections. The challenges of maintaining water quality are compounded by the need to monitor multiple parameters, including pH, temperature, turbidity, and water levels, which can be particularly inconvenient for individuals with busy schedules. This inconvenience is further exacerbated during water changes, which are not only time-consuming but can also cause temperature fluctuations that negatively affect aquatic life. To address these challenges, more efficient methods of real-time water quality monitoring and management are required. The

adoption of Internet of Things (IoT) technology offers a promising solution, enabling remote monitoring and control of aquarium systems through real-time updates to a smartphone. This approach not only simplifies the management process but also ensures a healthier environment for aquarium inhabitants, enhancing both user convenience and the well-being of aquatic life.

2.0 PROJECT OBJECTIVES

The project's objective is to develop an automatic water change mechanism and real-time water quality monitoring capabilities into an aquarium system. With a comprehensive solution that minimizes human care efforts and guarantees ideal conditions for aquatic life, this unique design aims to change traditional aquarium administration. The proposed system aims to improve aquarium management processes' overall sustainability, ease of use, and efficiency by utilizing cutting-edge technology, thereby enhancing the health and well-being of the aquatic ecosystem.

The primary objectives of this project are focused on enhancing the management of aquarium environments through the integration of IoT technologies. Firstly, the project aims to develop an IoT-based aquarium system that enables real-time monitoring of water quality parameters, such as pH, turbidity, and temperature. This system ensures that optimal conditions for aquatic life are maintained by continuously analyzing data and making automated adjustments as needed. The second objective of the project is to integrate an automated water change system into the aquarium setup. This feature is specifically developed to reduce the manual work often required for aquarium maintenance while enhancing the overall effectiveness, convenience, and ecological soundness of aquarium care. Together, these objectives aim to revolutionize traditional aquarium management practices, promoting the health and well-being of aquatic environments while significantly reducing the effort required by users.

3.0 PROJECT METHODOLOGY

In developing an advanced aquarium management system, the integration of various sensors and components is crucial to ensure precise monitoring and control. Central to this system is the ESP-WROOM-32 module, powered by the ESP32 microcontroller with a dual-core Xtensa LX6 CPU running at up to 240 MHz, which manages the water pump, pH sensor, temperature module, turbidity module, and ultrasonic sensor. This microcontroller, with its Wi-Fi and Bluetooth connectivity, facilitates seamless communication and control over the aquarium's monitoring system. The system includes a submersible DC water pump, activated by a 5V relay, to automate the water change process, while the DS18B20 temperature sensor ensures accurate monitoring of water temperatures ranging from -55°C to +125°C. Additionally, the water's pH and turbidity levels are monitored using the PH4502C pH sensor and a turbidity sensor module, respectively, ensuring the maintenance of optimal water conditions. The ultrasonic sensor measures the water level by detecting distance, which can be converted into centimetre or meter outputs. Sensor connections are made using various jumpers linked to the ESP32 GPIO pinout on a breadboard, with power supplied through a DC Power Jack Breakout Board. A USB DC cable is used to connect the power module and ESP32 for coding purposes. Finally, a one-gallon water bottle is utilized as a prototype base, providing a practical environment for testing and development. Figure 1 presents a flowchart illustrating the navigational

pathways and interactions within the Aquawater: An IoT Application for Aquarium Water Quality Monitoring. This diagram offers a comprehensive visual representation of the application's user interface, mapping out each step of the user journey from initiation to completion.

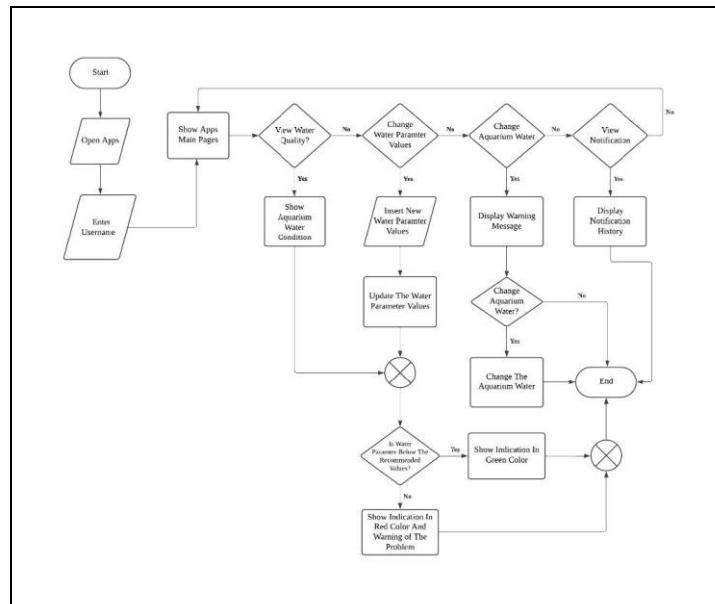


Figure 1: Project Flowchart

4.0 PROJECT RESULTS

The homepage of the Aquawater mobile application provides users with an interactive interface to monitor and manage their aquarium's water parameters. Users can view a chart displaying selected water parameters over time and can switch between different charts using the "Change Chart" button. Additional features on the homepage include a notification button, a water change button, and a floating plus button, which, when interacted with, reveal options to edit or schedule water changes. Initiating a water change prompts a confirmation pop-up, requiring users to confirm or cancel the action. Upon confirmation, the application sends a signal to the aquarium to proceed with the water change, as depicted in Figure 2. The scheduling page allows users to set water change schedules for specific days and times, with the option to select multiple days using the same timer, or to create additional schedules for different times, as shown in Figure 3. The parameter page displays default target values for water quality, which users can customize according to their needs. Changes can be saved or reset to default values, with an information button available to display an illustration of the water parameter, as illustrated in Figure 4.

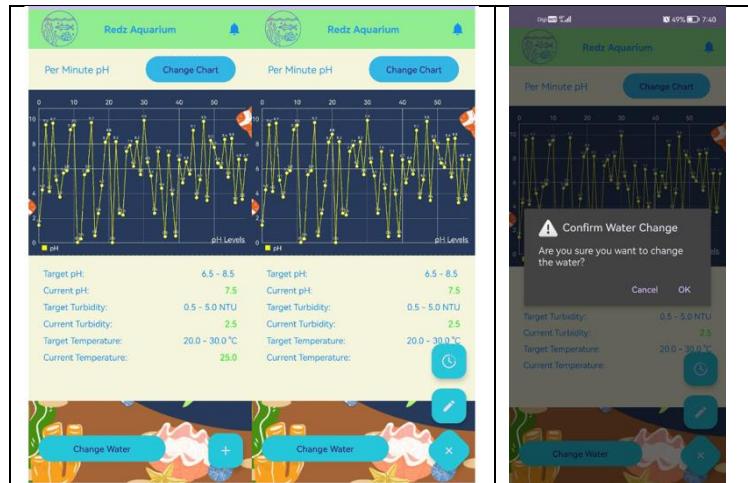


Figure 2: Main Page for Aquawater Mobile Application

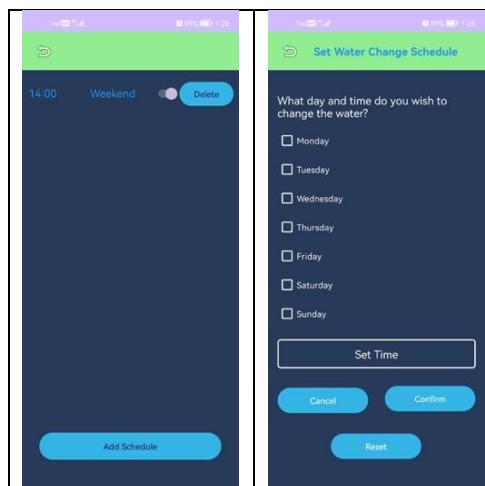


Figure 3: Scheduling Water Change for Aquawater Mobile Application

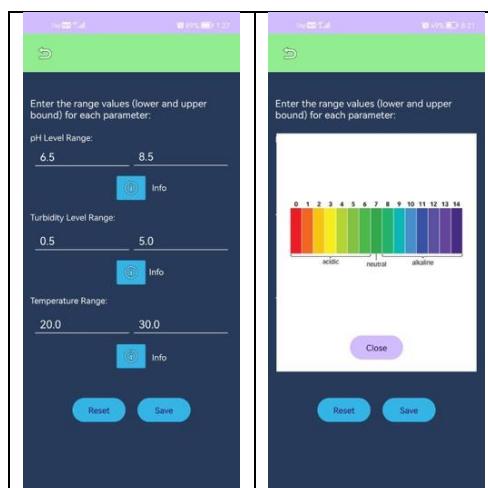


Figure 4: Customizing and Managing Water Quality

The notification page provides updates on the water change process and alerts users if any water parameters fall outside the desired range. Users can also filter graphs by selecting specific parameters using the "Change Chart" button, as demonstrated in Figure 5.

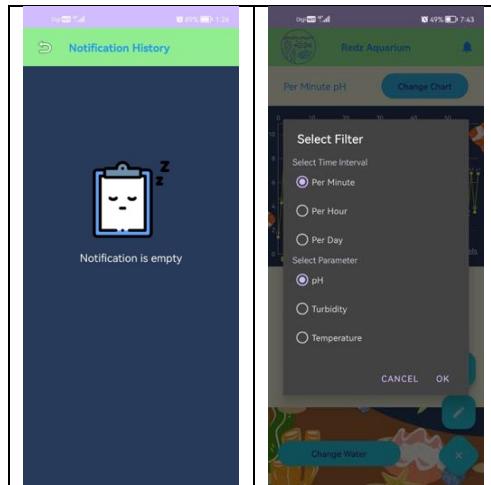


Figure 5: Water Change Updates and Parameter Notification

The AquaWater: An IoT Application for Aquarium Water Quality Monitoring prototype comprises several key components essential for its functionality. These include the ESP32 microcontroller, two relay modules, two water pumps, and sensor modules for monitoring water temperature, pH levels, turbidity, and water level via an ultrasonic sensor. Each of these components is integrated to work cohesively, allowing for comprehensive real-time monitoring and control of aquarium conditions. The assembly of these components in the prototype is depicted in Figure 6, demonstrating their configuration and interaction within the system.

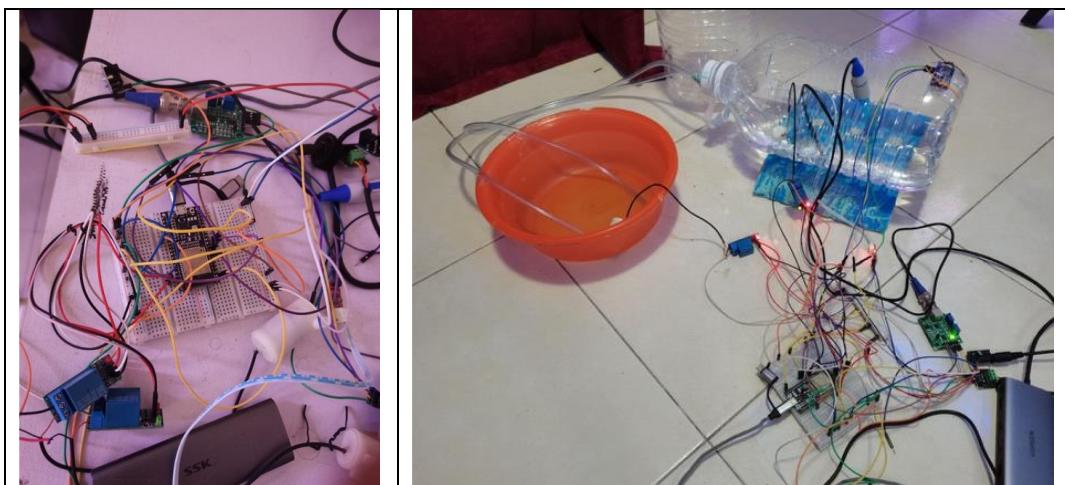


Figure 6: Project Prototype

5.0 CONCLUSION

In conclusion, the integration of an ESP32 microprocessor with various sensors such as pH, temperature, turbidity, and ultrasonic modules, enables comprehensive monitoring and management of aquarium water parameters. The sensor data is processed and stored in a database, allowing the mobile application to display real-time water quality information, set target values, and automate water changes through a 5V relay and water pump. This system offers aquarium hobbyists an efficient and user-friendly tool for maintaining optimal water conditions and ensuring the health of their aquatic environments.

(A-ST017) WASTE MANAGEMENT SYSTEM FOR ANALYSING REAL-TIME DUSTBIN'S STATUS THROUGH TELEGRAM APP AND CENTRALIZED DISPLAY MONITOR

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ABSTRACT

This project is developed to replace traditional waste collection method, allowing administrators to monitor dustbin conditions and reducing the need for constant cleaning. The primary parts of this project include hardware circuitry, ThingSpeak database channel, and Telegram app. Administrators and cleaners are able to get notifications regarding the status, location, slot, motion presence, and moisture level inside every dustbin via the ThingSpeak database channel and the Telegram app. The online ThingSpeak database channel is mostly used for verification with an ESP8266 NodeMCU. The input section integrates PIR, ultrasonic, and raindrop sensors, while the output port comprises an LCD, LED(s), servo motor, and buzzer. The ultrasonic sensor is used to determine the amount of space available inside the dustbin, whereas a PIR sensor detects the movement of any pest that could cause an unhealthy environment. Furthermore, the raindrop sensor implies the level of moisture inside the dustbin. In addition, a centralized information monitor is provided to consider some cleaners that might not have a smartphone to notify the status of the dustbin or does not even have the Telegram app. Therefore, this monitor is placed at a strategic location such as at ground floor and hallway so that everyone can see the notification clearly. ThingSpeak database channel platform enhances the collection of waste by storing, analyzing, and notifying in real time, conserving cleaners time and energy. As a result, a clean environment generates high profits for waste management organizations as well as benefits for UiTM community and society.

Keywords: Waste Management System, ThingSpeak Database Channel, Telegram App, Notification, Dustbin Status

1.0 INTRODUCTION

Waste management refers to the various recycling and disposal methods. They can be used to remove, treat, recycle, repurpose, and manage waste. The primary goals of waste management are to reduce waste while avoiding any potential hazards to human health and the environment [1]. An ineffective waste management system may cause the amount of waste in the dustbin to increase, resulting in an enormous amount of waste spilling out of the dustbin. Waste sorting can be time-consuming and energy-intensive, especially when dealing with huge areas like the UiTM campus that have lots of faculty buildings and dustbins. Therefore, this project aims to deal with a variety of environmental

issues, including an ineffective management system. The proposed project consists of three main components which are hardware, ThingSpeak database channel, and Telegram app. Administrators and cleaners are able to get real-time notifications about the dustbin's status, location, slot, motion, and moisture detection by connecting the ThingSpeak database channel to the Telegram app. The ESP8266 NodeMCU microcontroller is equipped with three inputs and six outputs. The input components consist of an ultrasonic, passive infrared (PIR), and raindrop sensors [2]. The ultrasonic sensor determines the amount of available space, the PIR sensor detects any motion [3], and the additional raindrop sensor implies the level of moisture within the dustbin. While the output components include an LCD, LED(s), servo motor, buzzer, Telegram application and a centralized monitor.

2.0 OBJECTIVES

- I. To construct a hardware system uses an ESP8266 NodeMCU microcontroller to measure the available space, motion, and moisturelevel inside a dustbin.
- II. To develop a ThingSpeak database channel that links to Telegram app which able to store, analyze, and to Telegram app which able to store, analyze, and process all the data in each dustbin.
- III. To create a central information monitor that will notify cleaners the status of the dustbin in real-time even if they are unable to access the internet.

3.0 METHODOLOGY

HARDWARE

The project relied primarily on three different sensors to display and monitor the output responses. An ultrasonic sensor is used to measure the amount of space available, while a PIR sensor detects any motion within the dustbin. These sensors are set up beneath the dustbin cover for analyzing all data inside the dustbin. In addition, the raindrop sensor is installed at the bottom of the dustbin to determine its moisture level. Furthermore, this smart prototype, as shown in **Figure 3.1**, includes an LCD, LED(s), buzzer, and servo motor indicating whether the dustbin is full or still available, as well as detecting the motion of bugs and moisture level inside it.



Figure 3.1: The Proposed Project Prototype

THINGSPEAK DATABASE CHANNEL

There are numerous useful platforms for data storage and analysis, including the Blynk app, Google Cloud IoT, Cisco IoT Cloud Connect, ThingSpeak Channel, and others [4]. This project utilizes ThingSpeak Channel as a key foundation for the Internet of Things component, as well as an IoT analytic platform service, to collect, visualize, and analyze data for the purpose of the waste management system [5]. A channel must be developed within a ThingSpeak database channel file, as shown in **Figure 3.2**, for storing, analyzing, processing, and monitoring all the data information sent by the sensors attached to the dustbin.

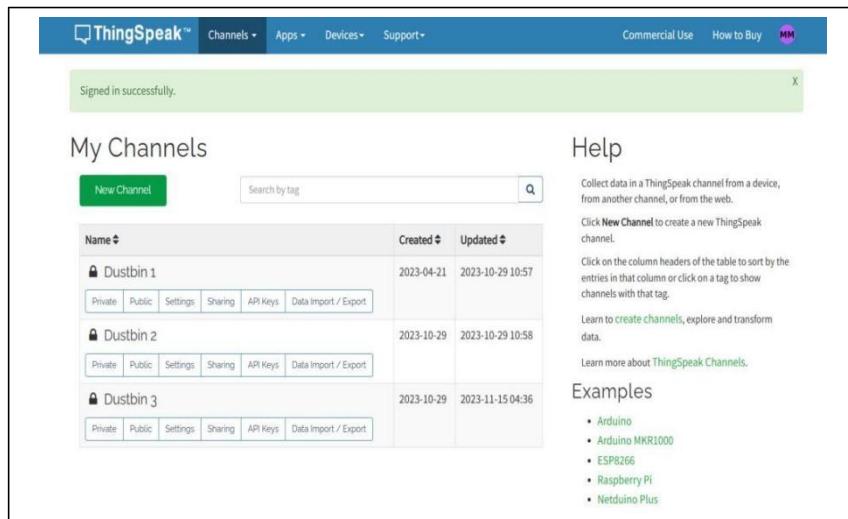


Figure 3.2: The Interface of ThingSpeak Database Channel

TELEGRAM APPLICATION

In this project, the Telegram app connects with the ThingSpeak database channel because it is easily accessible. Telegram is a popular cross-platform messaging app that is widely used due to its improved privacy and encryption features, as well as support for large group chats. It also has no affiliations with other social media platforms, which makes it more appealing to some [6]. This can be achieved by connecting the Telegram app to the ThingSpeak channel. Thus, when ThingSpeak receives data that exceeds its threshold, messages will show up in a Telegram group created specifically for a waste management system. As shown in **Figure 3.3**, the notification displayed the status of a specific dustbin, including the slot, location, motion and moisture detection, and which dustbin needed to be collected.

Johor Innovation Invention Competition and Symposium 2024 (JIICaS 2024)

ThingSpeak™ Channels Apps Devices Support

Apps / React / React on Dustbin 1

Edit React

Name:	React on Dustbin 1
Condition Type:	Numeric
Test Frequency:	On data insertion
Last Ran:	2024-02-18 09:31
Channel:	Dustbin 1
Condition:	Field 1 (Level of waste) is less than or equal to 5
ThingHTTP:	DUSTBIN STATUS (1)
Run:	Only the first time the condition is met
Created:	2023-10-28 11:48 am

(a) React Apps

ThingSpeak™ Channels Apps Devices Support

Apps / ThingHTTP / DUSTBIN STATUS (1)

Edit ThingHTTP

Name:	DUSTBIN STATUS (1)
API Key:	RA@IZWOOEHYMKLRH
Regenerate API Key	
URL:	https://api.telegram.org/bot6678861971:AAFN03djwWqLwYHypibSvAF-UnXRU5q/sendMessage?chat_id=4058050044&text=DUSTBIN 1: NEEDS TO COLLECT!!!
HTTP Auth Username:	
HTTP Auth Password:	
Method:	POST

(b) ThingHTTP Apps

Figure 3.3: The Interface of Connecting ThingSpeak With Telegram App

4.0 RESULT

HARDWARE OUTPUT

Figure 4.1 depicts the entire circuit connection of the project, including the printed circuit board (PCB) and the three input connections. The circuit's input connections have been successfully verified to produce the indicated output.

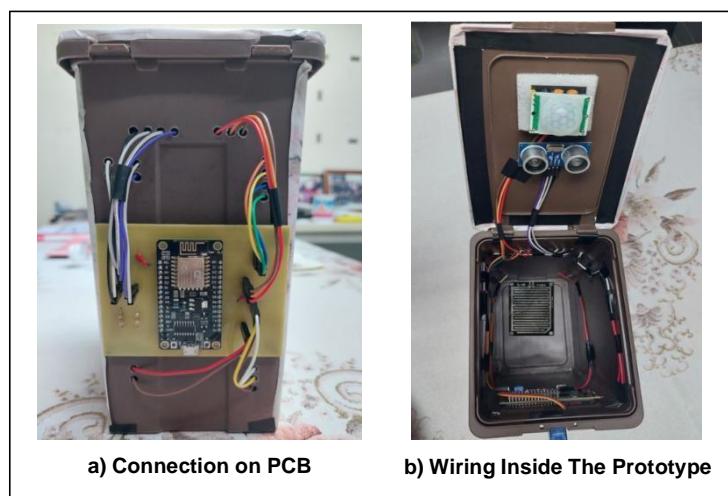


Figure 4.1: Circuit Connection onto Prototype

Referring to **Figure 4.2**, the condition displayed on the LCD indicates that the dustbin remains available in space with no motion present. The green LED indicates that the available space inside the dustbin is exceeding 5 cm from the lid. Both statuses can be detected by an ultrasonic and a PIR sensor. Meanwhile, the servo motor and buzzer are deactivated.



Figure 4.2: LCD Displays “Space Available and No Motion”

Figure 4.3 depicts the status shown on the LCD, indicating that the dustbin is ready to collect with the presence of motion. When the dustbin reaches a spacing of less than 5 cm from the lid, the red LED indicates it is FULL. These outputs are obtained from an ultrasonic sensor and a PIR sensor, respectively. The servo motor rotates 90 degrees in order to secure the dustbin while the buzzer will be activated.



Figure 4.3: LCD Displays “Ready To Collect and Motion Detected

Figure 4.4 illustrates the status indicated on the LCD when there is motion and moisture detected within the dustbin. When the dustbin reaches a distance of less than 5 cm from the lid, the red LED indicates that it is FULL. These outputs come from an ultrasonic sensor and a PIR sensor, respectively. The servo motor turns 90 degrees to lock the dustbin while the buzzer is activated.



Figure 4.4: LCD Displays the Moisture Level Detection

SOFTWARE OUTPUT

The notification in **Figure 4.5** shows the status of a specific dustbin, including slot, location, motion and moisture detection, and which dustbin requires to be collected.

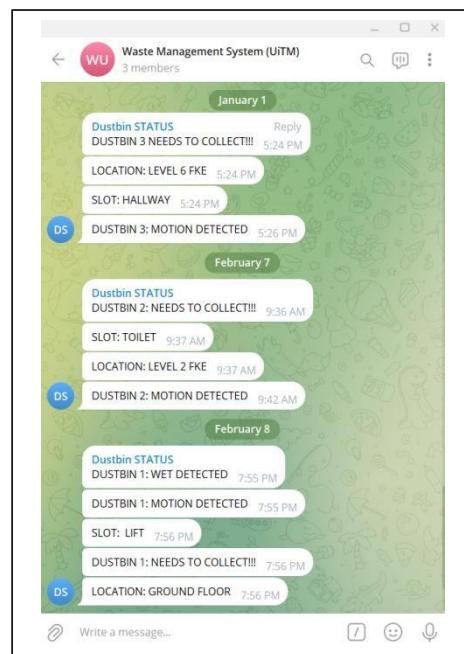


Figure 4.5: The Notification in Telegram App

Figure 4.6 shows that the dustbin has 11 cm of available space from the dustbin's lid with no motion by displaying a value of 0. It means that the dustbin has not yet reached its capacity. As a result, the user is allowed to use the dustbin.

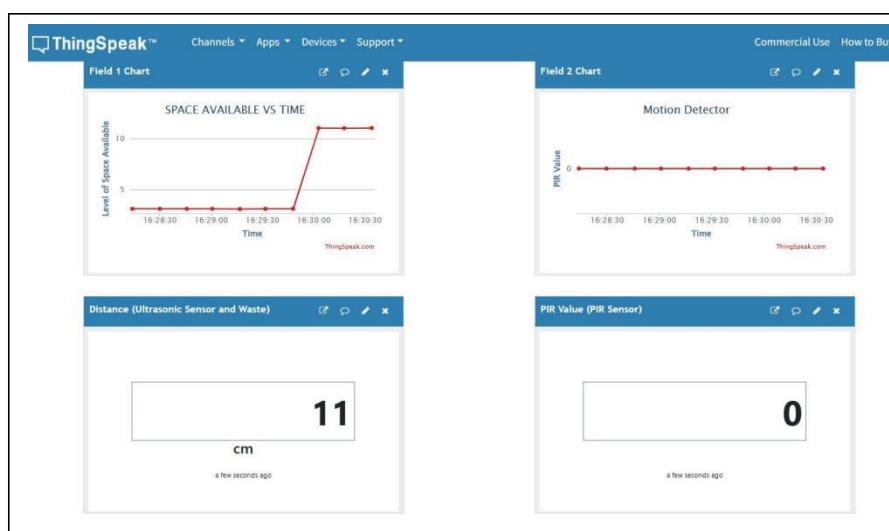


Figure 4.6: ThingSpeak Channel Analysis Shows The Dustbin is Still Available and No Motion Detected

In **Figure 4.7**, the data or measurement value indicates that the dustbin should be collected. This is because the dustbin has already reached its limit, which is less than 5 cm for the available space, and motion is detected by providing a PIR value of 1.

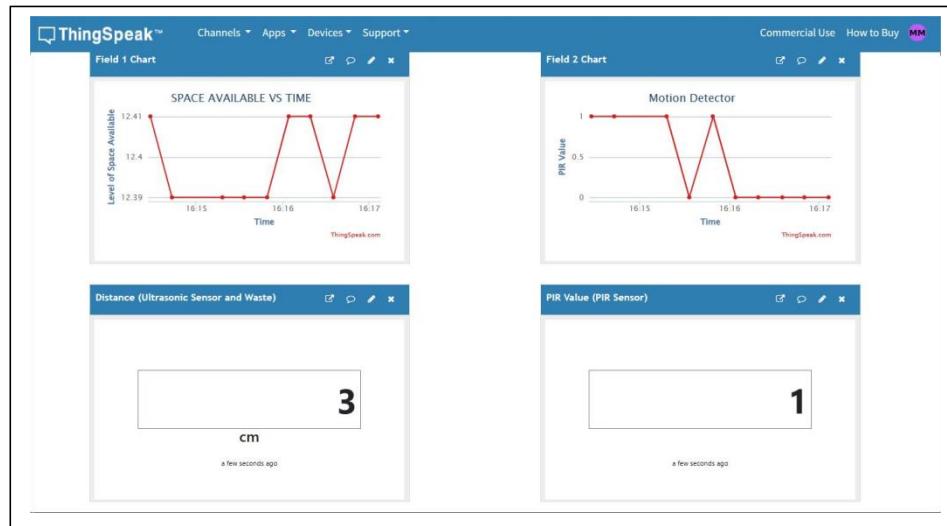


Figure 4.7: ThingSpeak Channel Analysis Shows The Dustbin isFull and Motion is Detected

The number of water droplets on the surface of raindrop sensor shown in **Figure 4.8** is 497 which means the dustbin is still dry. In this case, the threshold limit of raindrop sensor is set to lower than 300 to reach its maximum moisture level.



Figure 4.8: ThingSpeak Channel Analysis Shows the Moisture(wetness) Level inside the Dustbin. The threshold is set to number 300

The precise location of the dustbin implied in **Figure 4.9** is also possible to determined using the ThingSpeak channel, which is located at Pengajian Kejuruteraan Elektrik (PKE), UiTM Pasir Gudang, Bandar Seri Alam, Johor.

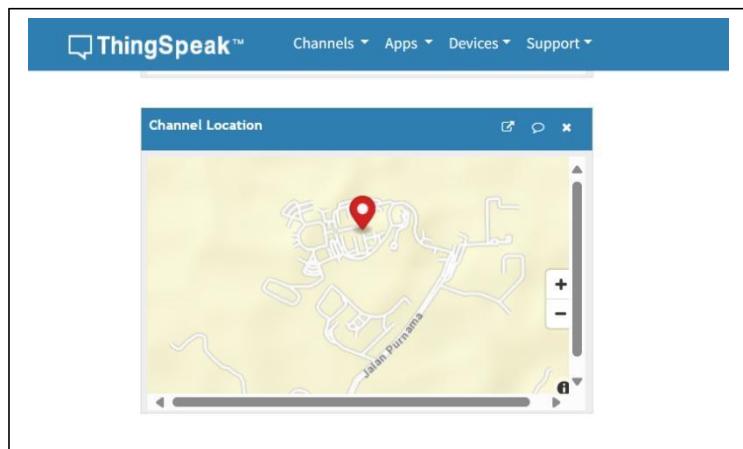


Figure 4.9: ThingSpeak Channel Analysis Shows The Channel Location of The Dustbin

BLOCK DIAGRAM

Figure 4.10 depicts the block diagram utilized in this project, which consists of three inputs and six outputs. The input section consists of an ultrasonic sensor, a PIR sensor, and a raindrop sensor. These sensors measure the amount of space available, as well as the presence of motion and wetness in the trash. Meanwhile, the output section consists of an LED, a buzzer, a servo motor, an LCD, the Telegram app for notification and a centralized LCD that act as a centralized monitor. The hardware components are connected to the ThingSpeak channel, transferring sensor data for storage and analysis in a database channel for graph representation and measurement value representation.

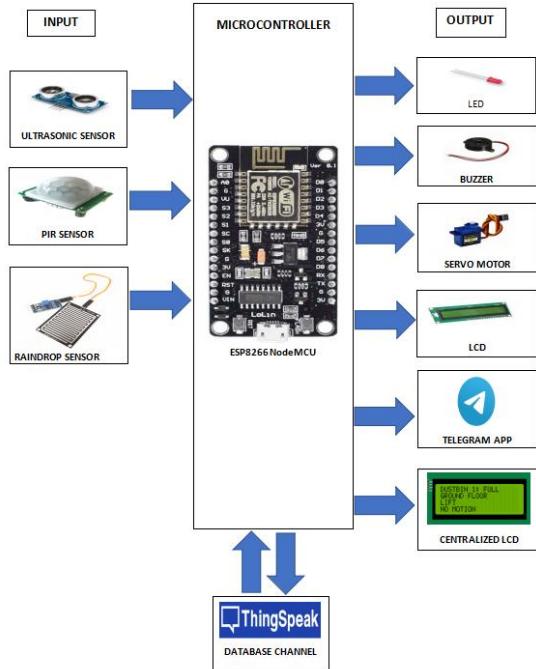


Figure 4.10: The Project System Block Diagram

FLOWCHART

The project's flowchart is shown in **Figure 4.11**. It consists of three key inputs that will control the system's outputs. To begin, an ultrasonic sensor will measure the available space in the dustbin, and if the threshold limit is achieved, the LCD will show "READY TO COLLECT", the LED will turn red, the servo motor turns 90 degrees, the buzzer will sound and centralized LCD shows the status, location and slot of the dustbin. Otherwise, the LCD displays "SPACE AVAILABLE" and the LED turns green.

Besides that, PIR sensors detect any motion within the dustbin. If there is movement, the LCD and centralized LCD will show "MOTION DETECTED!". Otherwise, LCD will show "NO MOTION" while centralized LCD is deactivated. Furthermore, the raindrop sensor measures the moisture level in the dustbin. The maximum value is set at less than 300 to guarantee the dustbin is moist. This circumstance will cause both LCD and centralized LCD to show "WET DETECTED" while the servo motor to spin 90°. Apart from that, only the LCD will display "DRY" and the others will be deactivated.

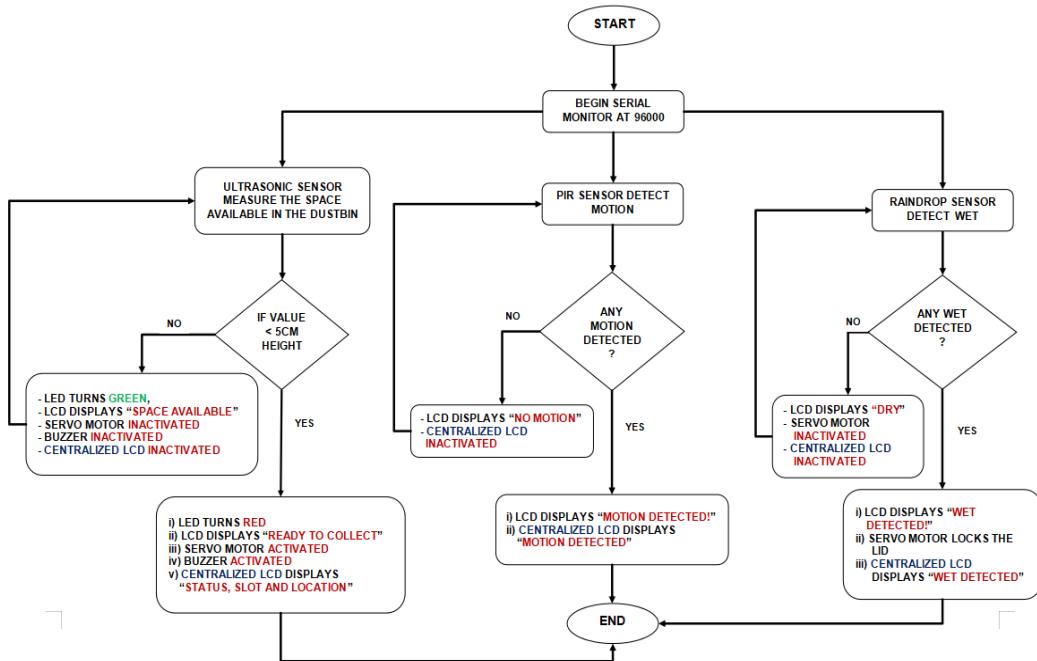


Figure 4.11: System Flowchart

5.0 CONCLUSION

This project can solve typical waste collection and disposal issues, particularly in large areas. Furthermore, the cleaners may become weary from routine physical inspection of each dustbin at all times, especially when the bins are located far apart in a large area such as a university campus. As a result, with this smart waste management system, cleaners will be able to collect waste in the dustbin more efficiently and with better management of human resources. This can be accomplished by sending cleaners a notification via smartphone to the Telegram app that includes the location, slot, motion and moisture detection (if applicable), and which dustbins need to be collected. Aside from that, the system may benefit the community by maintaining a clean and healthy environment through the use of the Internet of Things.

Furthermore, the system can benefit the community by keeping the environment in good shape and cleanliness. The project modified the dustbin by incorporating a locking mechanism. It can be set up to automatically shut the dustbin when it is full to prevent waste from pouring out and being overloaded.

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APPENDIX

GOLD Award Recognition Received from 9th EESEEE2023.



(A-ST018) CONTACTLESS PETROL PUMP PAYMENT SYSTEM VIA E-ZDEY APP WITH NFC MODULE INTEGRATED

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The global landscape of petrol payment systems is rapidly changing, with a greater emphasis on safety, effectiveness, and user convenience. The COVID-19 epidemic has resulted in an immediate need for contactless transactions, exacerbating the challenges faced by current systems and necessitating creative solutions. This endeavor tackles these problems by introducing an E-zdey Petrol Pump Payment System that uses Near Field Communication (NFC) technology and an integrated software or hardware approach. The primary goals of this project are to create a prototype for a contactless fuel pump payment system that includes hardware components such as the ESP32, PN532 NFC Module, Infrared Sensor, and YF-S401 water sensor, as well as to create a mobile application that uses NFC technology to enable a safe and seamless fuel pump payment system. The methodology for this project is divided into two components, which are ESP32-based hardware components and the development of an Android-based application that complements the system. The seamless communication between the hardware and the application is the framework of this innovative payment system. The proposed E-zdey application system allows users to leverage mobile devices for performing contactless payments via e-wallets which also stores all of the necessary data, such as balance, transaction history, and payment method format. Users must enter the value into their E-zdey app and choose whether to refuel in Ringgit Malaysia (RM) or Liters. Potential advantages of this project go over the immediate safety and effectiveness. Future recommendations embrace widespread usage of NFC-enabled petrol pump systems, which will contribute to a more secure and efficient fuel transaction experience.

Keywords: Contactless Payment, Near-Field Communication, E-wallet, Security, Android-based Application

1.0 INTRODUCTION

Technology advancements have transformed payment systems, particularly in the gasoline retail business. The introduction of Near Field Communication (NFC) technology and the growing use of E-wallets offer a new opportunity to rethink gas station payments, addressing the challenges faced by the current systems and ensuring secure, efficient, and user-friendly transactions. Currently, fuel stations mostly accept standard payment options such as credit and debit cards, as well as cash transactions [1]. This project is crucial for developing a prototype that allows consumers to make contactless payments at petrol stations using NFC [2] and the E-zdey app. The value of contactless payment systems cannot be

overstated, especially in light of the global COVID-19 pandemic. This strategy enhances transactional efficiency while also helping to minimize the transmission of infectious pathogens in public settings by reducing the number of physical contact points [3]. The proposed fuel pump system consist of ESP32 microcontroller, PN532 NFC Module, Infrared Sensor, DC water pump, YF-S401 water sensor, and buzzer, are meticulously configured to ensure optimal performance. In the world of software development, creating an Android application with Android Studio and Kotlin takes center stage [4]. This application, with its user-friendly interface, aims to enable seamless interactions. The integration with a MySQL database is critical for secure data management, and a dedicated server is essential for enabling real-time communication between the application and hardware components [5].

2.0 OBJECTIVE

- I. To develop an E-zdey mobile application system that leverages an e-wallet app to store all the necessary data such as balance, transaction history, and payment method layout.
- II. To design a prototype of a contactless fuel pump payment system that allow users to select between Ringgit Malaysia (RM) and Liters primarily using an ESP32, PN532 NFCModule, Infrared Sensor, and YF-S401 water sensor.

3.0 METHODOLOGY

BLOCK DIAGRAM

Figure 3.1 depicts the block diagram of the E-ZDEY Petrol Pump Payment System with NFC Module. The technology uses an infrared sensor to detect any car at the gas station. When an infrared sensor detects a car nearby, the Near Field Communications (NFC) Module activates an NFC-enabled payment for transactions, and the buzzer beeps when the transaction is successful. Following that, the water flow sensor will determine the amount of fuel dispensed. Each pump station has a push button that serves as an emergency stop. This device relies on a push stop button to prevent accidents such as explosions caused by gasoline leaking.

The project operates on input data via an ESP-32 microcontroller. The ESP32 is a low-cost Wi-Fi microchip with a full Transmission Control Protocol / Internet Protocol (TCP/IP) stack and microcontroller functionality that is commonly utilized in the development of IoT (Internet of Things) apps. One of the ESP32's advantages is its ease of use and adaptability. It can be used as a microcontroller on its own or as a wireless communication module in other electronic projects. Water pumps are utilized to dispense fuel from the fuel tank. The amount of fuel dispensed and the price per liter will be displayed on the LCD screen. The customer can see the cost of fuel per litre dispensed by gazing at the LCD display. The smartphone application functions as an e- wallet, while the Application Programming Interface (API) serves as the e- wallet's server.

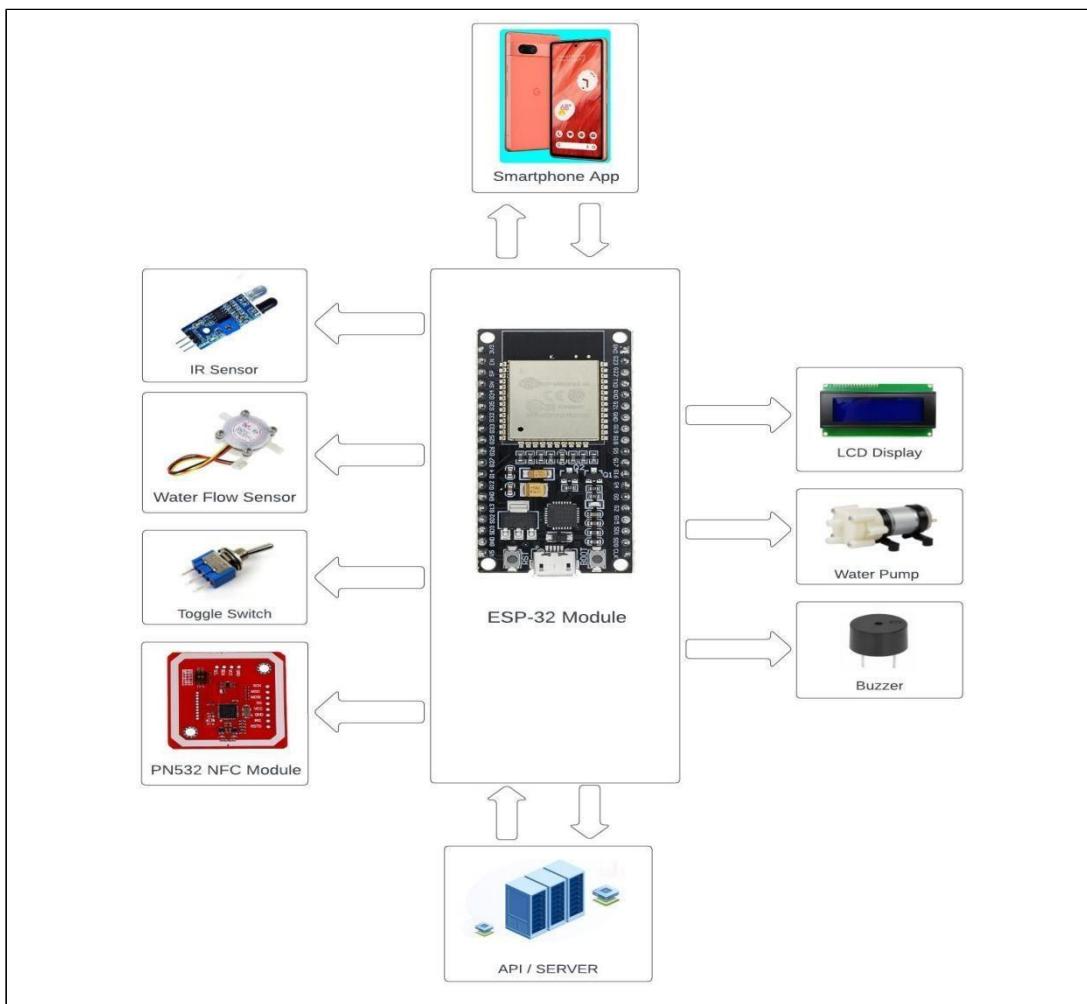


Figure 3.2 Overall Block Diagram of E-ZDEY Petrol Pump Payment System via NFC

HARDWARE OPERATIONAL FLOWCHART

The hardware system flowchart is illustrated in **Figure 3.2**. The hardware flowchart represents a systematic sequence of processes for the petrol pump payment system. It begins with the IR sensor recognizing the presence of a vehicle, which initiates the transaction procedure. Following that, the NFC reader evaluates data to determine whether a compatible device is in close vicinity.

Following successful verification, consumers have the option to select their chosen filling method, either Ringgit Malaysia (RM) or liters. The system then computes the cost of fuel using the predetermined price rate. If the user selects RM, the computation takes into account the selected fuel volume. After this, the system begins dispensing fuel. As fuel delivery begins, the system monitors the volume of fuel supplied in real time. The process iterates, determining whether the dispensed fuel has reached the desired cost. If so, the system completes the fueling procedure. If not, the dispensing will continue until the target cost is met.

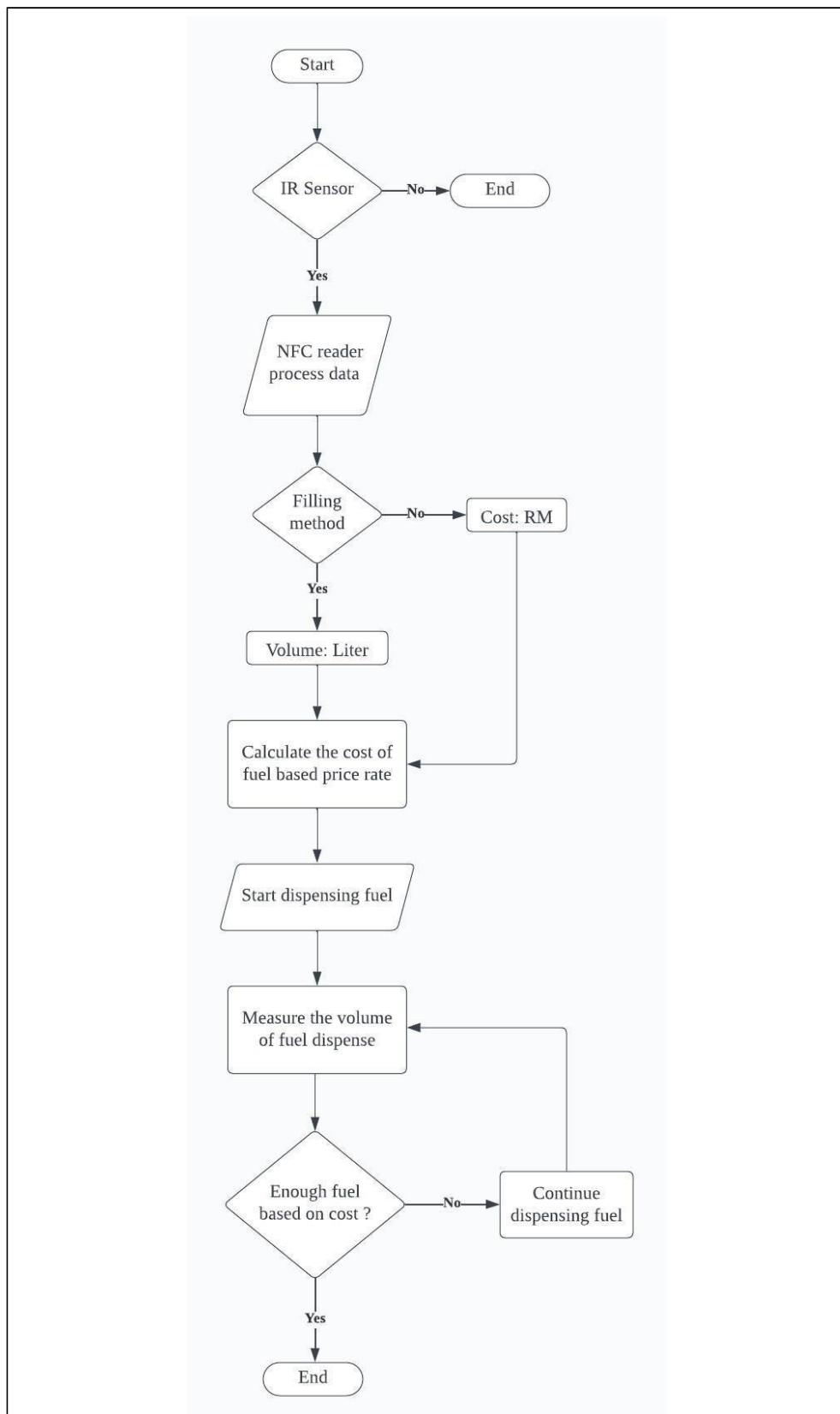


Figure 3.2: Hardware System Flowchart

SOFTWARE OPERATIONAL FLOWCHART

Figure 3.3 represents the application interface operational flowchart. The software flowchart depicts the operational processes of the user interface for the petrol pump payment system. It begins with the MySQL database, which stores user credentials. Users start the procedure by visiting the app's login page and entering their username and password. The system then validates the credentials entered; if they are correct, users are directed to the refueling page.

In the event of erroneous credentials, users are kept on the login screen, assuring security. After successfully logging in, users are sent to the refuel page, where they may select their preferred method, either in Ringgit Malaysia (RM) or liters. They then enter the necessary amount of RM or liters to start the refueling procedure. The system processes and transfers this data via the NFC module, allowing for safe communication between the program and the hardware components. This concise flowchart depicts the logical sequence of user engagements, resulting in a secure, intuitive, and efficient petrol pump payment experience via the integrated software application.

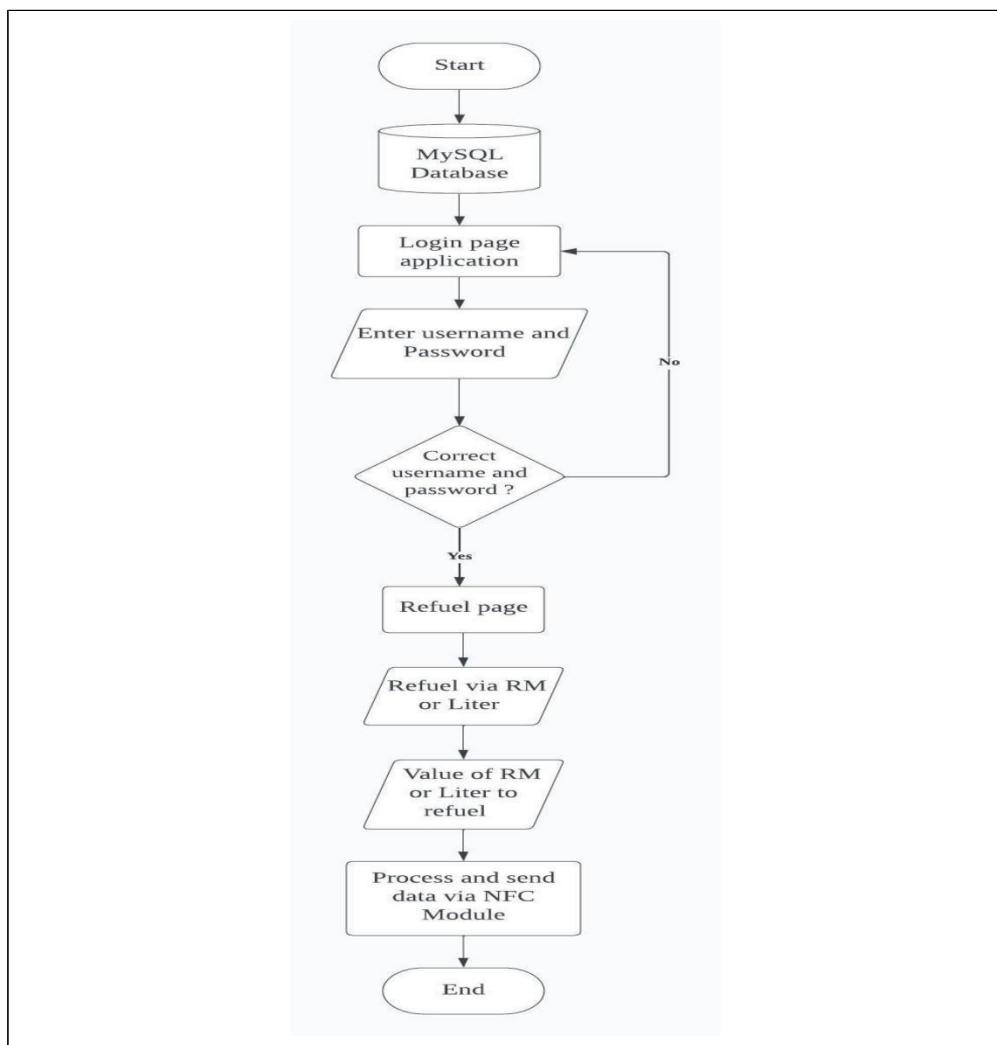


Figure 3.3: Application Interface Operational Flowchart

SCHEMATIC DIAGRAM

According to **Figure 3.4**, every component is designed in a complete circuit using Proteus 8 Professional. To avoid a short circuit in the system, every component connection must be checked prior to hardware assembly. E-zdey Petrol Pump Payment System using NFC module circuit is critical since the system requires 12 volts to run the water pump. Safety measurements should be taken properly during circuit design.

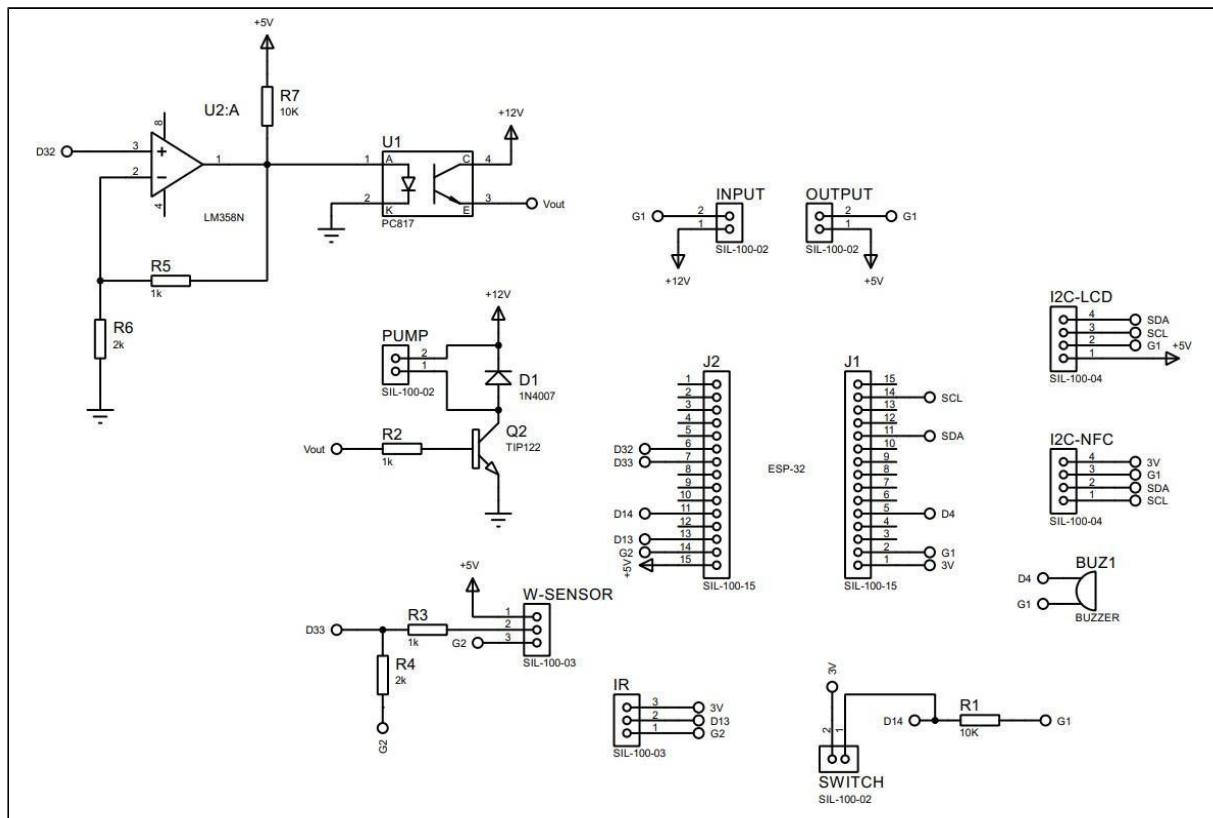


Figure 3.4: Schematic Diagram of E-zdey Petrol Pump Payment System via NFC Module

4.0 RESULTS

The petrol pump payment mechanism operates effectively, providing a user-friendly and secure experience. As a car arrives, the IR sensor recognizes its presence and initiates the transaction procedure. As illustrated in **Figure 4.1**, users must tap their phones to the NFC receiver to establish a secure connection with the system. Prior to use, the dedicated application must be installed and configured on the user's phone for system interaction.

The process for setting up the application and starting fueling using the NFC payment method is depicted in **Figure 4.2**. Upon initiation, the user enters the required fuel quantity and approves the transaction using the installed application. The PN532 NFC module enables the system to receive and securely process transaction details, such as cost and volume. The ESP32 microcontroller serves as the central processing unit, managing the data exchange between the application and the server.



Figure 4.1: Smartphone with NFC-enabled touch to the NFC receiver

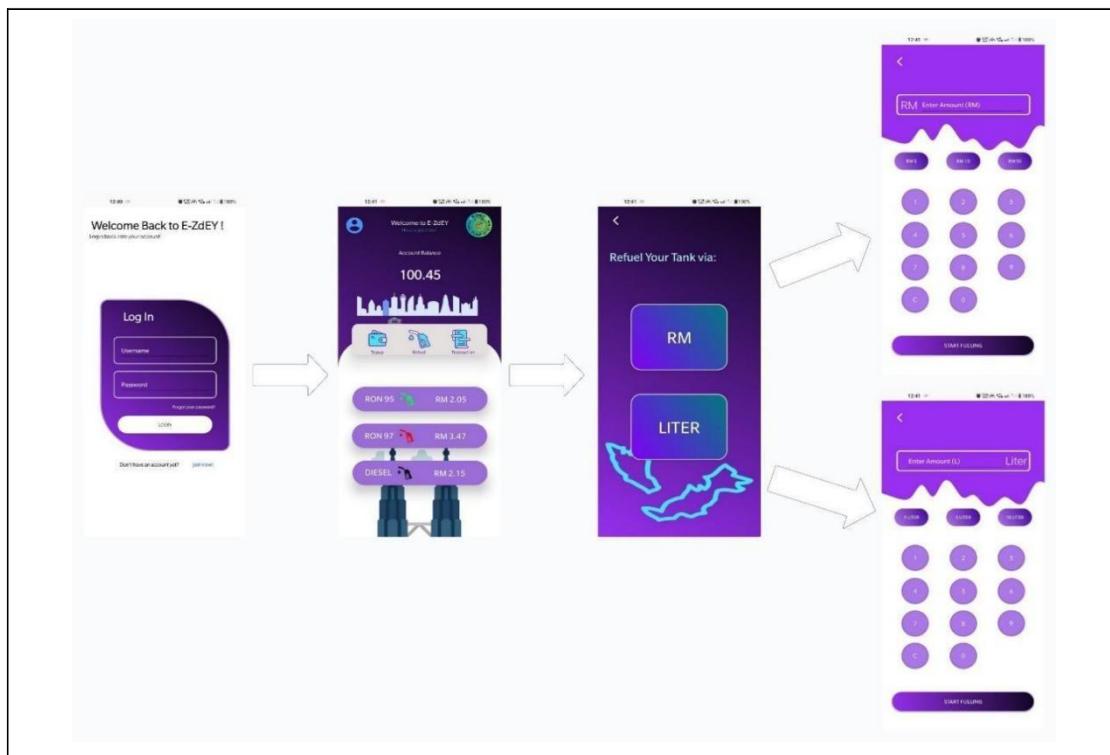


Figure 4.2: Application Interface The Ezdey App Interface

The server, in turn, examines the transaction information and returns the required data to the ESP32. The microprocessor commands the LCD to display the real-time flow rate meter, as seen in **Figures 4.3** and **Figure 4.4**. This provides users with quick feedback on transaction progress. Users can also view their transaction history in the program, displayed in **Figure 4.5**.



Figure 4.3: The LCD displays the target fuel flow rate by cost



Figure 4.4: The LCD displays the target fuel flow rate by liters

Transactions	
2024-01-07 06:55:53	
Fuel Transaction	RM 5.00
RON 95	
2024-01-07 06:41:03	
Fuel Transaction	RM 5.00
RON 95	
2024-01-07 06:38:17	
Fuel Transaction	RM 5.00
RON 95	
2024-01-07 06:37:44	
Fuel Transaction	RM 1.00
RON 95	
2024-01-07 06:35:05	
Fuel Transaction	RM 5.00
RON 95	
2024-01-07 06:31:34	
Fuel Transaction	RM 3.00
RON 95	
2024-01-07 06:30:36	
Fuel Transaction	RM 5.00
RON 95	
2024-01-07 06:25:31	
Fuel Transaction	RM 5.00
RON 95	
2024-01-07 06:22:57	
Fuel Transaction	RM 3.00
RON 95	
2024-01-07 06:20:33	
Fuel Transaction	RM 2.00
RON 95	

Figure 4.5: Transaction history in the application database

As illustrated in **Figure 4.6**, a strategically placed switch activates the fuel distribution motor at the nozzle. When users click the fuelling button, the motor starts and the LCD displays the current flow rate as portrayed in **Figure 4.7**. As shown in **Figure 4.8**, the motor comes to an automatic halt when it reaches the predefined target cost or liter, indicating that the fueling process is complete.



Figure 4.6: Activation motor switch



Figure 4.7: Start Fuelling process



Figure 4.8: LCD displays that the value has reached its target

5.0 CONCLUSION

E-ZDEY Petrol Pump Payment System via NFC Module, as demonstrated in this project, is a successful combination of novel hardware and software solutions. The transition from breadboard prototyping to creating a Printed Circuit Board (PCB) demonstrated the hardware components' commitment to dependability and scalability. Simultaneously, the software component, developed with Android Studio and Kotlin, demonstrated a user-friendly application that could be easily integrated with a MySQL database and a dedicated server.

This project achieved its goals by concentrating on security, efficiency, scalability and sustainability in fuel pump transactions. The iterative development process guaranteed continuous progress, resulting in a robust system capable of facilitating secure and quick transactions at petrol stations. This study not only provides a genuine solution to the problems with petrol payment methods, but it also contributes important insights to the evolving landscape of payment technologies. The successful deployment is an important step toward improving traditional gasoline transactions and satisfying the rising need for secure, efficient, and user-friendly solutions.

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APPENDIX

GOLD Award Recognition Received from 9th EESEE2023



(A-ST019) FISH DISEASE DETECTION USING CONVOLUTIONAL NEURAL NETWORK (CNN) ALGORITHM

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ABSTRACT

Effective disease detection in aquaculture is crucial for maintaining fish populations and promoting best practices. Traditional methods often rely on visual inspection alone, which can lack precision and efficiency. This study introduces a fish detection system that leverages Convolutional Neural Networks (CNNs) and advanced image processing techniques, with a flexible, iterative research approach guiding its development. The CNN model, selected through algorithmic analysis, achieves an impressive 88.04% accuracy in automatically identifying and diagnosing various fish diseases. Trained on diverse datasets, the model can discern key features from fish images. An intuitive software application is then developed for aquaculture professionals, enabling rapid and accurate disease diagnosis. This approach marks a significant advancement in applying machine learning for disease management in aquaculture, overcoming the limitations of manual observation and contributing to the sustainable future of fish farming.

Keywords: fish disease detection, cnn, convolutional neural network, aquaculture

1.0 INTRODUCTION

The aquaculture industry plays a crucial role in providing primary protein sources, driving global economic growth, and ensuring food security (Yasruddin et al., 2022). As the global population expands and the nutritional value of fish as a protein source gains widespread recognition, the demand for fish resources continues to rise (Yasruddin et al., 2022). However, the industry faces significant challenges, particularly in managing disease outbreaks among fish. Traditionally, diagnosing fish diseases has relied on expert assessments, which can be labor-intensive and prone to human error. This can lead to substantial financial losses for stakeholders, such as fish farmers, who are already grappling with issues like bacterial and fungal infections, as well as environmental pressures (Waleed et al., 2019).

Subsequently, diagnosing fish diseases is a complex task that demands a high level of expertise, and existing systems for disease detection have yet to achieve significant success. Early identification of diseased fish is crucial to prevent the spread of illness (Malik et al., 2017). The University Putra Malaysia's Institute of Bioscience emphasizes the need for increased collaboration among scientists, fish farmers, and other stakeholders to understand better and manage fish diseases, thereby addressing the growing demand for fish as a food source (Azman Zakaria, 2017). In response to this challenge, developing advanced and precise detection methods, such as Convolutional Neural Networks (CNNs), holds promise. CNNs, with their capability to recognize intricate patterns and features in images, can significantly enhance the accuracy of fish disease identification and

classification. This technology can aid aquaculture stakeholders, including fish farmers and researchers, in minimizing losses, ensuring fish health, and improving production by enabling early detection and prompt treatment. Thus, utilizing CNNs for fish disease detection is proposed as a valuable research project.

2.0 OBJECTIVE

This research aims to develop an advanced system for detecting fish diseases in aquaculture using Convolutional Neural Networks (CNNs). The primary objectives of the project are threefold. First, studying the Convolutional Neural Networks (CNNs) algorithms in identifying fish diseases within an aquaculture setting. Second, the project will focus on designing and building a prototype system that utilizes CNNs for disease detection in fish. Finally, the accuracy of the CNN-based system will be evaluated to ensure its reliability and effectiveness in diagnosing fish diseases. Through these objectives, the project intends to enhance disease detection methods, ultimately supporting the health and productivity of aquaculture operations.

3.0 METHODOLOGY

The research on fish disease detection using CNN follows the CRISP-DM (Cross-Industry Standard Process for Data Mining) framework, which is a standard approach for data mining projects. This framework has six phases: business understanding, data understanding, data preparation, modeling, evaluation, and deployment (Surhone, 2010).

The first phase, business understanding, defines project goals and identifies challenges in fish disease management. The data understanding phase involves collecting relevant images of diseased fish. For this study, the dataset of 300 images from Kaggle, provided by the Bangladesh Fisheries Development Corporation (BFDC), is split into training and testing sets in a 70:30 ratio. Details of the data are in Table 1.

Table 1: Details of the data used in this research.

Data Type	Secondary data
Source	Kaggle website
Number of Datasets	Total Dataset: 300 data Training dataset (70%): 210 data Testing dataset (30%): 90 data

The data preparation phase is crucial for making sure the collected images are ready to train the CNN model. This phase involves five main steps: image resizing, image normalization, data augmentation, dataset splitting, and labeling. In the resizing step, all images are adjusted to a standard resolution of 256 x 256 pixels to ensure computational efficiency. Next, pixel values are normalized to a common range. To prevent overfitting and improve model robustness, data augmentation techniques are applied. After these steps, the dataset is split into training and testing sets, with 70% of the images used for training and 30% for testing. The core of this research is designing and implementing a CNN model for fish disease detection, which includes three key stages: architecture design, training, and evaluation. The figure below illustrates the architecture of this fish detection system.

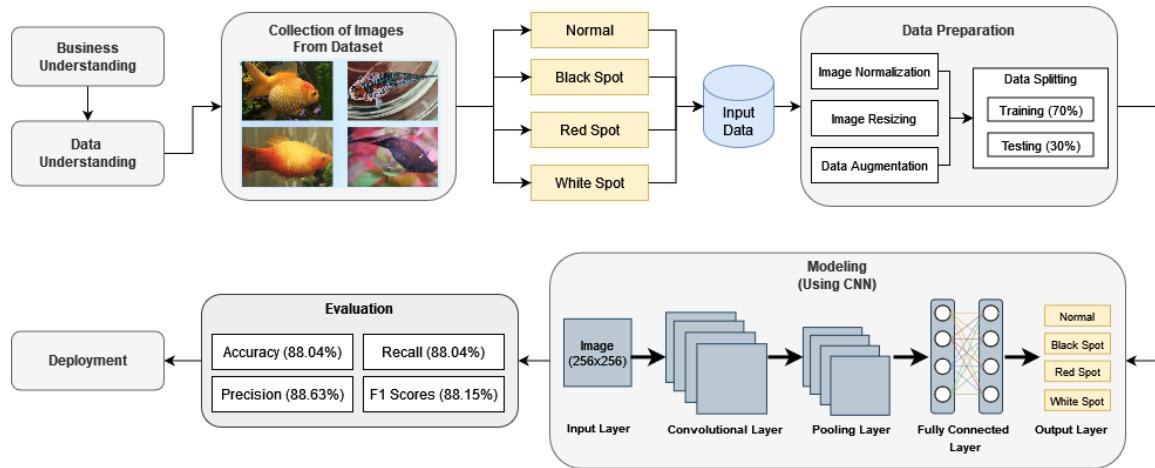


Figure 2: Architecture design of this fish detection system.

In the evaluation phase, the trained CNN model is evaluated on the test dataset to determine its effectiveness in detecting fish diseases. Key evaluation metrics are analyzed, including confusion matrices and classification labels. The last phase, deployment, involves integrating the model into a user-friendly application or system that fish farmers can utilize for real-time disease detection.

4.0 RESULTS

The implementation of the CNN for fish disease detection yielded promising results, both in terms of model performance and user interface functionality. In terms of user interface, the system was designed to be intuitive and user-friendly, facilitating easy integration into the daily operations of fish farmers. The interface allows users to upload images of fish, which are then processed by the CNN model for disease detection. The results are displayed in real-time, with clear textual labels of the detected disease. This design aims to provide immediate feedback and actionable insights, enabling users to make informed decisions quickly. The interface of the system is shown in the figure below (refer to Figure 3).

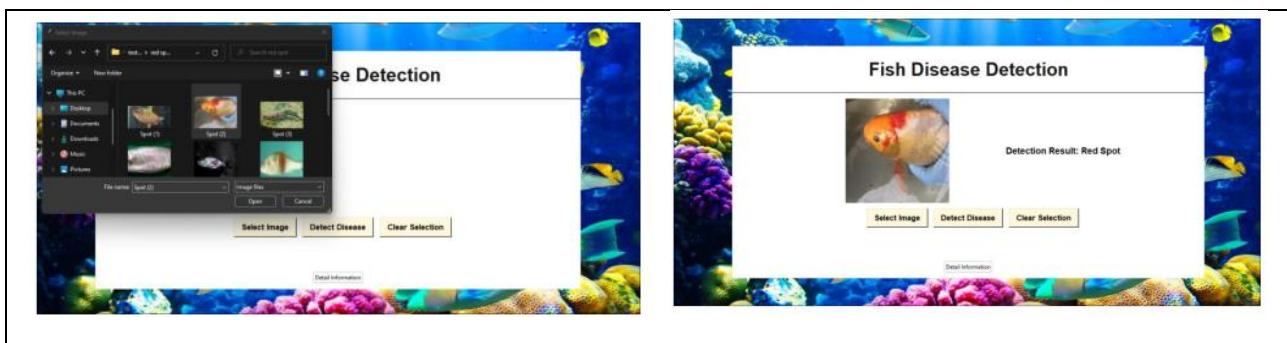


Figure 3: Interface of the system

For the model performance, the CNN model demonstrated a high level of accuracy in classifying fish images into four disease categories (Normal, Black Spot, Red Spot, and White Spot). Specifically, the model achieved an overall accuracy of 88.04% on the test dataset, with precision, recall, and F1 scores of 88.63%, 88.04%, and 88.15%, respectively, indicating strong performance across different disease classes. These results, refer to Table 2, highlight CNN's capacity to accurately distinguish between healthy and diseased fish, thereby reducing the risk of misclassification and supporting effective disease management.

Table 2: Result of the model performance

Evaluation Test	Result
Precision	88.63%
Recall	88.04%
F1 Score	88.15%
Accuracy	88.04%

The results are then summarized in a confusion matrix, which provides a comprehensive understanding of how well the model classified the data into the four categories (refer to Figure 4).

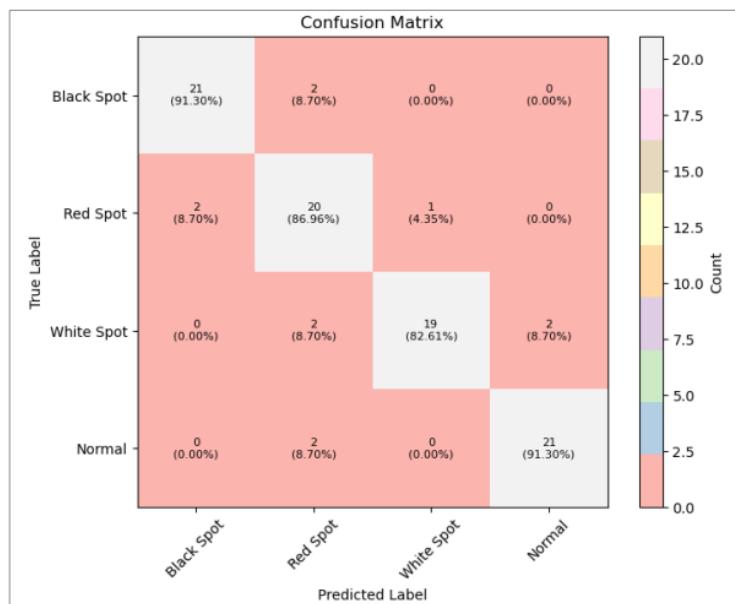


Figure 4: Confusion matrix of this research

In the Black Spot category, the model correctly identified 21 instances, achieving a high accuracy of 91.30%. However, there were 2 cases where Black Spot was misclassified as Red Spot, accounting for 8.70% of the instances. For the Red Spot category, the model accurately detected 20 instances, resulting in an 86.96% accuracy. There was also 1 instance where Red Spot was incorrectly predicted as White Spot, leading to a 4.35% error rate. Additionally, 2 instances of Red Spot were mistakenly classified as Black Spot, which makes up 8.70% of the cases. In the White Spot category, the model correctly identified 19 cases, yielding an accuracy of 82.61%. However, 1 instance of White Spot was misclassified as Red Spot, resulting in a 4.35% error rate, and White Spot was confused with Black Spot in 3 cases, accounting for 13.04% of the instances. For the Normal category, the model accurately classified 21 instances, corresponding to a 91.30% accuracy. However, there were 2 cases where Normal was incorrectly labeled as Red Spot, contributing to an 8.70% misclassification rate. Overall, the confusion matrix indicates that the model performs relatively well across all categories, with accuracy percentages ranging from 82.61% to 91.30%. However, there are still some misclassifications, particularly between similar disease categories like Red Spot and White Spot or Black Spot and Red Spot. These errors could be due to overlapping symptoms or visual similarities between different diseases.

5.0 CONCLUSION

The research developed a Convolutional Neural Network (CNN) model for detecting fish diseases, specifically targeting Black Spots, Red Spots, White Spots, and Normal conditions. The primary objective was to provide an accurate, efficient, and automated solution for disease detection, aiming to reduce reliance on manual inspection and mitigate financial losses in the aquaculture industry. The CNN model demonstrated commendable accuracy, ranging from 82.61% to 91.30%, with particularly high performance in identifying Black Spots and Normal conditions. However, some challenges were noted, particularly in distinguishing between Red Spots and White Spots. To address these issues, future enhancements could include expanding the dataset to include a broader range of examples, refining the model through fine-tuning, and incorporating additional pre-processing techniques to improve classification accuracy. The impact of this research on the aquaculture industry could be substantial. By offering a tool for timely and precise disease detection, the model could significantly enhance fish health management practices and reduce economic losses associated with disease outbreaks. Future research should focus on refining the CNN model by diversifying the dataset, optimizing the network architecture, and exploring additional data sources to further enhance accuracy and reliability. This study underscores the potential of CNNs as powerful tools for advancing fish disease detection and promoting the sustainability of aquaculture practices.

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(A-ST020) m-DAL v2 - MODULAR DATA LOGGER WITH SMART MONITORING SYSTEM FOR HERBACEOUS ROOF ECOSYSTEM SERVICE EVALUATION

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ABSTRACT

This project introduces the Modular Multichannel Data Logger (m-DAL), a versatile system tailored to assess herbaceous roof ecosystems' services. Unlike conventional and expensive data loggers, the m-DAL allows for concurrent measurements across multiple channels at a fraction of the cost, while enhancing adaptability and modularity. It is capable of gathering real-time ambient plant temperature and relative humidity data, enabling the investigation of leaf transpiration cooling through water supply manipulation in tropical climates. Utilizing open-source technology, it incorporates an Arduino Giga R1 WiFi microcontroller board interfaced with twelve channels, including type-K thermocouples with MAX6675 amplifiers and DHT22 sensors, with real-time monitoring via the Arduino IoT Cloud. Calibration is conducted using a two-point cross-calibration method with the Ambient Weather WH32B Thermometer-Barometer-Hygrometer for accuracy ranging from 96.15% to 99.72% for temperature sensors and 97.46% to 97.55% for humidity sensors. In field testing, it effectively demonstrates its capabilities in data collection, logging, real-time monitoring, environmental tracking, data storage, retrieval, validation, and cost-effectiveness. Finally, the recorded data offers opportunities for further analysis and modeling of herbaceous transpiration cooling as an ecosystem service. Embrace the versatility of the m-DAL for ecological research and beyond.

Keywords: Temperature sensor; Humidity sensor; Environmental data logger; Arduino IoT; Modular data logger system (m-DAL)

1.0 INTRODUCTION

This project introduces the modular multichannel data logger system (m-DAL) designed specifically for assessing herbaceous roof ecosystem services, addressing the limitations of existing data loggers by enabling concurrent measurements across multiple channels with enhanced adaptability and modularity at a reduced cost. The study emphasizes the importance of urban nature-based solutions like vegetated roofs in regulating ambient humidity to balance urban temperatures. While sensors are crucial for monitoring these services, existing data loggers lack modularity and adaptability, hindering their effectiveness. Commercial loggers have limitations such as limited customization options, fixed sampling rates, and constrained channels.

2.0 OBJECTIVE(S)

The objective is to develop a low-cost modular data logger system for evaluating vegetated roof plant ecosystem services, meeting various assumptions including concurrent

measurement of multiple channels, employment of fast-reading sensors, flexibility in programming, and cost-effectiveness in production.

3.0 METHODOLOGY

Leveraging open-source technology, the system utilizes an Arduino Giga R1 WiFi microcontroller board interfaced with twelve channels, incorporating type-K thermocouples with MAX6675 amplifiers, DHT22 sensors, and real-time monitoring via the Arduino IoT Cloud. Sensor calibration was conducted using a two-point cross-calibration method with the Ambient Weather WH32B Thermometer-Barometer-Hygrometer for the WS-2000 weather station. Accuracy assessments revealed temperature sensor accuracy ranging from 96.15% to 99.72% and humidity sensor accuracy from 97.46% to 97.55%. The block diagram illustrating the conceptual system's flow is depicted in Fig. 1 below.

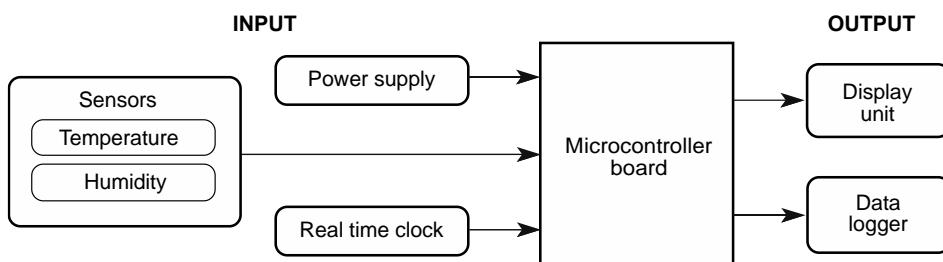


Figure 1: Block diagram of the developed system

3.1 System algorithm

In this setup, we've created a system flow algorithm to guide programming activities from device start to shut down. The algorithm has two parts: "Void Setup" (run once) and "Void Loop" (repeatedly). It starts with initializing the serial monitor, RTC, sensors, and SPI for the micro-SD card. In "Void Setup," the system checks and prepares the SD card for logging, showing an error message if unsuccessful. Moving to "Void Loop," sensors transmit data every 5 seconds with timestamps. Data is sent to the serial monitor and IoT Cloud before logging on the microSD card. These activities in "Void Loop" continue until the device is turned off.

3.2 Components

Components included in this configuration are, the Arduino Giga R1 WiFi microcontroller board, Real-Time Clock (RTC), data logger, temperature sensor (MAX6675 module with K-Type thermocouple), temperature and humidity sensor (DHT22), power supply unit, and necessary assembly components sourced from reputable suppliers.

3.3 Programming Code

Programming code for the Arduino Giga R1 WiFi microcontroller was written in Arduino IDE, involving downloading necessary function libraries, writing sketches based on the algorithm, selecting the microcontroller board and serial port in the IDE, compiling the code, and uploading it to the device, ensuring compatibility and functionality as depicted in the Fig. 2 below

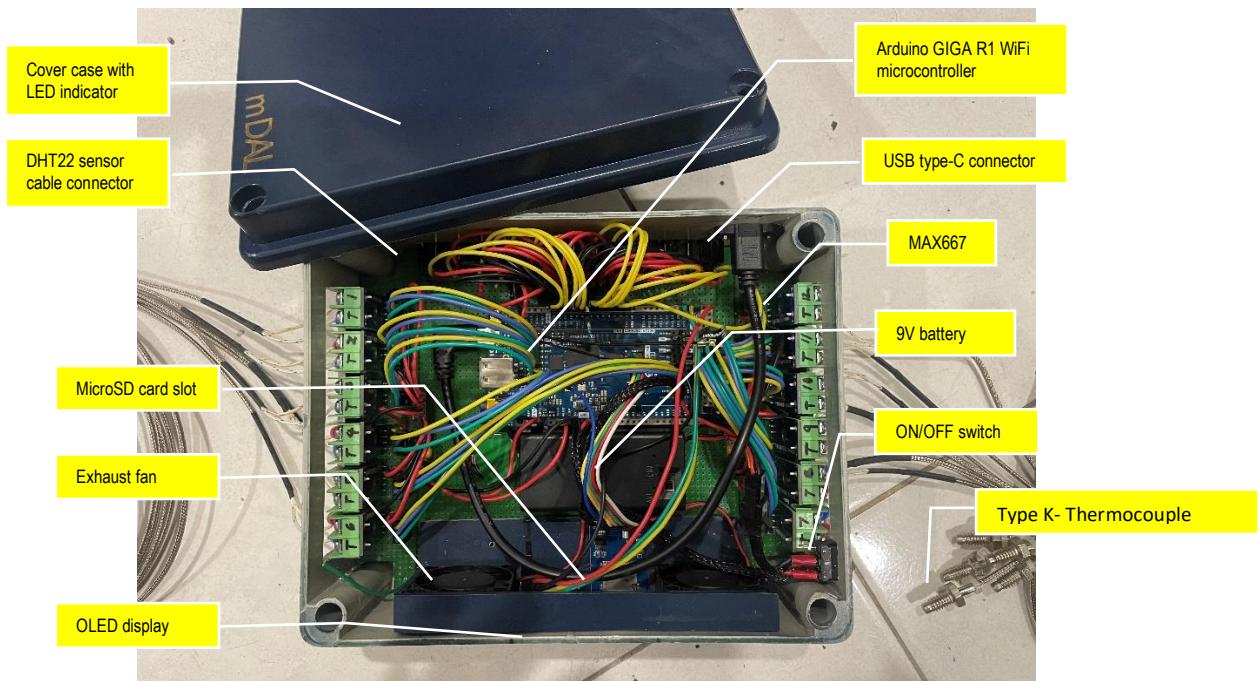


Figure 2: m-DAL v2 configuration system layout

4.0 RESULTS

The m-DAL system effectively logged real-time ambient leaf temperature and relative humidity data for two Coleus species (herbs), showcasing its capabilities in data collection, logging, real-time monitoring, environmental tracking, data storage, retrieval, validation, and cost-effectiveness. The collected data is available for further analysis and modelling of herbaceous transpiration cooling as an ecosystem service. However, the newly launched Arduino Giga R1 WiFi used poses a limitation as many function libraries and third-party shields have not yet been updated to accommodate the full functionality.

5.0 CONCLUSION

The system excels in various aspects, offering cost-effective solutions in data collection, logging, real-time monitoring, and environmental tracking. Despite the time-consuming development process, it enhances research skills and fosters a deeper understanding of data and equipment. Future plans include integrating capacitive soil moisture sensors to expand data collection for plant-water relations in urban vegetated roofs.

(A-ST021) MESIN MINI SOAPER

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ABSTRAK

Minyak masak adalah sejenis cecair yang digunakan dalam kalangan pengguna bagi tujuan memasak. Pembuangan sisa minyak masak yang tidak terkawal akan menyebabkan pencemaran alam sekitar. Pencemaran alam sekitar yang tidak dibendung akan menjurus kepada kerosakan ekosistem yang juga memberi kesan buruk kepada kehidupan manusia. Tujuan utama projek ini adalah untuk menghasilkan sebuah model Mesin Mini Soaper yang berkeupayaan untuk mengadun dan membentuk sabun buku berdasarkan minyak masak terpakai. Kelajuan motor pengadun Mesin Mini Soaper ditetapkan pada 150 rpm yang mana mampu mengadun sebatи minyak masak terpakai, air dan Natrium Hidroksida (NaOH) dengan nisbah 3:2:1 hanya dalam masa 10 minit. Campuran yang telah sebatи kemudiannya dikeluarkan mengikut saluran paip dan dimasukkan ke dalam pemanas. Proses pemanasan bahan campuran berlaku pada dua proses iaitu masak dan hangat. Masing-masing mempunyai suhu yang berbeza iaitu 100°C dan 60°C. Proses pemanasan masak akan beroperasi selama 1 jam manakala panas selama 1 jam 30 minit. Selesai proses pemanasan, campuran ini akan membeku dan membentuk menjadi sabun. Kajian menunjukkan bahawa mesin ini mampu meningkatkan produktiviti pengeluaran sabun berbanding dengan kaedah tradisional kerana proses pengerasan campuran menggunakan pemanas adalah lebih baik berbanding kaedah tradisional. Hasil sabun buku juga boleh terus digunakan berbanding dengan kaedah tradisional yang memerlukan masa selama 24 jam bagi tujuan pengerasan dan perlu melalui proses pemeraman selama satu bulan sebelum hasil sabun boleh digunakan. Mesin Mini Soaper dapat menjimatkan sebanyak 67% masa berbanding menggunakan pemukul telur dan sebanyak 50% berbanding alat pengacau automatik. Penggunaan mesin ini juga boleh menggalakkan amalan kitar semula minyak masak terpakai.

Kata Kunci: Kitar Semula, Mesin Sabun Buku, Minyak Masak Terpakai

(A-ST022) KAPOK SEED SEPARATOR MACHINE

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ABSTRACT

Kapok is a silky fibre obtained from the pods of the kapok tree. It is highly used for pillows, mattresses, toys, upholstery, insulation material, and as a substitute for absorbent cotton in surgery. Kapok is also naturally hypoallergenic, anti-microbial, and dust mite resistant which can overcome the health issues such as bacteria breeding and skin diseases. Kapok pillows are in high demand because of the beneficial use of the kapok and its lifespan. The traditional method to separate the seed from the kapok is using bare hands or beating using a wooden bamboo stick. However, there is a lack of safety and health issues when using traditional methods to make kapok pillows which may lead to itching and harm. The improper equipment also needs to be considered because the process requires blade rods composed of seed and stem. The difficulty in obtaining technical devices is due to the high cost of maintenance and acquisition of these machines, which does not match consumer money. Inadequate labor to complete the kapok filling process. In this study, a kapok seed separator machine is fabricated to evaluate the cleanliness of the kapok after the separation process and increase the speed of kapok pillow production. An electric motor and blower are used to separate aside the seed and kapok and instantly fill up the pillowcase with the well-separated kapok. As has been demonstrated, the Kapok Machine requires only 11 minutes to complete the process of making kapok pillow. The number produced for 1 kg kapok that can be done is 6 pieces. The design of this Kapok Machine ensures can assist SMEs in producing technologies that can reduce the risk of injury to employees during the process of seed separation from kapok and increase the speed of kapok pillow.

Keywords: Beating Rod, Kapok Processing Machine, Kapok Seed Separator Machine

(A-ST023) IoT ALARM SYSTEM: DETECTING & PREVENTING MICROSLEEP EVENTS

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ABSTRACT

Microsleep events while driving pose a significant risk for road accidents. To address this issue, this project proposed an Internet of Things (IoT)-enabled anti-microsleep alarm system for drivers. The system features a Node-Red, Mongo DB and Slack API that is equipped with sensors, a gauge dashboard to monitor driver physiology in real-time, including EAR and Lips Distance, notifications for the driver, voice out alarm with eSpeak, MongoDB for showing timestamp of the driver for yawn and drowsiness. The sensor data is transmitted to an onboard alarm unit that employs machine learning algorithms to analyze the metrics and detect early signs of microsleep episodes. Once the algorithms calculate a drowsiness score exceeding a defined threshold, multi-modal alarms encompassing auditory, visual, and tactile feedback are activated to alert the driver and prompt preventive actions before microsleep commences. The system is designed to be adaptive and customizable based on driver preferences and changing road conditions, allowing for improved detection accuracy and minimal distraction. This project aims to leverage recent advances in IoT and sensor technologies to introduce an intelligent microsleep alarm unit that can significantly enhance road safety by addressing a major yet often overlooked factor in driver fatigue. One of the most important aspects of the project is the integration with the Message Queuing Telemetry Transport (MQTT) protocol, enabling seamless communication and data exchange between the Python-based microsleep alarm system and the Node-RED platform. Node-RED, a powerful visual programming tool used for developing IoT applications, facilitated the creation of an intuitive and informative dashboard.

Keywords: Microsleep Detection, Road Safety, IoT

1.0 INTRODUCTION

Driver fatigue causes hundreds of car accidents annually. Drivers' capacity to use essential sensory input for safe vehicle operation is impaired by microsleep episodes, which cause brief loss of awareness. Researchers are working harder to identify solutions due to wearable tech and the IoT. Unobtrusive wearables with physiological sensors provide real-time driver drowsiness monitoring. The physiological characteristics analysed include eyelid closure, head position, HRV, brain activity, and more. Machine learning systems can detect microsleep and early-onset tiredness using sensor readout anomalies. IoT connectivity allows drivers to receive alerts for problematic states quickly. A compact, wearable headband with strain gauge sensors and a panic button is novel and promising. Strain sensors detect abrupt muscle tension reductions during microsleep. Detecting microsleeps in a driving simulator, the alert activates 0.96 seconds after each episode begins. Driver fatigue and microsleeps cause road accidents; IoT devices that respond rapidly could greatly

minimise them. Increasing sensor hardware and 5G infrastructure can help commercialise products.

2.0 PROJECT OBJECTIVES

The project aims to achieve two primary objectives: First, to develop and deploy a customizable anti-microsleep alarm system that leverages Internet of Things (IoT) technologies and real-time algorithms to detect and prevent drowsy driving. This system will utilize an array of sensors, including eye tracking modules and facial recognition cameras, to monitor physiological signs of fatigue and deliver timely multi-modal alerts to the driver. Second, to ensure that the system is adaptable and tailored to individual drivers' needs, the project will incorporate advanced machine learning algorithms and customizable alert mechanisms. By integrating wearable sensors, IoT connectivity, and real-time data processing, the system seeks to provide effective, personalized interventions that enhance road safety and reduce the risk of accidents caused by microsleep.

3.0 PROJECT METHODOLOGY

The Flowchart of this project that shown in Figure 1.

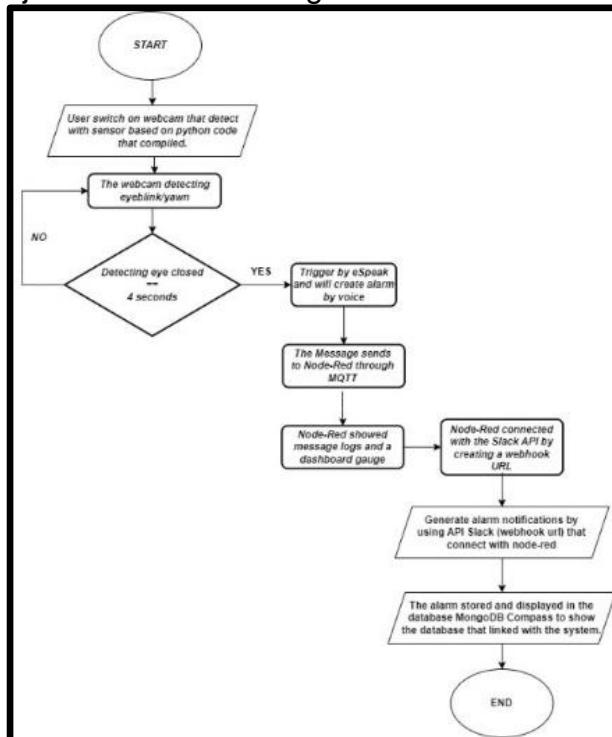


Figure 1: Project Flowchart

Table 1: Stages of Project Methodology

STAGES	TASKS	DELIVERABLES
Planning	<ul style="list-style-type: none"> Define problem and objectives. Review literature. 	<ul style="list-style-type: none"> Clear problem statement, scope, objective.
Design	<ul style="list-style-type: none"> Create logical design. Create a user-friendly interface for users. 	<ul style="list-style-type: none"> Detailed schematic diagram and user-friendly interface design.
Development	<ul style="list-style-type: none"> Follow coding guidelines with libraries & dependencies of python. Install Software such as VScode, Python, MQTT, Node-Red, Slack API and MongoDB. 	<ul style="list-style-type: none"> Fully coded system, established database with MongoDB that show alarm status and timestamp, and functional dashboard with notifications using Node-red with link of MQTT.
Evaluation	<ul style="list-style-type: none"> Test the integration sensor with webcam and access system sensor by notifications. 	<ul style="list-style-type: none"> A flexible webcam sensor system that integrates with dlib, OpenCV with low-latency data processing.

Figure 2 highlights the structured development environment and adherence to coding standards in the project. It illustrates the use of essential dependencies and libraries, notably OpenCV and dlib, which are pivotal for facial recognition and landmark identification, thus facilitating the accurate detection of fatigue indicators. Key metrics such as the Eye Aspect Ratio (EAR) and lips distance were utilized to assess gaping and fatigue in real-time video data. The implementation involved a comprehensive feedback loop for monitoring, the MQTT protocol for efficient communication between the Python system and Node-RED, and a range of additional components including the Slack API for notifications, MongoDB for data storage, and eSpeak for aural alerts. The summary, as depicted in Figure 3, underscores the successful integration of these technologies for real-time fatigue detection, outlines the challenges faced, and emphasizes the need for enhanced data aggregation and filtering methods. This chapter provides significant insights into the practical application and potential improvements of the technology.

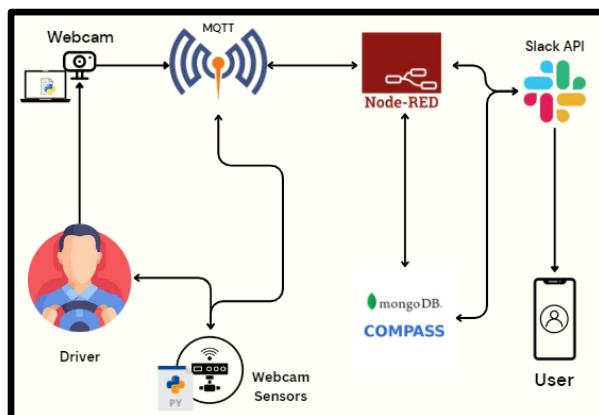


Figure 2: Project Logical Design

5.0 RESULTS

A development environment and coding standards were established to create a microsleep detection system, with Python being employed due to its adaptability. The system utilized OpenCV, dlib, and Haar Cascade for facial recognition, analyzing real-time video to identify indicators of drowsiness and yawning by calculating EAR (Eye Aspect Ratio) and Lips Distance which focusing on detecting face using face landmark x68. To facilitate communication and establish an intuitive interface for real-time monitoring, the project integrated MQTT and Node-RED. Stakeholders were informed of the potential for driver fatigue through the Slack API. The anti-microsleep alarm system, which is based on the Internet of Things (IoT), provides notable benefits such as continuous monitoring in real-time and exceptional precision. The technology employs continuous facial expression tracking of drivers to identify indications of weariness, facilitating prompt intervention to avert accidents. The system achieves a high level of accuracy in identifying prolonged eye closure and yawning by utilising advanced libraries such as OpenCV, dlib, and Haar Cascade for facial recognition, as seen in Figure 3.

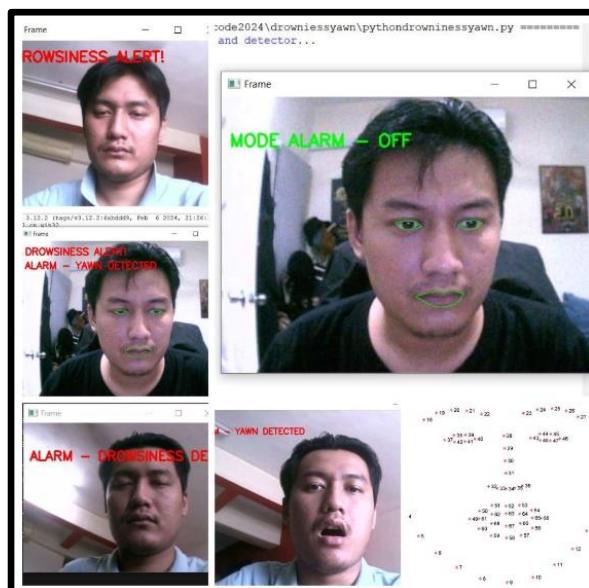


Figure 3: Sample Output from Webcam

The anti-microsleep warning system, which utilises IoT technology, includes a user-friendly dashboard created with Node-RED. This dashboard offers a clear and real-time presentation of Eye Aspect Ratio (EAR) and lip distances. The user-friendly interface facilitates effortless monitoring and enables prompt reactions to indications of driver weariness, as depicted in Figure 4.

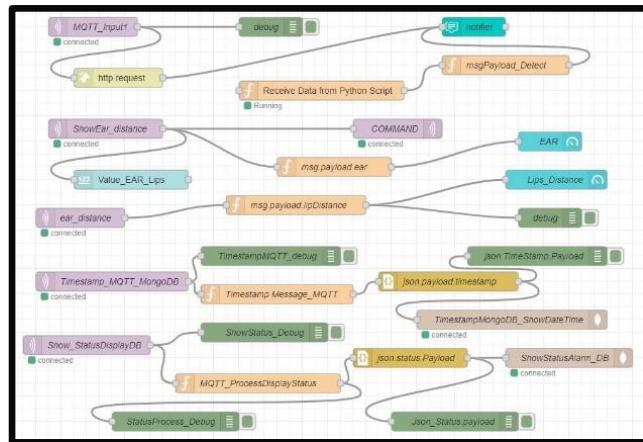


Figure 4: Node-Red Flow Map Linking with MQTT, Python and Slack API

The IoT-based anti-microsleep alert system has a significant impact, especially in improving traffic safety. The system's ability to identify tiredness in its early stages is essential for reducing accidents caused by microsleep, thus enhancing driving safety. In addition, the system's real-time alerts and notifications, which are sent through Slack, allow fleet managers to monitor the vigilance and safety of several drivers at the same time, as shown in Figure 5.

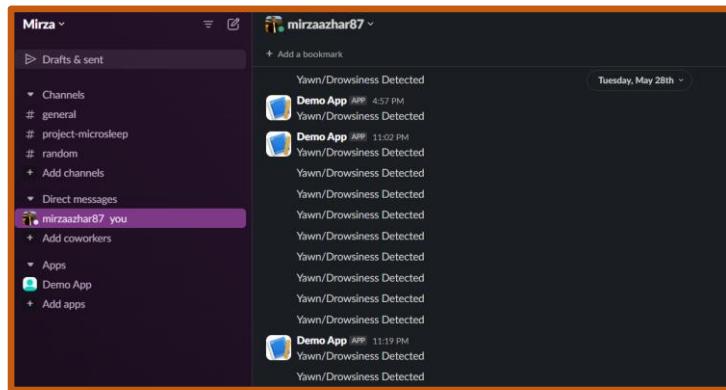


Figure 5: Notifications from Slack API

The findings from the IoT-based anti-microsleep alert system demonstrate its efficacy and dependability. Through the testing process, the system effectively identified occurrences of driver weariness and yawning, thereby demonstrating its proficiency in real-life situations. In addition, the system exhibited strong performance, consistently retaining precision and dependability in various driving circumstances. The IoT-based anti-microsleep alarm system stands out for its novel integrated approach to driver monitoring. By combining Python for development, OpenCV for image processing, and Node-RED for dashboard creation, the system offers a unique and innovative solution. Additionally, the integration of the MQTT protocol and Slack API for real-time alerts significantly enhances the system's utility and responsiveness, making it a cutting-edge tool for preventing microsleep-related accidents.

5.0 CONCLUSION

In conclusion, the IoT Anti-Microsleep Alarm for Drivers project successfully achieved its objectives of enhancing road safety by monitoring driver attentiveness and detecting fatigue. The project utilized advanced technology for real-time monitoring and alarm systems, employing facial landmark detection to monitor eye and mouth movements, which are key indicators of drowsiness and yawning. The system leveraged the MQTT protocol for efficient communication and integrated open-source tools like Node-RED and Slack API for data handling and notifications. Despite its success, the project acknowledges limitations in scalability and integration, necessitating ongoing improvements.

(A-ST028) BLYNK ACTIVATED SOLAR PANEL SHINER USING ESP32 AS MICROCONTROLLER

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ABSTRACT

Solar energy refers to the process of using photovoltaic (PV) panels to convert solar energy into electricity, either directly or indirectly. Most of the energy we use on Earth originates from clean, renewable sources, with solar energy being at the forefront due to its environmentally friendly attributes. It has gained global recognition as an effective and sustainable method for generating power. Although considerable research efforts are focused on maximizing the energy derived from sunlight, there are significant challenges, such as dust accumulation on solar panels and air pollution. These issues can lower the energy output from solar cells by over 25% to 40% in various regions, especially in tropical countries like India. To maintain optimal solar energy production, regular cleaning of solar panels is crucial. Automated solutions like robotic cleaners are emerging as a key technology to streamline this maintenance process, saving time and reducing the need for manual labour. The objective of this paper is to design a smart solar panel cleaning system that automatically cleans the PV panels using a combination of water spray and a brush to remove dirt and debris. The system relies on the ESP32 microcontroller to operate components like DC motors and ultrasonic sensors, ensuring thorough cleaning. The use of the ESP32 microcontroller allows for efficient data transmission and control between the different system components. This project has been proven to be fully functional with the development of prototype to evaluate the system's performance in real-world conditions.

Keywords: Blynk, ESP32, IoT, solar panel shiner.

1.0 INTRODUCTION

The rapid growth of solar energy as a primary source of renewable power has underscored the importance of maintaining the efficiency of solar photovoltaic (PV) panels. As these panels are typically installed outdoors, they are susceptible to dust, dirt, and other environmental contaminants that can significantly hinder their performance. Research indicates that even a thin layer of dust can reduce solar energy output by up to 25%, leading to substantial losses in energy production and, consequently, financial returns for solar energy users. To address this pressing issue, the development of an automated solar panel cleaning system has emerged as a viable solution. This innovation leverages advanced technologies, including the ESP32 microcontroller and various sensors, to create a smart cleaning mechanism that operates autonomously. By integrating Internet of Things (IoT) capabilities, the system not only enhances the cleaning process but also allows for remote monitoring and control via a smartphone application.

The motivation behind this innovation stems from the need to optimize solar energy production while minimizing the labour and resources required for manual cleaning.

Traditional cleaning methods are often labour-intensive, costly, and can pose safety risks, especially in large solar farms. By automating the cleaning process, this invention aims to ensure that solar panels remain in peak condition, thereby maximizing their energy output and contributing to the broader goal of sustainable energy utilization. This project represents a significant step towards enhancing the efficiency and reliability of solar energy systems, ultimately supporting the transition to a greener future.

2.0 OBJECTIVE

1. To build a prototype of Solar Shiner cleaning system using ESP 32 as microcontroller
2. To analyse the effectiveness of Solar Shiner cleaning system to maintain the cleanliness of the solar panel surface in maximizing their energy production under sun exposure.

3.0 METHODOLOGY

The system is built around an ESP32 microcontroller as shown in Figure 1, which serves as the brain of the operation, enabling real-time monitoring and control. It is equipped with various sensors, including ultrasonic sensors for distance measurement, a water level sensor to optimize water usage, and dust sensors to detect the accumulation of dirt on the solar panels. The cleaning mechanism consists of brushes and a DC water pump that work together to remove dust and debris effectively. Additionally, the system integrates IoT capabilities, allowing users to control and monitor the cleaning process remotely via a smartphone application. This feature enhances user convenience, enabling them to initiate cleaning cycles or check the status of the system from anywhere.

The final phase involved prototype development, testing and evaluation. The prototype was constructed using the selected components, and rigorous testing was conducted under various environmental conditions to assess its effectiveness. Performance metrics, such as the amount of dust removed and the increase in energy output from the solar panels, were measured to evaluate the system's efficiency. Data analysis was performed to establish the correlation between the automated cleaning process and the solar panels' energy production, providing valuable insights into the system's overall performance and effectiveness in maintaining solar panel cleanliness.

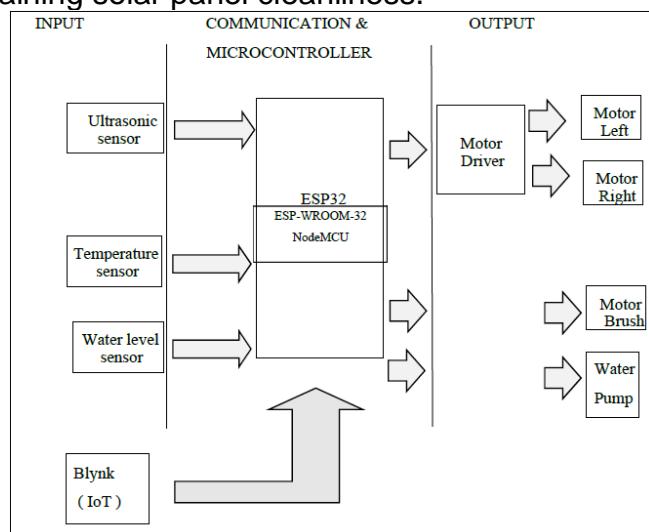


Figure 1: Block diagram of Solar Panel Shiner using ESP32

4.0 RESULTS

The automated Solar Panel Shiner system offers significant advantages and innovations in the renewable energy sector. By automating the cleaning process, it effectively enhances solar panel efficiency by keeping them free from dust and debris, leading to higher energy output and reduced operational costs. The integration of IoT technology enables remote monitoring and control, allowing for real-time updates and proactive maintenance, which further optimizes energy production and user convenience. The system's novelty lies in its use of advanced technologies, such as the ESP32 microcontroller and ultrasonic sensors, which create a smart, adaptive cleaning solution that operates independently of human intervention. This innovative approach sets a new standard for solar panel maintenance, contributing to greater sustainability and safety in the renewable energy industry.

5.0 CONCLUSION

Overall, the automated solar panel cleaning system represents a notable progress in the upkeep of solar energy technology. Given the increasing importance of solar power as a primary source of renewable energy, it is essential to prioritize the attainment of maximum efficiency in solar panels. This project effectively showcases the efficacy of an intelligent cleaning solution, which utilizes an ESP32 microcontroller and sophisticated sensors, in efficiently addressing the build-up of dust and debris. The system's IoT features allow for remote monitoring, resulting in decreased labour expenses and minimized safety hazards, while simultaneously improving user convenience. This innovation is notable for its practicality and creativity, leading to more effective and environmentally friendly solar panel maintenance techniques. Additionally, it establishes the foundation for future investigation and advancement in automated cleaning technology, facilitating the shift towards a more environmentally friendly future.

(A-ST030) THE GLOWGUARD MULTIFLEX UMBRELLA

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ABSTRACT

The GlowGuard Multiflex Umbrella represents a groundbreaking response to the evolving needs of consumers, seamlessly blending traditional umbrella functionality with cutting-edge innovation to elevate user convenience, safety, and practicality. Conventional umbrellas often fall short in addressing the diverse weather and safety challenges users encounter, necessitating a multifunctional solution capable of adapting to various conditions and preferences. Through a user-centric design approach, the GlowGuard Multiflex Umbrella aims to not only enhance user convenience and safety but also exceed customer expectations by integrating advanced features such as safety shining tape, a mini purse, LED lighting, and hooks. This innovative design ensures unparalleled versatility, convenience, and safety, making it a cost-effective and dependable choice for users navigating diverse weather conditions and outdoor activities.

Keywords: Multifunction, versatility, convenience, space savings and innovation

1.0 INTRODUCTION

One area of design thinking research that has garnered interest is innovation of meaning (IoM) (Goto S., Makino H., Ando T., 2023). The Multifunctional Umbrella is a groundbreaking innovation in umbrella design, offering a range of features beyond just protection. Its innovative design incorporates storage alternatives and integrated lighting solutions, enhancing user experience. This innovative umbrella design addresses common issues faced by users, such as carrying multiple items and safety concerns in low light conditions, pushing the boundaries of innovation (Dr. G. Yuvaraj, 2023).

2.0 OBJECTIVE

These are objectives of created The Glow Guard Multiflex Umbrella:

- The Multifunctional Umbrella is designed to enhance safety, especially in low-light conditions, by incorporating advanced lighting solutions and reflective tape for improved visibility (Jollybrolly, 2024).

- The Multifunctional Umbrella, unlike conventional models, offers more than just basic functionality, offering value-added features that enhance user experience and convenience.
- The Multifunctional Umbrella is designed to meet the diverse expectations of our customers, providing a reliable and adaptable solution for their daily needs.
- Utilizing user feedback in successive iterations, the Multifunctional Umbrella consistently enhances its value proposition, ensuring it meets evolving consumer expectations and surpasses expectations.

3.0 METHODOLOGY



Figure 1: The GlowGuard Multiflex Umbrella

The GlowGuard Multiflex Umbrella is a revolutionary product that offers safety and convenience. It features Safety Shining Tape on the Outer Canopy, which enhances visibility in low-light conditions, enhancing safety during walks or commutes according to Robustt Store (Store, 2023). The Mini Purse on the Inner Canopy provides secure storage for small essentials, eliminating the need for additional bags or pockets. The LED White Lamp on the Inner Canopy provides supplementary lighting for enhanced visibility, making it useful in indoor settings or during cloudy days (Austin, 2024). Two hooks on the Shaft allow users to hang items, freeing up their hands and increasing convenience. Torch Light Sync with the Shaft provides convenient illumination for navigating dark streets or pathways during nighttime (Areaspy, 2024). The umbrella provides optimal protection and comfort, addressing common issues faced by umbrella users in metropolitan environments, such as lack of storage space and safety measures. The versatile design and focus on user needs make it a revolutionary option in the market (E, 2021).

4.0 RESULTS

The GlowGuard Multiflex Umbrella is a space-saving umbrella that combines traditional functionality with modern features like LED lighting and integrated storage. It simplifies tasks like storing small items and hanging bags, offering cost savings compared to purchasing separate items. The umbrella's unique design elements and positive consumer reviews have led to increased product visibility and positive word-

of-mouth recommendations, setting a new standard for umbrella design, and addressing diverse user needs (Ai, 2024).

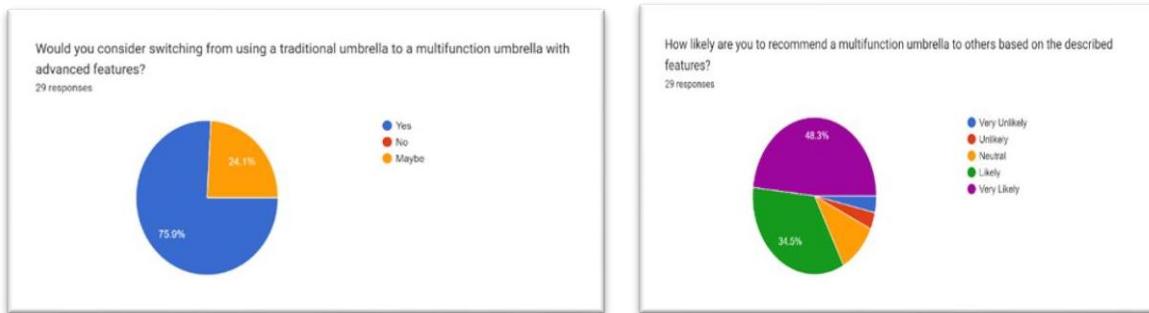


Figure 1 and 2 reveals the likelihood of people recommending a multifunction umbrella based on its features and which features they find most appealing.

The survey's results show how likely people to recommend a multifunction umbrella to others based on the described features the chart pie reveal that 46.4% of respondents very likely to recommended it, 35.7% likely to recommend it, 10.7% prefer neutral, and 3.6% maybe unlike. These statistics show people like or unlike to recommend this innovation product to other people. Based on the figure 2, 64.3% of respondents choose features of torch light sync with the shaft, followed by 57.1% for safety shining tape on the outer canopy, 21.4% mini purse on the inner canopy, 53.6% for LED on the inner canopy too and last is 35.7% for 2 hooks on the shaft. This shows that 3 feature they were very likely to make as innovation on the glow guard multiflex umbrella (Students, 2024).

5.0 CONCLUSION

Overall, the GlowGuard MultiFlex Umbrella signifies a notable progression in umbrella technology, providing a full resolution to prevalent difficulties encountered by consumers (Moodadmin, 2023). The product's adaptable design, which includes attributes like as UV protection, synchronised torch light, integrated storage options, and safety measures like reflective tape and LED illumination, makes it a functional and useful addition for different weather situations and outdoor pursuits. This unique umbrella establishes a new benchmark in functionality and safety by simplifying the user experience and offering a dependable solution for various requirements. The GlowGuard MultiFlex Umbrella is a reliable and versatile companion that offers both protection and convenience for daily commuting, outdoor adventures, or travel.

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(A-ST032) SAA AGG FILTER

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ABSTRAK

Sa Agg FILTER bermaksud Sand Aggregat FILTER atau dalam bahasa melayu penapis aggregat pasir. Objektif Sa Agg FILTER dibangunkan bagi menyelesaikan masalah pelajar Sijil Teknologi Pembinaan (STP) yang berhadapan dengan longgokan pasir yang bercampur dengan pelbagai benda asing seperti sampah sarap dan batu baur pelbagai saiz sehingga menyukarkan kerja amali bancuan konkrit untuk matapelajaran Bahan Struktur Binaan STP10203 dilaksanakan. Keunikan Sa Agg FILTER adalah ia dihasilkan dari sisa rangka basikal kanak-kanak yang dicantumkan dengan besi tetulang Y atau bar berbunga bagi membentuk bahagian utama penapis pasir yang dibalut dengan jaring PVC. Ruang penapis pasir akan terhasil dari balutan jaring PVC ini. Dari segi ketahanan, jaring plastik yang digunakan adalah dari bahan plastik yang tahan lasak yang mengandungi bahan polimer jenis neutral kimia, iaitu selamat untuk alam sekitar. Tidak seperti logam, yang bersifat mudah karat dan reput, Jaring PVC bersifat tahan dan mempunyai hayat perkhidmatan yang panjang. Sa Agg FILTER menggunakan konsep tenaga tork dan tenaga kinetik bagi menggantikan penggunaan tenaga elektrik. Ia bertujuan untuk memudahkan pengurusan kerja di lapangan sekiranya, berhadapan dengan masalah ketiadaan sumber elektrik. Kebaikan dari produk Sa Agg FILTER dapat dilihat melalui ujilari yang dilakukan, apabila produk ini berjaya mengasingkan pasir dari batu baur atau benda asing dengan melakukan pusingan 360 darjah mengikut arah jam atau lawan arah jam. Impak dari penggunaan Sa Agg FILTER, pasir yang bercampur bendasing akan terasing dan jatuh ke dalam bekas tадahan, manakala batu baur atau benda asing pula tersangkut di dalam jaring yang berbentuk silinder. Dapatkan dari hasil soal selidik membuktikan Sa Agg FILTER membantu menyelesaikan masalah pengasingan pasir dan bahan asing, dengan nilai purata min adalah 4.472 .

Kata Kunci: penapis pasir, bahan terpakai, jaring PVC, silinder

1.0 PENGENALAN

Sepanjang melaksanakan kerja amali Bahan Struktur Binaan, STP 10203, diantara masalah kritis pelajar ketika itu adalah mengasingkan batu baur atau benda asing dari pasir. Dari pemerhatian tersebut, timbul ilham untuk menyelesaikan beberapa rekabentuk pembinaan, sehingga akhirnya mendapat satu rekabentuk terakhir yang lebih efisien iaitu, Sa Agg FILTER yang menggunakan konsep tenaga tork dan tenaga kinetik bagi menggantikan penggunaan tenaga elektrik.

Sa Agg FILTER dapat mengasingkan pasir dari batu baur atau benda asing dengan melakukan pusingan 360 darjah mengikut arah jam atau lawan arah jam. Pasir yang terasing akan jatuh ke dalam bekas aluminium manakala batu baur atau benda asing akan tersangkut di dalam jaring yang berbentuk silinder.

1.1 LATAR BELAKANG PROJEK

Secara umumnya projek inovasi ini dilaksanakan bagi menapis pasir daripada objek-objek asing seperti batu, daun, plastik, sampah dan sebagainya dengan menggunakan kaedah putaran 360 darjah. Peringkat permulaan, pasir yang hendak ditapis dituang ke dalam jaring yang berbentuk silinder. Kemudian jaring akan ditutup menggunakan klip boleh laras (buka dan tutup secara manual) lalu diputar sehingga pasir didalam jaring jatuh ke bawah plat besi manakala, benda asing yang berada di dalam jaring akan dikumpulkan lalu dibuang di tempat yang di sediakan.

1.2 PENYATAAN MASALAH

1. Pelajar-pelajar sijil Teknologi Pembinaan Bangunan (STP) menghadapi masalah ketika menjalankan kerja-kerja konkrit terutamanya semasa megambil pasir yang bercampur dengan batu baur.
2. Isipadu pasir sebenar terjejas kerana adanya benda asing dalam pasir.
3. Boleh berlakunya kecederaan pada tangan seperti luka yang disebabkan benda tajam dalam pasir semasa proses pengasingan secara konvensional.

2.0 OBJEKTIF

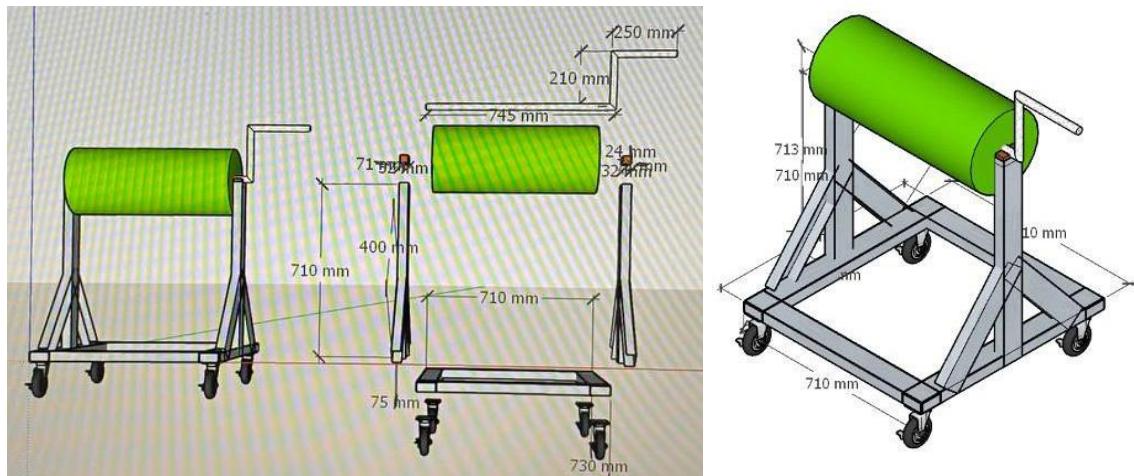
1. Memudahkan pelajar mengambil sukatan pasir yang betul
2. Membantu pelajar untuk menjimatkan masa serta memudahkan proses pengasingan pasir dari batu baur dan benda asing.

3.0 METODOLOGI

Perbincangan bersama pensyarah pembimbing asas permulaan gerak kerja projek Saa Agg FILTER. Projek Saa Agg FILTER dilaksanakan sepenuhnya di bengkel Kolej Komuniti Bandar Penawar (KKBP) melalui penggunaan bahan-bahan terpakai dan sisa amali. Kaedah penggunaan barang terpakai dan sisa amali ini mampu mengurangkan beban pelajar dari segi kos projek. Langkah kerja awal yang dilaksanakan adalah membuat lakaran lukisan projek yang hendak dilaksanakan secara 3D menggunakan perisian *sketch up* seperti yang ditunjukkan dalam Rajah 3.1.

Langkah seterusnya adalah meleraikan roda basikal serta pemegang basikal dari objek asal basikal itu sendiri seperti yang ditunjukkan dalam Rajah 3.2. Seterusnya mencantumkan batang besi tetulang bersama rangka basikal tersebut menggunakan kaedah kimpalan seperti yang ditunjukkan dalam Rajah 3.3. Kerja semburan dilakukan setelah besi tetulang dan basikal bercantum, ia bagi memastikan cantuman kimpalan lebih kukuh sekaligus kualiti kemasan kimpalan dapat dijaga seperti yang ditunjukkan dalam Rajah 3.4. Rangka dari besi C-Channel dibina untuk menyokong

binaan Saa Agg FILTER berdiri serta dijadikan tadahan untuk pasir yang tertumpah seperti yang ditunjukkan dalam Rajah 3.5



Rajah 3.1 : Lakaran 3D menggunakan perisian Sketch-Up untuk mendapatkan



Rajah 3.2 : Perbincangan bersama pensyarah pembimbing dari segi gerak kerja dan penggunaan bahan kitar semula sebagai asas dalam projek Saa Agg FILTER



Rajah 3.3 : Kerja pemotongan besi tetulang, penggunaan C-Channel serta kerja kimbalan dalam projek Saa Agg FILTER



Rajah 3.4 : Roda basikal dan besi tetulang yang telah dikimpal, disembur cat hitam, supaya kukuh, dan dibalut dengan jaring PVC agar dapat dijadikan penapis pasir



Rajah 3.5 : Saa Agg FILTER siap dibina dengan besi C-Channel sebagai sokongan berdiri dan tapak tadahan pasir

Dari segi kos pembinaan Saa Agg FILTER, adalah minima jika dibandingkan dengan impak yang diberikan untuk kegunaan pelajar STP agar mudah melaksanakan amali. Jadual 3.1 menunjukkan anggaran kos projek untuk Saa Agg FILTER. Apa yang tercatat adalah anggaran dari segi nilai wang, namun hakikaknya sebahagian besar barang-barang yang digunakan adalah percuma kerana menggunakan barang kitar semula dan sisa bengkel amali STP, kecuali jaring PVC hijau (item no 3) dibeli di kedai hardware berdekatan KKBP kerana tiada stok di stor barang STP.

Jadual 3.1: Kos Projek Saa Agg FILTER

Bil.	BAHAN	HARGA PERUNIT(RM)	BILANGAN(pcs)	JUMLAH(RM)
1	Roda	6.88	4	27.52
2	Self drilling screw	40.00	1	40.00
3	Jaring PVC hijau	18.20	1	18.20
4	C-Chanel	8.80	5	44.00
5	Kayu penyaru	3.44	2	6.88
6	Besi Y tetulang	5.50	2	11.00

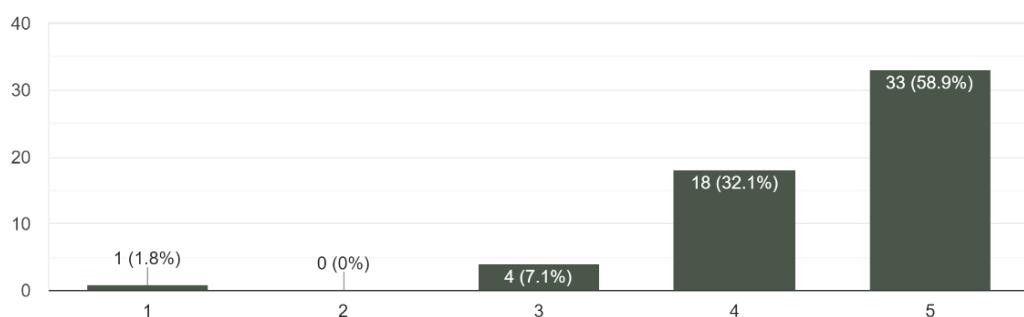
			TOTAL	147.60
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4.0 DAPATAN

Impak penciptaan Saa Agg FILTER adalah membantu memudahkan kerja pengasingan pasir yang bercampur aduk dengan bahan asing seperti batu baur, sampah sarap dan pelbagai lagi. Kerja mengambil pasir menjadi lebih mudah dan cepat. Pemerhatian yang dijalankan mendapati Saa Agg FILTER adalah produk penapis pasir yang mesra pengguna. melalui rekaannya yang tersendiri dari bahan terpakai, sekaligus menampakkan keunikannya sebagai produk yang dicipta menggunakan konsep *smart green*. Jadual 4.1 menunjukkan hasil keseluruhan catatan isipadu pasir yang dihasilkan melalui penggunaan Saa Agg FILTER. Sementara Rajah 4.1 menunjukkan peratus keberkesanan proses penyaringan pasir selepas menggunakan Saa Agg Filter.

Jadual 4.1: Hasil keseluruhan catatan isipadu pasir yang dihasilkan

BIL	ISIPADU ASAL (CM ³)	ISIPADU SELEPAS AYAK(CM ³)	ISIPADU SELEPAS AYAK(%)	PERATUS BENDA ASING YANG TERTAHAN(%)	PASIR YANG HILANG (%)
1	6446.55	5380.5	83.4	10	6.6
2	6466.55	5875.88	91.1	6	2.9
3	6446.55	5483.55	85.0	12	3.0
4	6446.55	4761.35	73.8	20	6.2
5	6446.55	5203.05	80.7	18	1.3



Rajah 4.1: Peratus keberkesanan proses penyaringan pasir selepas menggunakan Saa Agg Filter

5.0 KESIMPULAN

Penggunaan Sa Agg FILTER membantu mendapatkan bacaan sukatan isipadu pasir sebenar yang diperlukan seperti yang ditetapkan dalam helaian amali serta mengatasi masalah pengajaran dan pembelajaran yang terbeban dengan campuran pasir bersama batu baur serta bahan asing yang bergaul penuh dengan timbunan pasir. Cadangan penambahbaikan bagi meningkatkan keupayaan kerja penyaringan pasir adalah penggunaan peralatan tangan elektrik mudah alih seperti *cordless* sebagai bahan ganti untuk putaran konvensional, ia bertujuan menjimatkan tenaga pengguna ketika memutar.

(A-ST033) FLEXIBLE SAND DISPENSER (FSD)

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ABSTRAK

Pengurusan pembinaan yang cekap dan sistematik akan meningkatkan kualiti serta keberkesanan sesebuah projek pembinaan. Kerja yang kurang berkesan akan menyebabkan pembaziran masa dan tenaga serta kualiti binaan menjadi rendah. *Flexible Sand Dispenser (FSD)* merupakan satu produk inovasi untuk menapis, menyimpan dan mengambil pasir dengan mudah. Objektif FSD adalah untuk memudahkan kerja pengasingan pasir dan bendasing. Selain itu, FSD dapat menyediakan ruang penyimpanan pasir yang bertutup. Seterusnya, ia dapat mengurangkan pergerakan ulang alik dari lokasi kerja ke lokasi penyimpanan pasir. Skop projek bagi penggunaan FSD adalah terhad kepada kerja atau projek pembinaan berskala kecil. FSD adalah prototaip berbentuk segiempat sama yang berukuran $0.66\text{m(L)} \times 0.66\text{m(P)} \times 0.85\text{(T)}$. Proses uji lari FSD dilakukan di Kolej Komuniti Bandar Penawar yang memfokuskan pelajar dan pensyarah dalam bidang Teknologi Pembinaan Bangunan serta Penyelenggaraan Bangunan. Tinjauan soal selidik adalah metodologi yang digunakan dan dapatan data dianalisis menggunakan perisian Microsoft Excel. Hasil dapatan dipersembahkan dalam bentuk grafik seperti peratusan, jadual dan graf. Hasil analisis menunjukkan FSD dapat memudahkan kerja pengasingan pasir dan bendasing. FSD juga dapat menyediakan ruang penyimpanan yang bertutup. Selain itu, FSD dapat mengurangkan pergerakan ulang alik dari lokasi kerja ke tempat penyimpanan pasir. Kesimpulannya, FSD dapat meningkatkan kecekapan dan keberkesanan kerja-kerja pembinaan yang lebih sistematik.

Kata Kunci: pasir, menapis, mengayak, pengurusan pembinaan

(A-ST034) DUAL-FUNCTION SHOWER HEAD (SHOWERSOLVE) A SUSTAINABLE REMEDY FOR MINIMIZING PLASTIC CONSUMPTION

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ABSTRACT

Introducing the cutting-edge 2-in-1 shower head, a revolutionary solution to combat plastic waste while enhancing your shower experience. This dual-function innovative design called 'ShowerSolve' delivers soap and shampoo straight from the showerhead and champions sustainability by significantly reducing plastic consumption. At the heart of this design lies a centrally positioned dispensing mechanism, activated effortlessly by a single touch-button panel. Gone are the days of cluttered shower counters, as 'ShowerSolve' eliminates the need for multiple plastic dispensers, offering unparalleled convenience and accessibility. Moreover, 'ShowerSolve' refillable chambers store generous quantities of soap and shampoo, eliminating the reliance on disposable plastic bottles. Due to the inconvenience and environmental impact of traditional packaging, it paves the way for an eco-friendly bathing experience. Embrace 'ShowerSolve' and embark on a journey towards a greener future, where every shower is a step towards sustainability. With its streamlined design and futuristic appeal, this product enhances your bathroom aesthetic and promotes a more environmentally conscious lifestyle. Experience the dual benefits of convenience and eco-friendliness with 'ShowerSolve', a testament to innovation and responsible living. Join the movement towards a world where plastic waste is minimised, and every shower contributes to a brighter, cleaner future.

Keywords: Dual-function, Sustainable, Plastic reduction, Refillable, Eco-friendly

1.0 INTRODUCTION

ShowerSolve emerges as a revolutionary solution, aiming to transform your shower routine. This innovative 2-in-1 shower head tackles these issues head-on, promoting sustainability and convenience in equal measure. ShowerSolve boasts a dual-function design, dispensing soap, and shampoo directly from the showerhead and freeing up valuable counter space. Furthermore, the product utilizes refillable chambers, eliminating the reliance on disposable plastic bottles. This innovative approach reduces plastic waste and offers an eco-friendlier way to bathe.

2.0 OBJECTIVE

- i. To reduce the amount of plastic used in daily bath products.
- ii. To encourage the user to participate in the sustainability movement by adopting ShowerSolve at home.
- iii. To introduce innovative and eco-friendly alternative to traditional shower setups.

3.0 METHODOLOGY

This study used qualitative and quantitative research method to assess "ShowerSolve's" efficiency and user satisfaction. An eco-friendly lifestyle is encouraged by a 2-in-1 shower head that will improve your showering experience. Its features, functionality and practicality are broken down as follows:

I. Features:

- Dual Valve:** Dispenses both soap and shampoo directly from the showerhead.
Touch-Button Control Panel: Effortlessly switch between soap and shampoo with a single touch panel.
Refillable Chambers: Large, refillable chambers reduce reliance on disposable plastic bottles.

II. Functionality:

ShowerSolve integrates a central dispensing mechanism within the shower head. Refillable chambers for soap and shampoo are located inside the unit.

III. Practicality:

- **Easy Installation:** ShowerSolve is designed for easy installation using the system pressure through the inlet from the liquid reservoir.
- **Refill Management:** The refillable chambers are easily accessible and visible for timely refills.
- **Maintenance:** The dispensing mechanism and showerhead are designed for easy cleaning to prevent build-up and ensure hygiene.

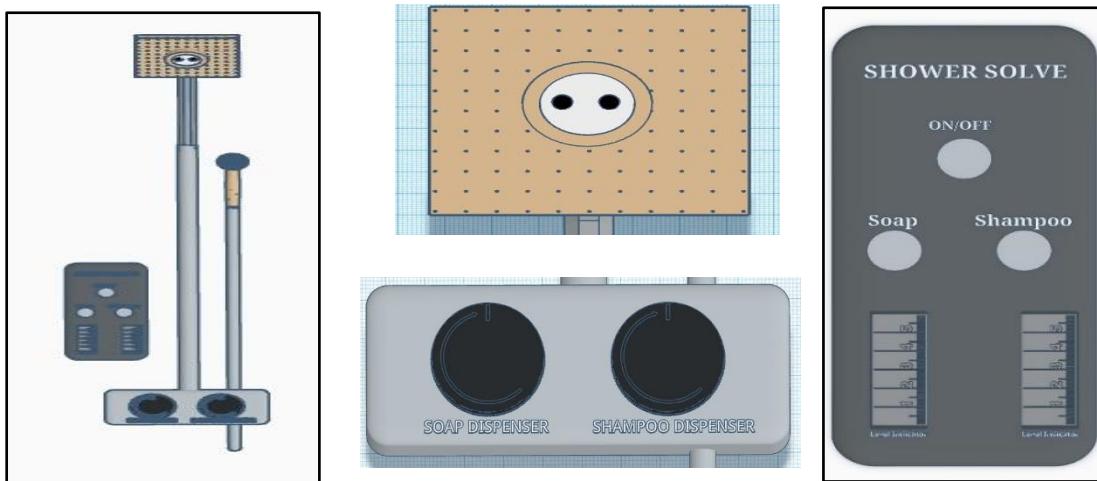


Figure 1: ShowerSolve 3D model.

Data Collection Method: A survey was done on 15 individuals based on their status to gather survey feedback for ShowerSolve product idea. The results are shown in the graph below:

4.0 RESULTS

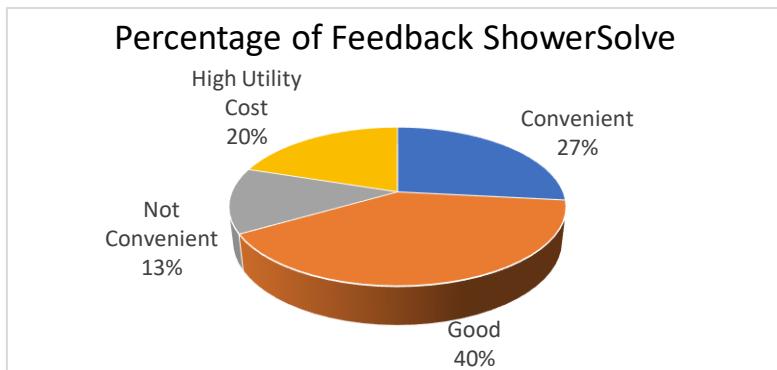


Figure 2: Pie Chart Percentage of Survey Feedback

According to the pie chart, 40% of survey respondents think highly of the ShowerSolve product, indicating that most users have a positive opinion of the product idea. While some respondents (13%) find it not convenient, a significant portion of respondents (27%) value it. 20% of respondents express concern about high utility expenses, suggesting a possible area for cost-efficiency improvement.

5.0 CONCLUSION

In summary, ShowerSolve combines sustainability and convenience into one cutting-edge device, making it an appealing option for users who care about the environment. ShowerSolve creates a future where every shower helps to create a healthier planet by reducing plastic waste and optimizing the showering experience. It lessens the need for thrown-away plastic bottles by combining shampoo and soap in the shower head. An easy-to-use touch-button panel allows users to simply operate the centralized dispensing system of "ShowerSolve". By eliminating clutter and encouraging an eco-friendly lifestyle, this innovative method provides a pleasant showering experience with a single touch-button dispensing system.

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(A-ST036) ETERNASCRIBE

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ABSTRACT

The EternaScribe is a revolutionary new printing device that is also good for the environment. Instead of standard ink cartridges, this innovative device uses flower petals for color ink and coffee grounds for black ink. Regular printers often have problems like paper jams, text that isn't clear, and error messages that aren't clear. This inkless printer is a reliable and environmentally friendly alternative. The EternaScribe uses the natural qualities of coffee grounds and flower petals to not only clean up the environment but also help it last longer through the circular economy plan.

Keywords: EternaScribe, Printer, Eco-Friendly, Convenient, Time-Saving, and Connectivity.

1.0 INTRODUCTION

The EternaScribe represents a paradigm shift in printing technology, addressing growing concerns regarding environmental sustainability. This new printer solves all the environmental problems that regular printing methods cause by using natural materials to make prints. The printer's main ink sources are coffee grounds and flower petals. This not only reduces its carbon footprint but also supports a circular economy by finding new uses for organic trash.

2.0 OBJECTIVE

Creating a creative and sustainable substitute for conventional printing techniques is the aim of the inkless printer. It aims to provide affordable, high-quality prints with less of an impact on the environment by using natural ingredients like coffee grounds and flower petals. This printer encourages innovation and productivity in the sector while meeting the growing need for environmentally responsible printing solutions.

1. To promote Sustainability and Environmental Friendliness.

The EternaScribe aims to reduce reliance on conventional ink cartridges, notorious for their environmental impact. By utilizing biodegradable materials like coffee grounds and flower petals, this printer contributes to minimizing environmental harm associated with printing.

2. To provide Time-Saving Convenience

This printer offer convenience through various avenues:

- Easy disposal: Biodegradable ink sources simplify disposal, eliminating the need for specialized recycling methods.
- Accessibility & flexibility: Remote printing capabilities via user-friendly mobile apps enable efficient management of printing tasks from anywhere.

3. To reduce Cost.

By utilizing readily available and cost-effective materials like coffee grounds and flower petals, the EternaScribe significantly lowers consumable expenses compared to traditional ink cartridges.

4. To strive for Quality & Performance

Precision ink delivery systems prevent printing issues such as jams and streaks, ensuring consistent print quality and reliability over time.

3.0 METHODOLOGY

The EternaScribe employs eco-friendly materials during production, aligning with the growing demand for sustainable technologies. Offering multiple connectivity options, including Wi-Fi and mobile apps, users can seamlessly print from various devices. Integration with voice-activated command systems like Google Assistant enhances convenience, while an integrated digital signature feature streamlines document signing processes.



Figure 1: Product of image

4.0 RESULTS

The EternaScribe revolutionizes printing technology with its eco-friendly approach and innovative features. Its appeal lies in providing vibrant prints while reducing environmental impact and printing costs. This printer sets new standards for sustainability and innovation, catering to environmentally conscious consumers and businesses alike.

5.0 CONCLUSION

In conclusion, the EternaScribe is a big step forward in printing technology. It provides a cheap and long-lasting way to print. This printer shows how innovation and concern for the environment can work together by putting environmental sustainability first and using natural materials. The EternaScribe is a shining example of progress in the printing business at a time when more people want eco-friendly technologies.

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(A-ST038) FACTORS IMPACTING THE MENTAL HEALTH OF MATHEMATICS STUDENTS IN UiTM, SHAH ALAM BASED ON AREA DOMINANCE METHOD

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ABSTRACT

Individuals are unable to efficiently handle their daily responsibilities and achieve their maximum capabilities unless they possess mental health. Recent research indicates a growing prevalence of mental health issues among Malaysian university students, significantly impacting their academic performance. This study centres on the mental health of mathematics students at UiTM Shah Alam, aiming to ascertain and prioritize the factors that influence their mental health states by employing fuzzy set theory and the Area Dominance Method. A thorough questionnaire was administered to ten mathematics students to evaluate different factors related to academic pressure, financial circumstances, lifestyle, social environment, and family dynamics. A comprehensive analysis of existing literature was performed to identify the key factors. The gathered data was examined using the area dominance approach to address the inherent uncertainty and complexity involved in evaluating mental health. The analysis indicated that academic pressure exerted the most significant influence on students' mental health, followed by family, financial, lifestyle, and social environment. These findings underscore the importance of focused interventions to mitigate these sources of stress and create a favourable learning atmosphere. This study makes a significant contribution to the wider discussion on student well-being by promoting a comprehensive approach to dealing with mental health problems in academic environments. The study uses advanced fuzzy analysis to provide practical insights for developing efficient support strategies and a deeper understanding of the factors that impact student mental health.

Keywords: mental health, university students, fuzzy set theory, area dominance method

1.0 INTRODUCTION

Mental health is crucial for overall well-being and quality of life, significantly impacting individuals' potential, stress management, and contributions to society. In Malaysia, mental health challenges are rising, particularly among university students, leading to academic underachievement (Isa et al., 2022). This study focuses on mathematics students at UiTM, Shah Alam, to identify factors affecting their mental health, including family, financial, lifestyle, social environment, and academic pressure. By employing fuzzy set theory and the Area Dominance Method, the research aims to prioritize these factors and develop targeted interventions to foster a supportive educational environment.

2.0 OBJECTIVE

- i. To identify factors that contribute to the Mental health of mathematics students at UiTM, Shah Alam.
- ii. To collect data on factors that contribute to the Mental health of mathematics students at UiTM, Shah Alam.
- iii. To analyze by ranking the collected data on Mental health concerns among mathematics students based on area dominance method.

3.0 METHODOLOGY

Area Dominance Method Analysis

The main methodology for prioritizing fuzzy numbers is predominantly based on the concept of area dominance. This concept considers the direction of dominance, which occurs when one fuzzy number dominates another. The directions of dominance can be classified into two distinct categories. Tseng and Klein are the individuals who introduced the area dominance method, and (Mohd Hanif et al., 2013) extended this method to be applied in implementation.

Category 1: Non-Overlapping Fuzzy Number

The first category is for non-overlapping case between fuzzy numbers \tilde{A} and \tilde{B} . \tilde{A} is said to dominate \tilde{B} if \tilde{A} is on the right-hand side of \tilde{B} and vice versa. \tilde{A} domination of \tilde{B} can be illustrated in the following Figure 1.

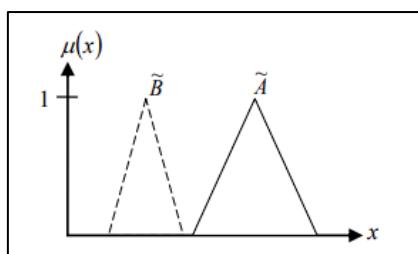


Figure 1. Non-Overlapping Fuzzy Numbers

Category 2: Overlapping Fuzzy Number

The second category is for overlapping case between fuzzy numbers \tilde{A} and \tilde{B} . The overlapping area of \tilde{A} and \tilde{B} is defined as the indifferent or intersection area between \tilde{A} and \tilde{B} . Suppose that there exists an overlapping area between \tilde{A} and \tilde{B} . Thus, $\mu_{\tilde{A} \cap \tilde{B}} \neq 0$ where $x \in X$. The direction of domination for overlapping case between two fuzzy numbers is defined as followed:

- (a) \tilde{A} dominates \tilde{B} if;
 - i. the non-overlapping area belongs to \tilde{A} and is on the right-hand side of the overlapping area, or

- ii. the non-overlapping area belongs to \tilde{B} and is on the left-hand side of the overlapping area, or
- iii. the non-overlapping area belongs to \tilde{A} and is at the upper dominance of the overlapping area.

(b) \tilde{B} dominates \tilde{A} if;

- i. the non-overlapping area belongs to \tilde{A} and is on the left-hand side of the overlapping area, or
- ii. the non-overlapping area belongs to \tilde{B} and is on the right-hand side of the overlapping area, or
- iii. the non-overlapping area belongs to \tilde{B} and is at the upper dominance of the overlapping area.

Figure 2 (a) to (c) shows the illustration of some cases in Category 2.

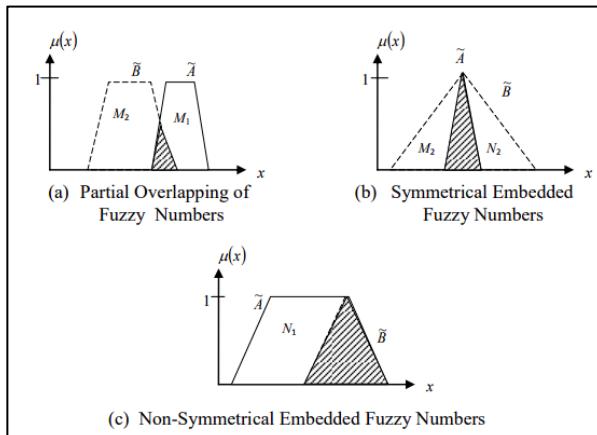


Figure 2. Some Possible Situations of Overlapping Fuzzy Numbers

The Proposed Algorithm for Ranking Fuzzy Numbers. (Mohd Hanif et al., 2013)

The proposed algorithm for ranking fuzzy number is by incorporating the upper dominance concept and inclusion of the spread factor are presented as followed.

Step 1. Find the area where \tilde{A} and \tilde{B} are indifferent (shaded region).

$$\begin{aligned} \text{Indifferent Area} &= \text{Area of Shaded Region} \\ &= \frac{1}{2} \times \text{Base} \times \text{Height} \end{aligned}$$

Step 2. Find the area where \tilde{A} dominates \tilde{B} based on category 1 or 2.

Step 3. Find the area where \tilde{B} dominates \tilde{A} based on category 1 or 2.

Step 4. Find the area of \tilde{A} and the area of \tilde{B} .

$$\text{Area } \tilde{A} \text{ and } \tilde{B} = \frac{1}{2} \times \text{Base} \times \text{Height}$$

Step 5. Compute $R^*(\tilde{A}, \tilde{B})$ and $R^*(\tilde{B}, \tilde{A})$

The formulation for calculating the degree of dominancy between \tilde{A} and \tilde{B} is defined as followed.

$$R(\tilde{A}, \tilde{B}) = \frac{\text{(areas where } \tilde{A} \text{ dominates } \tilde{B}) + (\text{area where } \tilde{A} \text{ and } \tilde{B} \text{ are indifferent)}}{\text{(area of } \tilde{A}) + (\text{area of } \tilde{B})}$$

$$R(\tilde{B}, \tilde{A}) = \frac{\text{(areas where } \tilde{B} \text{ dominates } \tilde{A}) + (\text{area where } \tilde{A} \text{ and } \tilde{B} \text{ are indifferent)}}{\text{(area of } \tilde{A}) + (\text{area of } \tilde{B})}$$

$$R(\tilde{A}, \tilde{B}) + R(\tilde{B}, \tilde{A}) = 1,$$

where $R(\tilde{A}, \tilde{B})$ is interpreted as the degree to which \tilde{A} is preferred to, or indifferent to \tilde{B} , and $R(\tilde{B}, \tilde{A})$ is defined as the degree to which \tilde{B} is preferred to, or indifferent to \tilde{A} .

Fuzzy numbers \tilde{A} and \tilde{B} are ranked based on the following conditions:

If $R(\tilde{A}, \tilde{B}) > 0.5$, then $\tilde{A} > \tilde{B}$.

If $R(\tilde{A}, \tilde{B}) = 0.5$, then $\tilde{A} = \tilde{B}$.

If $R(\tilde{A}, \tilde{B}) < 0.5$, then $\tilde{B} > \tilde{A}$.

4.0 RESULTS

The comparison of dominant criteria from implementation results and calculations from implementation section is presented in Table 1.

Table 1. Comparison of dominant criteria

No	Pairing Criteria	More influencing Criteria	Criteria dominates
1	Family and Financial	Family > Financial	Family
2	Family and Lifestyle	Family > Lifestyle	Family
3	Family and Social environment	Family > Social environment	Family
4	Family and Academic pressure	Family < Academic pressure	Academic pressure
5	Financial and Lifestyle	Financial > Lifestyle	Financial
6	Financial and Social environment	Financial > Social environment	Financial
7	Financial and Academic pressure	Financial < Academic pressure	Academic pressure
8	Lifestyle and Social environment	Lifestyle > Social environment	Lifestyle
9	Lifestyle and Academic pressure	Lifestyle < Academic pressure	Academic pressure

10	Social environment and Academic pressure	Social environment < Academic pressure
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After receiving the results, UiTM Shah Alam mathematics students' mental health was thoroughly examined. Academic pressure is the biggest factor, followed by family, financial, lifestyle, and social environment. China's largest college student population faces rising academic pressure, which affects their health (Zhang & Zheng, 2017). Personal and group academic stress were linked to negative emotions (Zhang & Zheng, 2017). This study found that men's and women's mental health are not affected by their close friend count inside and outside social housing (Liu et al., 2018). According to this supported literature review, academic pressure is the biggest issue facing high school and college students, and some people's mental health is unaffected by their environment.

Table 2 shows the results for this study:

Table 2. Results for ranking factors that influence Mental health

Ranking	Criteria
1	Academic pressure
2	Family
3	Financial
4	Lifestyle
5	Social environment

5.0 CONCLUSION

This project assessed and prioritized factors that affect the mental health of mathematics students at UiTM Shah Alam, focusing on family, financial, lifestyle, social, and academic pressures. Using the area dominance approach, the study analysed data from ten students, finding that academic pressure, family dynamics, financial stress, lifestyle choices, and social environment significantly impact mental health. Academic stress and family dynamics were the most influential. The study highlights the need for a holistic approach to supporting students, considering academic, familial, economic, lifestyle, and social factors. The findings will guide the development of targeted interventions to improve student well-being.

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(A-ST042) SMARTRESIDENT: RESIDENT MANAGEMENT CENTRE SYSTEM

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ABSTRACT

The complexities of managing residential communities in today's busy lifestyle have given rise to solutions. The proposed system is a smart platform that simplifies residential management. It is a solution to revolutionise residential community management by centralising and automating various tasks, catering to the needs of administrators, residents, and security guards. The requirement of notifying residents promptly when the packages arrive is crucial for an automated system to handle the problem of inconvenience and inefficient informing residents about delivered packages. Implementing such a system can minimise the need for frequent mailbox checks to enhance overall operational efficiency. The system addresses problems of paper-based announcements that benefit residents by offering a platform to disseminate messages to the residents and reducing paper usage, making sending and receiving messages without effort. The system allows residents to report issues and provide feedback for community improvement. The proposed system will be developed using the Waterfall model. A comprehensive series of functional and user acceptance testing will be conducted among potential users before proceeding with the deployment phase based on a 5-point Likert scale with three quality dimensions such as heuristics, content, and navigation. As a result, the system seeks to optimise residential management by automating tasks to increase efficiency and improve user experience.

Keywords: Resident Management System, Waterfall Model, Automation System, Smart Platform, Parcel Notification, Mobile Apps.

1.0 INTRODUCTION

The Resident Management Centre System is a mobile application system that simplifies and automates tasks related to residential management. This app is aimed to enhance communication and convenience in managing parcels, pre-registered for visitors, paying utility bills, sending feedback, dissemination announcements, reporting issues, and notifying disruptions related to water and electricity. The idea for this proposed system comes from reviewing similar existing systems. The existing notification process for delivered packages in our residential community lacks efficiency and convenience, making residents need to physically check their mailboxes frequently. Distributing paper notifications for water and power outages to residents is time-consuming and resource-intensive, leading to delays and significant paper waste. Besides, registering visitors with manual paperwork and lengthy procedures leads to delays and inefficiency. Therefore, there is a need to develop a system to optimise

residential management by automating tasks to increase efficiency and improve user experience.

2.0 OBJECTIVE

The objectives of the proposed system is to refine features for an improved Resident Management Centre System that eliminates the need for physical visits, providing easy access to services and enhancing resident satisfaction. It also involves testing and validation to ensure the new system design automates and simplifies resident management processes, reducing manual tasks and improving operational efficiency.

3.0 METHODOLOGY

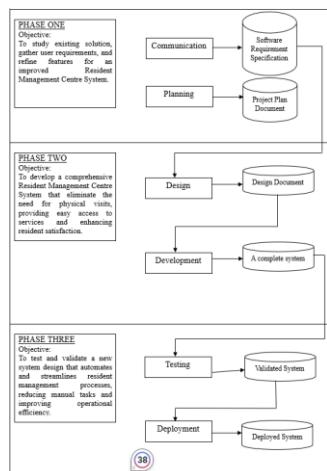


Figure 3.1: Project Framework

This proposed system will be developed according to the waterfall model. Figure 3.1 illustrates the flow of three phases. Phase one aims to study existing solutions, gather user requirements, and refine features for an improved Resident Management Centre System. Phase two focuses on developing a comprehensive Resident Management Centre System that eliminates the need for physical visits, providing easy access to services and enhancing resident satisfaction. Phase three is testing and validating a new system design that automates and streamlines resident management processes, reducing manual tasks and improving operational efficiency.

3.1 Phase One: Communication and Planning

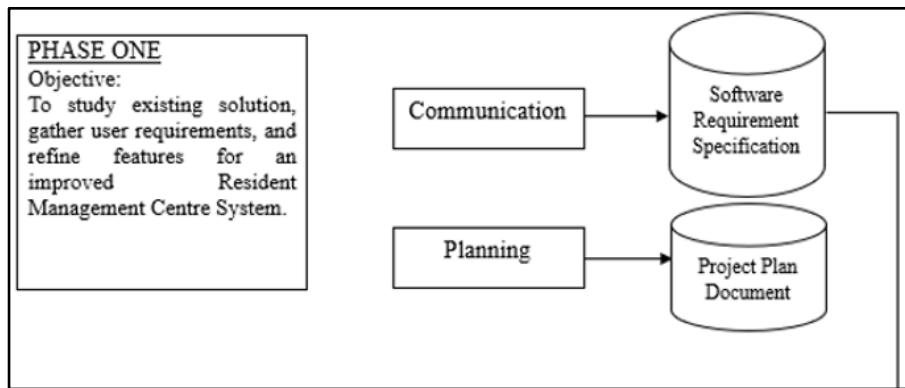


Figure 3.2: Phase One

During phase one of the project, the primary objective was establishing the foundation for a user-friendly Resident Management Centre System. This phase comprised two sub-phases: communication and planning. The communication phase involved thoroughly studying existing Resident Management Centre Systems and similar market solutions, such as the MyTaman App, MyGate App, and i-Neighbour App.

This analysis covered the features, benefits, and drawbacks of these systems, providing insights into industry best practices and identifying areas for improvement in the new system. In the planning phase, a supervisor reviewed and refined the requirement lists based on insights from the communication phase, ensuring accuracy, completeness, and consistency. Necessary resources and technical specifications were determined, including the choice of development frameworks like Flutter and database solutions such as Firestore. Hardware and software requirements, including a laptop, Android Studio, Dart programming language, and online drawing tools were identified.

3.2 Phase Two: Design and Development

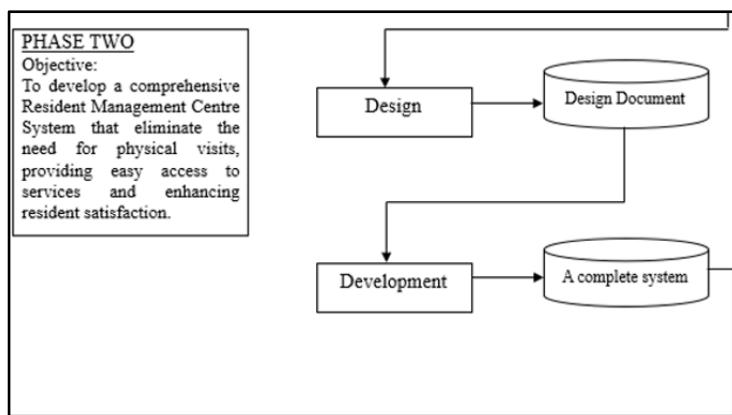


Figure 3.3: Phase Two

During the project's design, development, and testing phases, careful attention was given to creating a secure and intuitive system that enhanced resident satisfaction and convenience. The objective was to eliminate the need for physical visits to the management or post office by providing residents with easy access and utilization of the services offered. The detailed requirements gathered from previous phases were converted into a completed detailed systems design in the design phase. This design provided a clear picture of how the system would work and what it would look like.

Various diagrams, such as use case, activity, sequence, and class, were created using online tools like draw.io.

These diagrams helped visualize the system's functionality and interactions. A detailed description of the use case functionality and system design was documented. This description served as a reference during the development phase. A Resident Management Centre System prototype was built first during the development phase. This prototype guided the improvement of the system's aesthetics and the implementation of essential functions such as navigation, buttons, and text fields to enhance usability. After prototyping, a fully completed system is developed based on the prototype. The completed system's database was connected to Firestore to ensure seamless data management. All the requirements identified during the design phase were implemented in this phase and met the desired objective.

3.3 Phase Three: Testing and Deployment

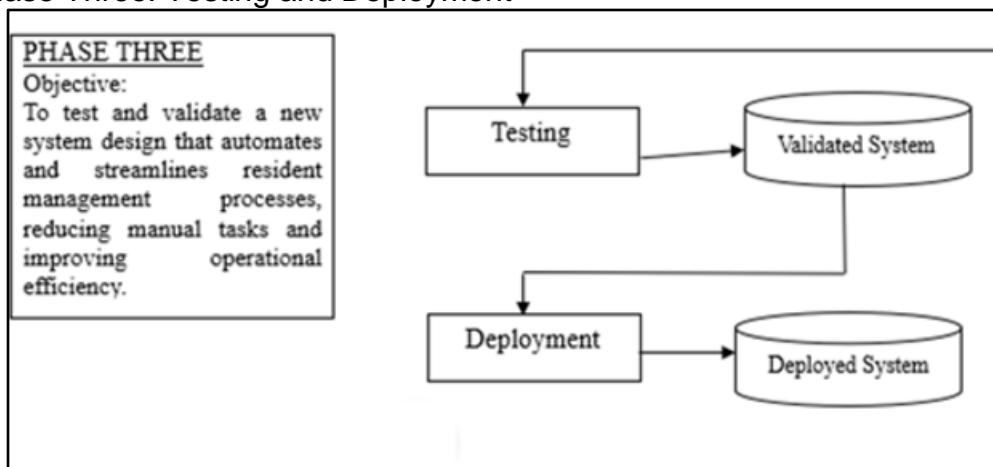


Figure 3.4: Phase Three

After completing the development phase, the modules were thoroughly reviewed to ensure they functioned as expected. These modules were then integrated to form a complete system. A comprehensive test plan was designed to validate the system's functionality and adherence to the requirements. This plan included the design of test data and the execution of testing activities, following object-oriented testing principles. The Resident Management Centre System was tested using an Android mobile phone to ensure it met the expected standards. Proper documentation is maintained throughout the process to address any issues or bugs identified during testing for further improvement. This documentation has served as a reference for future enhancements and maintenance.

During the User Acceptance Testing and Deployment phase, several activities were conducted to ensure the new system design enhanced operational efficiency and satisfied user requirements. The first activity was User Acceptance Testing (UAT), where beta testing occurred on the user side. A selected group of users, focusing on gated-community users, actively utilized the system and evaluated its performance against their specific needs. However, due to time constraints, the system is eventually tested by 30 adults without focusing only on the gated community users. This testing phase determined user satisfaction and bugs in the system. Besides, non-functional requirements such as performance, load, and stress were thoroughly tested during acceptance testing, and valuable user feedback was obtained. This feedback addressed errors, and the system was refined and optimized to meet desired

performance standards. The system was successfully deployed after all necessary amendments had been made.

4.0 RESULT

The system will be tested with 30 suitable respondents, the respondents will be required to access the application and answer the questionnaire with three quality dimensions: heuristics, content, and navigation. The system will be tested based on these three qualities. User Acceptance Testing helps to identify bugs that have not been addressed, know the real experiences of the respondent when using the system, and make enhancements or refinements to the system.

5.0 CONCLUSION

In conclusion, the Resident Management Centre System presents an innovative solution to simplify residential management processes. The system will be developed using the waterfall model. This proposed system helps to address key challenges such as inefficient parcel notifications, visitor registration, and utility bill payments. Besides, implementing User Acceptance Testing validates the system's effectiveness in meeting user expectations and refining the system for optimal performance before being deployed to the real environment. As a result, developing such a system has the potential to optimise residential management and enhance the convenience and satisfaction of all users.

(A-ST043) PERSONAL MANAGEMENT SYSTEM

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ABSTRACT

In today's fast-paced society, technology has brought people benefits and changed how individuals manage their tasks, schedules, appointments, and finances, where myriad applications can be used. Therefore, the centralised personal management system integrates the three functionalities, a to-do list, calendar, and financial record keeping, decreasing individuals using disparate applications and platforms and helping them stay organised and enhance personal productivity. The to-do list feature provides a structured approach to task management, preventing individuals from missing deadlines because of failing to prioritise tasks and struggling to focus on what truly matters. Moreover, proficiently allocating time is a big challenge for individuals. Therefore, the calendar feature offers a comprehensive and centralised view of an individual's schedule to keep up with their schedules, appointments, and events, avoiding conflicting commitments, missed appointments, and poor time management. It is important to have a financial record-keeping feature to help simplify financial management to achieve their financial goals and make informed decisions about their money, rather than struggling to understand their financial health comprehensively. The system will be developed based on the waterfall process model, utilising Flutter and Firebase. Before proceeding to the deployment phase of the system development, user acceptance testing (UAT) will be conducted among the potential users based on a 5-point Likert scale with three quality dimensions: heuristics, content, and navigation will be assessed. As a result, the proposed system has the potential to help individuals enhance personal productivity, organisation, and decision-making capabilities.

Keywords: Personal Management System, Mobile Applications, To-Do List, Calendar, Financial Record Keeping.

1.0 INTRODUCTION

The Personal Management System is a centralised mobile personal management system integrating three main functions: to-do list, calendar and financial record keeping. The idea of integrating the three main functions was based on the survey results of the questionnaire. The system provides task management capabilities, schedule events, and manage financial transactions.

People often overwhelmingly use multiple applications or platforms for different purposes in isolation, making it difficult to coordinate activities and make informed decisions. The lack of a to-do list and calendar features decreases productivity and poor time management. Users cannot break down tasks into manageable steps,

monitor the progress, stay on track, and manage scheduling conflicts. Furthermore, managing personal finances is challenging without proper record-keeping because it is hard to track spending, gain insights into spending patterns and habits, manage finances and make informed decisions. Therefore, there is a need to develop an application with multiple functions instead of using multiple applications.

2.0 OBJECTIVE

The primary aim is to design and develop a mobile application system capable of supporting users' needs to stay organized and make informed decisions with different functions, reducing the use of multiple applications and allowing them to manage and prioritize tasks, track tasks' progress, schedule appointments and events, and keep track of their financial transactions effectively.

3.0 METHODOLOGY

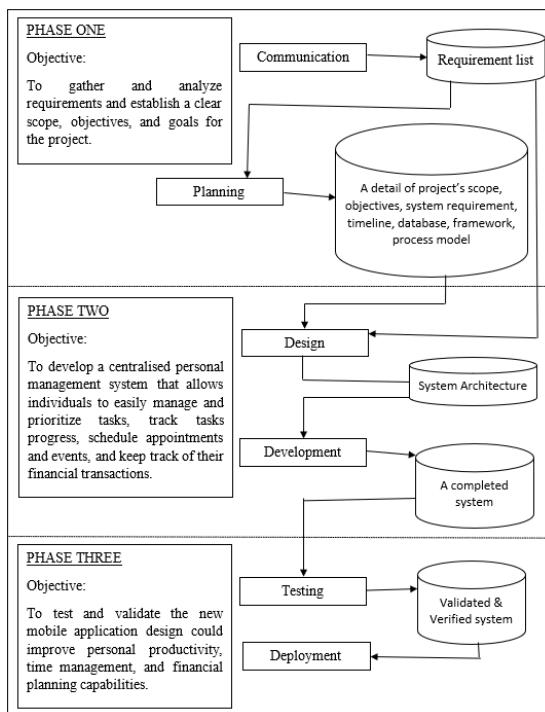


Figure 3.1: Project Framework

Figure 3.1 illustrates the project framework, which consists of three phases with distinct objectives. The first phase involves communication and planning, while the second focuses on design and development. Lastly, the third phase encompasses testing and deployment. During verification and validation activity, the user acceptance testing will involve 30 respondents to test the application based on the 5-point Likert scale with three dimensions: heuristics, content, and navigation will be assessed. Any identified issues or bugs are addressed based on the feedback received, and necessary enhancements are made to refine the application. Once UAT is successful and improvements are implemented, the centralized personal management system will be deployed to the real environment.

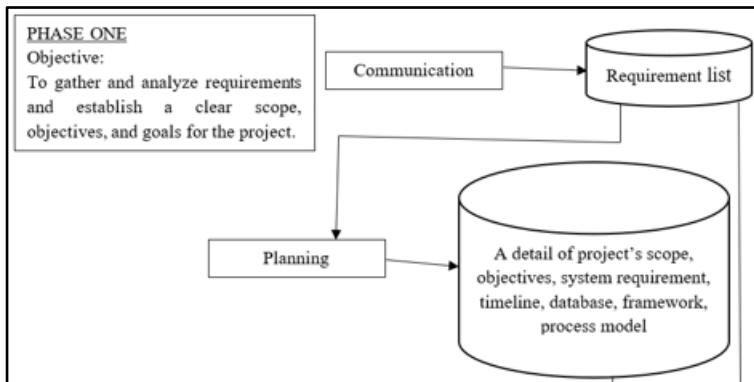


Figure 3:2 Phase One

The first phase of the project framework is the Communication and Planning Phase. This phase focused on gathering and analysing requirements and establishing a clear scope, objectives, and goals for the project. The requirements gathering began with studying existing systems and observing the challenges faced by people today. A comprehensive study of existing systems such as Todoist, Any.do, Google Calendar, and Fast Budget was conducted. A matrix comparison table was prepared to compare the features and functionalities of these systems to have a clear view of the strengths and weaknesses of existing systems. Additionally, understanding the challenges people face today benefited the preparation of the list of features for the respondent to vote. As a result, a list of features was well-prepared in questionnaires for respondents to vote for, and the system's features were based on the results from the questionnaires conducted. The questionnaires asked respondents to vote for desirable features from the well-prepared list of questions to collect user feedback and suggestions, ensuring those features fulfilled individual needs. The gathered requirements were then analysed, considering both functional and non-functional aspects, ensuring the system aligns with the users' productivity and organisation goals.

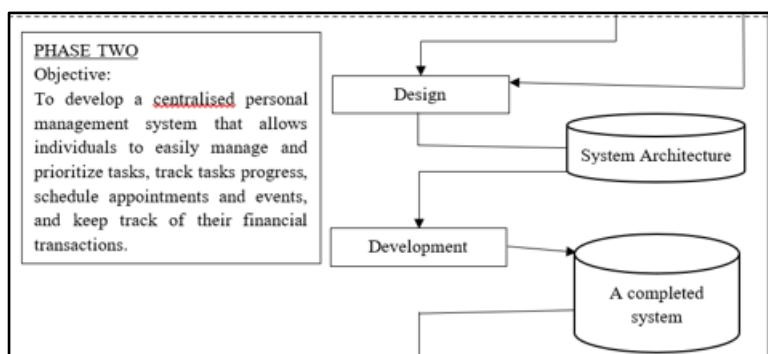


Figure 2: Phase Two

The second phase of our project framework is the Design and Development Phase. It aims to develop a centralised personal management system that enhanced personal productivity and organisation by providing features allowing individuals to easily manage and prioritise tasks, track task progress, schedule appointments and events, and keep track of their financial transactions. It focused on providing diagrams and prototypes to have a clear view of how the system works, how the interfaces look like and how the features and functionality will be performed, developing the system components and functionalities according to the designed diagrams and prototypes,

and conducting unit testing, integration testing, and system testing to ensure functionality and quality. This phase provided detailed architecture, user interface design, test cases, and reports. In the design phase, detailed system architecture and user interface design are created by providing use case diagrams, use case descriptions, class diagrams, and user interface of the application based on the requirements gathered in the previous phase. The designs focused on creating a user-friendly and intuitive personal management application interface.

The project proceeded to the development phase after establishing the diagrams. The development phase involved implementing the system components, functionalities, and database integration according to the diagrams and user interface using the tools, framework, and database defined in the previous phase. This includes building the necessary software modules, integrating the calendar, to-do list, and financial record-keeping features, and integrating with a database for data management. In the development phase, unit testing and integration testing are also conducted. By conducting testing, test cases were defined to validate the application's behaviour. Unit testing is conducted to ensure the correctness and functionality of the developed modules, followed by integration testing to validate the seamless integration of multiple modules.

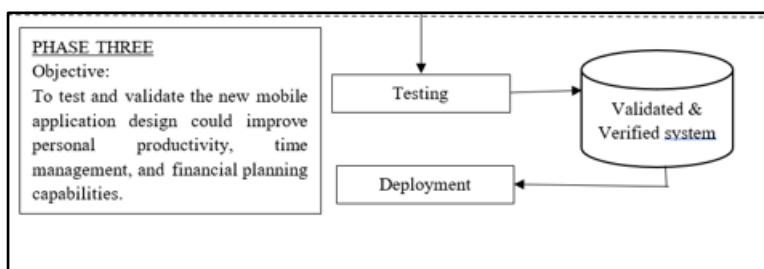


Figure 3.3: Phase Three

The final phase of the project framework is the Testing and Deployment Phase. This phase aims to test and validate the design of the personal management system and assess its potential to improve personal productivity, time management, and financial planning capabilities. The testing phase involved system testing and User Acceptance Testing (UAT). System testing is performed to test the complete integrated system's behaviour, performance, and functionality. Throughout this phase, the application is ensured it meets the defined requirements and quality standards. During the UAT, 30 potential respondents are invited to test the application and provide feedback on its usability, functionality, and performance through questionnaires to analyse and evaluate whether respondents were satisfied with the system requirements, design consistency, and application navigation using questionnaires. Any identified issues or bugs are addressed based on the feedback received, and necessary enhancements are made to refine the application. Once the application has successfully undergone UAT and all necessary improvements have been implemented, the centralised personal management system was deployed to the real environment.

4.0 RESULTS

The UAT is conducted before the system's deployment to test and validate the developed system meets its requirements and identifies potential issues. Due to the

system being suitable for any individual, 30 students and staff will be selected as respondents. The UAT will be conducted in the school lab, and the respondents will be required to access the application and answer the questionnaire shown in Figure 4.1 with three quality dimensions: heuristics, content, and navigation will be assessed. Any identified issues or bugs are addressed based on the feedback received, and necessary enhancements are made to refine the application.

5.0 CONCLUSION

In conclusion, developing a centralized personal management system integrates a to-do list, calendar, and financial record-keeping functionalities to provide a solution to using multiple applications and managing their tasks, schedules, and finances efficiently. The system aims to enhance productivity and facilitate informed decision-making. It will be developed based on the waterfall process model, utilising Flutter and Firebase. The UAT will be conducted, three quality dimensions will be assessed, and amendments will be based on feedback before deployment. As a result, the proposed system has the potential to help individuals enhance personal productivity, organisation, and decision-making capabilities.

**(A-ST044) THE EMPOWER-SUSTAIN MOBILE AND DESKTOP APPS[©]:
CARDIOVASCULAR e-HEALTH INTERVENTIONS FOR PATIENTS WITH
METABOLIC SYNDROME**

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ABSTRACT

Background: The prevalence of Metabolic Syndrome (MetS) and the associated cardiovascular (CV) risk factors in the Malaysian population has escalated over the past decades. This has resulted in the rising CV morbidity and mortality including in the younger age groups. Exponential use of mobile phones unlocks the potential to transform CV risk factors management in primary care using electronic health (e-health) technology.

Problem Statement: Most of these apps were developed in the Western countries and high-income Asian countries such as Japan and South Korea which might not suit the needs of Malaysian local population. To our knowledge, there is no e-health self-management mobile or desktop app which has been developed to suit individuals with MetS in Malaysia.

Objectives: To develop and evaluate the EMPOWER-SUSTAIN e-Health Self-Management Apps[©] for individuals with MetS in primary care.

Description of Innovation Products: The EMPOWER-SUSTAIN Mobile App[©] empowers patients to take charge of their own health to prevent heart attack and stroke. Using this desktop app, the receptionist can register a patient and the nurse can enter check-up data which include anthropometric measurements and investigation results. Information entered into the EMPOWER-SUSTAIN Desktop App[©] will sync with the EMPOWER-SUSTAIN Mobile App[©]. During consultation, the doctor will use the desktop app to check the information entered by the receptionist and the nurse and use the mobile app to empower patients with knowledge and skills to self-manage their conditions at home.

Conclusion: The EMPOWER-SUSTAIN Mobile and Desktop Apps[©] are the first comprehensive tools developed in Malaysia, to be used by health care providers and patients to manage multiple cardiovascular risk factors such as hypertension, diabetes, hyperlipidemia, overweight, obesity and smoking.

Keywords: e-Health Apps, Metabolic Syndrome, Cardiovascular Risks, Healthcare Management

1.0 INTRODUCTION

Epidemiological research from throughout the world have clearly proven that Metabolic Syndrome (MetS) is becoming a global health problem, affecting not just the western cultures but also Asian populations (Saklayen, 2018). In Malaysia, the prevalence of MetS components such as obesity, dyslipidaemia, hypertension, and diabetes has reached epidemic proportions (National Health and Morbidity Survey, 2019). MetS

affects 25 – 44% of the adult population of Malaysia with the risk increasing with age (Lim & Cheah, 2016). Self-management programmes are recommended in international clinical guidelines for the management of MetS components, and they have been related to better health outcomes (Kennedy et al., 2007). In Malaysia, self-management tools for changing behaviour were based mainly on papers e.g. self-management booklet (Ramlie et al., 2014). Exponential use of mobile phones in middle-income countries such as Malaysia unlocks the potential to transform paper-based self-management booklet into an app using electronic health (e-health) technology (Kvedar et al., 2016). However, most of these apps were developed in the Western countries and high-income Asian countries such as Japan and South Korea (Jamshidnezhad et al., 2019; Kim et al., 2021; Sequi-Dominguez et al., 2020) which might not suit the needs of Malaysian local population. To our knowledge to this date, there is no self-management desktop or mobile app which is available to cater the needs of the Malaysian population especially for individuals with MetS.

2.0 OBJECTIVE

To develop an e-health self-management intervention consisting of mobile and desktop apps for patients with MetS and primary care providers in the Malaysian primary care setting.

3.0 METHODOLOGY

Content from the EMPOWER-SUSTAIN Global Cardiovascular Risks Self-Management Booklet[©] was evaluated for its suitability to be included in the prototype. Storyboard (Chen et al., 2019) and wireframe (Erguera et al., 2019) were designed. Based on the wireframe, a mock prototype was designed to demonstrate the graphic representations of the content and function. Using the iterative model of the software development life cycle, a working prototype was developed based on the mock prototype (Ali, 2017). Utility (Wright et al., 2017) and usability testing (Ruggiero et al., 2015) of the EMPOWER-SUSTAIN Mobile and Desktop Apps[©] were conducted. Topic guide for the semi-structured interviews was developed based on the 10 Nielsen's Heuristic Principles (Gonzalez-Holland et al., 2017). Utility testing for the desktop and mobile apps were conducted among primary care physicians (PCP). They were requested to "think-aloud" (Eccles & Arsal, 2017) while they performed tasks assessing the desktop and mobile apps. Usability testing for the mobile app was conducted among patients with MetS. They were given the mobile app to use for three weeks before the usability testing. They were requested to "think-aloud" while performing tasks assessing the mobile app. Interviews were audio and video recorded, and transcribed verbatim. Data was managed using Nvivo software (version 12) for thematic content analysis (Thomas & Magilvy, 2011).

4.0 RESULTS

A total of seven PCP and nine patients were recruited. Six themes (efficiency of use, user control & freedom, appearance & aesthetic features, clinical content, error prevention, and help & documentation) emerged from the utility and usability testing. Based on this feedback, both apps were refined to improve their utility and usability. The mobile app contains 8 sections: My Profile, My Cardiovascular Risks, My Treatment Targets, My Check Up, My Weight Management, My Smoking Habit and

My Medication. The desktop app contains 7 sections which include: Home, About Us, Awards, Publications, Events, Contact Us and Management Section. The Management Section consists of 4 subsections: 1. Register New Patient 2. Reception 3. Check-Up Station 4. Consultation.



Figure 1: The EMPOWER-SUSTAIN Self-Management Mobile and Desktop Apps[©]

5.0 CONCLUSION

The EMPOWER-SUSTAIN Self-Management Mobile and Desktop Apps[©] are the most comprehensive and evidence-based apps available in Malaysia to empower patients and health care providers in managing multiple CV risk factors (hypertension, diabetes, hyperlipidaemia, overweight, obesity and smoking) to prevent heart attack and stroke. The apps are currently being used at a primary care specialist clinic. The EMPOWER-SUSTAIN Mobile and Desktop Apps[©] are ready for commercialization.

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(A-ST045) SOLAR STRIDE CRUISER

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ABSTRACT

The invention of the solar-powered walking bicycle, like the Lopifit bike, is a revolutionary way to combine exercise and transportation. This one-of-a-kind car is powered by electricity and has solar panels built in to make energy. It is an eco-friendly and healthy way to get around cities. Basically, it blends the ease of walking with the efficiency of cycling, making it a great solution to modern mobility problems. Lower carbon pollution and less reliance on fossil fuels are some of the environmental benefits of this technology that show how it can help make societies cleaner and healthier. Additionally, the addition of solar panels emphasises its commitment to sustainability, marketing it as an innovative solution in the search for more environmentally friendly modes of transportation. With an emphasis on being eco-friendly, the solar-powered walking bicycle changes the way we live in cities in a basic way. It could make a big difference in both people's health and the health of the world.

Keywords: Electric Scooter, Walking Bike, Healthy Body, Economical, Environment Friendly

1.0 INTRODUCTION

The solar-powered electric walking bike or scooter is a huge step forward in getting around cities and exploring for fun. Imagine a sleek, high-tech car that is decorated with solar panels that collect sunlight all the time to power your trip. With its electric motor, this gadget helps you move more smoothly, so you can make your way through busy cities without hurting the environment. The bicycle's structure is both light and strong, making it easy to move around in cities. Its foldable design also makes it easy to store and transport. Built-in LED lights make sure you can see during rides at night, and the ability to connect your phone wirelessly makes tracking easier. (Franklin & Pollette, 2021)

The technical details: The solar panels turn sunlight into electricity very effectively by using the power of photons to make a steady flow of electricity. The power is stored in a battery on the car, which you can use as a backup on your trips. The energy saved in the electric motor moves you forward with each step you take when it is turned on, whether you are going up steep hills or just getting around town(*Cycle Life - wiki.openmod-initiative.org*, n.d.). While this is going on, the solar panels keep working,

making sure that you always have energy to power your car or charge the battery for later use.

However, how does it show up in real life? The solar screen is not just a pretty addition; it is a completely new idea. Even though it might not be able to give you all the energy you need for your whole trip, it is a reliable friend that increases your energy needs and increases the distance you can travel with each beam of sunlight. In addition, its foldable design makes it easy to fit into your daily life, making it convenient while also being environmentally friendly(Moses & Moses, 2024)

. The solar-powered electric walking bike or scooter is a cutting-edge way to get around cities that is also environmentally friendly and useful. It makes being eco-friendly and normal life easy.

2.0 OBJECTIVE

The target market for the Lipofit Electric Walking Bike is people who want a cutting-edge way to get around and stay fit. To do this, it will be important to stress its innovative features, such as its ability to run on solar power and the health benefits of walking. The idea is to change the way people move around in cities and encourage them to make environmentally friendly choices. The goal of this effort is to get more people to use Lopifit to create a culture that puts health and community involvement first. In this way, it hopes to help reach the bigger goal of making societies healthy and stronger to deal with the problems that come with living in the digital age.

3.0 METHODOLOGY

A solar-powered electric walking bike or scooter is poised to transform urban mobility and leisurely exploration. Picture this: sleek solar panels adorn its body, constantly soaking up sunlight for on-the-go charging. Coupled with an electric motor, effortlessly aiding your movement, it promises an eco-conscious journey through the bustling city streets. This marvel boasts a lightweight, robust frame, effortlessly manoeuvring through urban landscapes, while its foldable design ensures easy storage and transport. Safety is not forgotten either, with built-in LED lights illuminating your path during nighttime rides, all while your smartphone guides the way with seamless connectivity.

Now, let us dive into the mechanics. The solar panels ingeniously convert sunlight into electricity, a dance of photons exciting electrons to create a steady current. This energy finds its home in the onboard battery, a reservoir ready to power your adventures. As you activate the electric motor, whether for a boost during a steep incline or a swift ride through the city, this stored energy springs to life, propelling you forward with each stride. Even as you cruise, the solar panels diligently continue their work, ensuring a continuous flow of energy to either power your ride directly or replenish the battery for later use. (How Does Solar Work?, n.d.)

But how does it all come together practically? The solar panel is not just a flashy addition; it is a game-changer. While it may not single-handedly power your journey, it acts as a steadfast companion, supplementing your energy needs and extending your range with each beam of sunlight. Plus, its foldable design ensures your urban

companion easily tucks away when not in use, fitting seamlessly into your daily routine. With this innovative blend of sustainability, functionality, and practicality, the solar-powered electric walking bike or scooter emerges as the ultimate solution for urban exploration, seamlessly merging eco-consciousness with everyday convenience.



Figure 1: This illustration depicts the sleek design and innovative features of the solar-powered walking bicycle, showcasing its solar panels folded under the belly, detachable seat, and integrated LED lights. Through adherence to international publishing standards and the adoption of a clear and concise writing style, this research seeks to advance sustainable urban transportation and promote healthier lifestyles globally by disseminating the knowledge and insights gained from the development and analysis of the solar-powered walking bicycle.

4.0 RESULTS

The results from our study indicate that solar-powered electric walking bikes or scooters offer numerous advantages that can positively impact communities. Solar cars, by utilizing solar energy to charge their batteries, significantly reduce reliance on fossil fuels, thus minimizing greenhouse gas emissions and promoting sustainability. These vehicles provide a convenient and eco-friendly means of transportation, aiding in errands and trips with their electric motor assistance and foldable design for easy storage and portability. Their usage can contribute to positive changes in urban transportation, reducing traffic congestion and encouraging physical activity during commutes. Moreover, solar panels integrated into these vehicles serve as built-in chargers, continuously replenishing the battery during travel and reducing reliance on traditional electricity grids. Factors influencing their effectiveness include sunlight exposure, solar panel efficiency, battery capacity, and electric motor optimization. Overall, this methodology advocates for environmental responsibility, user convenience, and healthier lifestyles, making solar-powered electric walking bikes or scooters a sustainable and practical option for urban commuting and leisure travel, further enhanced by their incorporation of solar panels.

5.0 CONCLUSION

In summary, the Solar powered walking bicycle which is Lopifit bike, offers a unique blend of transportation and exercise. By using electricity for propulsion and solar panels to generate electricity, it is environmentally friendly and promotes physical activity through a combination of walking and pushing. These bikes contribute to less pollution and healthier lifestyles(McLaughlin, 2021). Incorporating solar panels adds to their sustainability. Such innovations reflect a positive shift towards greener and healthier transportation options, aligning with modern trends and the potential for economic growth driven by technology.

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(A-ST046) DEVELOPMENT OF A PAPER-BASED BIOSENSOR FOR RAPID DETECTION OF BREAST CANCER

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ABSTRACT

Breast cancer is one of the most life-threatening diseases among millions of people worldwide. Early detection and diagnosis can increase the chance of successful treatment. This study aimed to develop an affordable paper-based biosensor for rapid detection of breast cancer biomarkers antigens (carcinoembryonic antigen (CEA) and CA-153) in peripheral blood. Paper-based biosensor techniques have been known to offer the advantages of producing simple, low-cost, and portable testing devices. The result was easily analysed by detecting the colour change due to antibody-antigen binding. The paper strip will be coated with specific antibodies against CEA and CA-153 and serve as a substrate. The blood sample from the finger prick will be loaded onto the sample pad and allowed to be absorbed, initiating migration to the strip. The sample flows through the conjugation pad containing gold particle-conjugated antibodies. A positive result indicates the presence of CEA and CA-153 antigens, which can be observed by double-coloured lines in the detection pad. A control line indicates the functionality of the kit. The absence of a double-coloured line indicates a negative result. By providing a quick and efficient way to test for breast cancer, the rapid test kit has the potential to save lives and improve the overall quality of healthcare for millions of individuals worldwide.

Keywords: Breast cancer, biosensor, carcinoembryonic antigen, CA-153

1.0 INTRODUCTION

Breast cancer is the leading cause of cancer-related death worldwide and in Malaysia. Approximately 2.2 million new cancer cases and more than 10 million deaths occurred in 2020. It is approximately more than 680,000 deaths among women globally, as reported by the World Health Organization/International Agency for Cancer Research in the '2020 Global Cancer Report' (Sung et al., 2021). In Malaysia, breast cancer accounts for 19% of all cancer cases, with one out of five cancer patients diagnosed with breast cancer. Malaysian women's age-standardized incidence rates of breast cancer have been rising, reaching 34.1 in 2016 (Azizah et al., 2016). Over the past few years, there has been a gradual rise in the occurrence of breast cancer, particularly among adolescents (Fernandes et al., 2023). Recently, an estimated 47.9% of women in Malaysia were diagnosed with cancer at Stage III and IV, despite the implementation

of early screening, prevention, and control programmes (Azizah et al., 2019; Dahlui et al., 2011; Islam et al., 2018). For over three decades, carcinoembryonic antigen (CEA) and cancer antigen 15–3 (CA15-3) have been recommended as serum tumour markers in the clinical management of breast cancer (Shao et al., 2015). CA15-3 is a large glycoprotein (300-450 kDa) produced by the apical surface of epithelial ducts and acinic breast cells and is subsequently released into milk. CA15-3 is found in the bloodstream in cases of cancerous breast morphology disruption (Fejzić et al., 2015). Meanwhile, the CEA is a glycoprotein in the human digestive system, which plays a crucial role in cell adhesion. It is frequently elevated in the blood, indicating tumour metastasis (Bidard et al., 2012; Yerushalmi et al., 2012). Clinical practice has focused on early breast cancer detection and treatment to minimise patient mortality and enhance the quality of life. Currently, breast cancer is screened and diagnosed using various methods such as imaging, ultrasound, pathology, and serum tumour marker detection (Luo et al., 2023). Despite the accessibility of advanced therapeutic approaches and detection technologies, mortality and morbidity due to breast cancer remain significant issues worldwide. Moreover, conventional screening approaches require expensive costs, are time-consuming, and are inconvenient for follow-up screening. Therefore, a better prognosis for the survival of cancer patients depends on early detection. Developing a significant, cost-effective, and user-friendly paper-based biosensor antigen home test kits can revolutionise cancer treatment.

2.0 OBJECTIVE

This study aims to develop an affordable paper-based biosensor for rapid detection of breast cancer biomarkers antigens (carcinoembryonic antigen (CEA) and CA-153) using peripheral blood.

3.0 METHODOLOGY

A paper-based biosensor will be developed based on the principle of lateral flow assays (LFA). The LFA will be composed of four main components: a sample pad, conjugate release pad, test pad, and absorbent pad. These components will be securely attached to a supporting card for secured and appropriate handling (Figure 1). The sample pad enables the appropriate interactions of peripheral blood samples that contain CEA/CA153 antigens on the conjugate pad and the nitrocellulose membrane. It also manages and distributes sample flow homogeneously. The conjugate pad contains antibodies that are specific to the antigen. The conjugate pad then allows the release of molecules (fluorescence) that are conjugated to the antibodies towards the test pad. The membrane between the conjugate pad and the test pad is important for the interaction of conjugate molecules with the target antigens. It will also provide the surface for the interaction of conjugate molecules at the border of the test line and control line. The test line shows the colour change that indicates the concentration of the target analytes for qualitative analysis. On the other hand, the control line represents the positive capillary flow of the sample. The absorbent pad is designed to maintain the capillary action rate and prevent the sample's backflow (Koczula & Gallotta, 2016).

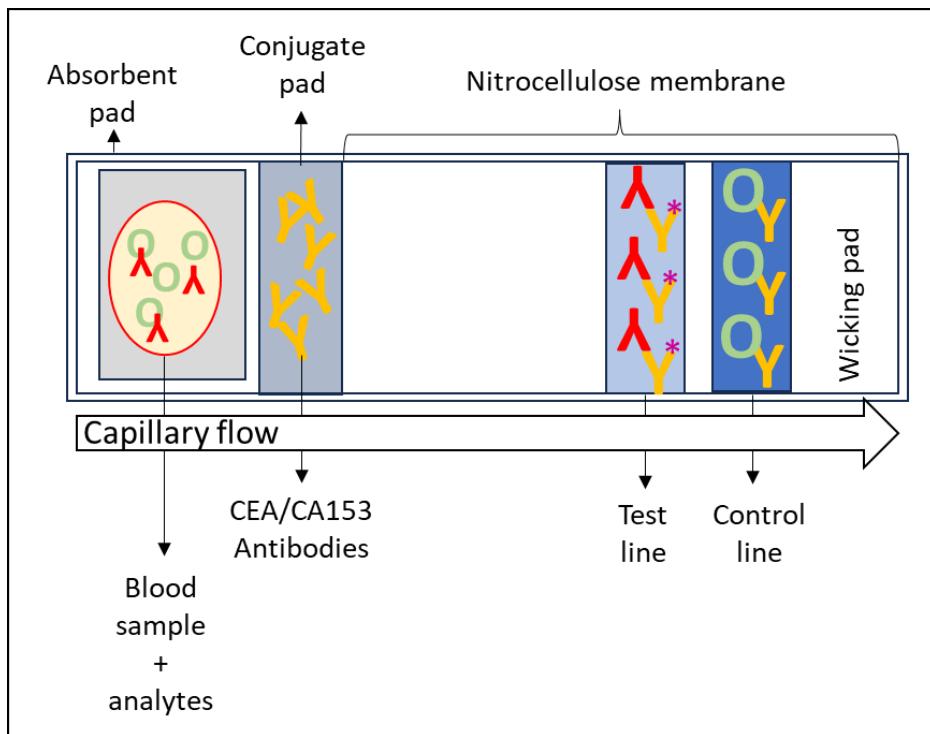


Figure 1: Description of a paper-based biosensor

4.0 RESULTS

Early detection of breast cancer is important for enhancing patient survival rates. This study introduces a novel paper-based biosensor for rapid detection of breast cancer biomarkers (CEA and CA15-3). This biosensor utilises the idea of the LFA approach to provide a cost-effective, user-friendly, and rapid diagnostic solution. In contrast to conventional diagnostic procedures, this biosensor only requires a small amount of sample (peripheral blood) and rapid processing duration with immediate findings, which is convenient for the user. This biosensor's price and simplicity could significantly decrease the expenses associated with breast cancer screening and diagnosis, making it a financially feasible alternative for patients and healthcare systems.

5.0 CONCLUSION

Early detection of breast cancer is crucial for better prognosis. Developing a simple and inexpensive detection approach can decrease the rate of morbidity and mortality of cancer patients. Thus, this research introduces a novel paper-based biosensor for rapid detection of breast cancer biomarkers. The innovation of this biosensor will have a significant impact on human health and the economy of healthcare systems.

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(A-ST048) BIOSHELL: SUSTAINABLE PHARMACEUTICAL CAPSULES FROM RECYCLED FRUIT PEELS

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ABSTRACT

Traditional pharmaceutical capsules are made from animal-derived gelatine and synthetically from hydroxypropyl methylcellulose (HPMC). Both sources face sustainability issues, the animal-derived gelatine raises concerns related to animal welfare. Furthermore, both sources lead to environmental degradation because of intensive resource use and chemical processes. BioShell is an organic capsule that was developed from fruit peels to solve sustainability and animal welfare issues. Around 1.3 billion tonnes of food produced for human consumption worldwide is wasted. This led to significant environmental and economic issues. The improper disposal of food waste also can contribute to greenhouse gas emissions from landfill sites as the common food waste treatment. Recycling food waste can reduce waste production, especially in the food and beverage (F&B) production industry. The objective is to develop capsules used for pharmaceutical industries from fruit peels that come from the waste of F&B industries. The raw materials of fruit peels like oranges and apples are collected from the F&B industries. These fruit peels will be extracted by an enzymatic process to extract the pectin and proteins that can be converted into biopolymers and transformed into capsules called BioShell. The BioShell are an innovative capsule developed in Malaysia, that is produced from food waste and is useful for pharmaceutical industries. This capsule can reduce the food waste that needs to be treated by recycling it to produce useful products in the pharmaceutical industry.

Keywords: Recycling, Food Waste, Sustainability, Bio Capsule, Pharmaceutical

1.0 INTRODUCTION

The Food and Agriculture Organisation (FAO) of the United Nations has determined that every year, over 1.3 billion tonnes of food, or more than one-third of all food produced, is lost, or wasted along the food supply chain from basic production to ultimate consumption (Nordin et al., 2020). As discussed by Thyberg & Tonjes, 2016, food waste is food intended for human consumption but thrown away or not eaten by people. Food waste was divided into three categories by the European Commission: food lost during the production phase, food waste that could have been consumed but was lost during consumption, and avoidable food waste that could have been consumed but was lost during consumption (Garcia et al., 2017). Reducing food waste

can be one strategy to preserve sustainable growth as 95% of food waste disposed of in landfills leads to the emission of methane gas and other greenhouse gasses (Quested et al., 2011). Sources of food waste may come from the food industry during the production phase including fruit peels, leaves, stems, and seeds.

The idea is to reduce inedible food waste by upcycling the waste collected from the food industry to produce products that may benefit humans. This innovation is to extract pectin from the fruit peels to produce capsules for pharmaceutical industries. Interestingly, up to 50% of the weight of the fruit is made up of peel waste, typically burned or thrown in the trash. By using these byproducts more, waste, and environmental issues may be decreased. In addition, this material has a great deal to use in active packaging systems because contains an abundance of bioactive components, which permit significant anticancer, antibacterial, and antiviral activity (Hanani et al., 2018). Thus, this study aims to develop a capsule called "BioShell" that can be applied by pharmaceutical industries in preparing capsules for medication without interfering with the pharmacodynamics of the active ingredients.

2.0 OBJECTIVE

The objective of this study is to develop a capsule used for pharmaceutical industries from fruit peels that come from the waste of food and beverage industries. The proposed rapid test kit is designed to be low-cost and convenient to use.

3.0 METHODOLOGY

The unprocessed orange and apple fruit peel waste is collected from the food and beverage industries in Johor Bahru, Johor. After cleaning and chopping them into small pieces, the peels are dried for 48 hours at 30°C in a cabinet dryer. The dried peels are milled into powder by a mill machine and stored in the freezer before further procedure. Briefly, 500 g of powdered peels are dissolved in 4000 ml of deionised water at the ratio of 1:8 (w/v) with pH 1.65 adjusted with concentrated sodium hydroxide (NaOH) and hydrochloric acid (HCl). Then, the mixture is placed for one hour in a water bath (95 °C) and cheesecloth is used to filter and separate the residue. The filtrate is added with 95% ethanol at a filtrate-to-ethanol ratio of 1:2 and left for 12 hours. After removing contaminants with three washes of 70% ethanol and then undiluted ethanol, the precipitated pectin is collected by filtering it through cheesecloth and drying it in a vacuum oven. This pectin extraction method is modified and adopted from Obarisiagbon et al. 2023.

16g of pectin is weighed and dissolved in 384 g of distilled water to form a gel-like mixture. The gel-like mix is transferred into a glass box. After being dipped into the gel mixture, the capsule body mould with the capsule shell size 000 dimensions is flattened and heated at 50 °C in the oven. Utilising a size 000 capsule cap mould, the same procedure is repeated. The gel mixture is reheated until it melts. After being heated for 20 minutes in the oven, the capsule shell was once more dipped in the gel mixture and reheated to 50 °C until it dried and was taken out of the mould. Every capsule is tested for dissolution in acid solution, disintegration in water, and mechanical properties tests, including tensile and elongation tests. BioShell capsules that pass the test will be further used as capsules.

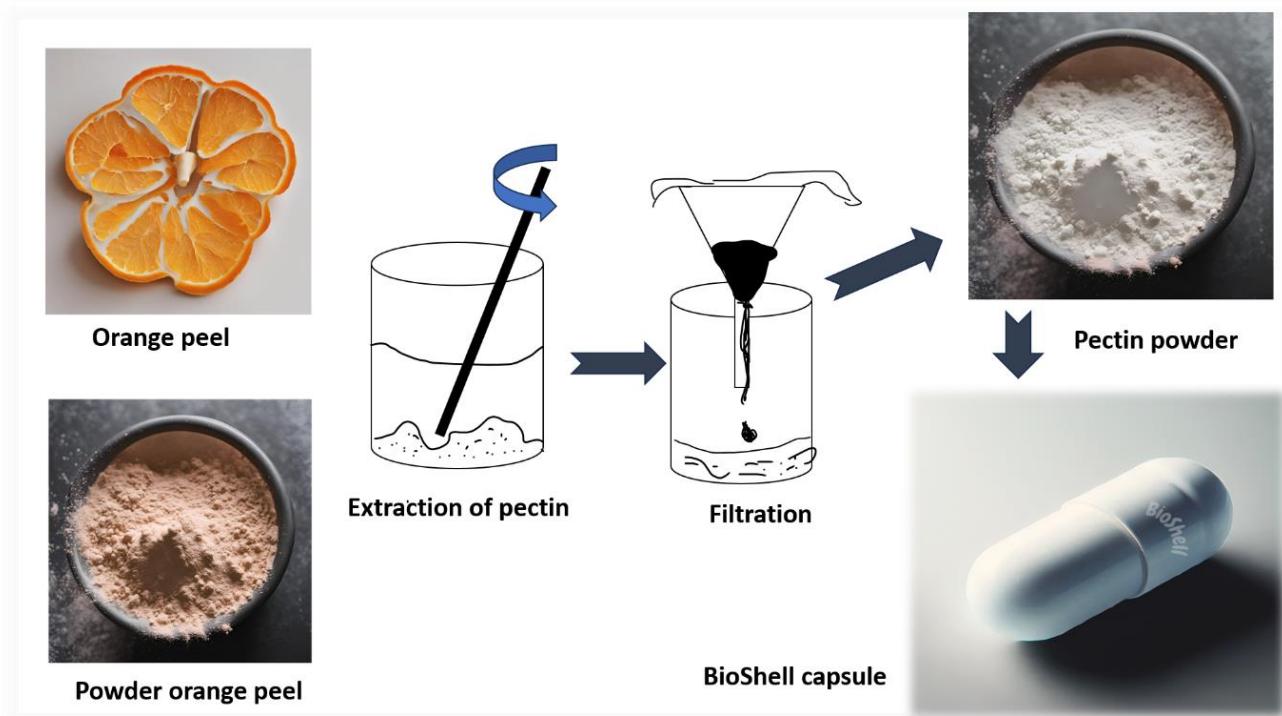


Figure 1: Development of BioShell from Pectin of orange peel

4.0 RESULTS

BioShell capsule that develops from the Pectin of the orange peel will be a potential capsule for drug delivery in the pharmaceutical industry. BioShell passed the dissolution, disintegration and mechanical properties test that can replace the traditional capsule that is produced from a material called gelatin, mostly based on pork products. Pectin, a polymer that is mainly extracted from plant products has strong adhesive qualities for creating gels and capsules. Because the capsule shells produced in this study resembled the specifications of pharmacopoeia capsule shells and the characteristics of commercial capsule shells, BioShell may be a substitute material for hard capsule shells. Moreover, pectin has been reported successfully used in controlled release systems, gastro-retentive systems, colon-specific delivery systems and mucoadhesive delivery systems (Sriamornsak, 2011).

5.0 CONCLUSION

It is proposed that this invention could solve one of the sustainable development issues in Malaysia. Producing BioShell from the non-edible fruit peel can reduce the production of food waste that may lead to harmful effects on the environment. Consequently, the development of a sustainable BioShell capsule supports the nation's efforts with its dedication to the Sustainable Development Goals.

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(A-ST050) KATA 3 in 1 POCKET TRANSLATOR DEVICE: REVOLUTIONISING COMMUNICATION AND BRIDGING LANGUAGE BARRIERS

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ABSTRACT

The rapid globalisation of the modern world has intensified the need for effective communication across language barriers. As people travel, work, and engage in cross-cultural interactions, understanding and being understood becomes crucial for success. The innovation of the KATA pocket translator device has emerged as a transformative solution, offering a compact and accessible tool to bridge diverse languages and cultures. KATA Pocket translator device, powered by advanced language processing technologies, revolutionises how individuals navigate linguistic differences. Designed to be a 3 in 1 smart device, KATA seamlessly integrates real-time translation capabilities for verbal interactions—where users can converse directly with the device—and text translation facilitated through its intuitive scanner or capture function. Moreover, it serves as a reliable dictionary, allowing users to access definitions of specific words swiftly. Its features include two built-in microphones with noise cancellation technology, a pen scanner and camera for accurate text translation, and online translation supporting 40 languages and 70 accents. This comprehensive functionality empowers users to communicate effortlessly, transcending the limitations imposed by their native language. From travellers to professionals conducting international business, the demand for reliable pocket translators reflects the universal need to overcome language barriers. For Muslim travellers, KATA is a valuable tool that allows them to scrutinise food ingredients in foreign languages through its scanner feature, helping them adhere to religious principles. The KATA pocket translator device thus revolutionises communication and travel experiences, empowering users to connect, explore, and engage with the world meaningfully.

Keywords: KATA Pocket Translator, Language Barriers, Real-Time Translation

1.0 INTRODUCTION

In today's rapidly globalising world, the need for effective communication across language barriers has become more critical than ever. As people travel, work, and engage in cross-cultural interactions, the ability to understand and be understood is essential for success. Language barriers can hinder personal and professional growth, leading to missed opportunities and misunderstandings. For instance, studies indicate that patients and families facing language barriers receive significantly less communication from healthcare teams than from English-speaking families, which can adversely affect health outcomes and patient satisfaction (Pocketalk, 2021).

In 2021, developments in pocket translators, such as the Pocketalk device, highlighted their growing capabilities. It became the first HIPAA-compliant device designed for healthcare professionals, allowing for seamless communication between caregivers and patients who speak different languages. It supports translations in 82 languages,

offers audio readouts, and includes features like text translation via a camera (Pocketalk, 2021). This translator device is particularly beneficial in dynamic environments such as tourism, where real-time communication is crucial.

Hence, the KATA pocket translator device has emerged as a transformative solution in response to this pressing need. Offering a compact and accessible tool to bridge diverse languages, this device has significantly transformed communication across linguistic barriers.

2.0 PRODUCT OBJECTIVES

The KATA pocket translator device aims to facilitate seamless communication across diverse languages and cultures, addressing the need for effective language translation. It empowers users by providing a compact, user-friendly tool with real-time verbal and text translation capabilities. Additionally, KATA enhances the travel experience for Muslim users by enabling them to scrutinise food ingredients in foreign languages, supporting adherence to dietary and religious principles. The device seeks to bridge language barriers and improve personal and professional interactions worldwide. Furthermore, according to a report, the global language translation device market is expected to reach a valuation of USD 3,166.2 million by 2032, growing at a compound annual growth rate (CAGR) of 10.4% from 2023 to 2032. This growth is driven by the increasing demand for seamless international communication across various sectors, including travel, healthcare, and business (The Brainy Insights, 2024).

3.0 INNOVATION AND DESIGN

KATA will be the first translator device to offer a comprehensive suite of translation capabilities produced in Brunei. The device is powered by advanced language processing technologies, revolutionising how individuals navigate linguistic differences. Designed to be a 3-in-1 smart device, KATA seamlessly integrates real-time translation capabilities for verbal and text interactions facilitated through its built-in microphone, intuitive scanner, and capture function, as shown in Figure 1. Moreover, it serves as a reliable dictionary, allowing users to access definitions of specific words swiftly. This multi-functionality is achieved through sophisticated hardware and software integration to ensure accuracy and user-friendliness.



Figure 1. KATA Pocket Translator Illustration Design

The KATA pocket translator also boasts several other advanced features, including water resistance, a rectangular shape, a touchscreen interface, and multiple connectivity options such as Bluetooth and Wi-Fi. It is chargeable, enhancing its portability and convenience for users on the go. Furthermore, KATA can translate languages from both soft and hard copies and voice inputs. It can also translate languages used by disabled individuals, enabling communication with those who use alternative forms of language.

3.1 Key Innovative Features

The KATA pocket translator device boasts a range of features designed to enhance user experience and functionality, as summarised in Table 1.

Table 1. KATA Pocket Translator Device Key Innovative Features

Key Features		Description
1.	Noise Cancellation	It is equipped with two built-in microphones with noise-cancellation technology. These microphones provide clear and accurate real-time translation during conversations.
2.	Voice Input Translation	Translates spoken language, enabling real-time verbal communication between speakers of different languages.
3.	Text Translation	The device includes a pen scanner and camera for accurate text translation, allowing users to translate written content quickly and efficiently.
4.	Dictionary Function	Users can access definitions and meanings of specific words, making KATA a comprehensive language tool.
5.	Multilingual Support	Online translation capabilities support 40 languages and 70 accents, ensuring broad applicability.
6.	User-Centric Design	The device is compact and portable, designed to be easily carried and used in various settings, from business meetings to travel adventures.
7.	Water Resistance	Designed to withstand exposure to water, ensuring durability and functionality in various environments.
8.	Rectangular Shape	Sleek and practical design, making the device easy to handle and carry.
9.	Touchscreen Interface	Intuitive and user-friendly touchscreen for easy navigation and operation.
10.	Bluetooth / Wi-Fi	Multiple connectivity options for seamless data transfer and communication.
11.	Chargeable	Equipped with rechargeable batteries, providing portability and convenience for users on the go
12.	Soft and Hard Copy Translation	Able to translate text from both digital documents and printed materials, offering versatility in translation tasks.

3.2 Product Novelty and SDG Alignment

KATA will be the first translator device to provide a complete set of translation features, making it a groundbreaking innovation in the field. It combines real-time verbal translation, text translation through capturing and scanning, and a quick dictionary

function in one compact device. With built-in microphones and advanced noise-cancellation technology, KATA ensures precise and accurate verbal translations during direct conversations. Its integrated camera and pen scanner enable users to capture and translate written text from various sources. For instance, Muslim travellers can use KATA to check ingredients written in foreign languages to ensure they adhere to dietary restrictions.

Given that, this innovation aligns with the United Nations Sustainable Development Goals (SDGs), particularly SDG 4 (Quality Education) and SDG 9 (Industry, Innovation, and Infrastructure). It facilitates access to education and information for non-native speakers, promoting inclusive and equitable quality education (United Nations, 2022; Planbox, n.d.). It fosters greater understanding and collaboration across cultures, contributing to innovation and improved global connectivity. Through these capabilities, KATA empowers individuals to engage more fully in a globalised world, supporting sustainable development and inclusive growth.

4.0 PRODUCT SIGNIFICANCE AND USER PERCEPTIONS

To assess the significance and user perception of the KATA pocket translator device, a pilot study survey was conducted using Google Forms. The survey sampled 55 participants who actively travelled or studied abroad to assess the perceived necessity and potential impact of the KATA pocket translator on users' communication experiences. Participants were asked to rate the necessity of the device, identify the most helpful feature, and indicate their likelihood of recommending the device to others. The results were then tabulated and analysed using IBM SPSS to provide an overview of the data. Frequency distributions, percentages, and cumulative percentages were calculated.

4.1 Product Necessity Rating

The data in Table 2 indicate a strong positive reception of the KATA pocket translator device among the participants. 61.8% of respondents found the device necessary, highlighting the critical need for practical communication tools in diverse languages. These reflect a significant demand for the KATA pocket translator device, particularly in environments where language barriers can impede personal and professional interactions. Moreover, only 10.9% of respondents deemed it moderately necessary, suggesting that while most users recognise its importance, a smaller segment finds it less critical but still useful.

Table 2. Product Necessity Rating

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Necessary	34	61.8	61.8	61.8
	Necessary	15	27.3	27.3	89.1
	Moderately Necessary	6	10.9	10.9	100.0
	Total	55	100.0	100.0	

4.2 Feature Preference

When examining the key features of the KATA pocket translator, the Text Translation by capturing or pen scanning feature emerged as the most favoured, chosen by 54.5% of participants. This preference indicates the high value placed on accurately and efficiently translating written content, which is essential for users of foreign languages in documents, signs, ingredients, and menus. The KATA translator's functionality aligns with the growing demand for reliable translation tools that facilitate communication across language barriers, making it an asset for travellers and professionals.

Table 3. Innovative Feature Preference

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Real-Time Verbal Translation	10	18.2	18.2	18.2
	Text Translation	30	54.5	54.5	72.7
	Dictionary Function	6	10.9	10.9	83.6
	User-Centric Design	9	16.4	16.4	100.0
	Total	55	100.0	100.0	

4.3 Likelihood of Recommendation

The willingness to recommend the KATA pocket translator's innovation to others is notably high, as shown in Table 4, with 69.1% of participants indicating they are very likely to recommend the device. This solid inclination to recommend suggests high user satisfaction and confidence in the device's capabilities. It reflects that users find the device necessary and trust its performance and utility enough to advocate for it among peers.

Table 4. Likelihood of Recommendation

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Likely	38	69.1	69.1	69.1
	Likely	17	30.9	30.9	100.0
	Total	55	100.0	100.0	

5.0 ACHIEVEMENT OF IDEA

Even though the KATA pocket translator device is still developing as a research-based innovation, the concept for this product was awarded second place in the Halal Product Innovation Competition 3.0, organised by the Halalan Thayyiban Research Centre at Universiti Islam Sultan Sharif Ali. This recognition emphasised the innovation's potential to bridge language barriers, particularly aiding Muslim travellers to inspect food ingredients in foreign languages, thus supporting adherence to dietary and

religious principles. The promising research demonstrates the device's potential to ensure compliance with Halal requirements.

6.0 CONCLUSION

The KATA 3 in 1 pocket translator device is the first innovation to offer comprehensive translation capabilities, namely real-time verbal translation for direct conversations, text translation through capturing and scanning, and a quick dictionary function. In summary, pocket translator devices represent a significant innovation in overcoming language barriers, with substantial benefits in various fields. This approach addresses various communication needs, making it a versatile tool for all users. Besides, the strong endorsement from survey results highlights KATA's promise to enhance global connectivity and improve overall communication efficacy. As such, the innovation of KATA facilitates personal and professional interactions and has the potential to revolutionise how people navigate linguistic differences, especially in bridging gaps and fostering more meaningful global interactions.

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(A-ST053) T.I. CALC: TOPOLOGICAL INDICES CALCULATOR APP

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ABSTRACT

Calculator apps are digital tools that can be used on mobile devices, tablets, or computers for performing mathematical calculations. MATLAB has become widely recognised as a powerful tool for developing calculator apps, utilising MATLAB App Designer's advanced capabilities. Topological indices are numbers that describe the topology of a graph and its properties. Over the last two decades, researchers have successfully correlated numerous topological indices with a variety of physical and physicochemical properties. The most significant types of topological indices of graphs are degree-based and distance-based topological indices. The degree-based topological indices studied in this research include the first general Zagreb index, the zeroth-order Randić index, and the reduced first Zagreb index. The distance-based topological indices include the Wiener index, the hyper-Wiener index, and the Harary index. In graph theory, a zero divisor graph is one in which the vertices are the zero divisors of a ring, and two vertices are adjacent if their product is zero. The set of vertices, the set of edges, and the degree of a vertex in the zero divisor graph for the integers modulo ring are determined in order to generate the programming code for the calculator app. This code is based on basic definitions and previous results in graph theory and ring theory. The development of this topological indices calculator app, which is named as T.I. CALC, uses MATLAB App Designer with user-friendly interfaces and features for computing the topological indices. This app has the capability of visualising and displaying the results.

Keywords: Topological Index, Zero Divisor Graph, Commutative Ring, MATLAB App Designer

1.0 INTRODUCTION

In the field of chemistry and materials science, topological indices are crucial in predicting the properties of molecules and materials. Topological index is a function that assigns a numeric value to a (molecular) graph that predicts its various physical and structural properties. This work can help the chemists and biologists to analyse the physical properties of the molecule in the simplest way without involving any laboratory work. The main difficulty in computing topological indices arises from the requirement for accurate and efficient mathematical techniques.

T.I. CALC, a topological indices calculator app, has been created to overcome these challenges by utilising the features of MATLAB App Designer. The app is intended to simplify and enhance the process of computing topological indices by

offering a user-friendly interface and robust computational capabilities. This app not only saves time but also enhances the accuracy and reliability of the results. This feature enhances the user's understanding and interpretation of the data, making T.I. CALC a valuable tool for both educational and research purposes.

The motivation behind developing T.I. CALC is to provide an accessible and efficient tool for computing these indices, particularly for degree-based and distance-based indices. The degree-based topological indices included in this study are the first general Zagreb index, the zeroth-order Randić index, and the reduced first Zagreb index. The distance-based topological indices consist of the Wiener index, the hyper-Wiener index, and the Harary index. It is specifically designed for computing topological indices of the zero divisor graph of integers modulo ring. The algorithms using MATLAB App Designer for T.I. CALC is based on fundamental definitions and existing results from graph theory and ring theory.

2.0 OBJECTIVES

The objectives in developing the T.I. CALC are stated as follows:

- i) To build new algorithms in T.I. CALC using MATLAB App Designer based on the general formulas of topological indices.
- ii) To design comprehensive and user-friendly interfaces, allowing users to easily interact with the calculator app.
- iii) To obtain and visualise the properties of the zero divisor graph for the ring and to calculate the topological indices of the graph.

3.0 METHODOLOGY

The methodology for developing T.I. CALC begins with determining the general formulas for some properties of the zero divisor graph for integers modulo ring, specifically the set of vertices, the set of edges, and the degree of a vertex. Subsequently, the general formulas for degree-based and distance-based topological indices are derived. Once these formulas are established, new algorithms are developed and implemented within the MATLAB environment using MATLAB App Designer. The user interface is designed to be clean and intuitive, allowing users to easily input data, perform calculations, and view the results. The design process utilizes drag-and-drop components and customizes their behaviour, incorporating features like custom input fields, advanced mathematical functions, and a user-friendly interface to enhance accessibility and ease of use. Thorough testing is conducted to ensure the app's accuracy and functionality, with results validated against known values from the literature or manual calculations. T.I. CALC ultimately provides a valuable tool for the rapid computation and analysis of topological indices, benefiting research in fields such as theoretical chemistry, network analysis, and other fields.

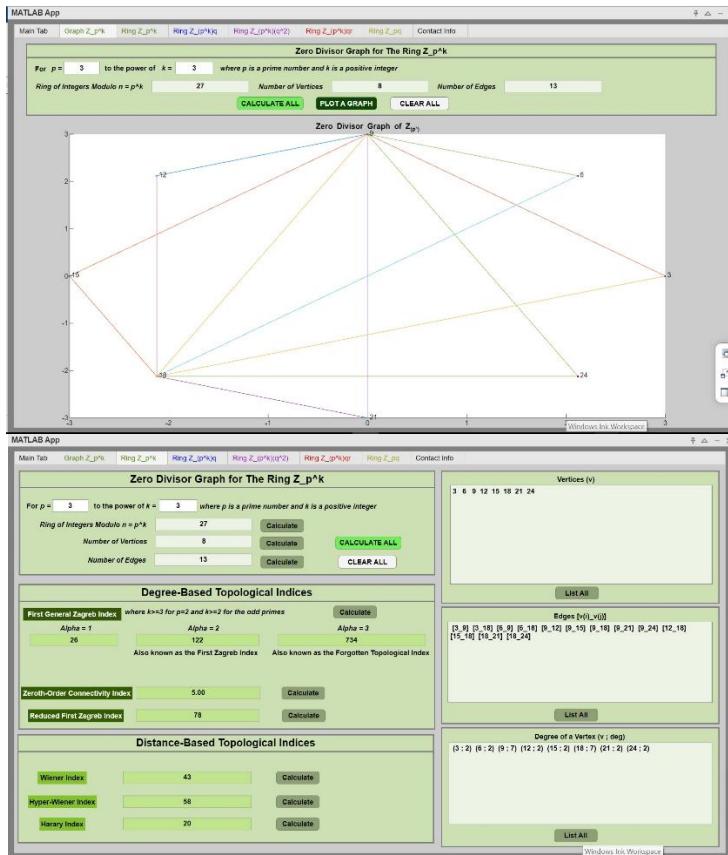


Figure 1: The user-friendly interface of T.I. CALC

4.0 RESULTS

Some advantages and novelty of T.I. CALC are included as follows:

- **Advantages**
 - i) Efficient and Accurate Computation: The algorithms of the calculator app are designed to efficiently compute topological indices, ensuring quick and accurate results.
 - ii) Visualization Capabilities: Its ability to provide visual representations of graph and the calculated topological indices.
- **Novelty**
 - i) T.I. CALC using MATLAB App Designer as the development base applies advanced concepts from graph theory and ring theory, particularly in calculating and visualisation tools of topological indices
 - ii) An amazing educational tool that can be used to explore and analyse graph features and encouraging future study in topological indices.

5.0 CONCLUSION

In conclusion, T.I. CALC is an innovative application that addresses the need for a specialized tool to compute and visualise topological indices of a graph. This calculator app is comprehensive and easy to use for researchers and students studying ring theory, graph theory and topological indices.

**(A-ST056) ENHANCING STEM EDUCATION THROUGH GAME-BASED
LEARNING: A CASE STUDY OF 'ENCHANTED ALCHEMICAL ADVENTURES OF
ACID AND BASE'**

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ABSTRACT

Educational resources are crucial for enhancing the effectiveness of lesson delivery. The Game-Based Educational Courseware embraces the 2024 Malaysian Teachers Day theme, "Guru Jauhari Digital Aspirasi Negara Madani," and introduces a revolutionary approach to education by transforming traditional courses into interactive and captivating experiences. This courseware incorporates digitally created educational resources, combining technology and education to create a flexible learning environment that caters to the varying needs of students. Traditional educational methods frequently encounter difficulties in properly captivating students, resulting in restricted academic achievements and disinterested learners. This courseware, created using the ADDIE Model, has two main goals: to encourage the study of STEM courses by employing interactive learning techniques, and to improve critical thinking abilities by including game-based learning that aligns with chemistry curriculum standards. The educational courseware, "Enchanted Alchemical Adventures of Acid and Base," utilises interactive exercises and multimedia components to engage students and enhance their learning experience. The programme incorporates the use of repetition and reinforcement in an interactive game format to guarantee the long-term retention of information. Initial results suggest that the courseware has notable advantages, such as being in line with curriculum standards, improving ICT skills, and promoting critical thinking and problem-solving abilities. Furthermore, it provides self-paced educational resources, enhancing the learning process. By utilising this groundbreaking method, instructors are able to establish enhanced learning environments that stimulate and encourage pupils. The Game-Based Educational Courseware not only aligns with curricular standards but also promotes dynamic and pleasant educational experiences, hence ensuring improved learning results.

Keywords: Game-Based Educational Courseware, STEM Education, Critical Thinking Skills, Game-Based Learning, Self Learning

INTRODUCTION

In secondary education, conventional teaching methods have primarily relied on traditional approaches centered around physical textbooks containing textual information and static images. While these resources serve as essential tools for knowledge transmission, they may not effectively engage all students. Many learners become disinterested and disengaged when passively consuming information from

textbooks, leading to a sense of monotony and disconnection from the learning process (Papastergiou,M.,2009). This disengagement particularly disadvantages STEM subjects, making it harder for students to understand and memorize concepts. This lack of engagement is especially pronounced in STEM subjects, where abstract concepts and complex theories can be difficult to grasp without interactive and dynamic instructional methods. The result is often a superficial understanding of the material, where students can memorize facts for tests but fail to develop a deep, conceptual understanding necessary for advanced study in science and technology fields. The courseware transforms traditional chemistry lessons into an immersive game-based adventure (Gee,2003). Students navigate through a magical world as budding alchemists, completing quests and solving puzzles that are directly related to the curriculum content. To cater to diverse learning styles (Mayer,2009), the courseware integrates various multimedia elements, including text, pictures, videos, voice-overs, and background music. This multimedia approach not only makes learning more engaging but also helps students better understand and retain complex concepts. By making chemistry fun and interactive, the courseware aims to reverse the declining trend of students enrolling in science streams (Chen, H. Y., Liao, C. H., Chang, C. H., & Wu, H. K., 2018). The engaging content helps demystify scientific concepts, making them accessible and enjoyable for all students.

In alignment with the theme of this year's Teachers' Day, "Guru Jauhari Digital, Aspirasi Negara MADANI," the courseware enhances ICT (Information and Communication Technology) skills among teachers. It provides educators with modern tools and techniques to deliver lessons more effectively (Mishra & Koehler, 2006). The courseware encourages creative thinking and problem-solving skills among future educators, supporting the Ministry of Education's targets for fostering innovation in teaching methods. Recognizing the diverse needs of learners, the courseware is designed to be inclusive and adaptive (Rose & Meyer, 2002). It offers features that cater to special needs students, providing an alternative to traditional textbook-based learning environments. The courseware is designed to be integrated into the curriculum of secondary schools to make chemistry more engaging and accessible. It is also suitable for tertiary institutions offering bachelor's degrees in Education, providing future educators with innovative teaching tools. The adaptive design ensures that students with special educational needs can also benefit from this interactive learning approach. By incorporating game mechanics into learning, students are more likely to stay engaged and motivated (Prensky, 2001). Interactive simulations and real-time feedback help students grasp complex chemistry concepts more effectively.

The Game-Based Educational Courseware revolutionises conventional chemistry courses by converting them into an engaging and interactive experience. Students assume the roles of aspiring alchemists, exploring a fantastical realm complete with challenges and enigmas that exactly correspond to the curriculum material. This creative method utilises a range of multimedia components, such as text, images, videos, voice-overs, and background music, to accommodate different learning preferences.

METHOD

The courseware is intentionally designed to be inclusive and flexible in order to accommodate the varying needs of learners. It provides customised features for students with unique needs, offering a valuable alternative to standard learning settings that rely on textbooks. The courseware is specifically designed to be integrated into the secondary school curriculum, with the aim of making chemistry more captivating and easily understandable. Utilising interactive simulations and providing real-time feedback enhances students' comprehension of intricate chemistry subjects with greater efficacy. Utilising multimedia components improves the ability to remember and retrieve information. The courseware also facilitates the cultivation of critical thinking, problem-solving, and ICT abilities in both students and teachers. This courseware has been created utilising advanced PowerPoint abilities and techniques. It is designed to be easily available on any browser and device, providing users with flexibility and a user-friendly experience.

The development of the Game-Based Enchanted Alchemical Acid and Base Courseware followed the **ADDIE model**, which comprises five phases: Analysis, Design, Development, Implementation, and Evaluation. Each phase was meticulously executed to ensure the creation of a high-quality, engaging educational tool. In the **Analysis phase**, a comprehensive needs assessment to identify the gaps in current chemistry education, particularly in the areas of acids and bases, revealed a lack of engagement with traditional teaching methods. We also reviewed curriculum standards to align the courseware's content with educational requirements. The target audience was defined as secondary school students.

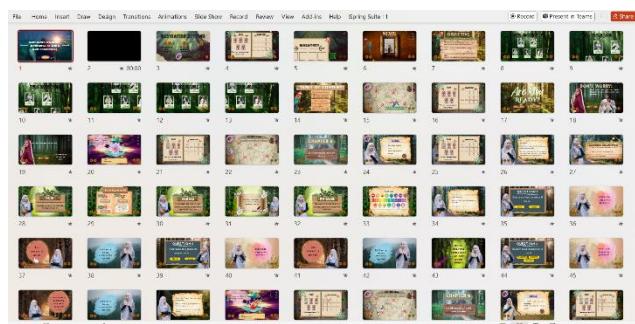


Figure1: Example of the layout design of the game-based courseware



Figure 2:Using ADDIE MODEL to develop the Game-Based Educational Courseware is shown in the Digital Poster

During the **Design phase**, the courseware's learning objectives and outcomes been developed. We created detailed storyboards and scripts to integrate educational content seamlessly with game elements. The design included interactive simulations, content and quizzes to enhance engagement. Visual and audio elements, such as animations, voice-overs, and background music, were carefully selected to complement the storyline and reinforce learning objectives. We also planned for adaptive learning paths to cater to varying student abilities. In the **Development phase**, the actual creation of the courseware took place. team members collaborated to bring the design to life. The interactive modules, animations, and game mechanics were developed using basic educational technology tools with advanced skills. Continuous testing was conducted to ensure functionality and usability. The **Implementation phase** involved deploying the courseware in selected pilot schools. Briefing sessions were conducted for educators to familiarize them with the courseware and its features. The team members provided technical support and resources to ensure smooth integration into the existing curriculum. Students began using the courseware, and their engagement and performance were closely monitored. In the **Evaluation phase**, both formative and summative assessments were conducted to measure the courseware's effectiveness. Data were collected on student engagement, understanding of chemistry concepts, and overall satisfaction. Feedback from educators and students was analyzed to identify areas for improvement. The results showed a significant increase in student interest and comprehension in STEM subjects. Based on the findings, final adjustments were made to enhance the courseware further. By following the ADDIE model, the development of the Game-Based Enchanted Alchemical Acid and Base Courseware was systematic and effective, resulting in a robust educational tool that promotes STEM education and fosters a deeper understanding of chemistry through engaging, interactive learning.

FINDINGS



Figure 3: Positive feedback related to the contents

The game-based educational courseware underwent a pilot test with 27 form four students, yielding overwhelmingly positive feedback. Students reported heightened levels of understanding, follow the syllabus, find new content and updates, the content is appropriate with the culture and social contexts of the Malaysian students, increased engagement compared to traditional methods, and a sense of enjoyment during the learning process. The efficacy of game-based educational courseware in assisting STEM students is extensively documented (Annetta, Minogue, Holmes, & Cheng, 2009). By offering a captivating and participatory educational setting, it facilitates the cultivation of a more profound comprehension of scientific principles among students. This method not only improves academic achievement but also fosters a better enthusiasm for STEM subjects. The courseware's capacity to enhance the enjoyment and accessibility of learning has the potential to substantially augment student enrollment in science streams, thereby satisfying a crucial requirement in contemporary education.



Figure 5: High level of motivation using the game-based educational courseware.

The Game-Based Educational Courseware is a notable progression in the field of chemical teaching. By converting conventional teachings into immersive experiences, it captivates students, accommodates various learning requirements, and provides educators with cutting-edge resources. This technique offers the potential to improve the whole learning experience, by making chemistry more attractive and easily understandable for all students. Ultimately, it will help to establish a firmer basis in STEM education. The courseware's inclusive design and adaptability guarantee that all students, irrespective of their learning style or needs, can derive substantial and captivating educational benefits.

CONCLUSION

The "Game-Based Enchanted Alchemical of Acid and Base Courseware" addresses a critical challenge in Malaysian education: low student enrollment in STEM fields. By integrating gamification with educational content, this innovative courseware transforms traditional chemistry lessons into engaging and interactive experiences, making learning both enjoyable and effective. This initiative aligns with Malaysia's educational goals of enhancing digital literacy and preparing students for a technologically advanced future. The Game-Based Enchanted Alchemical of Acid and Base Courseware has reached Technology Readiness Level (TRL) 7. The justification for this grade lies in the fact that the product has undergone thorough pilot testing, during which input was collected and used to make essential modifications and enhancements. After making these changes, the courseware has been put into use in three distinct educational institutions, including an international school. This showcases its efficacy and dependability in various educational settings. In addition, the courseware has obtained official copyright, guaranteed its protection as intellectual property and confirming its authenticity and originality. The courseware's successful implementation and functioning in these real-world environments demonstrate its functionality and its ability to meet the educational requirements and standards necessary for wider use. Therefore, TRL 7 precisely indicates the advanced level of development of the courseware, emphasising its preparedness for extensive use and additional verification in practical educational settings.

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(A-ST063) ADVANCING SUSTAINABLE AND RAPID PRODUCTION OF HYDROGEN VIA NOVEL BOROPHENE CATALYST

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ABSTRACT

Hydrogen is a renewable energy resource with potential to replace fossil fuels and does not cause environmental concerns during energy generation. However, current mass-production methods involve fossil fuels, prompting urgent research into green hydrogen generation. The recent emergence of borophene oxide (BO), a material resembling graphene, has been theorized to enhance hydrogen production when used as a catalyst. Nevertheless, practical test in such application was not done. Thus, in this project, borophene was synthesized via modified Hummers' method and used to hydrolyze sodium borohydride, a reaction that produces hydrogen to proof the mentioned theory. Plate-like BO was successfully produced and characterized. More importantly, the experimental results showed that BO performed significantly better than TiO₂, a common photocatalyst in where BO was able to produce 50 mL of H₂ in only 90 s. However, further doping the BO with Fe reduced the catalytic performance and took at least 3.33 times longer than BO to produce 50 mL of H₂. Despite this, the project has successfully proven the catalytic properties of borophene in hydrogen production and borophene could be utilized in the future in the generation of sustainable energy.

Keywords: Borophene; Graphene; Hydrogen; Green Energy; Hydrogen Evolution Reaction

1.0 INTRODUCTION

Hydrogen (H₂) has emerged as an alternative to fossil fuels due to its exceptional properties of zero pollution emissions and high energy which has drawn considerable interest recently in energy utilization as a clean energy carrier. On 5 October 2023, the Malaysian government introduced the Hydrogen Economy Roadmap (HETR) to establish itself as a prominent hydrogen-based economy, generating revenues exceeding RM400 billion by 2050. Thus, this research may be able to contribute efforts to the Malaysian Government in HETR. Extensive research was done to produce renewable hydrogen which is environmentally friendly as it does not produce

greenhouse gas emissions during production. One such method proposed is the hydrolysis of hydrogen-rich compounds, such as sodium borohydride. Traditionally graphene (Gr) has been used in NaBH_4 hydrolysis, however, borophene, a crystalline atomic monolayer of boron, emerged as a new technology with greater catalytic activity potential than graphene in hydrogen evolution reaction which is theorised due to its outstanding properties which enable high catalytic activity from its extreme electron deficiency and abundant active sites.

2.0 OBJECTIVE

1. To synthesize BO and characterize its physicochemical properties.
2. To evaluate the effects of various process parameters (reaction time, catalyst and reactant amounts) on H₂ production.
3. To compare the kinetic profiles of H₂ production induced by various commonly used catalysts alongside borophene.

3.0 METHODOLOGY

Borophene was produced using a modified Hummer's method. Borophene itself is highly soluble in water which is attributed by its hydrophilic properties and being a nanocatalyst which has a high surface ratio over volume ratio, contributing its ability as a catalyst.

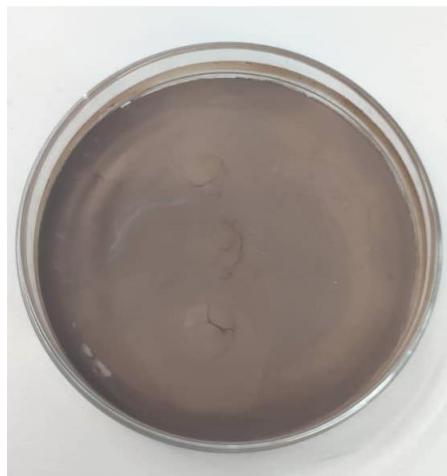


Figure 1: Synthesized dried BO.

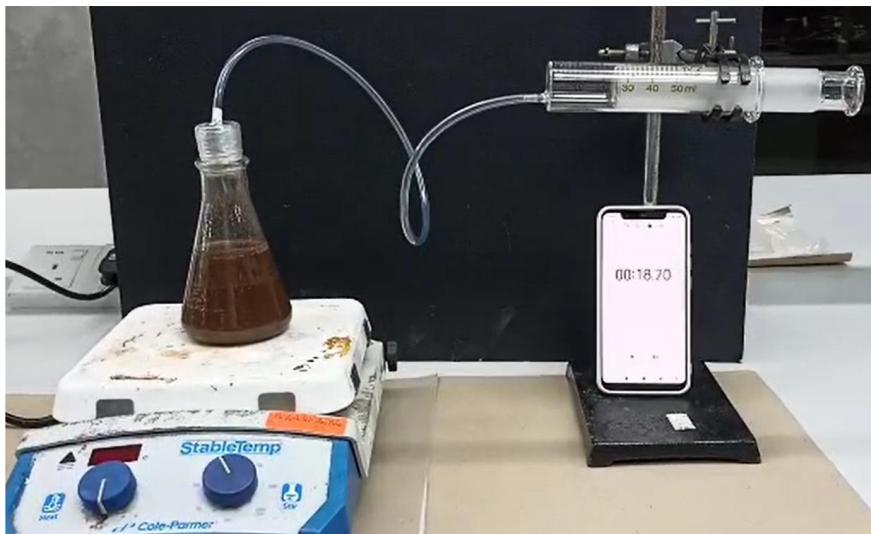


Figure 2: Setup of NaBH_4 hydrolysis.

4.0 RESULTS

This study showed that the synthesis of BO as a novel catalyst for the purpose of H_2 production via NaBH_4 hydrolysis. Research on the comparison between nanomaterials (as catalysts) is scarce and limited, which makes this study necessary. Here, the H_2 production of NaBH_4 hydrolysis was carried out with BO and TiO_2 .

5.0 CONCLUSION

The experimental results showed that BO performed significantly better than TiO_2 , a common photocatalyst in where BO was able to produce 50 mL of H_2 in only 90 s. However, further doping the BO with Fe reduced the catalytic performance and took at least 3.33 times longer than BO to produce 50 mL of H_2 . Despite this, the project has successfully proven the catalytic properties of borophene in hydrogen production and borophene could be utilized in the future in the generation of sustainable energy

(A-ST075) CREATIV-AR APPS: STEM MODEL BASED LEARNING ON AUGMENTED REALITY DRIVEN-TECHNOLOGY

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ABSTRACT

The integration of innovative technology in modern education has revolutionised the conventional educational framework. Modern technology overlays digital information like audio, video, and graphics on top of real-world environments through the usage of augmented reality (AR) and programming-based teaching and learning. Furthermore, its usefulness can be used to science, technology, engineering, and mathematics (STEM) education as well as technical and vocational education. While AR has been shown to have great educational potential by numerous researchers, there has been limited empirical study investigating its incorporation into STEM education for this type of cutting-edge technology inquiry. Finding the best augmented reality technology for STEM education in accordance with national educational compatibility is necessary. Therefore, the purpose of this study is to determine the AR technology that appropriate for STEM education. Its goal is to improve pupils' capacity for creativity, critical analysis, and problem-solving, in order to develop the Creativ-AR as a model-based in STEM education. This research begins over preliminary analysis, through the qualitative survey to investigate the needs of the students and teacher. Plus, interview session with the practitioners also conducted to gather the module contents associated to STEM curriculum. The design and development of the Creativ-AR started by determination of the type of AR that match to module content through the details story board, 3D simulation model and programming using Unity and Blender. The module contents also verified and validated by the expert in this area. As a result, the Creativ-AR prototype is totally accepted and get positive feedback from students and teacher on the prototype demonstration, including critical thinking abilities and improving STEM education as a whole. The findings of this study could have a big impact on how useful teaching methods and resources are created for incorporating augmented reality into STEM curriculum.

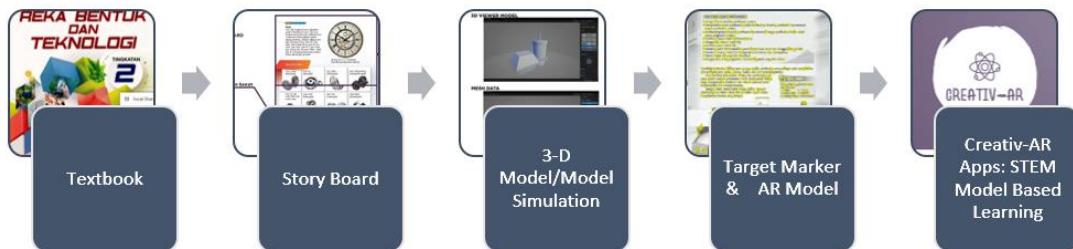
Keywords: Virtual Reality, Augmented Reality, Innovation, Advanced Technology, Revolution

PRODCUCT DESCRIPTION

Creativa revolutionizes STEM education in secondary schools with its innovative Augmented Reality (AR) technology. Specifically designed for RBT (Technology Design) subjects, this smart application serves as an invaluable teaching aid, enhancing both the teaching and learning experiences. By utilizing AR, Creativa transforms static RBT textbooks into dynamic, interactive learning tools. With just a smartphone, students and teachers can bring textbook objects and diagrams to life in

stunning 3D animations, providing a deeper understanding of complex concepts and fostering a more engaging educational environment.

DIAGRAM/FLOW PROCESS/SCREEN SHOT AND RELATED VISUAL



Flow process of the Creati-AR Apps development

2.2.1 Mengenal Pasti Komponen Mekanikal

Sistem mekanikal adalah beberapa komponen yang berfungsi sebagai penghantar bagi menyelesaikan sesuatu tugas yang telah diprogramkan. Selain itu, sistem ini juga merupakan mekanisme yang digunakan bagi mendapatkan sesuatu hasil pengeluaran.

Untuk menghasilkan reka bentuk sistem yang dikehendaki, pelbagai komponen mekanikal digunakan sama ada secara berasingan atau gabungan. Ada pelbagai jenis komponen mekanikal. Komponen ini saling berkait untuk menyelesaikan masalah atau tugas-tugas seperti yang dikehendaki oleh pengendali.

Komponen Mekanikal

INFO ERSTA

Sistem mekanikal yang paling ringkas menggunakan sekurang-kurangnya dua jenis komponen mekanikal.

Gear

Gear ialah komponen yang digunakan untuk memindahkan kuasa. Gigi yang terdapat pada badan gear berfungsi untuk menyalurkan kuasa daripada sumber kepada penerima. Terdapat pelbagai jenis gear, iaitu gear serong, gear taji, gear heliks, gear tulang hering, gear rak dan pinan, gear miter, gear skru, gear dalam, gear serong pilin, dan gear belitan. Setiap gear ini mempunyai fungsi yang berbeza antara satu dengan yang lain.

Rajah 2.2.1 Pelbagai jenis komponen mekanikal yang digunakan dalam reka bentuk sesuatu gajet mekanikal

Jenis-jenis Gear

Gear serong (Bevel gear)	Gear taji (Spur gear)	Gear heliks (Heliical gear)	Gear tulang hering (Herringbone gear)
Gear rak dan pinan (Rack and pinion gear)	Gear miter (Miter gear)	Gear skru (Screw gear)	Gear dalam (Internal gear)
Gear serong pilin (Spiral bevel gear)	Gear belitan (Worm gear)		

Gambar Foto 2.2.1 Komponen mekanikal yang digunakan pada jam

Gambar Foto 2.2.2 Jenis-jenis gear

MARI LAKUKAN

Nyatakan dua alat-alat mekanikal yang kamu tahu. Kemudian, nyatakan jenis gear yang digunakan pada alat-alat itu.

STEM based learning for Form 2 Textbook (RBT subject)

CREATIVA CONTENT STORYBOARD
BAB : 2.2
SUB TOPIK : 2.2.2
MUKA SURAT : 44
JENIS AR : AR & VIDEO

Bahagian Bawah

Jenis Input : Video
Justifikasi :
1. Klik dan keluar video contoh proses
2. Graphic

Bahagian Atas

Jenis Input : 3D
Justifikasi :
1. Model Jam
2. Simpel pecahan komponen
3. Graphic

Gambar Foto 2.2.1 Komponen mekanikal yang digunakan pada jam

Jenis-jenis Gear

- Gear servong (Bevel gear)
- Gear taji (Spur gear)
- Gear heliks (Helical gear)
- Gear tulang herring (Herringbone gear)
- Gear rik dan pinan (Rack and pinion gear)
- Gear inter (Miter gear)
- Gear luar (External gear)
- Gear dalam (Internal gear)
- Gear sepong (Spiral bevel gear)
- Gear belakar (Worm gear)

Gambar Foto 2.2.2 Juz-szerz gear

JIICaS

Hujung dasar silsilah yang
kembara. Kembara, menjelajah
sejauh jauh. Kembara, menjelajah
sejauh jauh.

The story board for Topic 2 'Rekabentuk Mekanikal'

SENARAI 3D MODEL & TARGET MARKER

2.2.1 Mengenal Pasti Komponen Mekanikal

Senarai mekanikal adalah kumpulan komponen yang berfungsi sebagai penghantar bagi gerakan mekanikal dari sumbernya ke dalam sistemnya. Ia pun mungkin juga merupakan maklumat yang diperlukan bagi invetigasi sesuatu hasil penilaian.

Untuk menghadkan rasa berasa stres yang dilahirkan, pembaharuan komponen mekanikal dilakukan sama ada secara berangsur atau dibangun. Ada pelbagai jenis komponen mekanikal. Komponen ini sanggup untuk menyediakan masalah atau bagian seperti yang ditunjukkan oleh program.

Komponen Mekanikal

TIPS GEMILAH

Grahan mekanikal yang paling ringkas menggunakan wilem-pukul-gaya dan jenis komponen mekanikal.

Rain 2.2.1 Pelbagai jenis komponen mekanikal yang digunakan dalam senarai senarai mekanikal

3D VIEWER MODEL

MESH DATA

The 3D simulation for Topic 2.2 'Rekabentuk Mekanikal' page 43



Meeting discussion in collaboration with Pengetua SMK Dato Haji Talib Karim



Use of Creativ-AR apps on the RBT textbook using smartphone

BENEFITS

1. Enhanced Visualization: Provides clearer, more vivid representations of RBT concepts, improving comprehension and retention.
2. Engaging Learning Environment: Increases student motivation and participation through interactive and immersive learning experiences.
3. Accessible Anytime, Anywhere: Enables learning beyond the classroom, supporting flexible and remote learning scenarios.
4. Personalized Learning: Accommodates diverse learning styles with customizable content and interactive features.
5. Improved Teaching Efficiency: Helps educators explain complex topics more effectively and efficiently, saving time in lesson preparation.

COMMERCIALIZATION POTENTIAL

The development of this apps, Ceativ-AR is very suitable in supporting and realizing the MARA Strategic Plan (PSM) 2021-2025 and Malaysia Agenda for Sustainable Development (2030 Agenda), covering one of the main cores SGD 4: Quality Education.

The development of this KidcadTech-Creativa kit model will implement the STEM-based national curriculum, applying cutting-edge technologies such as AR, VR, robotics and Adruino, EV3 and Scratch code & programming in the Lego Spike application which is starting to become the focus of parents and consultants in the field robotics and technical.

Sustainability Agenda



CONCLUSION

In conclusion, the integration of augmented reality-based modules in STEM education demonstrated significant potential in enhancing student engagement, improving learning outcomes, and fostering creativity, critical thinking, and problem-solving skills. This research provides a strong foundation for further exploration and implementation of augmented reality technology to transform STEM education practices and outcomes.

Comprehensive exposure in augmented reality technology will creates skills and educated students workforce with digital and cutting-edge knowledge in line with the current situation that prioritizes digitization, the exploration of knowledge without borders, lifelong learning and the generation of a high-income society.

ACKNOWLEDGMENT

We express our deepest appreciation to everyone involved, especially the teachers of SMK Dato Haji Talib and UniKL who always provide support and cooperation for us to realize this innovation project.

This work was supported by the Research and Innovation, Universiti Kuala Lumpur.

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(A-ST078) ENHANCING QUALITY SELECTION IN INNOVATION CONFERENCES BY FUZZY LOGIC DESIGNER

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ABSTRACT

This study investigates the manual process that judges employ to choose winners of innovation conferences. Finding opportunities to enhance the system requires an understanding of the current selection process. As part of the qualitative approach, judges were interviewed, and the selection criteria and processes used were examined. The results showed that the manual system had a number of flaws, including biases and inconsistencies in the evaluations. In order to improve accuracy in selecting winners, the study's outcome suggests implementing a more automated and systematic selection process. A fuzzy logic system has been implied for usage in innovation conferences as an approach for winner selection.

Keywords: innovation, fuzzy logic, selection, decision making

1.0 INTRODUCTION

Innovation conferences are organized to generate new ideas and promote teamwork by selecting a winner. The Fuzzy Logic Approach (FLA) in these competitions aims to enhance the overall performance by improving the quality of the selection process. This approach can lead to significant improvements in the competition system, ensuring a more accurate and effective selection of winners. This study demonstrates the usefulness of fuzzy logic in supporting decision-making and improving the quality of winner selection in innovation conferences.

2.0 OBJECTIVES

1. To construct a model for enhancing selection processes in innovation conferences by using a fuzzy logic-based framework for decision-makers.
2. To explore and apply Fuzzy Logic framework in real-life contexts such as the selection of winners in innovation conferences.

3.0 METHODOLOGY

The methodology process encompasses several stages: data collection, system design, and implementation. Firstly, the criteria for selecting the students were identified. Three important criteria are highlighted: content, presentation, and innovation. The system uses these inputs to generate outputs in the form of awards: "Gold," "Silver," or "Bronze." Each award plays a crucial role in ensuring the system's efficiency. Data collection involves gathering relevant information about the participant's projects, such as their content quality, the effectiveness of their presentations, and the level of innovation demonstrated. System design entails developing a fuzzy logic model that incorporates these criteria to evaluate students' performance accurately. Implementation involves applying this model to the collected data to determine the appropriate award for each student. By focusing on these three criteria, the system ensures a fair and comprehensive assessment, ultimately selecting the worthiest winners.

4.0 RESULT

There are various benefits to the innovation conference's selection processes switching from a manual to an automated approach. In the first place, it minimizes variations caused by human subjectivity by ensuring consistency in evaluation criteria and processes. Second, automation speeds up the process of evaluation so that judges can concentrate on deeper evaluations. Third, automated systems rely on unbiased algorithms, which reduce individual prejudices. Fourth, accountability and transparency are improved by well-defined rules and guidelines. Lastly, scalability guarantees efficient handling of an increasing number of submissions.

5.0 CONCLUSION

In conclusion, there are biases and inaccuracies in the current manual selection process for Innovation Conferences. By implementing a more sophisticated selection process that makes use of cutting-edge technologies, these problems must be resolved. Innovation conferences can ensure more objective and fair decisions by standardizing their selection processes through the implementation of an automated system. By using this method, they will be able to find the worthiest winners, promoting an environment that is fairly and transparently.

(A-ST080) COOLERCUP

MUHAMMAD NAZHIF BIN NORHISHAMUDDIN, EMIR IQMAL ALIFF BIN SHAHARUL NIZAM, MUHAMMAD ALIF NAJMAN BIN MOHD ADLI, MUHAMMAD AZREEN FIKRY BIN MUHAMMAD HISHAM

UiTM CAWANGAN TERENGGANU KAMPUS DUNGUN,
SURA HUJUNG, 23000 DUNGUN, TERENGGANU.

ABSTRACT

In today's dynamic consumer landscape, the demand for efficient, portable cooling solutions is growing. The Coolercup, a revolutionary product designed to fastly cool hot water, emerges as a potential game-changer. This paper illuminates the Coolercup's features, benefits, and market potential conventional cooling methods. We undertake an in-depth exploration to evaluate its efficacy and practicality across various contexts.

1.0 INTRODUCTION

Traditional cooling methods often entail troublesome processes and time-consuming procedures, which may not align with the fast-paced lifestyles of contemporary consumers. The advent of the Coolercup heralds a paradigm shift in this domain. Engineered for rapid cooling and portability, the Coolercup offers an intuitive solution to the perennial challenge of accessing cold water on the go. By contextualizing the Coolercup within the broader discourse of cooling technologies, this introduction lays the groundwork for a comprehensive assessment of its utility and market viability.

2.0 OBJECTIVE

Cooling Performance Evaluation:

Quantify Cooling Efficiency: The primary objective is to quantitatively assess the cooling performance of the Coolercup under various conditions, such as initial water temperature, ambient temperature, and humidity levels. This involves conducting controlled laboratory experiments to measure the time taken for the Coolercup to cool a standardized volume of hot water to a predetermined temperature threshold.

Benchmarking Against Traditional Methods: Another key objective is to benchmark the cooling efficacy of the Coolercup against traditional cooling methods, such as refrigeration and ice baths. By comparing cooling times, energy consumption, and user experience, we aim to ascertain the relative advantages and limitations of the Coolercup in real-world scenarios.

Market Analysis and Consumer Segmentation:

Identify Target Demographic Segments: A pivotal objective is to identify and delineate the target demographic segments that are most likely to benefit from the Coolercup's features and capabilities. This involves conducting comprehensive market research, including surveys, interviews, and data analysis, to understand consumer preferences, purchasing behaviors, and pain points related to hydration and cooling needs.

Explore Potential Applications: Furthermore, we aim to explore the potential applications of the Coolercup across various market segments, including outdoor enthusiasts, travelers, households, workplaces, and event organizers. By identifying niche markets and specific use cases, we aim to develop targeted marketing strategies and product positioning to maximize market penetration and consumer adoption.

Economic and Environmental Assessment:

Evaluate Cost-Effectiveness: An essential objective is to conduct an economic assessment of the Coolercup's cost-effectiveness compared to traditional cooling methods. This involves analyzing factors such as initial investment costs, operational expenses, and potential cost savings associated with using the Coolercup over time.

Assess Environmental Impact: Finally, we aim to assess the environmental impact of the Coolercup throughout its lifecycle, from production and distribution to usage and disposal. By conducting a life cycle analysis (LCA), we seek to quantify metrics such as energy consumption, greenhouse gas emissions, and resource depletion, comparing the Coolercup's environmental footprint to that of traditional cooling methods.

3.0 METHODOLOGY

The methodology for this study encompasses a multifaceted approach to thoroughly evaluate the Coolercup. In laboratory testing, a controlled environment is established

to accurately assess the device's cooling performance. High-precision temperature sensors and data loggers are utilized to measure water temperature throughout the cooling process under various conditions, ensuring reliable results. Parallel experiments are conducted with traditional cooling methods to provide a basis for comparison.

Market research involves the careful design of surveys to capture consumer preferences and behaviors related to hydration and cooling solutions. A diverse sample population is targeted through stratified sampling methods to ensure representative insights. Data collected from surveys and interviews are analyzed using both quantitative and qualitative techniques to identify trends and patterns.

Economic and environmental assessments are conducted to evaluate the Coolercup's cost-effectiveness and sustainability. Cost analysis involves quantifying manufacturing, distribution, and operational costs, as well as potential cost savings compared to traditional methods. Life cycle assessment (LCA) considers the environmental impacts of the Coolercup throughout its entire life cycle, from raw material extraction to disposal.

Finally, the findings from laboratory testing, market research, and economic/environmental assessments are integrated to provide a holistic understanding of the Coolercup's performance and market potential. Recommendations are formulated based on these insights to guide stakeholders in optimizing the Coolercup's design, marketing strategies, and pricing to maximize its adoption and impact. Through this comprehensive methodology, we aim to generate robust empirical evidence and actionable insights to drive the successful implementation of the Coolercup.



Figure 1: This is an overview of the Coolercup's product.

To optimize the Coolercup's ability to rapidly cool hot water, several design considerations and materials can be implemented. One effective approach involves utilizing a metallic inner core, such as aluminum or copper, renowned for their high thermal conductivity. This core efficiently transfers heat away from the hot water to the cup's surroundings, facilitating faster cooling. Additionally, incorporating a double-walled insulation design helps maintain a temperature gradient, preventing external heat from infiltrating the cup and ensuring efficient cooling. Integration of phase change materials (PCMs) further enhances cooling capacity by absorbing heat during phase

transitions, effectively storing thermal energy and sustaining lower temperatures within the cup. Complementing these features, a convection cooling mechanism, like fins or channels, promotes heat dissipation through airflow, accelerating the cooling process. For advanced cooling performance, active cooling technologies such as thermoelectric cooling modules or Peltier devices can actively transfer heat away from the water, ensuring rapid cooling even in challenging conditions. Lastly, designing the cup's interior with enhanced surface area, such as ribbed or textured surfaces, maximizes contact with the hot water, facilitating more efficient heat transfer and enhancing overall cooling performance. By integrating these materials and design features, the Coolercup achieves swift cooling, offering users a convenient and efficient solution for enjoying cold water on the go.alternatives.

4.0 RESULTS

The empirical findings of our study underscore the transformative potential of the Coolercup in revolutionizing the cooling landscape. Laboratory tests reveal that the Coolercup consistently outperforms conventional methods, delivering rapid cooling within a fraction of the time. Market analysis corroborates this sentiment, elucidating a palpable demand for portable cooling solutions across diverse consumer cohorts. Moreover, environmental assessments underscore the Coolercup's commendable energy efficiency and reduced carbon footprint, underscoring its sustainability credentials.

5.0 CONCLUSION

In summary, the Coolercup emerges as a beacon of innovation in the realm of portable cooling technologies. Its unparalleled cooling efficacy, portability, and eco-friendly attributes position it as a disruptive force within the market landscape. The empirical evidence presented herein substantiates the commercial viability and consumer appeal of the Coolercup, advocating for its widespread adoption across various domains. Moving forward, continued research and development efforts hold the key to optimizing the Coolercup's design and unlocking its full potential in catering to evolving consumer needs and preferences.

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(A-ST083) BRAILLEEASE: SIMPLIFYING BRAILLE LITERACY WITH LOW-TECH ASSISTIVE TECHNOLOGY

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ABSTRACT

The BrailleEase: Simplifying Braille Literacy with Low-Tech Assistive Technology project introduces an innovative redesign of the traditional braille slate and stylus to enhance braille literacy for visually impaired individuals. This low-tech assistive technology initiative addresses the significant challenges posed by the conventional design, which requires users to write in reverse. This method often leads to errors and presents a steep learning curve, hindering effective braille literacy. Recognizing the need for a more user-friendly and efficient solution, BrailleEase aims to simplify the braille writing process through a mirrored-orientation usage. The project employs a user-centered design methodology, incorporating iterative testing and feedback from visually impaired users to ensure the new design meets their needs effectively. The project has successfully developed a fully functional prototype using 3D printing. Future production will involve injection molding through a supplier to ensure scalability and consistency. This innovation not only improves the user experience but also fosters inclusivity and accessibility, making braille literacy more attainable for the visually impaired community.

Keywords: braille literacy, low-tech assistive technology, user-centered design, accessibility, inclusive education,

1.0 INTRODUCTION

The BrailleEase project introduces an innovation aimed at simplifying braille literacy for visually impaired individuals. Traditional braille slates and styluses require users to write in reverse, a method that often results in errors and presents a significant learning curve as shown in Figure 1. This complexity can deter individuals from effectively learning and using braille, limiting their ability to read and write independently.

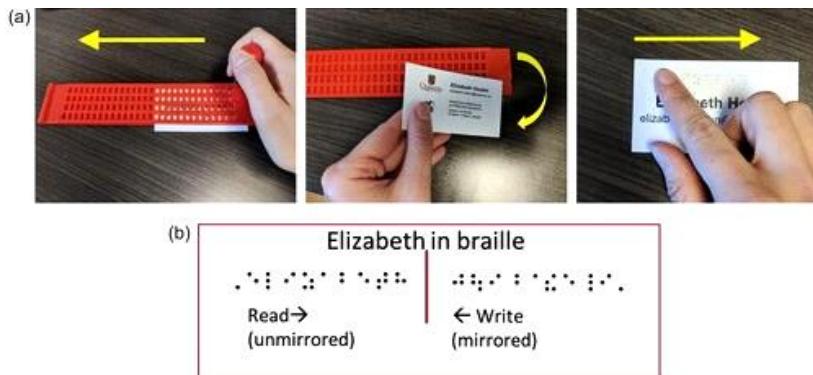


Figure 1: Traditional Braille slate and stylus usage:

(a) using the slate and stylus to write in Braille; (b) the difference in Braille character orientation for reading (unmirrored) and writing (mirrored) (Hoskin et al., 2023).

Motivated by the need to make braille literacy more accessible and user-friendly, the BrailleEase project focuses on redesigning the braille slate and stylus to allow for mirrored-orientation usage. This low-tech assistive technology innovation simplifies the writing process, reducing the potential for errors and making it easier for users to learn and practice braille. By adopting a user-centered design approach, the project ensures that the needs and feedback of visually impaired individuals are at the forefront of the development process.

The BrailleEase project has successfully developed a fully functional prototype using 3D printing, demonstrating its usability and effectiveness. Future production plans include transitioning to more advanced manufacturing methods, ensuring consistent quality and scalability. This innovation not only addresses the technical challenges of the current design but also contributes to fostering a more inclusive society by empowering visually impaired individuals with better tools for reading and writing.

2.0 OBJECTIVE

The following are the objectives of this innovation

- i) Redesign the traditional braille slate and stylus for mirrored-orientation usage to enhance user experience and accessibility for visually impaired individuals.
- ii) Incorporate user feedback through a user-centered design methodology to ensure the product meets the specific needs and preferences of users.
- iii) Develop a cost-effective and sustainable low-tech assistive technology to promote inclusivity and independent braille literacy.

3.0 METHODOLOGY

3.1 User-Centered Design and Feedback

The methodology for the BrailleEase project began with a comprehensive analysis of customer needs and the identification of the core problems with existing Braille writing tools as listed in Table 1 below.

Table 1: Summary of methods of analyzing customer needs and identifying problems

Method	Description	Key Findings
Interviews and Surveys:	Conducting interviews and surveys with visually impaired individuals and sighted participants of Braille courses to gather firsthand insights into their experiences with traditional Braille slate and stylus.	<ul style="list-style-type: none"> — Difficulty of mirrored writing (slate) — Ergonomic discomfort of existing tools (stylus)
Benchmarking:	Analyzing comparable products available on the market through online platforms like Shopee and existing patents to identify their strengths and weaknesses.	<ul style="list-style-type: none"> — Highlighted necessary improvements for creating a more user-friendly Braille slate and stylus.
Problem Definition:	Synthesizing data from user feedback and benchmarking to clearly define the problem. The primary issue was the complexity and error potential of the traditional slate and stylus system, requiring users to write Braille characters in mirrored orientation.	<ul style="list-style-type: none"> — Complexity complicates the learning process for both sighted individuals learning to write Braille and visually impaired individuals — Increases the likelihood of errors

3.2 Conceptual Design

Various conceptual designs of the slate and stylus were proposed, as illustrated in Figure 2. A Pugh chart was then used to evaluate and compare these different concept designs for the Braille slate and stylus. By assessing each design against a set of predefined criteria, the chart helps identify the most promising design that best meets the project's objectives, as shown in Figure 3.

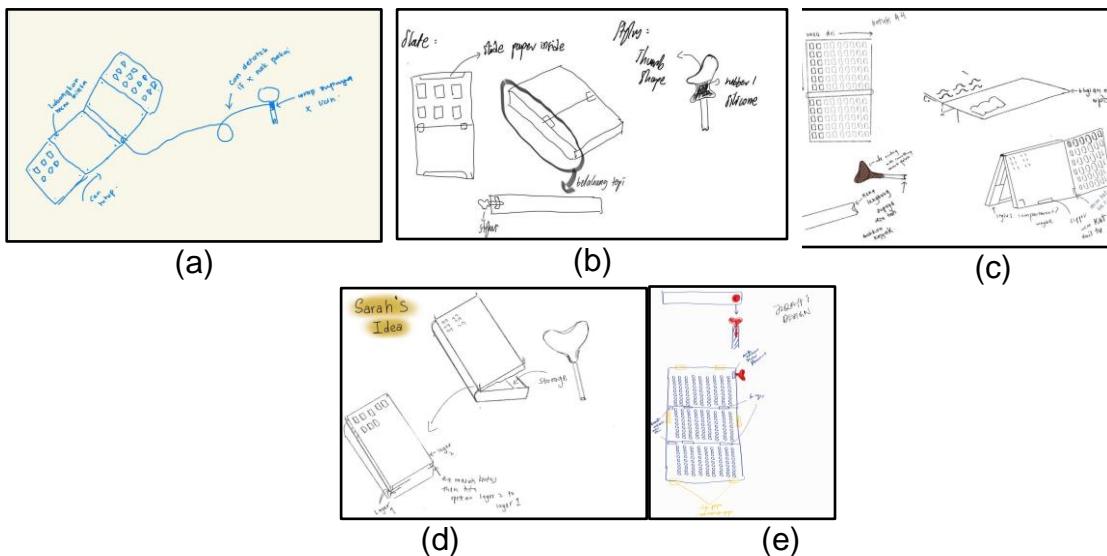


Figure 2: Initial concept designs of Braille slate and stylus by team members

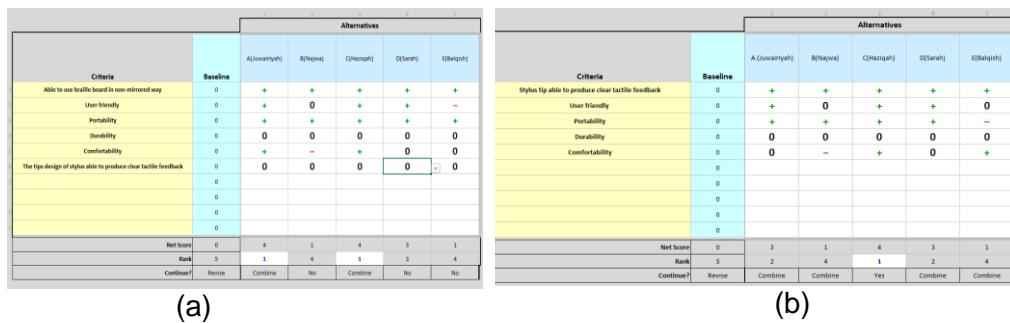


Figure 3: Pugh charts evaluating all the concept designs: (a) Braille slate, and (b) stylus.

Based on the evaluation in the Pugh Chart above, the embodiment design for the BrailleEase project was finalized by combining the most promising concepts. The final design incorporates elements from multiple initial concepts to create an optimal solution, as detailed in Table 2. The drawings of the finalized designs are shown in Figure 4.

Table 2: Finalised design elements for improved BrailleEase

Component	Finalised Design
Slate (Figure 4)	<ul style="list-style-type: none"> The final slate design is a combination of concepts illustrated in Figure 2(a) and Figure 2(c). This combination leverages the strengths of both designs to enhance usability, ergonomics, and functionality.
Stylus	<ul style="list-style-type: none"> The final stylus design is based on the concept illustrated in Figure 2(c). It was selected for its superior ergonomics and ease of use that complement the slate design.

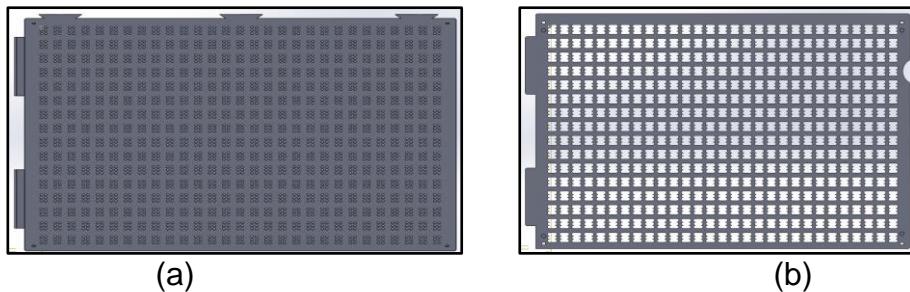


Figure 4: The finalised design of the Braille slate; a) lower slate, and b) slate cover

3.3 Prototype Development

The development of the BrailleEase prototype was guided by a user-centered design methodology. This approach involved engaging with visually impaired users throughout the design process to gather continuous feedback and ensure the product met their specific needs and preferences, as shown in Figure 5. Iterative testing and refinement phases were conducted to incorporate user feedback into the design. Prototypes were developed using 3D printing technology, which made it easy to quickly make and improve the designs based on user feedback.



Figure 5: User testing sessions

4.0 RESULT

The redesigned Braille slate and stylus addressed the primary issues of traditional systems through a user-centered design approach, as shown in Figure 6. Users could write Braille characters in their natural orientation, significantly reducing complexity and errors. The ergonomic design and improved functionality received positive feedback, highlighting the project's success in making Braille writing more accessible and user-friendly for both visually impaired and sighted users.

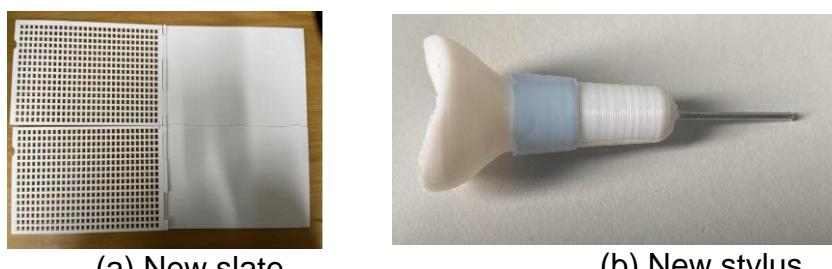


Figure 6: New improved braille slate and stylus- BrailleEase

5.0 CONCLUSION

The BrailleEase project successfully developed a redesigned Braille slate and stylus that address the primary issues of traditional systems. Through a user-centered design approach, the project incorporated continuous feedback from visually impaired and sighted users, resulting in a product that allows for writing Braille characters in their natural orientation. This significantly reduces complexity and errors, making Braille writing more accessible and user-friendly. The ergonomic design and improved functionality received positive feedback, highlighting the effectiveness of the new design in meeting the needs of users. The BrailleEase project demonstrates the importance of involving end-users in the design process to create effective and inclusive assistive technologies.

ACKNOWLEDGEMENT

Acknowledgement is extended to KL Braille Resources and AMTech, Kulliyyah of Engineering, IIUM, for their support and resources throughout this project. Special thanks are given to Bro Amiruddin, an IIUM blind student, for his invaluable support and feedback. This prototype has been submitted for copyright approval.

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(A-ST088) PAWNURTURE LITE

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ABSTRACT

PawNurture Lite is an innovative solution designed to enhance pet care, particularly in food consumption, by combining advanced technology with a user-friendly mobile application. Traditional feeding methods often fall short, especially for those with demanding schedules or unpredictable routines. This solution was developed to address common challenges such as the availability of pet owners, the tendency to overfeed pets, and the high cost of pet hotel services. PawNurture Lite aims to study and improve existing products in the market, design a mobile application with IoT integration, and develop an IoT device aligned with the latest trends. It offers remote feeding capabilities, portion control, pet recognition, and additional features for monitoring food storage and pet conditions. This comprehensive functionality provides pet owners with an efficient way to manage their pets. Additionally, the integration of mobile applications has allowed pet owners to monitor their pet's eating habits and allow early detection of health issues. With its intuitive user interface, PawNurture Lite delivers convenience, peace of mind, and a higher standard of pet care.

Keywords: Pet Feeder, Smart Pet Feeding

1. INTRODUCTION

PawNurture Lite represent a significant innovation in pet care, allowing owners to feed their animals remotely through a mobile app connected to the internet. These smart feeders automatically dispense a specified amount of food at pre-set times, ensuring pets receive consistent and appropriate nutrition. For pet lovers, maintaining a feeding schedule is crucial, and these devices help achieve that regardless of the owner's availability. This innovation addresses common challenges in pet feeding, such as ensuring food consistency and preventing early or late access to meals. This IoT-based solution promotes a healthier lifestyle for both pets and owners by automating feeding routines, providing portion control, and monitoring pet conditions remotely. It aims to simplify pet care, offering a more reliable alternative to traditional manual feeding methods.

2. OBJECTIVE

The primary objectives of this project are to study and enhance existing pet feeder products available in the market, design a mobile application integrated with IoT technology, and develop an IoT device that aligns with current technological trends. The project aims to refine the functionality and performance of current pet feeders by

addressing identified limitations and incorporating advanced features. The development of a mobile application will facilitate seamless interaction between users and the IoT device, allowing for remote monitoring and control of pet feeding routines. By leveraging contemporary IoT advancements, the project seeks to create a state-of-the-art pet feeder that enhances user convenience, accuracy, and overall pet care experience.

3. METHODOLOGY

This project follows the Rapid Application Development (RAD) methodology as a guideline to develop fully functional product. RAD is ideal for projects that require fast development [1], frequent changing requirements [2] and prioritize cost savings [3]. The methodology is divided into six (6) phases: analysis and quick design, build, demonstrate, refine, testing, and implementation. Each phase is essential for maintaining project progress and ensuring milestones are achieved within the set timeline.

4. IMPLEMENTATION

Hardware Development

For the hardware development as shown in Figure 1, several hardware components are used to develop a complete prototype such as ESP32(1), Ultrasonic Sensor HC-SR04(2), Servo SG90(3), RFID MFRC522(4), Piezo Buzzer (5) and Load Cell Sensor(6).

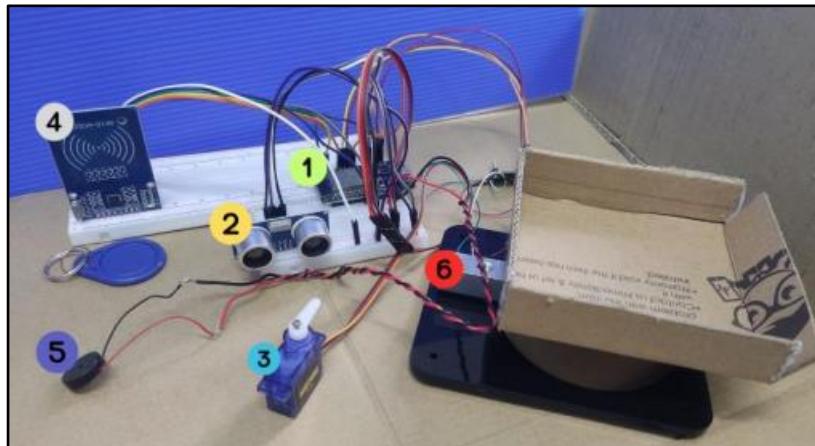


Figure 1: Product Prototype

Software Development

Software involvement is essential to enable remote management of the device through mobile phones. Various software integration across different environments work together to develop the mobile app functionality. As shown in Figure 2, Arduino IDE is used to program the microcontroller ESP32 which is connected to Blynk Apps. Additionally, Firebase real-time database is used to store RFID tag numbers.

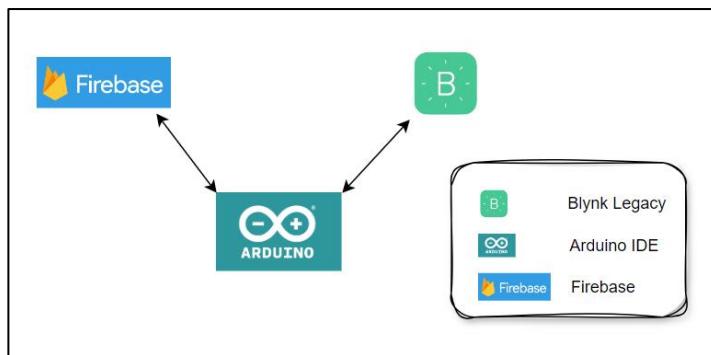


Figure 2: Software Requirements

5. RESULT

PawNurture Lite with its unique features such as waste control, RFID technology and data analytics in user-friendly system, provides pet owners with convenience and peace of mind in managing their pet. An overview of the project is as follows.

Features

- a) Portion control
The system is designed to accurately measure and dispense the pre-set portion amount, ensuring that pets receive the correct amount of food at every feeding.
- b) Waste control
PawNurture Lite is designed to minimize waste by combining leftover food from the previous meal with the next feeding, resulting in a smaller portion being dispensed for the upcoming session.
- c) Notification alert
The notification alert feature keeps pet owners informed about the status of PawNurture Lite device. The system sends notifications to the owner's mobile device regarding completed feeding sessions, low food levels, or any issues with the feeder. These alerts ensure that the pet owner is always aware of the device's condition, even when they are away from home.

Functionality

- a) Automatic feeding
The automatic feeding functionality is the core of the PawNurture Lite system. It allows for customizable feeding time, ensuring consistent and timely feeding. When the food storage level is low, automatic feeding will be disabled to prevent the pet from receiving insufficient amount of food, but manual feeding is available. Engaging the user to manually feed the pet through the mobile app also serves as a reminder of the low food storage.
- b) Manual feeding
Pet owners can manually dispense food through the mobile application, providing flexibility for unscheduled feeding times or extra meals.

c) Food storage monitoring

The system regularly checks the food levels in the storage compartment and alerts the owner if the supply is running low.

d) Eating habits monitoring

This function helps pet owners track their pet's health and well-being. The system records data on the pet's eating patterns and the timing of meals. In addition, the data can be exported in CSV format.

e) RFID registration

The RFID tag is a key feature that enables the system to recognize registered pets. The RFID registration process is straightforward and can be completed through the mobile application.

Usefulness

a) Eliminate direct human-interaction

PawNurture Lite is designed to work independently without the need for direct human interaction in the pet feeding process. Additionally, busy pet owners can enjoy peace of mind, knowing that PawNurture Lite will manage their pet's meal automatically.

b) Customizable

This system allows pet owners to tailor the feeding process to their specific needs and preferences. Different breed of pet requires different amount of food, making it suitable for various animal breeds.

c) Precise and consistent

With the load cell sensor and a pre-set feeding schedule, issues of underweight and overweight pets can be avoided, as the device ensures precise and timely feeding.

Practicality

a) User-friendly interface

The PawNurture Lite system focuses on user experience. The mobile app is straightforward and easy to use, making it accessible to everyone regardless of their level of technical skills.

b) Rapid deployment

PawNurture Lite can be quickly deployed with minimal setup time and complexity.

c) Sound

A better sound device model is recommended to produce louder sound comparing to current piezo buzzer used.

d) RFID scanner

A better RFID scanner model is recommended, as the current RFID model can only read up to a maximum of 50mm, while in this project, only up to 25mm is

effective. The recommended reading range is approximately 1.5 meter to allow for easier reading at a further distance, making it much more convenient for use with pet.

6. CONCLUSION

In conclusion, PawNurture Lite has made significant advancements in the field of pet care, combining cutting-edge technology to overcome common challenges faced by pet owners. By automating the feeding process, enabling real-time monitoring, and providing data analysis, this innovation ensures that pets receive consistent and appropriate feeding even in their owners' absence. PawNurture Lite not only simplifies pet ownership but also contributes to the overall well-being of pets, making it a valuable asset for pet lovers. This innovation enhances traditional feeding methods.

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**(A-ST090) DATA RETRIEVAL RELATED TO RESOURCE ALLOCATION,
COURSE AND STUDENT PERFORMANCE USING GRAPH DATABASE**

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ABSTRACT

The emergence of the big data era is a direct result of the rapid and exponential growth in the amount of data produced daily. Given the vast amount of data, it has the potential to provide us with valuable insights if we possess the ability to interpret it. Different groups, mainly higher education institutions (HEI), are actively evaluating and exploring big data in a planned way and this profession is commonly referred to as Learning Analytics (LA). LA involves the systematic gathering, quantification, analysis, and transmission of information about learners and their surrounds to understand and improve learning and its environments. This field uses data from the Learning Management System (LMS) and the Massive Open Online Course (MOOC) platform. The aim of this study is to provide a data retrieval model that relies on an ontology and using several query strategies to evaluate its effectiveness. The study employed a case study approach and involved a sample of 11 participants, who were chosen across a focus group. The interview result is crucial for identifying the essential information needed in LA pertaining to course allocation, course performance, and student performance. The interview result is necessary in determining the classes and queries for the purpose stated in this study, from a faculty management and lecturer perspective. The suggested model comprises an independent ontology called Student Performance and Course (SPC), and SPARQL queries for the data manipulation. Furthermore, the ontology can be divided into three distinct ontologies to encompass more precise subjects.

Keywords: Learning analytics, HEI ontologies, Course performance, Student performance

1.0 INTRODUCTION

The increasing utilisation of LMS has emerged as a major and influential trend in the field of education during the past decade. Universities utilise LMS to effectively manage and monitor their courses and training programs and subsequently, the utilisation of e-learning had a significant surge following the onset of the COVID-19 pandemic, particularly on Massive Open Online Course (MOOC) platforms (Yuan et al., 2020).

According to (Laécio Araujo Costa & Lais do Nascimento Salvador, 2019), LA involves the gathering, examination, and understanding of data pertaining to students and their engagement with educational systems. The main objective of learning analytics is to

gain a thorough understanding of students' learning habits, identify areas that need improvement, and use data-driven decision-making to optimise the learning experience. Educational practices are monitored, assessed, and enhanced through the use of various technologies and data sources.

Learning Analytics is the discipline that focuses on the measurement, collecting, analysis, and reporting of data to get a deeper understanding of learning processes and enhance them (Spinner et al., 2019). By monitoring students' learning progress and measuring their performance, educators and researchers might gain advantages, particularly in e-learning contexts (Purwoningsih et al., 2020). Meanwhile research on (Elnozahy et al., 2019) has revealed that certain universities have begun to prioritise data analysis and policy formulation to improve the educational process. By employing online learning behaviour analytics, developers may effectively assess students' performance and forecast and depict their progress.

Learning analytics can assist educators in comprehending student performance trends and enhancing the curriculum and teaching quality. Simultaneously, the system has the capability to intervene with underperforming students at the opportune moment, employing methods such as dialogue prompts or educational materials to enhance their learning efficacy.

Currently, universities maintain more than one system to manage their educational system, which includes matters related to students and courses. For instance, in order to comprehend student performance, certain universities may employ multiple systems for the same purpose. When assessing student performance, it is crucial for the lecturer and faculty coordinator to identify the precise information needed. That will function as the primary indicator for the student monitoring method. According to (Nurmoslim et al., 2017), the on-going assessment data is very crucial for the lecturer to identify the problematic student. By closely monitoring the students' carry marks, the lecturer can identify the students who require extra attention from their lecturer. Another crucial metric for assessing student achievement is the tracking of class attendance and participation, which can also be employed to measure student performance in online forums (Hussain et al., 2018). Addressing the student performance, it will greatly enhance the overall course performance. Based on the previous interview conducted in the study, the researchers have invented a data retrieval model which focuses on student performance and course performance information that might also involve data from MOOCs platform. Furthermore, the creation of the data retrieval model utilising a graph database also enables the integration of data from many universities. This will provide heterogeneous data that can be utilised for comparison analysis, as it includes data from different universities.

2.0 OBJECTIVE

To develop a Graph Based Data Retrieval Model that incorporate data related to resource allocation, course and student performance.

3.0 METHODOLOGY

The study main objective is to create a Graph Based data Retrieval Model using diverse data from HEI courses and student performance. The model designed consist of seven layers: Data Preparation, Competency Question (CQ) Preparation and Analysis, Data Preprocessing, Ontology Model Development, Ontology Validation, Ontology Alignment and Integrated Repository.



Figure 1: Heterogenous Data Retrieval Process

The CQ that was generated from the interview session is very significant in the model that is being proposed since it is used to determine the classes that are included in the research ontology as well as the types of queries that are used. Once the data is load into the repository, the data will be manipulated by using the SPARQL queries.

4.0 RESULTS

The construction of the data retrieval system provides considerable benefits, including the assistance it provides to the faculty administrator in improving the efficiency with which resources are allocated, as well as the enhancement of the method for monitoring the performance of both the course and the students. This organised framework will assist HEI in becoming more effective in terms of resource management, and it will also provide these institutions with improved monitoring capabilities that are able to accommodate enormous data sets. If this model is implemented, the data will be centralised, which means that lecturers will no longer be required to retrieve the data from a variety of LMS platforms in order to do their analysis. Because they have used the offered query strategies, the faculty administrator and lecturer are now only needed to conduct the queries. All of the calculations are done within the GraphDB platform, which eliminates the requirement for the faculty administrator and lecturer to perform the calculations manually any longer.

5.0 CONCLUSION

In conclusion, the HEI can manage the allocation of its resources and monitor the course and student performance with the use of this data retrieval model. Using this methodology, faculty administrators can plan which courses to provide each semester according to the number of lecturers they currently have. By using this strategy, the lecturer may simply keep an eye on the attendance and also to the on-going assessment results of their students. Furthermore, if past student performance data is

needed for comparison, this approach also provides it. Additionally, this cutting-edge strategy was one of the first to provide data integration among HEI universities. Data from different universities can be compared thanks to the integration of heterogeneous data. Universities and researchers may additionally compare their data with the data from other universities in addition to viewing the LA specific to their own institutions.

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(A-ST093) GASSHIELD: ADVANCED HOME GAS LEAK DETECTION SYSTEM

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ABSTRACT

Gas leaks in residential environments pose significant safety risks due to the odourless and colourless nature of natural gas and liquefied petroleum gas (LPG), commonly used for cooking and heating. Current detection methods often fail to promptly identify leaks, exposing occupants to potential explosions and health hazards. This study addresses this critical issue by developing and implementing an advanced home gas leak detection system. Utilizing advanced sensor technology, the system detects gas leaks near appliances and triggers immediate audible and visual alarms to alert occupants. An automatic gas shutoff feature halts the gas supply upon detection, reducing the risk of explosions. Additionally, a built-in ventilation fan disperses gas to prevent hazardous concentrations. Integration with a smartphone app provides real-time updates and alerts, empowering homeowners to take swift action remotely. Preliminary testing demonstrates the system's effectiveness in detecting and mitigating gas leaks, enhancing residential safety standards. The study contributes significantly by offering a comprehensive solution to mitigate the dangers associated with gas leaks, ensuring timely detection and intervention to safeguard families against hidden dangers in their homes. The proposed solution improves residential safety and provides safer living environment for homeowners and their families.

Keywords: Gas Leakage, Detection System, Advanced Sensor Technology, Home Safety, Smartphone Integration

1. INTRODUCTION

Our homes, even though offering shelters of comfort and relaxation, it can also have hidden dangers such as gas leaks. Natural gas and LPG, while essential for daily living, pose a hidden threat due to their odourless and colourless nature. Despite the addition of odorants by utility companies, leaks can still go unnoticed, leading to potentially catastrophic events such as fires, explosions, and carbon monoxide poisoning. Homeowners may be unaware of a leak or may not have enough time to respond effectively. To address this critical safety concern, this project aims to develop a smart gas leakage detection system that offers real-time detection, automatic mitigation, and remote mobile notifications, thereby enhancing home safety. Utilizing advanced electrochemical sensors placed near gas appliances, the system detects leaks and triggers a loud siren and flashing LED lights to alert occupants. It also automatically shuts off the gas supply via a solenoid valve and activates a ventilation fan to disperse the gas. Integrated with a smartphone app, the system offers real-time

updates and remote control, ensuring homeowners can manage gas leaks even when away. Designed for typical residential settings, this system enhances home safety and provides peace of mind by preventing potentially catastrophic incidents.

2. OBJECTIVE

The objectives of the project are to develop a real-time gas leak detection system for home use by utilizing the MQ-3 and MQ-5 gas sensors for accurate monitoring. It integrates automatic mitigation measures, such as a gas shutoff mechanism using a valve and servo motor, to prevent explosions and fires upon leak detection. Additionally, the project includes the implementation of a mobile application using Blynk software, enabling homeowners to receive remote notifications of gas leaks, ensuring timely response and enhanced home safety.

3. METHODOLOGY

This project implements a rapid prototyping methodology, which is ideal for developing innovative products. This iterative method prioritizes speed and adaptability, making it suitable for IoT-based device development. Figure 1 shows the steps of the prototyping model.

Prototyping Model

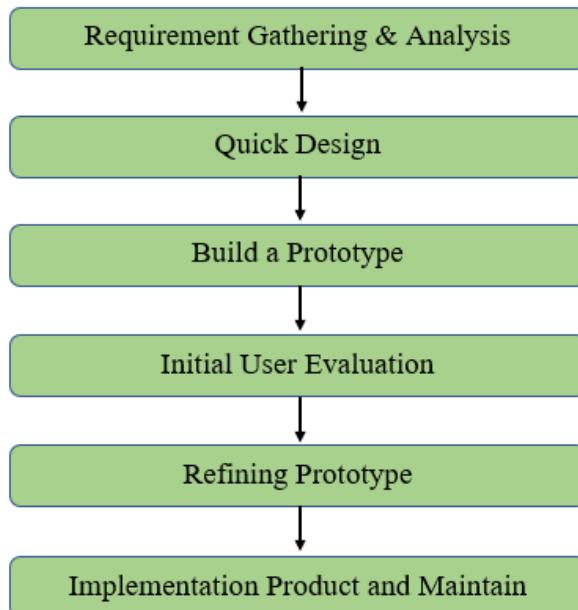


Figure 1: Prototyping model

4. IMPLEMENTATION

The implementation of the project is as illustrated in Figure 2. Several hardware components are used to develop a complete prototype such as Arduino UNO, ESP8266 ESP-01S, MQ-3 gas sensor, MQ-5 gas sensor, buzzer, fan, and servo motor. Software integration is essential to enable remote management of the device through mobile phones. Arduino IDE is used to program the microcontroller ESP32 which is connected to Blynk Apps.

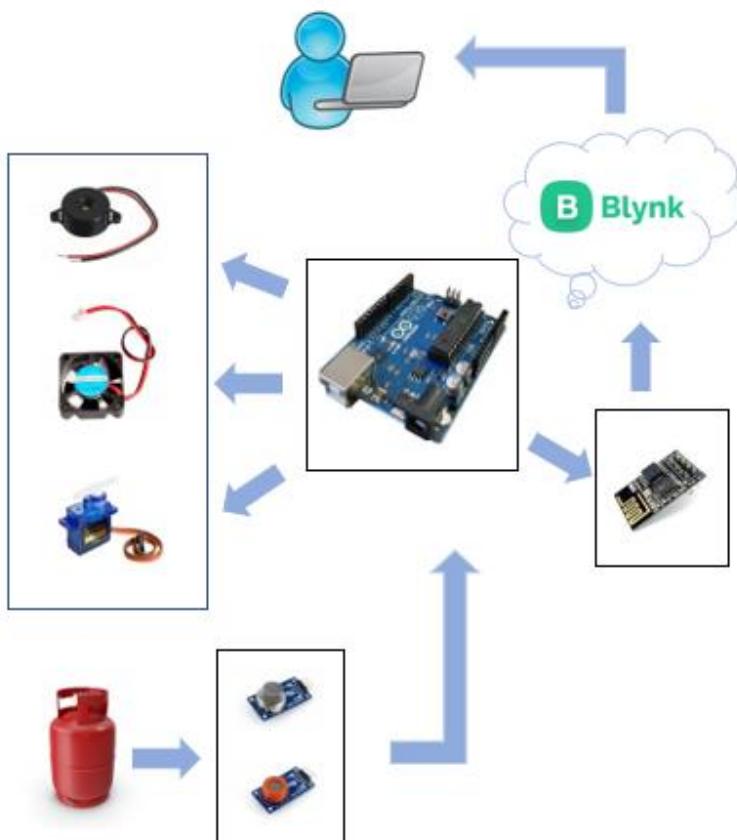


Figure 2: Overview of the system

5. RESULT

An overview of the key features of the project are as follows.

a) Automatic gas shutoff

Servo motor integration: The automated response mechanism of the system featured a servo motor for gas shutoff, which was triggered by the Arduino Uno when a gas leak was detected. This critical safety feature effectively stopped the gas flow, reducing the risk of explosions and further leaks, thereby enhancing the overall safety of the home.

b) Real-time alerts

Auditory and Visual Alarms: Upon detecting a gas leak, the system immediately triggers a loud siren to alert occupants, while flashing LED lights provide a visual warning, especially important for those who may be asleep or have hearing impairments.

c) Ventilation support

Automatic Ventilation Fan: To reduce the concentration of leaked gas, the system can activate a ventilation fan. This fan helps to disperse the gas, particularly in cases where the leak is minor, and immediate evacuation is not required.

d) Mobile connectivity

Smartphone Application: The system integrates with a dedicated smartphone app (Blynk), providing real-time status updates and alert notifications. The app allows homeowners to receive instant alerts about potential gas leaks, even when they are away from home. In some implementations, the app also allows remote control of the gas supply, adding an extra layer of safety.

e) Data Management

Data visualization: The system's data visualization capabilities through the Blynk app allowed for accurate data logging and real-time visualization on mobile dashboards, providing valuable insights into gas leak incidents and supporting continuous monitoring and decision-making processes.

6. CONCLUSION

In conclusion, proposed solution represents a significant advancement in home safety. By integrating state-of-the-art sensor technology, automation, and mobile connectivity, the system empowers homeowners to detect and mitigate gas leaks proactively, significantly reducing the risk of dangerous incidents. Potential enhancement to the system could involve integrating additional sensors, such as carbon monoxide detectors, to improve detection accuracy and expand safety monitoring capabilities.

(A-ST094) DIGITALIZATION ADOPTION IN THE CONSTRUCTION INDUSTRY IN MALAYSIA: THE WAY FORWARD

NUR IDZNI BINTI ABDUL GHAFUR
NASRUDDIN BIN FAISOL

ABSTRACT

This study explores the impact of digitalization on the construction industry as well as focusing on factors influencing and limiting its adoption. The research methodology involves a quantitative method utilizing a questionnaire as the primary research instrument to gather data from stakeholders in the construction industry, including developers, design teams, contractors, and subcontractors. The study's findings have shown that the current state of digitalization in the Malaysian construction industry is highly adopted and highlight key factors influencing and limiting its adoption. The implications of this research include recommendations for industry players to address resistance to new technologies through continuous learning initiatives, tailored training programs, and improved communication and collaboration using digitalization. This study also provides valuable insight for stakeholders, policymakers, and researchers to promote digitalization in the construction industry, emphasize well-targeted government initiatives, and collaborate to drive digital transformation.

Keywords: Digitalization, Digital technologies, Building information modelling, Internet of Things, Construction, Malaysia.

1. INTRODUCTION

Digitalization is changing the construction industry by improving design, building, and management processes. While many sectors have quickly adopted digital transformation, construction has been slower. "Digitization" means converting things to digital format, like turning old drawings into digital files (Lok et al., 2023). The construction sector is one of the least digitized industries (Koch et al., 2019). Digitalization has greatly impacted routine construction tasks by providing better access to information and faster communication ((Lee et al., 2021).

Using digital technology in construction helps with maintenance operations and overcomes limitations of traditional systems (Mannino et al., 2021). Digitalization is key to making construction more efficient (Pedral Sampaio et al., 2023). Construction organizations are essential for delivering and managing infrastructures accurately throughout their lifecycles. However, they have been slower to adopt digitalization compared to other industries, especially during the pandemic (Siccardi & Villa, 2023). This study examines the important role of technology adoption in transforming construction practices.

2. OBJECTIVE

1. To study current state of digitalization in construction organization in Malaysia.

2. To investigate the factors that influence a rise in digitalization in construction organization in Malaysia.
3. To determine the factors that limit a rise in digitalization in construction organization in Malaysia.

3. METHODOLOGY

A questionnaire survey was developed, and a pilot study was conducted to test the suitability of the questionnaire questions. Using an online questionnaire survey, it was sent to construction organizations consisting of both public and private sector organizations. A total of 146 construction organizations responded to the questionnaire survey. These included housing developers, contractors, architects, quantity surveyors, engineers, and subcontractors. All questionnaires were analyzed using SPSS software by conducting a compare means analysis between respondent groups. Factors with the highest means were ranked at the top, while factors with the lowest means were ranked at the bottom. This ranking system indicates which factors are important and which are not important in this study. Only some findings are reported here.

4. RESULT

The study analyzes the current state of digitalization in the construction industry by examining various demographics such as sector, organization type, organization size, and years of experience. It finds that digitalization is widely adopted at personal, organizational, and project levels, with high means across different sectors and organization types. Key factors influencing digitalization include communication, collaboration, and high efficiency, while high demand by clients, advancements in technology, and government initiatives are seen as less influential. Conversely, resistance to new technologies, hesitation, and limited financial resources are major barriers, with insufficient training opportunities being less significant. Overall, the findings highlight a high demand by clients, advancements in technology, and government initiatives are typically considered potential drivers for digitalization, the data suggests that in the construction industry, particularly in Malaysia, these factors are not as influential.

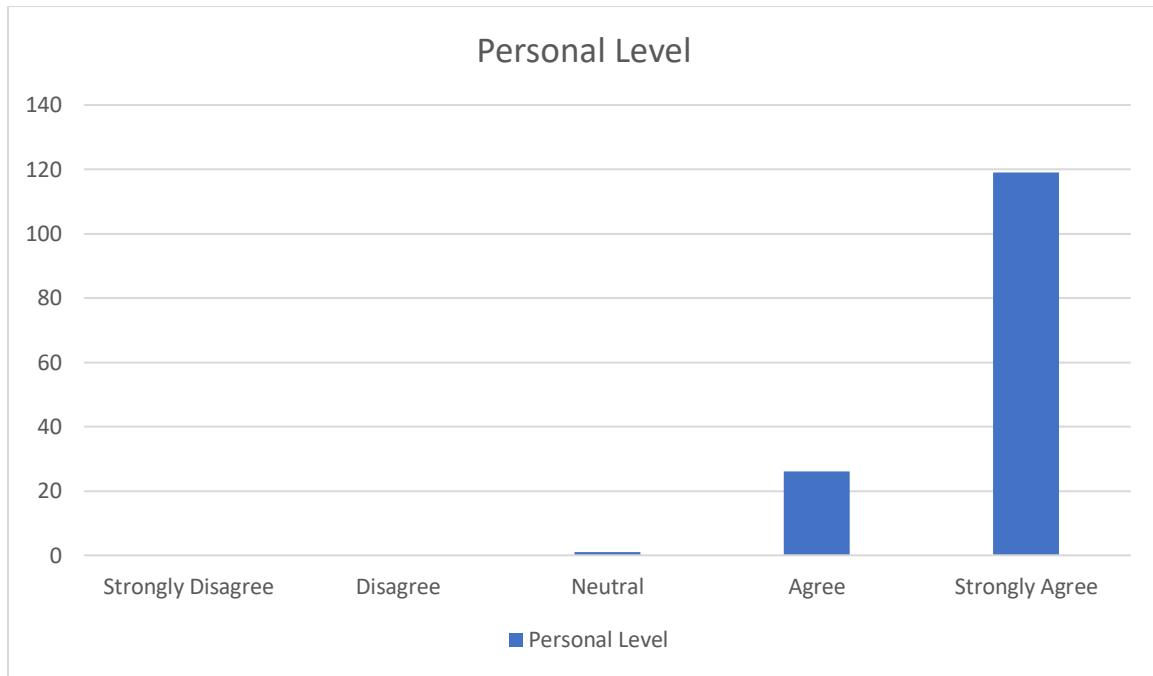


Figure 1: Current state of digitalization in personal level

Table 1: Factor influencing the rise of digitalization in construction (by type of sector)

	Overall		Private		Public	
	Mean	σ	Mean	σ	Mean	σ
High demand by client	2.76	1.88	2.93	1.89	2.13	1.71
Advancement in Technology	2.62	1.82	2.81	1.84	1.90	1.60
Government Initiatives	1.95	1.55	1.98	1.53	1.84	1.61

5. CONCLUSION AND WAY FORWARD

1. The findings reveal that digitalization is widely adopted, with communication, collaboration, and efficiency being key drivers, although cost constraints, reluctance to change, and inadequate government initiatives pose challenges.
2. This result also shows that digitalization adoption is more focused on the trend of usage for aspects of communication and collaboration, but not necessarily on the digitalization needs as required by clients, due to advancements in technology and government initiatives.
3. The steps that need to be taken by organizations in the workplace or by the government are to raise awareness that the use of digitalization must aim to increase productivity at the personal, organizational, and governmental levels.

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(A-ST097) FORESTGUARD ALERT

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ABSTRACT

Forest fires are becoming increasingly frequent and severe due to rising global temperatures driven by climate change, often escalating from small incidents to widespread destruction. This project addresses the critical challenge of controlling and extinguishing these fires by proposing the use of IoT-based sensors for early detection. The system deploys sensors in forested areas to detect initial signs of fire, such as temperature spikes and smoke. Once these signs are detected, the system triggers alarms and sends immediate notifications to authorities and nearby residents, facilitating a rapid response that significantly reduces the risk of large-scale damage. In addition to forested areas, this innovative technology can be applied to other fire-prone locations, such as agricultural farms, where early detection is crucial for protecting crops and preventing economic losses. The IoT-based sensors offer a reliable early detection system that enhances fire management practices, enabling quicker and more effective interventions. The ultimate goal of this project is to mitigate the adverse impacts of forest fires by providing a robust and proactive approach to fire detection and management. By safeguarding both the environment and local communities, this system contributes to the overall safety and resilience of vulnerable regions. It represents a significant advancement in the field of fire management, leveraging modern technology to address a pressing global issue. Through the deployment of these sensors, the project not only aims to prevent the extensive destruction caused by forest fires but also to offer a scalable solution that can be adapted to various environments, promoting sustainability and economic stability across different sectors.

Keywords: IoT-based sensors, Forest fires, Fire management, Early detection, Wildfire prevention

1. INTRODUCTION

Forest fires have become an increasingly urgent global issue, with their frequency and intensity rising due to climate change and human activities. In recent years, the world witnessed a significant increase in forest fire incidents, resulting in extensive damage to ecosystems, wildlife habitats, and human communities. The primary challenge in managing forest fires is the lack of effective early detection systems, which often leads to uncontrolled fires spreading rapidly and causing widespread destruction. This project seeks to address this critical gap by developing an innovative forest fire alarm system using IoT technology, specifically designed for early detection and rapid

response. The proposed system leverages a Raspberry Pi as the central hub, sensors and software applications for effective detection and monitoring. By offering a cost-effective and easily deployable solution, this IoT-based system aims to significantly improve early fire detection, enhance communication between authorities and local residents, and ultimately reduce the devastating impacts of forest fires on both human life and the environment.

2. OBJECTIVE

The project aims to significantly enhance early detection capabilities for forest fires by integrating advanced sensor technology and IoT-driven notification systems. By combining the MQ2 smoke sensor and flame sensor, the system is designed to detect even the smallest signs of fire, enabling timely alerts. These alerts are delivered through a dual notification system, utilizing both Telegram for immediate, real-time warnings to users and ThingSpeak for comprehensive data visualization and monitoring by authorities. This integration ensures a robust and responsive solution, providing critical information to prevent the spread of forest fires and minimize potential damage.

3. METHODOLOGY

This project implements a Waterfall methodology. This methodology is a linear and sequential approach to product development, where each phase of the project must be completed before the next one begins. It typically follows a defined set of stages: requirements gathering, design, implementation, verification/testing, and maintenance. In this methodology, the process flows in one direction like a waterfall, with minimal overlap between stages. This approach is well-suited for projects with clear objectives and stable requirements, as it allows for thorough documentation and structured progress.

4. IMPLEMENTATION

The implementation of the project is as illustrated in Figure 1. Several hardware components are used to develop a complete prototype such as Raspberry Pi, MQ2 smoke sensor, flame sensor, web camera, and buzzer. Software integration is essential to enable remote management of the device through mobile phones. Python and Geany are used for the programming part, ThingSpeak as a cloud-based IoT analytics platform that allows users to collect, analyze, and visualize data from various sensors and devices in real time, and Telegram as a cloud-based messaging application.

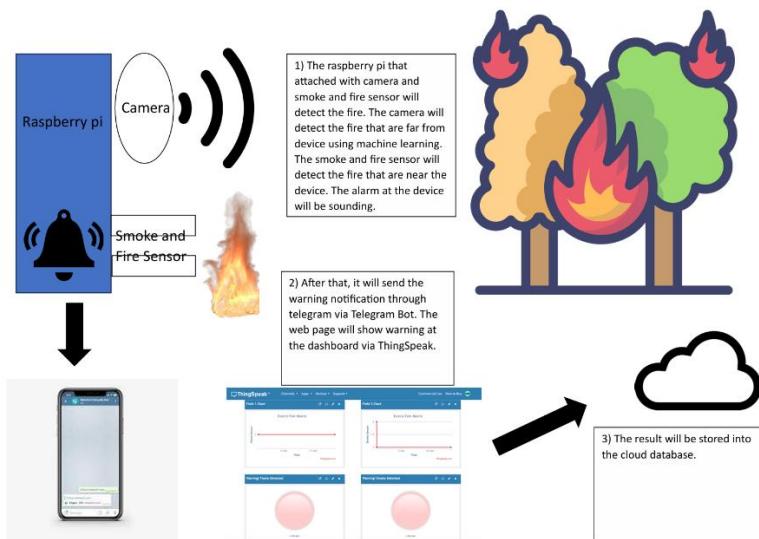


Figure 1: Overview of the system

5. RESULT

An overview of the key features of the project are as follows.

a) Environmental monitoring with sensors

Flame sensors: These sensors detect the presence of flames by measuring the intensity of infrared light. When flames are detected, the system can trigger an alert.

MQ2 smoke sensor: This sensor measures smoke levels in the air, which can indicate the presence of fire or other pollutants. High smoke levels will prompt the system to send notifications.

b) Real-time data collection

Continuous monitoring: The system continuously monitors environmental conditions to detect any signs of fire or smoke, providing real-time data on the status of the monitored area.

Data logging: The system can log data for historical analysis, helping to track patterns and improve future response strategies.

c) Immediate alerts and notifications

Telegram bot integration: The system uses a Telegram bot to send real-time notifications to users. This provides an immediate alert to anyone subscribed to the bot, ensuring timely awareness.

ThingSpeak dashboard: This cloud-based platform displays real-time data and alerts, which can be accessed by authorities or emergency response teams. It provides a centralized view of the data from multiple monitoring points.

d) IoT connectivity

Raspberry Pi: This low-cost, compact computing unit serves as the central hub of the system. It processes sensor data and manages communication between sensors, notifications, and dashboards.

Network integration: The system connects to the internet via Wi-Fi, allowing for remote access and control. It ensures that alerts and data can be transmitted to relevant parties regardless of their location.

e) Cost-effective and scalable

Affordable components: Utilizing inexpensive hardware like the Raspberry Pi and sensors helps keep the overall cost low, making it accessible for widespread deployment.

Scalability: The system can be scaled to cover larger areas by adding more sensors and Raspberry Pi units. This flexibility allows for the expansion of monitoring coverage as needed.

f) User-friendly interface

Telegram notifications: The use of Telegram for notifications ensures that alerts are easily received and understood by users, who can set up custom alerts and preferences.

ThingSpeak dashboard: The dashboard provides a visual representation of data, making it easy for authorities to monitor conditions and act.

g) Deployment and maintenance

Ease of installation: The system is designed to be easy to deploy in various forested or remote areas, with minimal setup required.

Low maintenance: The components are chosen for their durability and low maintenance needs, ensuring reliable long-term operation.

6. CONCLUSION

In conclusion, this project contributes significantly to the early detection and rapid response to forest fires, addressing the critical need for more effective fire management systems. By integrating the MQ2 smoke sensor and flame sensor, the system offers enhanced detection capabilities, allowing for prompt identification of potential fire incidents. The use of Telegram for real-time alerts and ThingSpeak for data visualization ensures that users and authorities are informed quickly and clearly, facilitating swift action to minimize damage. This project not only improves current forest fire detection and response mechanisms but also lays the groundwork for future enhancements, such as incorporating AI-driven predictive analytics and expanding the system to cover larger areas. Further research could explore the integration of additional environmental sensors, drone-based surveillance, and machine learning algorithms to predict and prevent fires before they escalate, making the system even more robust and comprehensive in safeguarding our forests and communities.

(A-ST102) SECURING ARUDINO-BASED SYSTEM USING SECURE CODING & IDS

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ABSTRACT

Arduino platforms are popular for their user-friendliness and adaptability, making them common in various projects. However, their widespread use also exposes them to security vulnerabilities. This paper addresses these threats by focusing on secure coding practices and developing a robust intrusion detection system (IDS). It begins with an analysis of potential security flaws in Arduino systems, identifying areas prone to exploitation. By emphasizing best practices in secure coding, the project aims to strengthen Arduino applications against malicious attacks. The IDS will play a critical role by continuously monitoring Arduino systems for unusual activities that could indicate a security threat. The study seeks to enhance the security of Arduino-based systems through a comprehensive framework combining secure coding and IDS, offering valuable insights for developers to create more secure and resilient systems.

Keywords: Security vulnerabilities, Secure coding practices, Intrusion detection systems (IDS), Application security, Arduino

1.0 INTRODUCTION

The rapidly evolving landscape of the Internet of Things (IoT) and microcontrollers, particularly Arduino-based systems, has led to their widespread use in various applications, from industrial systems to hobbyist projects. However, as these systems become integral to larger industrial and residential networks, they also become prime targets for cybercriminals, exposing significant security vulnerabilities. These weaknesses could lead to data theft, unauthorized access, or even physical harm if exploited. Despite the popularity of Arduino due to its flexibility, affordability, and user-friendly nature, a comprehensive understanding of its security flaws and mitigation strategies remains limited. Current security measures often focus on network security while overlooking potential hardware and software vulnerabilities.

One of the main challenges is the lack of secure coding practices. Many developers may neglect secure coding guidelines, such as the principle of least privilege, proper error handling, and input validation, due to Arduino's simplicity, leaving systems exposed to attacks. Additionally, the absence of Intrusion Detection Systems (IDS) in Arduino-based setups further worsens the security risks. IDS are crucial for monitoring systems for malicious activity or policy violations and alerting users to potential security breaches. Without IDS, attackers could exploit vulnerabilities in Arduino-based systems undetected, leading to significant damage, especially in critical applications like automotive systems, industrial machinery, and home security.

2.0 OBJECTIVE

This study aims to identify vulnerabilities in Arduino-based systems by thoroughly examining their architecture, setup, and coding standards. Once identified, the study will develop secure coding practices, including guidelines on error management, secure data storage, and input validation, to mitigate these risks. Additionally, the study will implement an IDS to detect and alert administrators of suspicious activity. The effectiveness of these mitigation techniques will be evaluated through various attack scenarios to assess the system's resilience. Ultimately, the goal is to provide developers and administrators with practical guidelines for securing Arduino-based systems.

3.0 METHODOLOGY

In order to protect Arduino-based systems, this study employs a comprehensive approach that includes evaluating the state-of-the-art security measures, creating secure coding guidelines, and the implementing IDS into place. The study's materials include the documentation of developed guidelines, software tools for security analysis and intrusion detection, and Arduino hardware. In addition to deploying IDS to monitor system activities for possible intrusions, the goal is to identify common security weaknesses and build a set of best practices for secure coding. With the support provided by these methods, IoT devices' security framework should be strengthened and made more resilient to attacks via the Internet. Figure 1 depicts the flow of the system.

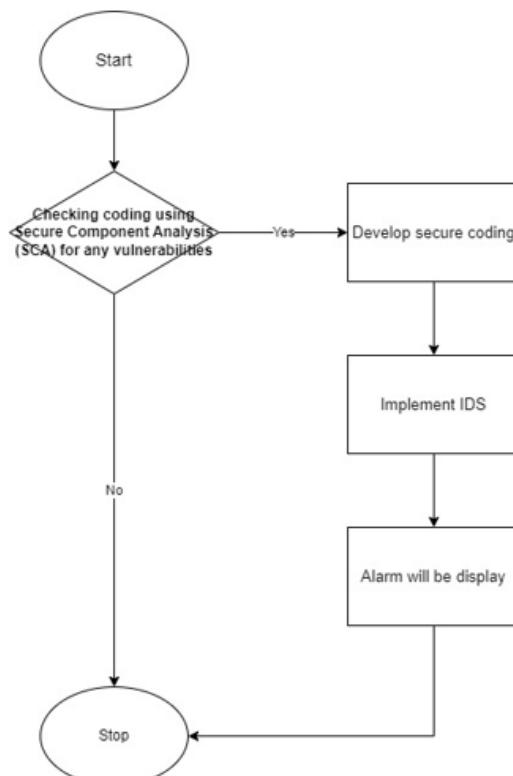


Figure 1: Flow of the study

4.0 RESULTS

4.1 Security Evaluation of Arduino Projects

The literature research indicates that when developers initially begin working with Arduino, many of them lack a firm grasp of ICT security fundamentals. Due to this unfamiliarity, their projects can be vulnerable. This gap is especially troubling in the context of Arduino projects for a number of reasons. Due to the nature of open systems, Arduino projects commonly being shared publicly on sites such as GitHub, where other developers can use them as models or templates. Security flaws in the original code may spread to other projects if they exist. A thorough grasp of potential threats, vulnerabilities, and mitigation techniques is necessary in the complicated field of security. Without this understanding, programmers could unintentionally add security risks into their systems. Table 1 shows the comparative analysis of security evaluation.

Table 1: Comparison of Security Evaluation

Author	Objective	Proposed Approach	Result
Corno & Mannella, 2023b	To identify security issues in these projects and categorize them based on security concepts	The approach involves categorizing the identified security issues based on fundamental security concepts	The research provides insights into the security concerns present in Arduino projects created by hobbyist programmers.
Bakhshi et al., 2024	To review IoT firmware vulnerabilities and auditing techniques.	Various tools like Firm-AFL and FIRMCORN employ fuzzing approaches to find vulnerabilities in IoT firmware	It categorizes IoT firmware vulnerabilities across eight axes, detailing susceptibility triggers and domain limitations based on prior literature
Alrawi, A. N., Ammar, M., & Campbell, R., 2020	Evaluate the security of IoT devices, including Arduino-based systems	Systematic security evaluation framework including threat modeling, attack surface analysis, and security testing	Identification of common security issues in home IoT devices, leading to improved security guidelines for manufacturers
Sicari, S., Rizzardi, A., Grieco, L. A., & Coen-Porisini, A. 2015	Address security, privacy, and trust issues in IoT deployments	Propose a multi-layered security architecture combining encryption, access control, and trust management	Improved security and privacy for IoT deployments, fostering greater user trust in IoT technologies

4.2 Intrusion Detection System (IDS)

Table 2 presents the related works applying IDS to Arduino-based systems. There are four (4) types of IDS, namely signature-based, anomaly-based, hybrid, and behaviour-based.

Table 2: Comparative Analysis of IDS for Arduino-based systems

Author	IDS Type	Strengths	Features
Reeves et al., n.d.	Signature-based IDS	High accuracy for known threats, low false positives	Uses known attack patterns for detection
Nowroozi et al., 2018	Anomaly-based IDS	Can detect new and unknown attacks, adaptable	Detects deviations from normal behavior patterns
Zarpelão et al., 2017	Hybrid IDS	Balances accuracy and coverage	Integrates signature-based and anomaly-based methods
Mitrokotsa et al, 2017	Behavior-based IDS	Adaptable, detects sophisticated attacks	Analyzes behavior patterns over time

4.3 OWASP Secure Coding Practices

This guide offers a comprehensive checklist of technology-agnostic software security coding practices that can be seamlessly integrated into the software development lifecycle. Rather than focusing on specific vulnerabilities and exploits, the guide emphasizes secure coding requirements, making it an essential resource for developers aiming to mitigate common software risks through best practices. It covers a broad range of topics, including input validation, output encoding, authentication, session management, access control, cryptography, error handling, data protection, communication security, system configuration, database security, file management, and memory management. The OWASP guide (Canedo et al., 2024) provides crucial guidelines to ensure that Arduino-based systems are developed with security at their core. The principles outlined are applicable to any software development project, including those involving Arduino, offering a solid framework for research focused on evaluating and mitigating security vulnerabilities.

4.4 Testing Scenario: Arduino Uno RFID Security System

The Arduino Uno RFID security system aims to secure access to a PC or laptop using RFID technology integrated with Arduino which involves several key scenarios to validate its functionality and security measures. The scenario centres around implementing a secure access control system using an Arduino Uno board and RFID technology to protect access to PC or laptop systems. Authorized users approach the Arduino Uno RFID reader module and present their RFID tags. The reader module detects the RFID tag and reads its unique identifier (ID), which is then transmitted to the Arduino Uno microcontroller. The microcontroller compares this ID against a pre-defined list of authorized RFID tag IDs stored in its memory. Upon successful validation, the Arduino Uno triggers an action to grant access to the connected PC or laptop, typically by sending a command via USB serial communication to simulate

unlocking the device or controlling an output pin for external locking mechanisms. The system provides immediate feedback to the user regarding the authentication outcome through LED indicators or messages displayed on a serial monitor.

The scenario defines a practical application of RFID technology integrated with Arduino Uno for secure access control. It aims to authenticate users based on authorized RFID tags, demonstrating the system's ability to prevent unauthorized access to sensitive PC or laptop environments. The scenario exemplifies the implementation of secure coding practices within the Arduino sketch, ensuring secure handling of RFID tag data and validation processes to mitigate potential security vulnerabilities. Additionally, the scenario can extend to incorporate IDS principles, testing the system's capability to detect and respond to anomalous activities, such as repeated unauthorized access attempts or abnormal RFID tag behaviours.

4.5 Metric Measurement

Metrics measurement in this study involves the quantitative assessment of various security aspects, focusing on specific, measurable indicators to evaluate the effectiveness of secure coding practices and the performance of intrusion detection systems. These metrics are essential for determining how well the system is protected against vulnerabilities and how effectively it responds to potential security threats. They offer a means to track progress, pinpoint areas for improvement, and validate the security measures implemented. In this project, key metrics might include vulnerability detection rate, false positive rate, system performance overhead, response time, and code coverage.

5.0 CONCLUSION

This study addressed essential areas of security in Arduino-based systems by focusing on secure coding practices and IDS, with the goal of improving Arduino-based system security and mitigating common vulnerabilities caused by developers' lack of security awareness. This combined strategy of proactive prevention with secure code and reactive monitoring with IDS creates a comprehensive security framework. It ensures that Arduino-based systems are not only functional, but also resistant to cyber threats, protecting both their functionality and the data they handle. These techniques aim to increase Arduino-based systems' defences against potential intrusions by preventing common security flaws. This study enhances the topic of IoT security academically while also providing practical benefits. It provides crucial insights about the security of embedded systems and serves as a foundation for future research and development in the field.

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(A-ST113) MYRENO - HOME DECORATION AND INTERIOR DESIGN PORTAL

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ABSTRACT

This project is motivated by the need to address inefficiencies in home design collaboration. We aim to streamline the design process and enhance communication while cultivating trust and transparency between designers and clients. Our objectives include creating a user-friendly platform, empowering clients with design tools, and offering budget tracking and data analytics. Techniques involved are UI/UX design, software development, and data analysis. Expected results are efficient project management, informed decision-making, and improved design experiences. In conclusion, this project aspires to revolutionize the home design industry, setting new standards for a seamless, data-driven, and collaborative design journey.

The project is developed in a systematic way. Requirements were gathered. Proper system analysis was taken into account and a software model based on the requirement was introduced. The development methodology used is Agile where the project was incrementally and iteratively developed. Adopting an agile methodology yielded the results of where the development of MyReno was characterized by continuous improvement, responsiveness to change, and a strong focus on delivering a product that not only meets but exceeds the expectations of clients and designers involved in the home renovation process.

Driven by the desire to completely transform the home remodeling industry, MyReno is an example of creative project management. With a multi-platform interface that is both safe and easy to use, MyReno aims to provide an unmatched user experience. The driving force behind this initiative is its dedication to giving customers and designers access to a special area where lines of communication are unobstructed, project management is simple, and the life-changing process of renovating a house becomes a joyful and cooperative endeavor. MyReno wants to be the spark that ignites a new chapter in home remodeling—one in which users approach their projects with confidence and excitement and where creativity and efficiency coexist.

1.0 INTRODUCTION

The **myReno web application** was developed to tackle common issues in the home interior design industry, such as fragmented communication and disorganized project management. By providing a centralized platform for all project-related activities, myReno aims to streamline the workflow, enhance collaboration between clients and designers, and ultimately improve the efficiency and satisfaction of the design process.

The idea came to rise due to the needs to address the challenges faced by homeowners and clients during the renovation process. Aspects like budget constraints, timeline pressures and client expectations are general problems that are faced by not just the client but in some cases the designer too as each of these challenges requires careful planning, adaptability and effective communication.(Tan, 2021)[1]. In most cases, customer journey towards deep renovation poses several challenges for homeowners such as lack of guidance and tracking. Building renovation is often perceived as a burden associated with time consuming planning, high uncertainty about reliability of professionals, process duration and value of energy efficiency measures (Greco and Olivadese) [2]. It is worth noting and can be deduced easily that the many challenges faced can be mitigated by properly communicating and always keeping track of the project.

2.0 OBJECTIVE

- To provide a centralized workspace for managing home interior design projects.
- To enhance communication and collaboration between clients and designers.
- To improve project management and organization.
- To increase efficiency and reduce project turnaround times.
- To enhance client satisfaction and overall user experience.

3.0 METHODOLOGY

The development of the **myReno web application** involved the integration of various features designed to meet its objectives. Key features include:

- **Project Management Tools:** Allow users to create, track, and update tasks and timelines.
- **Real-time Collaboration:** Supports messaging, file sharing, and feedback loops to facilitate seamless communication.
- **Design Resources:** Provides a library of templates, tools, and materials to assist in creating detailed and customized design plans.
- **User Interface:** Designed to be intuitive and user-friendly, simplifying the design process for both clients and designers.

Table 1: SWOT Analysis

S	Strength	Local Adaptation <ul style="list-style-type: none"> • Tailored for the Malaysian Market User - Centric Design • Intuitive and user-friendly interface
W	Weakness	Learning Curve <ul style="list-style-type: none"> • Users, especially those unfamiliar with digital project management tools may face some minor difficulties Internet Dependency <ul style="list-style-type: none"> • Reliance on stable internet connection
O	Opportunity	Local Adaptation <ul style="list-style-type: none"> • Growing demand for digital solutions in home renovation sector Collaborative Partnerships <ul style="list-style-type: none"> • Formation of partnerships with local businesses
T	Threats	Competitive <ul style="list-style-type: none"> • User acquisition might be difficult due to similar existing systems (Rekatone, Atap)

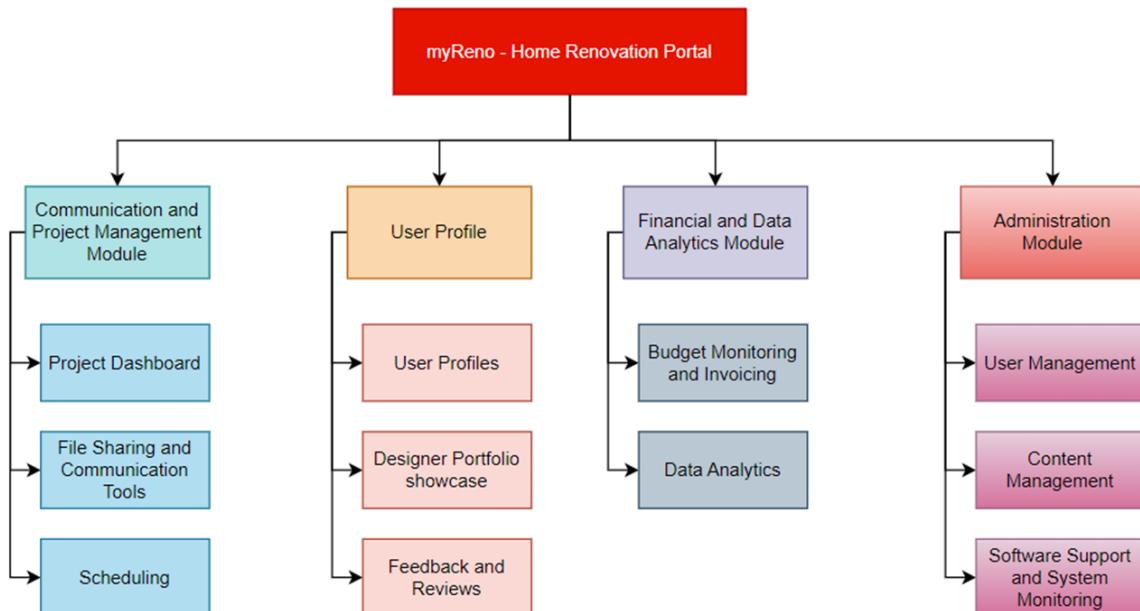


Figure 1: Breakdown of Modules

4.0 RESULTS

MyReno introduces a standout Communication and Project Management Module designed to simplify the renovation journey. The centralized Project Dashboard offers a bird's-eye view of the project's progress, ensuring both clients and contractors stay on the same page. Our File Sharing and Communication tools seamlessly connect clients and contractors in real-time, promoting efficient collaboration. With the Scheduling feature, setting project timelines becomes a breeze, helping coordinate tasks and appointments effortlessly. This user-friendly approach to communication and project management sets MyReno apart by making the renovation process not just organized but also stress-free.

The User Profile Module on MyReno prioritizes personalization for both clients and contractors. User Profiles allow individuals to manage their information and preferences, creating a tailored experience. The Designer Portfolio feature lets contractors showcase their expertise through past works, acting as a virtual portfolio to attract clients. The Feedback and Reviews section cultivates transparency, enabling clients to share their experiences. MyReno's focus on user profiles ensures that each interaction feels personalized, fostering a sense of connection and trust between clients and contractors.

In the Financial and Data Analytics Module, MyReno redefines financial transparency. The Budget Monitoring and Invoicing tool empowers clients with insights into expenses, ensuring transparent financial management. Data Analytics takes it a step further, allowing clients and designers to assess performance through system-generated analytics. MyReno's commitment to financial clarity and data-driven insights not only sets it apart in the industry but also empowers users with the tools to make informed decisions throughout the renovation process. Overall, MyReno's approach to financial management and data analytics stands as a unique feature, bringing a new level of transparency and control to the renovation experience.

5.0 CONCLUSION

The **myReno web application** offers a transformative solution for the management and execution of home interior design projects. By directly addressing common industry challenges such as fragmented communication, disorganized project management, and lack of transparency, myReno stands out as a powerful tool for both designers and clients. The platform's comprehensive features—ranging from real-time collaboration and project tracking to personalized user profiles and financial transparency—streamline the entire design process. This leads to improved efficiency, stronger client-designer relationships, and a more satisfying overall experience. MyReno's focus on user-centric design and data-driven insights ensures that every project is managed with precision and clarity, ultimately setting a new benchmark in the industry. As a result, myReno not only enhances project outcomes but also fosters trust, creativity, and collaboration, making the renovation journey more enjoyable and successful for all involved.

(A-ST115) REINFORCED CONCRETE DAMAGE ASSESSMENT VIA METAL MAGNETIC MEMORY

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ABSTRACT

Reinforced concrete structures are an essential part of modern infrastructure, and their safety and lifespan are critical. These structures are affected by load-induced and cyclic stresses over time, which can cause concealed structural damage and threaten their integrity. In general, the beam's integrity is determined by the reinforcement in the concrete. As an outcome, monitoring the behaviour of the reinforcement in the concrete is crucial to ensuring the reinforced concrete beam's integrity. The main purpose of this research is to examine the behaviour of the reinforcement in the beam under cyclic loading utilizing a magnetic metal memory (MMM). 8 reinforced concrete beams measuring 150mm x 200mm x 1750mm were produced and subjected to cyclic loading using three point loads. Throughout the fatigue test, the maximum load and minimum load of 90% and 20% of the beam's ultimate load were applied. The MMM was used to scan the underneath of the beam at the centre in a distance of 1150 mm. Visual observation was employed in observing the crack that developed in the beam surface under cyclic loading. The MMM approach was discovered to be useful in the detection of RC beam damage. It has the potential greatly improve RC beam safety. Early and accurate damage assessment identifies and mitigates structural faults, lowering the danger of unexpected failure and assuring occupant and public safety.

Keywords: metal magnetic memory, three-point loading, cyclic loading, reinforced concrete beam, steel

1.0 INTRODUCTION

Reinforced concrete (RC) structures are commonly used in construction, such as bridges and carriageways for high-speed railways and dams, they are exposed to cyclic loads over their service life. This type of loading impacts the performance and integrity of the structures, as performance diminishes (Md Nor et al., 2014). As the weight acts continually, the consequences extend beyond the concrete to the steel bars imbedded in it. Noorsuhada (2016) presented an overview of the impacts of cyclic loading on reinforced concrete buildings. It was discovered that the loading leads to the production of cracks in the concrete till failure and necessitates monitoring of the structures during operation to ensure the integrity of the structure.

The metal magnetic memory (MMM) approach has been widely used for stress concentration diagnosis because to its advantages of time savings, low cost, and ease of operation as compared to traditional magnetic flux leakage methods. To date, no theoretical model has been reported to describe the link between stress concentration and SMFL signals in MMM method. Wang et al. (2010) suggested a linear model for analysing SMFL signals in the stress-concentration zone.

The MMM approach may detect these effects using a magnetogram, which shows the dependency of magnetic field intensity on probe distance from the start of the experiment. A specific cart with probes is moved above the surface of the measured region (for example, in a pipe or beam axis), and the device's wheel measures the driven distance. The signal from each channel, along with the distance, is captured in digital form in the device's memory and shown graphically, either directly as H_p or as a gradient dH_p/dx . The captured data is presented as a graph (also known as a magnetogram). The inspection can reveal zones with greater stress concentration (SCZ), indicating an increased possibility of changes or faults in the material structure. The concentration of stress is proportional to the magnitude of the magnetic field intensity gradient at a given point. This NDT approach has a significant advantage in measuring speed and sensitivity (Pospisil et al., 2021).

2.0 OBJECTIVE

The objective of this study is to determine the maximum loading capacity (P_{ult}) of the reinforced concrete beam under static loading. It is also to determine the behaviour of steel bar in concrete using Metal Magnetic Memory when subjected to 90% P_{ult} cyclic loading.

3.0 METHODOLOGY

A reinforced concrete beam of 150 mm x 200 mm x 1750 mm was constructed for this study. The fatigue test was carried out at a maximum load of 90% of the beam's load capacity. Throughout the fatigue test, a 1 Hz sine wave was used. The MMM was secured to the beam's lowest section. The scanning line was 1450 millimetres long.

Table 1: Load protocol for the fatigue test

	P_{ult} (kN)	P_{max} (kN)	P_{min} (kN)
SB16	66	59	13
SB12	43	39	9

The static test was undertaken to determine the maximum load that the beam can withstand without severe deflection or failure. This test was performed on two samples: one with a 12mm tension bar and one with a 16mm tension bar. The load technique was used to assess the damage to the reinforced concrete beam. The ultimate load for 12mm and 16mm sample are 43kN and 66kN respectively. The cyclic load test was conducted with maximum load of 90% of the ultimate load while the minimum load was

set at 20% of the ultimate load as stated in Table 1. Figure 1 shows the setup of the sample for fatigue test. The fatigue test for each sample was performed for 100 cycles for the first 10 tests, followed by 1000 cycles for the next tests. The test will finish when the sample breaks or the crack width reaches 5 mm.

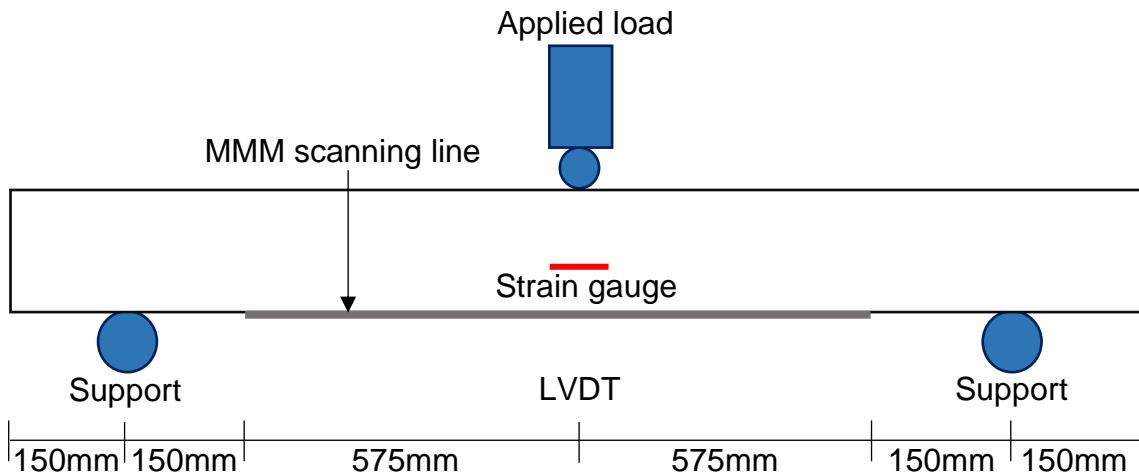


Figure 1: The setup of fatigue test for SB16 and SB12

4.0 RESULTS

The signal Figure 2 depicts the results of metal magnetic memory (MMM) testing on SB16, whereas Figure 3 depicts the results for SB12. At various distances, the H_p-2 value is higher. This is due to the presence of ties for both connection and reinforcement. The link spacing results in a consistent peak distance. SB16 sample fail and break after only 120 cycles. SB12 sample attain 5mm crack widths after 6135 fatigue test cycles.

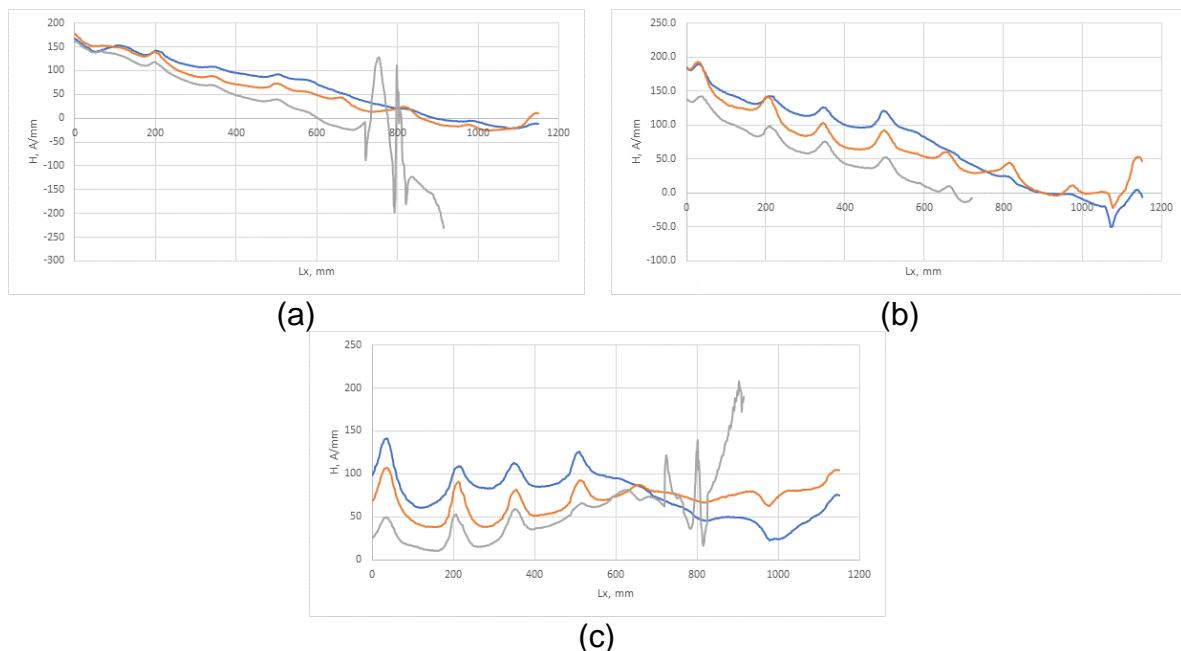


Figure 2: The MMM result for SB16 at (a) scanning line 1, (b) scanning line 2 and (c) scanning line 3

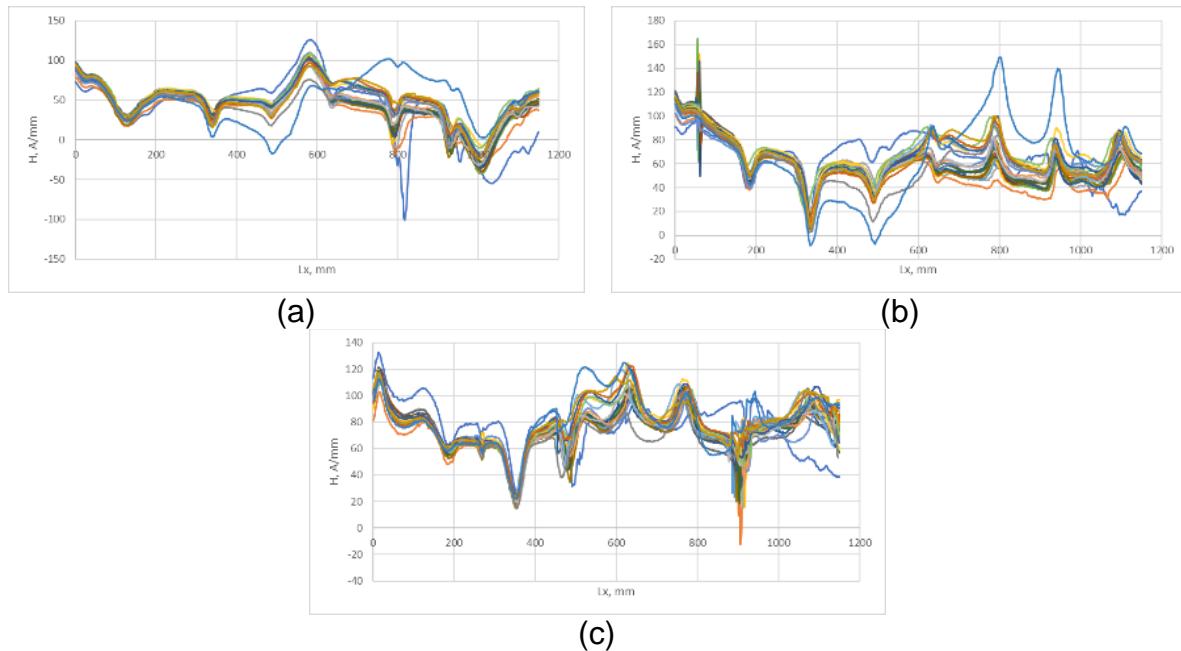


Figure 3: The MMM result for SB12 at (a) scanning line 1, (b) scanning line 2 and (c) scanning line 3

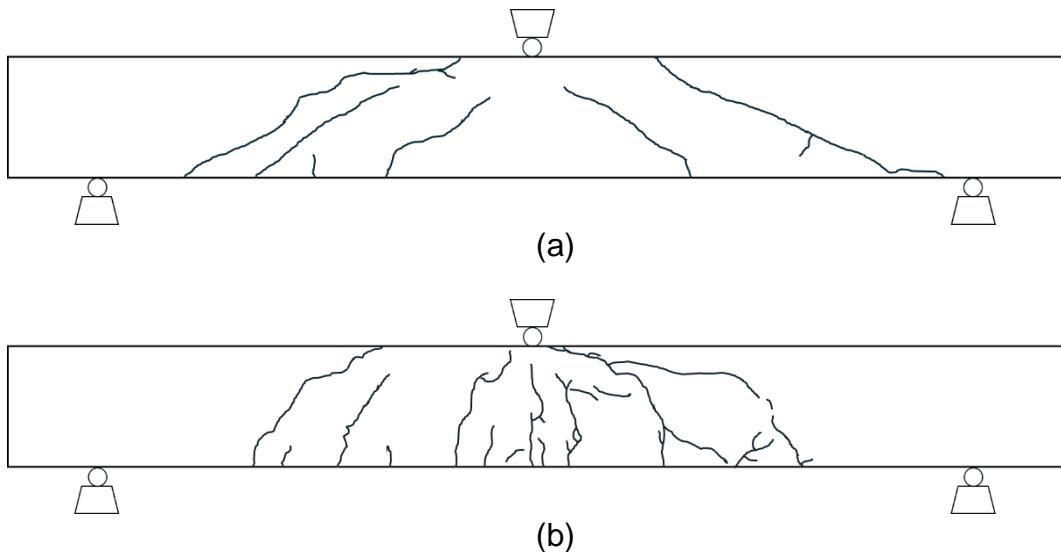


Figure 4: Crack pattern of the sample (a) SB16 and (b) SB12

The metallic magnetic storage sensor device can produce two types of magnetic flux leakage signals: component signals, represented by $H(p)$, and normal composite gradient signals, represented by $dH(y)/x$. The component signal is created by deforming the H_{p-1} and H_{p-2} signals. Most of the signals had high magnetic gradient values, indicating a zone of large stress concentration. The magnetic flux leakage signals take on a convex shape with each cycle, showing that cyclic voltage deformation causes substantial fluctuations in signal shape. Figures 2 and 3 indicate that the crack growth zones at the scan line are used to characterize the magnetic signal parameters. When a load is applied to the bar, a high signal is detected via HP-1 and HP-2. This shows that the reinforcement in the beam has changed significantly. Figure 4 shows the final crack pattern for SB16 and SB12. From the crack pattern, the failure mode of the samples is shear failure for SB16 and flexural failure for SB12.

5.0 CONCLUSION

In conclusion, the Metal Magnetic Memory approach uses magnetic flux signals to identify faults in reinforced concrete beams. The MMM signal, calculated from the Hp-1 and Hp-2 signal values, reveals considerable stress concentration zones in the centre of the scanned surfaces. As a result, the MMM approach can detect the behaviour of steel bars by increasing flux leakage signals that indicate the zone of stress concentration in reinforced concrete beams.

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(A-ST116) RESOURCE DISTRIBUTION SYSTEM POST-DISASTER

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ABSTRACT

In the aftermath of disasters, resources play a crucial role in aiding affected communities who have likely suffered substantial losses. The assistance provided can be immensely beneficial, particularly for those in dire need. Post-disaster resources are limited and require careful distribution to maximize their impact. However, organizations involved in relief efforts may face difficulties in distributing resources efficiently. Numerous organizations operate independently without coordinating with each other, leading to duplication of efforts such as resource oversupply in some areas and inadequate support in others. Moreover, current distribution methods where resources are distributed randomly do not consider factors indicating recipient's level of needs. This may lead to resources potentially reaching those who do not require assistance and overlook those who do. The mobile application developed for this project utilizes an intelligent algorithm called Genetic Algorithm to allocate resources based on factors including income, number of dependents, senior citizen status and disabilities, prioritizing distribution to those most in need. The application also enables an organization to access information on current and past relief operations of other organizations, fostering coordination and strategic planning of resource distribution. In addition to enhancing the efficiency of resource distribution through priority-based allocation and strategic planning among organizations, the system was developed with the objective to streamline the process of providing and receiving resources, benefitting both organizations and affected populations. This system offers advantages that are of great importance in improving the landscape of post-disaster relief operations.

Keywords: resource allocation, post-disaster, genetic algorithm, mobile application

1.0 INTRODUCTION

In the aftermath of a disaster, the loss of personal belongings and damage to homes can be extensive. The financial burden to repair or replace these items is substantial, particularly for individuals with lower incomes or larger households. Additionally, senior citizens and disabled individuals may face increased challenges in accessing essential items post-disaster due to their conditions. For those living on the edge financially, resources provided by relevant organizations can make a significant difference. However, due to limited resources, it becomes crucial to ensure that aid reaches those who truly need it. Efficient allocation is essential to maximize the impact of the limited resources available for disaster relief.

Multiple agencies are involved in providing relief and rescue efforts after disasters. Aside from governmental agencies that are responsible in managing and handling disasters, there are multiple non-governmental organizations (NGOs) in Malaysia that

provides relief effort such as National Disaster Management Association (NADIM) Malaysia, and MERCY Malaysia.

Due to a lack of coordination between organizations in relief efforts, there may be duplication of efforts in some areas, while other areas may receive little to no attention at all. As an example, some affected areas might have an abundance of resources for smaller number of victims as they received resources from several agencies which may lead to resources going to waste. Meanwhile, there might be some areas that receive inadequate resources compared to the affected population as there is only one agency providing resources. This will inevitably lead to an inefficient allocation of resources, particularly when those resources are limited.

Moreover, post-disaster relief operations often involve providing sets of similar resources distributed either randomly among households or through an application. However, the distribution is usually done without considering factors that may signify receivers' level of needs. Consequently, these distributions may result in limited resources potentially reaching individuals not requiring assistance while overlooking those who genuinely need support.

The mobile application developed in this project aims to address these issues by creating a system that allocates resources more efficiently by fostering coordination between organizations and implementing priority-based allocations, prioritizing victims based on criteria including income range, number of dependents, senior citizenship, and disability status.

2.0 OBJECTIVE

1. To develop a system that optimizes priority-based resources allocation to disaster-affected families and individuals that are most in need.
2. To create a platform that fosters coordination among NGOs to strategically distribute disaster relief resources, reducing duplication of efforts and maximizing aid coverage of affected areas.
3. To create a user-friendly and accessible interface for organizations and individuals, streamlining the process of providing and receiving resources after disasters.

3.0 METHODOLOGY

The mobile application's functionalities are organized into three modules: the User Module, Resource Module, and Information Module. Figure 1 below illustrates the module diagram, highlighting each module and its respective main features.

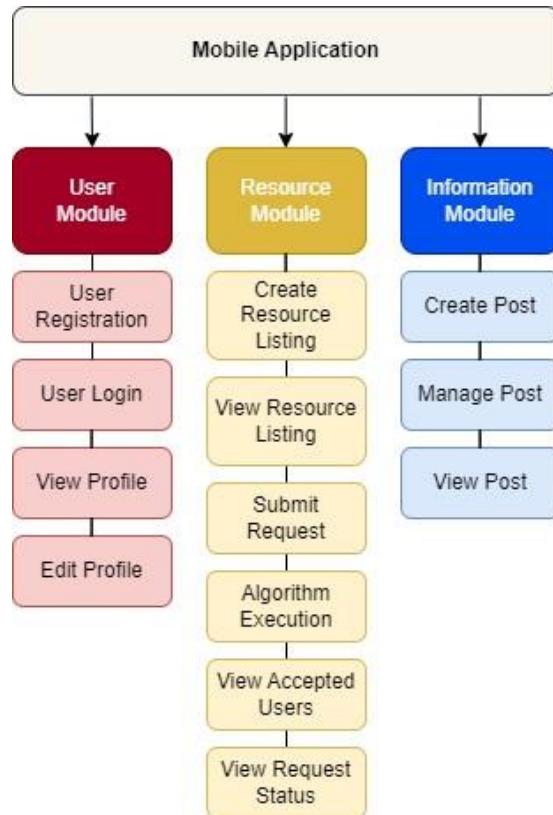


Figure 1: Module Diagram

The User Module is designed to handle account registration, login and profile management for three different user types which are Organizations, Public Users, and Administrators. Organizations are affiliated with NGOs or humanitarian organizations actively involved in disaster relief efforts. Public users are individuals or family representatives who register on the platform to request resources. They must provide personal and household information that will assist in the priority-based resource allocation. Administrator will be responsible for managing and overseeing the entire platform.

The Resource Module is the core component of this application where the resource distribution actually takes place. Organizations can upload detailed resource listings, including information such as location, distribution date and time, quantity, and resource type. To promote coordination and strategic planning, organizations can view both past and ongoing resource listings from other organizations.

Given the priority-based allocation system, which also prioritizes senior citizens and people with disabilities, organizations are responsible for delivering resources directly to the homes of successful recipients. To facilitate the resources delivery for organizations, public users can only view nearby listings within 5km of their home address. Public users can easily browse and request resources from the available listings.

Resource listings will stop accepting requests 24 hours before the specified distribution time. At this 24-hour mark, a genetic algorithm is triggered to optimize resource allocation for the listing. Users can then check the status of their requests to see

whether they have been accepted or rejected. Meanwhile, the organization in charge can view the details of all successful recipients.

The genetic algorithm (GA) used in this system is an intelligent algorithm for solving optimization problems by emulating the process of natural selection to iteratively evolve potential solutions. It works by generating a population of possible solutions, allowing them to evolve through recombination and mutation over multiple generations, much like natural genetics. Each solution's fitness, determined by its fitness function, influences its likelihood of reproducing and creating "fitter" offspring, in line with the "Survival of the Fittest" principle from Darwinian Theory. The GA's ultimate goal is to find optimal or near-optimal solutions.

In the context of this system's resource allocation optimization, the genetic algorithm seeks to identify the most efficient distribution of resources to prioritized families or individuals based on specific criteria. The process begins by initializing a population of potential solutions (resource allocations), represented as chromosomes. A fitness function is then applied to evaluate how well each resource allocation solution meets the priority criteria. The fitness function used in this system considers several factors:

- Income: Income ranges are predefined with corresponding scores; lower income ranges receive higher scores, while higher income ranges receive lower scores.
- Number of Dependents: Scores are allocated based on the number of dependents within the requester's household.
- Disability Status: Requesters with disabilities receive an additional score.
- Senior Citizen: Requesters aged 60 and above receive an additional score, following the age definition for senior citizens in Malaysia.

The fitness score for each chromosome (solution) is calculated by summing the scores for each criterion within the chromosome's genes and then totalling the scores across the entire chromosome. The selection of the fittest chromosomes, based on their fitness scores, simulates the natural selection process. Higher fitness scores indicate better resource allocation. This process is repeated iteratively over a defined number of generations to evolve progressively better solutions. When the algorithm terminates, the optimal solution will represent the most effective resource allocation for requesters in the specific listing.

The last module in this system is the Information Module which serves as a platform for all users to create and share posts on disaster-related topics, including disaster preparedness, safety measures, and others. These posts are publicly accessible, allowing all users to view and benefit from the shared knowledge. The module is designed to enhance awareness and provide valuable information on disaster-related issues, fostering a more informed and prepared community.

4.0 RESULTS

The project involves a unique approach to disaster resource management by utilizing an intelligent algorithm to optimize priority-based resource allocation. Implementation of Genetic Algorithm in the system ensures that resources allocation is optimized and ensuring that resources reach those most in need based on the priority criteria. This

approach enhances the effectiveness and efficiency of resource distribution, especially for limited resources.

Furthermore, the system allows organizations to access details of ongoing and previous relief distributions conducted by various other organizations throughout affected regions. Traditionally, organizations conduct their relief efforts independently without coordinating with one another. This is an original approach that has not been previously implemented in existing method or system. It allows organizations' strategic planning by offering insights into areas already assisted, enabling more effective coordination to optimize aid coverage and reduce redundancy in relief efforts.

The application also significantly impacts disaster relief efforts by offering a centralized platform which streamlines the process for organizations and affected victims alike. For organizations, it facilitates the efficient management and distribution of resources, while victims benefit from an accessible system for requesting aid. This centralized platform ensures a smoother and more coordinated response after disasters, ultimately making the relief process easier and more effective for all parties involved.

5.0 CONCLUSION

In conclusion, this mobile application is designed to optimize the distribution of disaster relief resources using a Genetic Algorithm. It considers factors such as income range, number of dependents, senior citizen status, and disability status among affected individuals. The primary goals of the application are to optimize priority-based resource allocation to ensure the resources directed to those most in need, and to foster better coordination among organizations, thereby reducing duplicated efforts and maximizing coverage in disaster-affected areas. By integrating these objectives into the application's functionalities and incorporating intelligent component in the system, the project seeks to offer an innovative solution that significantly improves the landscape of post-disaster relief operations.

(A-ST117) BUKU KIA SYSTEM (KESIHATAN IBU DENGAN ANAK)

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This study presents the development and implementation of the Buku KIA System (Kesihatan Ibu dengan Anak), a web-based maternal health record system aimed at improving communication and record-keeping among mothers, nurses, and doctors. The project addresses the challenge of accessibility, accuracy, and timeliness in maternal health information management, which is currently hindered by traditional paper-based records. The Buku KIA System was developed using Agile methodology, focusing on iterative development and stakeholder collaboration. The system's features and functionality were refined based on user feedback from healthcare professionals and mothers, with data from existing health records informing the design. Preliminary results indicate that the transition to a web-based system has improved administrative efficiency, data accuracy, and patient involvement. Users have reported increased engagement and satisfaction with the personalized educational materials and timely reminders provided by the system. This research demonstrates the utility of web-based systems in enhancing maternal healthcare management by streamlining administrative tasks and improving data accuracy, contributing to better healthcare outcomes. The Buku KIA System advances our understanding of how digital health records can transform communication and data management in maternal healthcare.

Keywords: maternal healthcare, web-based system, health record management, Agile methodology, patient engagement

1.0 INTRODUCTION

In the era of Industry 4.0, innovation and technological advancement are driving significant changes in healthcare, particularly in how patient information is managed and utilized. The Buku KIA System (Kesihatan Ibu dengan Anak) is a pioneering innovation that introduces a web-based maternal health record system, designed to revolutionize communication and record-keeping among mothers, nurses, and doctors. This inventive system addresses longstanding challenges in maternal healthcare, such as the limitations of traditional paper-based records, including issues of accessibility, accuracy, and timeliness.

The Buku KIA System represents a breakthrough in healthcare technology, offering a sustainable and efficient solution that reduces reliance on paper records and enhances data management processes. By leveraging digital platforms, this innovative system not only improves the accuracy and speed of information exchange but also fosters greater patient engagement through personalized educational materials and timely

reminders. Early evidence suggests that the system has significantly enhanced both administrative efficiency and patient satisfaction, leading to improved healthcare outcomes.

This invention demonstrates the profound impact that digital health records can have on maternal healthcare, showcasing how innovation can transform traditional practices into more effective, sustainable, and patient-centered approaches.

2.0 OBJECTIVE

- i. **Develop a Comprehensive Digital Platform:** Create a robust web-based system that integrates maternal health records, facilitating seamless communication and data exchange among mothers, nurses, and doctors.
- ii. **Enhance Data Integrity and Accessibility:** Design the system to ensure accurate, real-time updates of maternal health information and enable easy access from various devices, improving the reliability and availability of records.
- iii. **Automate Administrative Functions:** Implement features that automate routine tasks such as scheduling, record-keeping, and reminders, reducing the administrative burden on healthcare providers and improving operational efficiency.
- iv. **Enhance User Experience:** Focus on user-friendly design and functionality to ensure ease of use for both healthcare professionals and patients, leading to higher adoption rates and better overall satisfaction.

3.0 METHODOLOGY

The Agile methodology enabled the Buku KIA System to evolve into a robust, web-based platform that significantly improved administrative efficiency, data accuracy, and patient engagement. By focusing on the needs of healthcare providers and mothers, and by maintaining a flexible and iterative approach, the project successfully transitioned from traditional paper-based records to a modern digital health record system that enhances maternal healthcare management.

This approach underscores the effectiveness of Agile in developing digital health solutions, particularly in environments where user needs and technological requirements are complex and continuously evolving. The key aspect of the agile process is as below:

1. **Iterative Development:**
 - The system was built incrementally, with each sprint producing a functional version of the software that could be tested and reviewed by users. This approach allowed the development team to continuously refine and improve the system based on real-time feedback from mothers, nurses, and doctors.

2. Stakeholder Collaboration:

- Regular meetings were held with key stakeholders, including healthcare professionals from Klinik Kesihatan Ayer Hitam and mothers, to gather insights and validate the functionality being developed. This collaboration ensured that the system remained aligned with the actual needs of its users, leading to a product that was both relevant and effective.

3. Flexibility and Responsiveness:

- Agile's flexibility allowed the development team to adapt to changing requirements and priorities. As new insights were gained from user testing and feedback, the team could pivot and make necessary adjustments to the system's features, ensuring that the final product addressed the most critical challenges in maternal health record-keeping.

4. User-Centered Design:

- The development process was driven by the needs and experiences of the users. User stories and personas were created to guide the design and development, ensuring that the system was intuitive, user-friendly, and capable of delivering personalized educational materials and timely reminders to mothers.

5. Continuous Improvement:

- After each sprint, the team conducted retrospectives to assess what worked well and what could be improved. This continuous cycle of evaluation and adaptation allowed for steady progress toward a more refined and effective system.

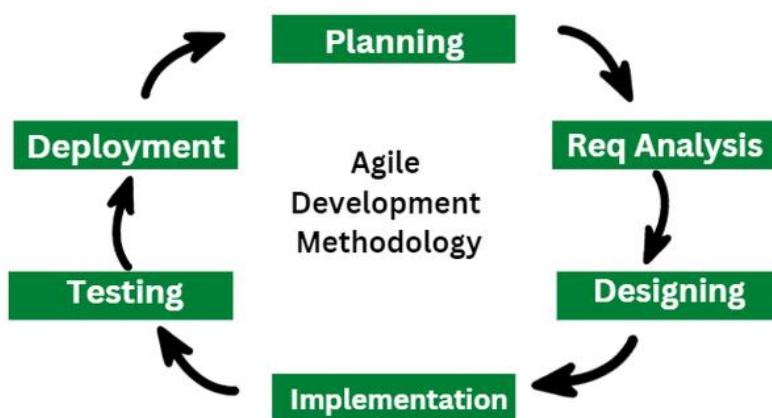


Figure 1: AGILE methodology was used to be a reference to develop a system.

4.0 RESULTS

The implementation of the Buku KIA System has led to significant advancements in maternal healthcare management by leveraging advanced digital technologies. One of the most notable outcomes is the system's real-time health data management and secure storage capabilities. This feature ensures that healthcare professionals and patients have immediate access to the most current and accurate information, greatly enhancing the quality of care provided. The transition from traditional paper-based records to a digital platform has reduced the likelihood of errors, ensuring that crucial health data is consistently up-to-date and readily available.

A key impact of the Buku KIA System is its ability to deliver personalized educational content tailored to the specific needs of individual mothers. This customization has resulted in higher levels of patient engagement, as mothers are now more informed and empowered to make decisions regarding their health and the health of their children. The proactive notification system, another innovative feature, has been instrumental in improving adherence to prenatal and postpartum care schedules. By providing timely reminders for appointments, vaccinations, and other important health updates, the system ensures that critical care milestones are met, ultimately leading to better health outcomes for both mothers and their children.

User feedback has been overwhelmingly positive, with reports of increased satisfaction and a high adoption rate among healthcare professionals and patients (see Appendix for details). The system's user-friendly design has made it accessible and easy to use, contributing to its successful integration into everyday healthcare practices. Additionally, the reduction in administrative errors, such as missed appointments and inaccuracies in record-keeping, highlights the practical benefits of the system in streamlining healthcare operations.

4.1 Sample Data and Results

To further illustrate the effectiveness of the Buku KIA System, a sample of key performance metrics before and after its implementation highlights significant improvements:

Metric	The use of Buku KIA	After Implementing Buku KIA System Prototype (3 months)
Prenatal Visit Attendance Rate	65%	92%
Postpartum Visit Attendance Rate	55%	89%
Missed Appointment Rate	18%	5%
Patient Health Data Accuracy	85%	98%
Patient Engagement (via notifications)	45%	80%

Timely Vaccination Compliance	72%	95%
User Satisfaction Rate	60%	88%
Error Rate in Health Records	12%	3%
Administrative Time Spent on Paperwork	35 hours/week	10 hours/week
Cost Reduction in Administrative Work	-	40% reduction

Insights

- **Prenatal and Postpartum Visit Attendance:** The system's proactive notification system resulted in a significant increase in attendance rates for both prenatal and postpartum visits, ensuring mothers receive the necessary care during critical stages.
- **Missed Appointment Rate:** A considerable decrease in missed appointments was observed, from 18% before implementation to just 5% after, owing to the system's timely reminders.
- **Patient Engagement:** With tailored educational content delivered through the system, patient engagement levels saw a marked improvement, indicating that mothers are now more involved in their healthcare decisions.
- **Vaccination Compliance:** The system has led to higher compliance with vaccination schedules, improving from 72% to 95%, ensuring timely immunizations for infants.
- **User Satisfaction:** User feedback highlights that satisfaction rates increased due to the system's user-friendly design and better access to personalized healthcare information.
- **Administrative Efficiency:** The transition to digital records greatly reduced the time spent on administrative paperwork, freeing up healthcare providers to focus more on patient care.

The Buku KIA System also demonstrates significant potential for scalability and flexibility. Its adaptable design allows for easy customization to suit different healthcare settings or regions, making it a versatile tool in maternal health management. Moreover, the system has shown promise in contributing to cost efficiency by reducing the reliance on paper records, minimizing administrative labor, and preventing redundant tests or procedures due to more accurate information management.

Preliminary data suggests that the system has positively impacted health outcomes, particularly in prenatal and postpartum care. Early case studies indicate that timely interventions and better-informed healthcare decisions are contributing to improved maternal and child health.

In terms of integration, the Buku KIA System has seamlessly merged with existing healthcare systems and databases, facilitating a smooth transition from traditional methods to the new digital platform. This integration ensures that the benefits of the system are fully realized without disrupting ongoing healthcare processes.

Finally, the success of the Buku KIA System can also be attributed to the comprehensive user training and support programs implemented during its rollout. These programs have equipped healthcare providers and patients with the necessary skills to utilize the system effectively, ensuring its wide acceptance and effective use.

Overall, the Buku KIA System represents a novel and impactful solution in maternal healthcare management. Its combination of advanced technology, user-centered design, and real-time data management sets it apart as a pioneering innovation. The system's ability to deliver personalized, timely, and accurate health information has not only transformed traditional maternal healthcare practices but also paved the way for more effective, sustainable, and patient-centered approaches in the future.

5.0 CONCLUSION

In conclusion, the Buku KIA System (Kesihatan Ibu dengan Anak) represents a significant advancement in maternal healthcare management, harnessing the power of digital technology to address critical challenges associated with traditional paper-based records. By transitioning to a web-based platform, this innovative system enhances communication among mothers, nurses, and doctors, while ensuring data accuracy and accessibility.

The system's ability to automate administrative functions, provide personalized patient interactions, and support sustainable practices underscores its role in modernizing healthcare delivery. The early positive results, including improved efficiency, increased patient engagement, and reduced environmental impact, highlight the potential of digital health records to transform maternal healthcare.

As a pioneering solution in the era of Industry 4.0, the Buku KIA System sets a new standard for integrating technology into healthcare practices, demonstrating how innovation can drive better outcomes and more effective management in maternal healthcare. The continued development and refinement of this system promise further advancements in enhancing healthcare delivery and patient care.

(A-ST121) EPRCA INTERLOCKING BLOCK

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ABSTRACT

Construction waste is expected to increase in step with the projected 50% increase in global egg production and consumption by 2035. This growth is mainly due to the impact of increasing construction activity caused by faster urbanisation and population growth. In addition, poor strategic planning and management of projects often leads to mistakes such as poor execution, excessive ordering of materials and incorrect storage, which increases the amount of waste. This increased output of waste leads to environmental problems that coincide with simultaneous economic expansion, limited landfill capacity and strict waste disposal laws. The main objective of this study is to evaluate the flexural strength of Interlocking blocks (IB) under three-point loading containing 30% recycled concrete aggregate (RCA) instead of sand and eggshell powder (ESP) instead of cement. Pozzolanic materials, 10% silica fume and admixtures and 1% superplasticiser (Sika ViscoCrete-2192) are added to the combination. Compression tests were carried out to determine the ideal percentage of eggshell powder (5%, 10% and 15%). The strengths were determined after a curing time of 7, 14 and 28 days. The result shows that the addition of 30% recycled concrete aggregate and 5% eggshell powder to the blocks increases their compressive and flexural strength. The use of ESP and RCA at 5% and 30% respectively to replace cement and fine aggregate therefore has a major impact on improving the critical performance of IBS.

Keywords: interlocking block, cement, eggshell powder, sand, recycled concrete aggregates

1.0 INTRODUCTION

Sustainable development in the construction industry can be advanced through the recycling and utilization of construction and demolition waste (CDW), including recycled concrete aggregate (RCA). While RCA helps reduce waste and conserve natural resources, challenges such as higher porosity, lower density, and alkali-silica reactions (ASR) require ongoing research for mitigation and management. As the global concrete demand grows, driven by rising populations, the need to conserve resources and minimize waste becomes increasingly important. Malaysia, with a population of 29.4 million in 2019, will see further growth in residential demands, exacerbating the pressure on natural resources.

Old eggshells (ES) from pastry shops, quick food establishments, and chick incubators create big problems for the environment when they sit in landfills untreated over many

years, causing damage to nearby ecosystems and triggering allergy symptoms. However, it can turn those leftover eggshells into a powder and use it in construction, replacing regular lime in concrete. This not only lowers the amount of cement needed but also recycles wasted eggshells. An even better idea is to use eggshell powder (ESP) instead of cement altogether. It's a sustainable alternative since eggshells are widely available trash materials. Previous research says that ES is actually a major environmental issue among bio-waste types. Incorporating such unwanted stuff like ES into mortar mixes can help make building processes more environmentally friendly and promote waste reduction campaigns.

Research is focused on creating sustainable interlocking blocks (IB) with RCA, addressing issues like excessive weight, poor adaptability, and functional constraints seen in solid block designs. The goal is to develop eco-friendly interlocking block designs that improve construction adaptability, functionality, and offer lightweight solutions. Bridging the gap between pavement-oriented interlocking block designs and limited options for structural applications is crucial. Prioritizing environmental consciousness, waste reduction, and efficient resource management within the evolving technology landscape is essential for the construction industry to successfully shift towards a circular and regenerative model.

2.0 OBJECTIVE

This study's primary goal is to determine the flexural strength of interlocking blocks (IB) with three points of loading that consist of 30% recycled concrete aggregate (RCA) in place of sand and eggshell powder (ESP) in place of cement under three different loading scenarios.

3.0 METHODOLOGY

This research focuses on the development and evaluation of sustainable concrete mixtures, incorporating recycled materials such as eggshell powder (5%, 10%, 15%) and recycled concrete aggregates (30%), alongside cement, silica fume (10%), sand, and a superplasticizer (1%). Two sets of concrete samples with dimensions of 50mm x 50mm x 50mm and 160mm x 40mm x 40mm were prepared and subjected to compression and flexural tests at 3, 7, 28, and 56 days of curing. A total of 84 samples across seven mix designs were tested to determine the mechanical properties of the mixtures. Compression tests were conducted on 36 cube samples (50mm x 50mm x 50mm) to ascertain their ultimate compressive strength according to ASTM C140/C140M-18 standards and ISO/IEC 17025 accredited procedures. These tests aimed to measure the resistance of the concrete to crushing forces and assess the quality of the hardened material.

Additionally, the study introduced three designs of interlocking blocks, each sized at 280mm x 125mm x 100mm, cured for 7, 14, and 28 days, totalling 18 samples as shown in table 1. The flexural strength of these blocks was evaluated using a Universal Testing Machine, adhering to BS EN 13523-7(2001) standards. The test results provide insight into the blocks' structural performance and load-bearing capabilities prior to failure. Drawing from British Standard BS 6073 – 1:1981, the interlocking block designs, including a control interlocking block (CIB) and the Single Inclined Connection Interlocking Block (SICIB) illustrated in figure 1, were crafted to meet specific

dimensions and performance criteria. The SICIB features inclined interlocking elements inspired by tongue and groove joints, coupled with a chamber edge design, to improve the engagement and structural integrity of masonry walls. The research aims to enhance the sustainability and efficiency of construction materials and methods, contributing valuable data on the use of waste materials in concrete production and the efficacy of innovative interlocking block designs.

Table 1: The list of interlocking concrete blocks samples and the total

No	Sample	Curing Age (Days)		
		7	14	28
1	Control Design	3	3	3
2	Single Inclined Connection Interlocking Block	3	3	3
	Total Sample	6	6	6

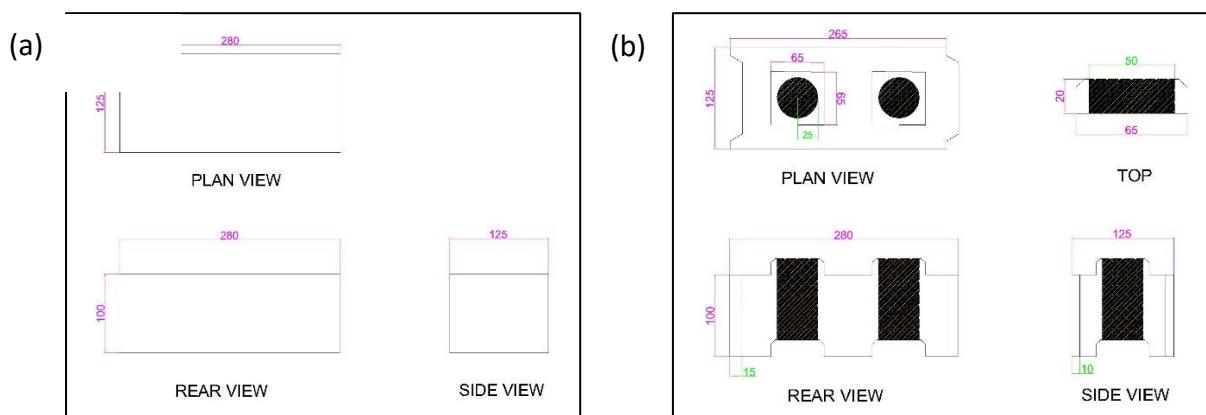


Figure 1: The schematic diagram: (a) control interlocking block (CIB); (b) single inclined connection interlocking block (SICIB)

4.0 RESULTS

Table 2 presents the relationship between the average compressive strength of hardened mortar containing eggshell powder (ESP) and 30% recycled concrete aggregates (RCA). Higher ESP percentages and extended curing times result in improved strength, with samples containing 5% ESP showing a strength increase from 18.18 MPa to 38.12 MPa between 3 and 56 days of curing. However, compressive strength varies depending on the ESP percentage and curing duration. Increasing ESP content raises initial compressive strength for example, at 3 days, 5%, 10%, and 15% ESP led to 18.18 MPa, 18.72 MPa, and 17.26 MPa, respectively. Highest compressive strength starting with 10% ESP, followed closely by 5% ESP but it had increased the strength at 7 days to 56 days. Meanwhile 15% ESP be the second highest compression strength compared to 10% ESP. This highlights the significance of optimizing ESP percentage to attain desired strength properties in mortar mixes, demonstrating that moderate ESP amounts contribute to stronger mortar while higher percentages may not result in additional gains.

Table 2: Compression strength of hardened mortar cube

Days	3	7	28	56
Control	19.12	23.37	35	38.18
5%	18.18	23.78	37.59	38.12
10%	18.72	18.38	28.16	28.84
15%	17.26	20.98	30.60	31.35

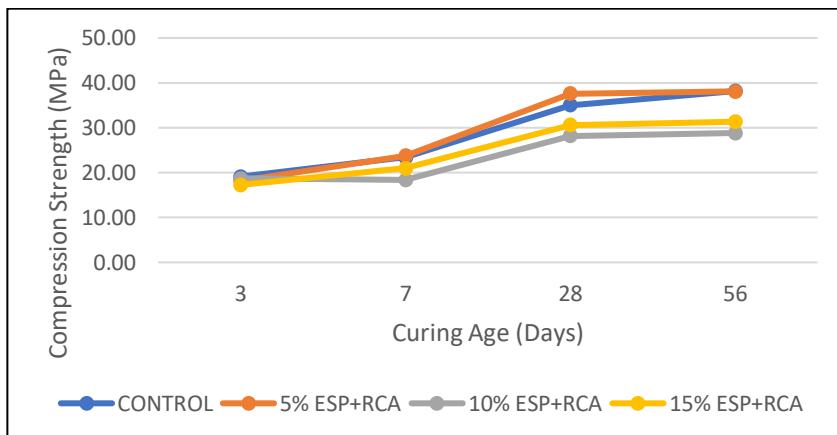


Figure 2: Comparison of compression strength of cubes

The study discussed in the extended abstract explores the usage of eggshell powder (ESP) and 30% recycled concrete aggregates (RCA) as a viable cement substitute and sand substitute in concrete mixtures. Blends comprising 5%, 10%, and 15% ESP, together with a consistent 10% silica fume (SF) content, demonstrated comparable strength levels to control samples without ESP. However, the ideal replacement ratio for ESP, considering the flexural strength tests, proved to be 5% as shown in table 2 and have been illustrated in figure 2. The 5% ESP mixture surpassed the control sample's flexural strength at 7 and 28 days, whereas the control sample outperformed at 3 and 56 days. Still, the 15% ESP mixture exhibited comparable strength to the control at 3 days but had a slight decrease at 28 days, and a significant drop at 56 days. When ESP substitution went beyond 5%, the mortar's strength declined at all ages compared to the control. This reduction in strength indicates that excessive ESP weakens the cement-aggregate bonds, resulting in decreased flexural strength when ESP replacement surpasses the recommended 5%. Furthermore, employing ESP in combination with SF promotes the conservation of natural resources, making a 15% substitution of ESP with SF environmentally friendly.

The study discusses the performance of control interlocking blocks and single inclined connection interlocking blocks (SICIB) of various ages. Table 3 reveals that the average maximum force for SICIB is 4.099 N/mm² in control mixture and 3.677 N/mm² for 5% ESP+RCA mixture, occurring at 28 days, while the 7 days samples exhibit a minimum strength of 2.828 N/mm². Both SICIB and CIB display a progressive increase in stress from 7 days to 28 days. The difference between SICIB and CIB strength values remains relatively small; however, CIB reaches its peak stress earlier. Both types of blocks show an upward trend in average strength, but CIB reaches its optimum values earlier, suggesting a better performance. Although the 28 days SICIB sample shows a decrease in strength compared to the CIB, it still maintains a high level. Moreover, the average load difference between SICIB and CIB are acceptable, although both of them shows better performance within the difference of the design.

According to Figure 3, the blue bar and line represent the control sample, while the yellow bar and line signify the 5% ESP+RCA mixture, making the distinction between various designs evident. Ultimately, the investigation uncovers that the SICIB and CIB exhibit comparable performance.

Table 3: Average flexural strength of CIB and SICIB

No	Sample	Control Sample			5% ESP+RCA		
		7	14	28	7	14	28
1	Control Interlocking Block (CIB)	5.333	6.334	10.000	4.240	4.539	5.162
2	Single Inclined Connection Interlocking Block (SICIB)	2.828	2.984	4.099	3.577	3.585	3.677

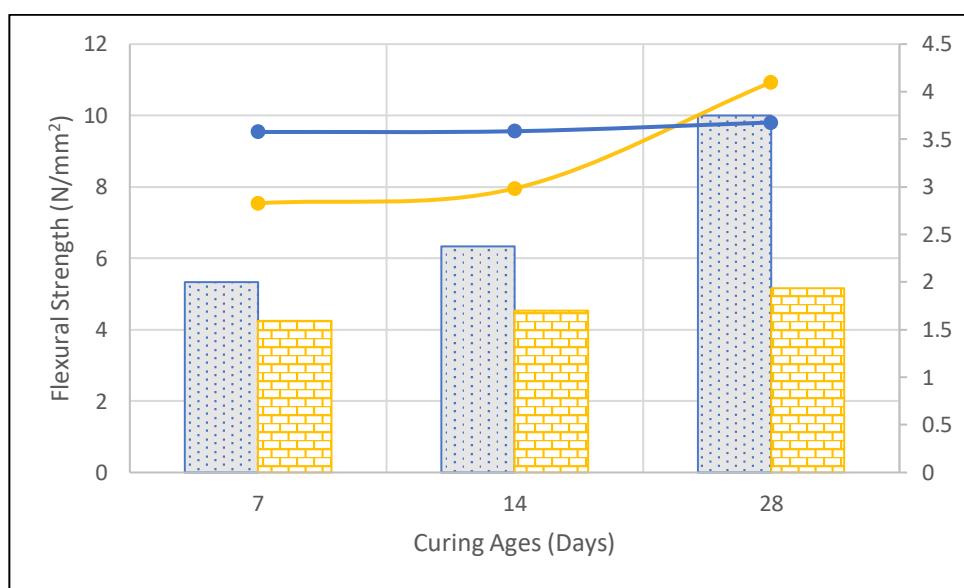


Figure 3: Comparison of CIB and SICIB by control sample and 5% ESP+RCA

5.0 CONCLUSION

In nutshell, the construction industry can really benefit from following circular economy ideas, such as reusing materials from demolished buildings. One good example is using recycled concrete aggregate (RCA) instead of normal aggregates in concrete. Although there are problems when adding RCA to interlocking blocks, people are actively working on solving these issues and making the performance of alternative materials better. There is an increasing need for greener building materials, so it's important to keep looking for new ways and innovations to build in an eco-friendly manner. By paying attention to the environment, reducing waste, and using new technologies, the construction industry can change to be more sustainable and renewable. Research suggests that adding eggshell powder (ESP) in mortar production, particularly at a 5% replacement of cement, is a smart choice that considers both performance and sustainability. Utilizing alternative materials like ESP can help build greener structures without losing important features. Paying close attention to the right mixture ratios, like using RCA instead of fine aggregates, will

makes sure that the performance is maximized and the change to sustainable construction is smoother.

(A-ST126) SIMPLY BOOK SERVICE: A COMPREHENSIVE MOBILE APPLICATION FOR ON-DEMAND HOUSEHOLD SERVICE

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ABSTRACT

The proposed system, Simple Book Service: A Comprehensive Mobile Apps for On-Demand Household Service, is a service provider platform designed to offer efficient and reliable solutions for marginalized groups facing household problems. This ongoing project aims to provide a systematic approach to requesting essential services, specifically focusing on plumbing work, electrical wiring tasks, gardening, and running errands. Based on observations and interviews with potential users, these four services were identified as critical needs. Previously, when needing these services, users had to search for providers through conventional means, such as advertisements. The drawback of this method was that the legitimacy of the services offered was questionable. By using the proposed mobile app, all required services are offered within a single application, where users can find the necessary services based on their location. Additionally, the legitimacy of the services offered is guaranteed, as the system admin verifies the service company's ID before vendors can advertise their services. Users can also write reviews about the services after using them. This app is also equipped with a security feature that includes an in-app emergency button; if the user triggers this function, all emergency contacts will receive an SMS alert simultaneously. This feature is essential to protect users who live alone while repair work is being carried out. The app also caters to those with limited time or physical ability, offering gardening and errand services tailored to user needs. By utilizing Simply Book Service, users gain access to secure and trusted services, effectively addressing their household challenges. The app's software project development follows the Waterfall Model. The implementation of such a service provider system utilizes modern programming frameworks like Flutter, Laravel, MySQL, and Bootstrap to develop this app. In conclusion, the Simply Book Service offers a comprehensive, secure, and user-friendly solution for accessing essential household services, significantly enhancing the quality of life for marginalized groups.

Keywords: Household Service, Mobile Applications, Service Provider Platform

1.0 INTRODUCTION

The proposed system, Simple Book Service: A Comprehensive Mobile Apps for On-Demand Household Service is an on-demand home services mobile app systems aimed at providing an efficient and trusted process to help marginalized groups to solve their problems that might encounter at home. This system provides a more systematic approach to requesting services from the system.

The times are constantly changing, and with the pace of technological advancement, people's stress levels have increased. Thus, this app is useful for those who live alone. When they find themselves in need of assistance while alone at home, there is often no one to turn to, and they may be hesitant to seek help from strangers because of security issues. Therefore, it is necessary to create a service provider system to address common issues that they might encounter at home, such as plumbing and electrical repairs, gardening management, and errand services. The implementation of such a service provider system utilizing modern programming frameworks like Flutter, Laravel, MySQL, and Bootstrap to develop this system. The project uses a waterfall model, starting with communication and planning, moving through design, development, and testing, and finally to user acceptance and deployment.

The goal of this system is to assist marginalized groups in society, such as individuals living alone, people with disabilities, and the elderly, in obtaining more reliable assistance. Administrators will verify all the services registered in the proposed system where only reliable service providers able to register as the vendor. This process may include background checks, verification of licenses or certifications, and screening for any previous complaints or malpractice. A review or feedback session also included in this system. Genuine reviews often contain specific details about the service provided, the interactions with the service provider, and the overall experience. This is to ensure that review and feedback are authentic, thus providing users with valuable insights to make decisions to choose vendors.

Thus, it can guarantee the safety of users and mitigate the risk of robbery. By requiring service providers to undergo comprehensive background checks and verifying their identities, the system establishes a foundation of trust and accountability. Additionally, the platform incorporates GPS tracking and a check-in/check-out system to monitor service providers during interactions with users. This mobile app system also offering insurance coverage. Furthermore, a blog space allows users to share experiences and warn others about potential safety risks, creating a supportive environment where individuals can access reliable assistance without feeling threatened. Numerous services can help those people in need. However, based on the observation and interview session, people voted for four main mandatory services. Therefore, after thinking twice, this system will provide four main services which are plumbing, servicing electrical maintenance, and gardening. This is also where the system name comes from.

By considering security and trustworthiness in this system, an emergency button is provided for users to click on when they are feeling insecure. When using the services, there will be the possibility of occurring accidents. So, users can ask for help using that button. Once the emergency button is clicked, the system administrators will receive the notification and contact the police. The application system will also start to record a 1-minute audio recording and submit it through the system. The recording will then be forwarded to the police station. Thus, users' security will be assured.

2.0 OBJECTIVE

The objective of this project is to identify the key features of on-demand home services mobile applications, specifically those that integrate essential home services such as plumbing, electrical maintenance, and gardening. Following this, the project aims to design a mobile application that effectively incorporates these on-demand services. Finally, the project will focus on developing and validating the mobile application system to ensure it meets the proposed requirements for on-demand home services. To identify the features of on-demand home services mobile app systems that integrate home services such as plumbing, servicing electrical maintenance, and gardening.

3.0 METHODOLOGY

Figure 1 shows the general flow of the waterfall model. According to Bassil (2012), the Waterfall SDLC model is a sequential software development process in which progress is regarded as flowing increasingly downwards (similar to a waterfall) through a list of phases that must be executed in order to successfully build a computer software. It consists of five main phases which are communication, planning, design, development, and deployment. Each phase is responsible for different software engineering activities. In the waterfall model, all the phases must be done one after another.

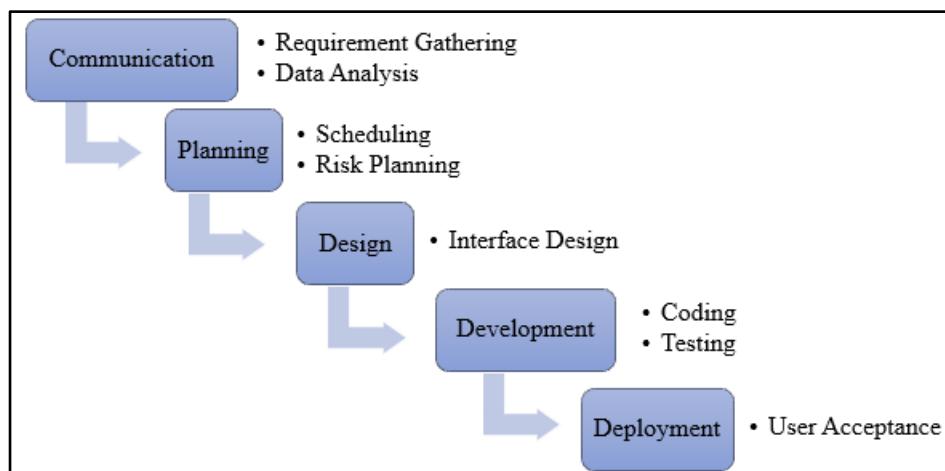


Figure 1: Waterfall Model

There are a few reasons why we chose this process model. First of all, the most important prerequisite for using the waterfall process model is clear. Another factor is this proposed system is a big and complex project. With this waterfall process model, it provides good preparation and planning before starting the process. Thus, it increases the chances for the system to have 100% correctness. It can ensure the project output is consistent and complete. Besides, it is more stable and has a longer operational life. It is because a project under the waterfall process model is produced phase by phase. Enhancements may make in the future. The waterfall process model also allows to incorporate new features and adapt to changing customer preferences.

In the communication phase, the main objective is communicating with all the stakeholders involved to generate the system requirement. All system details must be carefully analysed to ensure that a proper system requirement is produced and agreed by all parties involved. In this phase, all data and functionality of the system must be

analysed deeply to ensure the feasibility of the system. Therefore, a questionnaire is distributed to potential users to gather their opinions. This survey also helps to decide the mandatory services needed in this system.

In the planning phase, the main objective is to generate a systematic plan for all the software development process. Software developers must identify the resources needed for the system development such as how much manpower was required, what is the skill capacity of the developers, what are the hardware and software requirement and how much time needs to be allocated to each phase of development. So, the developer needs to generate a schedule based on these aspects. In this phase, the risk of the system also needs to be analyzed and generate risk planning. During the design phase, the main object is to create a general design of the system interface and function. Software developers must generate an interface design and the flow of the interface for the system. Also, the UML diagram such as the use case diagram, activity diagram, sequence diagram, traceability matrix, and entity relational diagram are illustrated to use as a reference.

In the development phase, the main object is to develop the system based on the requirement, design, and planning from the previous stages. The report is prepared and written at this phase. A presentation about the proposed system was also conducted. After that, the quality of system is evaluated during this phase via various types of testing activities to ensure system performs with high quality.

4.0 CONCLUSION

In conclusion, the Simple Book Service: A Comprehensive Mobile App for On-Demand Household Services is a thoughtfully designed system aimed at addressing the unique challenges faced by marginalized groups, such as those living alone, the elderly, and people with disabilities. By integrating essential services like plumbing, electrical maintenance, and gardening within a secure and user-friendly platform, the app offers a reliable solution for individuals who may struggle to find trusted assistance. The use of modern programming frameworks ensures that the system is robust and scalable, while the adoption of the Waterfall model provides a structured approach to its development.

The app's emphasis on security and trustworthiness is particularly noteworthy. Through thorough background checks, GPS tracking, and an emergency response feature, the system prioritizes the safety of its users, making it a trustworthy resource for those in need of home services. Additionally, the inclusion of user reviews, insurance coverage, and a community blog space fosters a supportive environment where users can make informed decisions and share their experiences.

Overall, the Simple Book Service app not only provides essential home services but also establishes a secure and reliable platform that enhances the quality of life for its users. By addressing both practical needs and safety concerns, this system stands out as a vital tool for marginalized individuals seeking dependable assistance in their daily lives.

(A-ST130) ECO-BIN: REVOLUTIONIZING WASTE MANAGEMENT THROUGH IOT INTEGRATION

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ABSTRACT

Pulau Tengah, situated in Mersing, is an island that requires preservation for future generations. To address this need, Eco-Bin was innovated. Eco-Bin is an IoT-based project designed to optimize waste collection and recycling processes. Developed specifically to assist janitors, volunteers, and staff on Pulau Tengah, Eco-Bin facilitates efficient monitoring of garbage levels in waste bins through the Blynk application, streamlining waste disposal and enhancing collection efficiency. Eco-Bin aligns with Sustainable Development Goal (SDG) 11: Sustainable Cities and Communities by promoting efficient resource utilization, reducing operational costs, and improving public health and cleanliness. The implementation of Eco-Bin on Pulau Tengah promises a cleaner environment, enhanced public health, and increased operational efficiency, contributing significantly to community sustainability and well-being. The system utilizes ultrasonic sensors to monitor waste bin fill levels in real-time, displaying detailed information such as weight and capacity on an integrated digital display. Additionally, Eco-Bin features alarm LED indicators to signal full bins and leverages IoT connectivity to notify waste management personnel promptly. The primary objectives of this project include designing an IoT system capable of accurately detecting and displaying garbage levels via Blynk and an LCD screen attached to each Eco-Bin. Furthermore, the project underwent rigorous user acceptance testing involving 20 respondents, including volunteers and Pulau Tengah staff, to validate system efficacy and user satisfaction. Results from these tests indicated strong user agreement that Eco-Bin effectively meets their needs and provides a viable solution to waste management challenges. In conclusion, Eco-Bin represents a transformative step in waste management practices, endorsing environmental sustainability, supporting public welfare, and aligning with global efforts to develop smarter, more sustainable waste management infrastructures.

Kata Kunci: Pulau Tengah, Eco-Bin, Arduino, IoT-based project, ultrasonic sensor.

ABSTRAK

Pulau Tengah, yang terletak di Mersing, merupakan sebuah pulau yang memerlukan pemeliharaan untuk generasi akan datang. Bagi memenuhi keperluan ini, Eco-Bin telah dihasilkan. Eco-Bin adalah projek berasaskan IoT yang direka untuk mengoptimalkan proses pengumpulan dan kitar semula sisa. Dibangunkan khusus untuk membantu pekerja pembersihan, sukarelawan, dan kakitangan di Pulau Tengah, Eco-Bin memudahkan pemantauan tahap sampah di dalam tong sampah secara efisien melalui aplikasi Blynk, sekali gus meningkatkan kelancaran proses pembuangan dan kecekapan pengumpulan sisa. Eco-Bin selari dengan Matlamat Pembangunan Lestari (SDG) 11: Bandar dan Komuniti Lestari dengan menggalakkan penggunaan sumber secara efisien, mengurangkan kos operasi, serta meningkatkan kesihatan awam dan kebersihan. Pelaksanaan Eco-Bin di Pulau Tengah menjanjikan persekitaran yang lebih bersih, peningkatan kesihatan awam, dan kecekapan operasi yang lebih tinggi, sekali gus menyumbang secara signifikan kepada kelestarian dan kesejahteraan komuniti. Sistem ini menggunakan sensor ultrasonik untuk memantau tahap penuh tong sampah secara masa nyata, dengan paparan maklumat terperinci seperti berat dan kapasiti pada paparan digital yang disepadukan. Selain itu, Eco-Bin dilengkapi dengan penunjuk LED yang berfungsi sebagai amaran apabila tong penuh dan menggunakan sambungan IoT untuk memberi notifikasi segera kepada petugas pengurusan sisa. Objektif utama projek ini termasuk mereka bentuk sistem IoT yang mampu mengesan dan memaparkan tahap sampah dengan tepat melalui aplikasi Blynk dan skrin LCD yang dipasang pada setiap Eco-Bin. Selain itu, projek ini telah menjalani ujian penerimaan pengguna yang melibatkan 20 responden, termasuk sukarelawan dan kakitangan Pulau Tengah, untuk mengesahkan keberkesanan dan kepuasan pengguna terhadap sistem ini. Hasil ujian menunjukkan persetujuan yang tinggi daripada pengguna bahawa Eco-Bin berkesan dalam memenuhi keperluan mereka dan menyediakan penyelesaian yang boleh dipercayai untuk cabaran pengurusan sisa. Kesimpulannya, Eco-Bin mewakili langkah transformasi dalam amalan pengurusan sisa, menyokong kelestarian alam sekitar, kesejahteraan awam, dan sejajar dengan usaha global untuk membangunkan infrastruktur pengurusan sisa yang lebih pintar dan lestari.

1.0 PENGENALAN

Pengurusan sisa yang cekap dan berkesan adalah salah satu cabaran utama dalam menjaga kebersihan dan kelestarian alam sekitar, terutamanya di kawasan tumpuan awam seperti pulau pelancongan, bandar, dan komuniti perumahan. Sistem pengurusan sisa konvensional sering kali berhadapan dengan masalah seperti pengosongan tong sampah yang tidak menentu, pembuangan sisa yang tidak terkawal, dan penggunaan sumber yang tidak efisien. Kesan daripada kelemahan ini termasuk peningkatan pencemaran, pembaziran tenaga, dan risiko kesihatan kepada komuniti.

Projek Eco-Bin dibangunkan sebagai penyelesaian inovatif yang menggabungkan teknologi Internet of Things (IoT) untuk mengatasi masalah ini. Eco-Bin merupakan sistem tong sampah pintar yang dilengkapi dengan sensor ultrasonik untuk memantau tahap penuh tong sampah secara masa nyata dan menghantar maklumat tersebut terus ke aplikasi Blynk. Aplikasi ini memberi notifikasi segera kepada petugas pengurusan sisa apabila tong sampah perlu dikosongkan, sekali gus mengelakkan

masalah tong melimpah dan memastikan pengurusan sisa dilakukan dengan lebih cekap.

Di samping itu, Eco-Bin juga menyokong Matlamat Pembangunan Lestari (SDG) 11: Bandar dan Komuniti Lestari, dengan mempromosikan penggunaan sumber yang efisien, mengurangkan kos operasi, serta meningkatkan kebersihan dan kesihatan awam. Sistem ini bukan sahaja direka untuk memenuhi keperluan pengurusan sisa di Pulau Tengah, Mersing, tetapi juga boleh diaplikasikan di pelbagai lokasi lain seperti kawasan perumahan, taman awam, dan institusi pendidikan.

Melalui penggunaan teknologi canggih, Eco-Bin mampu memberikan data yang tepat mengenai tahap sampah dalam tong, membantu dalam merancang laluan pengumpulan sisa yang lebih efisien, serta mengurangkan jejak karbon akibat pengumpulan sisa yang tidak terkawal. Projek ini juga mempunyai potensi untuk meningkatkan kesedaran masyarakat mengenai kepentingan pengurusan sisa yang berkesan dan kelestarian alam sekitar.

Secara keseluruhannya, Eco-Bin bukan sahaja memperkenalkan pendekatan pintar dalam pengurusan sisa, tetapi juga memainkan peranan penting dalam menjaga kebersihan dan kesejahteraan komuniti, sekaligus menyumbang kepada kelestarian alam sekitar yang lebih baik untuk generasi akan datang.

2.0 OBJEKTIF

i. Mereka Bentuk Sistem IoT yang Tepat dan Efisien

Membangunkan dan melaksanakan sistem IoT yang mampu mengesan serta memaparkan tahap sampah secara tepat dalam tong sampah melalui aplikasi Blynk dan skrin LCD yang dipasang pada Eco-Bin. Ini termasuk pemantauan masa nyata dan pemberitahuan automatik apabila tong hampir penuh.

ii. Meningkatkan Kecekapan Pengumpulan Sisa

Meningkatkan kecekapan pengumpulan sisa dengan memantau tong sampah secara masa nyata, memudahkan perancangan laluan pengumpulan yang lebih efektif, mengurangkan masa operasi, serta mengoptimumkan penggunaan sumber seperti tenaga dan bahan api.

iii. Pengumpulan dan Analisis Data untuk Penambahbaikan Sistem

Mengumpul dan menganalisis data mengenai tahap pengisian tong sampah dan frekuensi pengosongan untuk membuat keputusan berasaskan data. Data ini akan digunakan untuk mengenal pasti lokasi strategik bagi penempatan tong sampah dan penambahbaikan berterusan dalam pengurusan sisa.

3.0 METODOLOGI

Projek Eco-Bin adalah satu inovasi berasaskan teknologi IoT yang dibangunkan untuk mengoptimumkan pengurusan sisa di Pulau Tengah, Mersing. Sistem ini menggabungkan sensor ultrasonik, papan Arduino ESP32, aplikasi Blynk, dan skrin LCD untuk menyediakan penyelesaian pengurusan sisa yang efisien dan bersepadu. Metodologi ini merangkumi reka bentuk sistem, pembangunan prototaip, ujian pengguna, dan pelaksanaan sistem dalam situasi sebenar.

3.1 Reka Bentuk dan Pembangunan Sistem Eco-Bin

Proses reka bentuk melibatkan pemilihan komponen utama dan penyusunan sistem yang merangkumi: -

i. Sensor Ultrasonik

Digunakan untuk mengukur tahap sampah dalam tong secara masa nyata.

ii. Papan Arduino ESP32

Bertindak sebagai pengawal mikro utama yang memproses data dari sensor dan menghantar maklumat ke aplikasi Blynk melalui rangkaian Wi-Fi.

iii. Aplikasi Blynk

Digunakan untuk memantau tahap sampah dan menghantar notifikasi segera kepada petugas apabila tong sampah hampir penuh.

iv. Skrin LCD

Dipasang pada Eco-Bin untuk memaparkan tahap sampah secara langsung dan memberikan maklumat kepada pengguna di lokasi.

v. Penunjuk LED

Berfungsi sebagai amaran visual kepada petugas apabila tong sampah telah penuh.

Proses pembangunan Eco-Bin melibatkan pemasangan sensor ultrasonik di dalam tong sampah, penyambungan komponen elektronik, dan pemrograman papan Arduino ESP32. Sistem ini kemudian diuji untuk memastikan data yang dihantar ke aplikasi Blynk adalah tepat dan notifikasi diberikan pada masa yang sesuai.

Jadual 1: Pembangunan Projek Inovasi

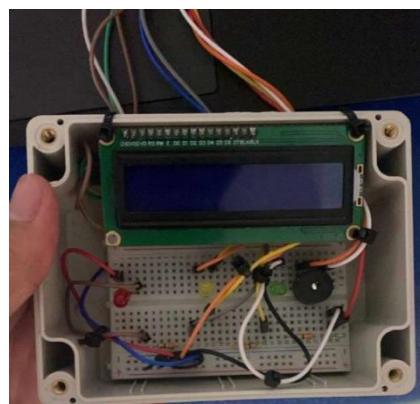
Langkah	Aktiviti	Peralatan/Komponen
1. Reka Bentuk Sistem	Reka bentuk litar dan susun atur komponen sistem.	Arduino ESP32, Sensor Ultrasonik, Skrin LCD, Penunjuk LED
2. Pemrograman Sistem	Pemrograman papan Arduino untuk mengintegrasikan data daripada sensor dan menghantar maklumat ke aplikasi Blynk.	Arduino IDE, Blynk Platform
3. Pemasangan Komponen	Pemasangan komponen dalam tong sampah untuk memastikan semua sensor dan paparan berfungsi dengan betul.	Sensor, Kabel Penyambung, LCD, Modul Wi-Fi
4. Ujian Sistem	Ujian ketepatan sensor, kebolehpercayaan penghantaran data, dan keserasian aplikasi Blynk.	Ujian Lapangan dan Makmal

3.2 Lakaran Projek



Rajah 1: Lakaran Projek Eco Bin

3.3 Pemasangan



Rajah 2 : Pemasangan komponen elektronik dan LCD pada breadboard.

3.4 Pengujian



Rajah 3 : Pengujian sistem melalui Blynk (a) dan paparan keluaran melalui LCD (b)

3.5 Pemasangan Pada Model



Rajah 5 : Pemasangan pada model untuk membentangkan projek

3.6 Pemasangan Pada Prototype



Rajah 5 : Pemasangan pada prototype untuk dibawa ke Pulau Tengah

4.0 HASIL DAPATAN

Projek 'Eco-Bin' meningkatkan kecekapan pengumpulan sisa di Pulau Tengah melalui data real-time dan pemantauan jarak jauh menggunakan aplikasi Blynk, mengurangkan kos operasi dan menjaga alam sekitar. Dengan integrasi IoT dan paparan digital, Eco-Bin memberikan maklumat visual yang jelas, sementara pengumpulan dan analisis data membantu menambah baik pengurusan sisa. Rekabentuk yang mesra pengguna, dengan indikator LED dan notifikasi IoT, memudahkan operasi oleh kakitangan, menyumbang kepada kelestarian alam sekitar dan kesejahteraan komuniti.

5.0 KESIMPULAN

Sebagai kesimpulan, 'Eco-Bin' merupakan inovasi yang praktikal dalam pengurusan sampah, yang bukan sahaja menyokong kelestarian alam sekitar tetapi juga meningkatkan kesejahteraan awam. Inisiatif ini selaras dengan usaha global untuk membangunkan infrastruktur pengurusan sampah yang lebih bijak, menjadikannya langkah penting ke arah masa depan yang lebih bersih dan lestari.

(A-ST131) ZIRCONATE-BASED DOUBLE CERAMIC LAYER SYSTEM OF THERMAL BARRIER COATINGS (TBC)

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ABSTRACT

Ceramic coatings used in high-temperature applications, focusing on their behaviour under thermal stress and their ability to resist oxidation. The aim of this project is to evaluate on how these coatings can prevent cracks caused by oxidation at the thermally grown oxide (TGO) layer. Two types of samples which single ceramic layer and double ceramic layer thermal barrier coating (TBC) were prepared using Atmospheric Plasma Spray (APS). The high temperature oxidation was conducted on ceramic-coated samples exposed to 600°C in electric furnace and subsequent cooling. The outcomes of this study will contribute to the development of ceramic coatings with enhanced resistance to oxidation, particularly in high-temperature environments. The findings provide insights into the factors influencing the formation and growth of TGO layer and contribute to the prevention of cracks caused by oxidation. The study compared the oxidation resistance of single-layer YSZ (Yttria-Stabilized Zirconia) and double-layer LZ/YSZ (Lanthanum Zirconate/Yttria-Stabilized Zirconia) thermal barrier coatings (TBCs) under high-temperature conditions (600°C). The findings revealed that the double-layer LZ/YSZ coating demonstrated better resistance to oxidation, as indicated by lower weight changes and thinner thermally grown oxide (TGO) layers, compared to the single-layer YSZ coating. This suggests that the LZ/YSZ coating offers improved protection against oxidation and better performance in extreme temperature environments. This research holds practical implications for industries relying on high-temperature applications. It establishes a foundation for further advancements in ceramic coatings, with the objective of improving material performance and extending the lifespan of components operating in extreme conditions.

Keywords: Ceramic coatings, thermal stress, oxidation resistance, thermally grown oxide (TGO) layer, high-temperature applications

Introduction

In recent years, there has been a great demand for the development of materials used for ceramic coatings' pivotal role in high-temperature applications such as gas turbines, where their microstructure significantly influences properties and performance. The study emphasizes the use of ceramic coatings, LZ and YSZ, on Inconel 625 to enhance its durability and resistance to oxidation. Recognizing the challenges faced by turbine blades in harsh conditions, the research aims to characterize the microstructure of Single Ceramic Layer (YSZ) and Double Ceramic Layer (LZ/YSZ) coatings, shedding light on their structural integrity and resistance to high-temperature degradation. The problem statement underscores concern about TBC degradation, prompting the need for innovative coating materials and designs to improve gas turbine engine durability and safety.

Objective

The research objectives encompass microstructural characterization before and after testing, evaluation of thermally grown oxide (TGO) growth, and assessment of high-temperature oxidation behaviour. The expected outcomes include insights into oxidation prevention, the effectiveness of double-layer coatings, and the protective role of TGO, contributing to the optimization of ceramic coatings for high-temperature applications.

Methodology

Material

The Inconel 625 was cut into pieces measuring 15 x 15 x 6 mm. The double ceramic layer (DCL) LZ/YSZ coating system was prepared using APS with specific spraying parameters outlined in Table 2. Specimens were sandblasted with 24–50 mesh alumina grit to increase surface area and improve coating adhesion, resulting in a surface roughness of 6–8 µm, measured with a Mitutoyo surface roughness tester. The roughened surfaces were then cleaned with acetone in an ultrasonic bath for 15 minutes, washed, and preheated at 70–100 °C in an oven. A bond coat of NiCoCrAlYTa powder (particle size 5–37 µm) was applied using a high-velocity oxy-fuel (HVOF) system, achieving a thickness of 150 µm. For the topcoats, Metco 204 NS-G YSZ powder (ZrO_2 -8 wt% Y_2O_3) was applied using atmospheric plasma spray (APS) deposition equipment as the intermediate layer, resulting in a thickness of 200–250 µm. Finally, commercial $La_2Zr_2O_7$ powder was used as the topcoat, achieving a thickness of 80–100 µm.

Table 2 Air plasma spray parameters.

Parameters	YSZ	LZ
Current (A)	600	600
Voltage (V)	70	70
Primary gas, Ar (l/min)	38	35
Secondary gas, H ₂ (l/min)	3	8
Powder feed rate (g/min)	35	34
Spray distance (cm)	12	10

Experimental Setup

Designing a furnace setup for high-temperature oxidation tests involves several key components and specifications:

- i. **Furnace Dimensions:** Must accommodate the test specimens and ensure uniform heating and cooling based on test requirements.
- ii. **Insulation Materials:** High-temperature insulation materials like ceramic fibre or refractory bricks minimize heat loss and maintain a stable environment.
- iii. **Heating Elements:** Typically, resistance heating elements such as Kanthal or Nichrome are used to achieve and sustain the target temperature of 600°C.
- iv. **Temperature Control System:** Employs sensors and feedback mechanisms for precise temperature control throughout the test, including heating to 600°C for 5 hours and cooling for 24 hours.

These components ensure a controlled environment for accurate assessment of materials performance under cyclic high-temperature stress.

Sample Preparation

In the high-temperature oxidation test, rectangular specimens of Inconel 625 are used, each measuring 15mm x 15mm x 6mm. One specimen is coated with LZ and weighs 10.7063g, while another is coated with YSZ/LZ and weighs 11.3637g. The dimensions (length, width, and height) and weight of the specimens at Figure 0.1 are critical for assessing their response to high-temperature oxidation. The surface area, determined by length and width, influences the interaction with the high-temperature environment. The volume, derived from the dimensions, helps understand the material's oxidation behaviour and volume changes. The weight is used to calculate heat capacity, which provides insights into the energy required for temperature elevation and thermal energy storage. These parameters collectively help evaluate the oxidation rate, extent of oxidation, and performance variations based on different coatings.



Figure 0.1 Specimen size: 15mm x 15mm x 6mm.

High Temperature Oxidation test

The pre-oxidation process involves placing specimens in a furnace for about 12 hours at an elevated temperature to form a consistent oxide layer. Before testing, the specimens are meticulously prepared through cleaning, deburring, coating, or adjusting surface roughness to ensure accuracy. The furnace is then configured and calibrated for precise temperature control, and specimens are placed inside to ensure uniform heating and cooling. The heating cycle begins with a gradual increase in temperature, typically at a rate of 8°C per minute, from ambient to the desired maximum. This is followed by a cooling cycle, where the temperature is decreased back to ambient conditions at the same rate. To replicate real-world conditions, multiple heating and cooling cycles are performed. During the process, researchers closely monitor and record parameters such as temperature, time, and specimen responses. Specific heating and cooling cycles might involve, for instance, heating to 600°C for 5 hours followed by a 24-hour cooling period. Additionally, dwell periods or hold times may be introduced at temperatures to allow for stabilization or observation, depending on the testing requirements and the properties of the materials being tested.

Result

Microstructure

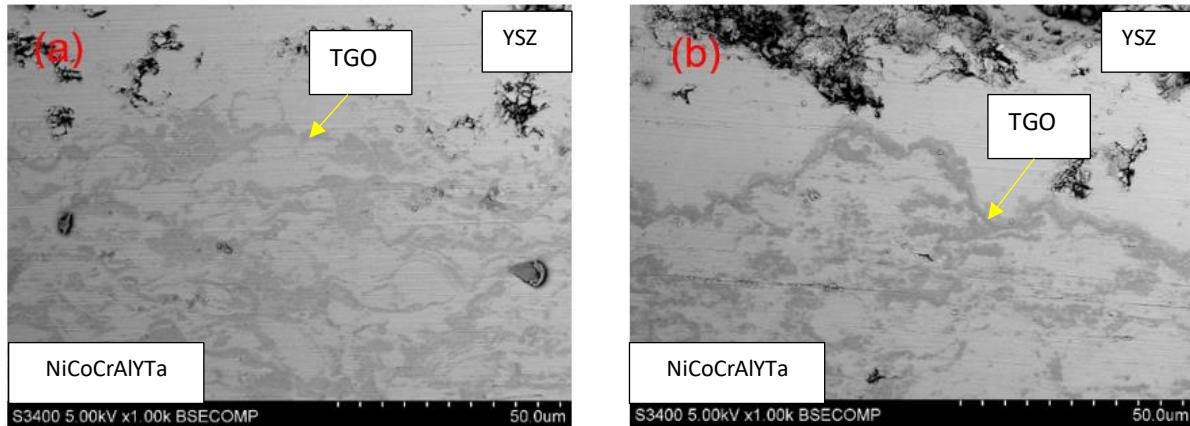


Figure 0.1 SEM Microstructure of sample (a) Lanthanum Zirconia/ Yttria Stabilized Zirconate (b) Yttria Stabilized Zirconate.

Figure 0.1 highlights the oxidation behaviour of dual-layer (DCL) and single-layer (SLC) coatings after a 90-hour high-temperature oxidation test. The DCL coating exhibits superior oxidation resistance, as evidenced by the absence of a black area representing the Thermally Grown Oxide (TGO) layer. Instead, the presence of a grey area within the DCL coating indicates mixed oxides, including chromia, spinel, and nickel oxides (CSN), suggesting a complex but effective defence against oxidation. In contrast, the single-layer YSZ coating shows a clear TGO line after 90 hours, indicating less robust oxidation resistance. The cross-sectional morphology of the YSZ coating reveals a continuous Al_2O_3 scale (black area) and lacks the mixed oxides seen in the grey area of the DCL coating. This distinction underscores the unique oxidation characteristics of the YSZ coating during high-temperature oxidation testing and emphasizes the influential role of layer thickness ratios in determining the overall oxidation resistance of the coatings.

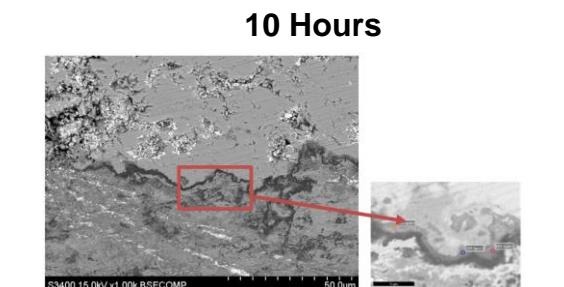


Figure 0.2 Close up TGO layer for YSZ

Table 3 Data of Elements in TGO layer YSZ

Coloured Dark Area	Element	%Atomic
	Al ₂	20.42
	O ₃	42.68
Gray Area	Cr	17.92
	Co	8.36
	Ni	10.62

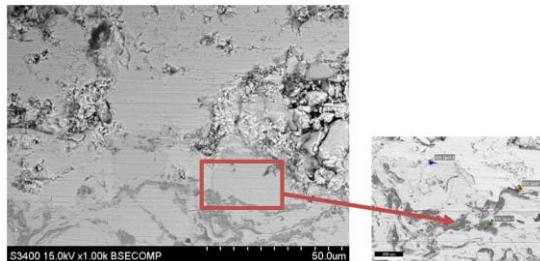


Figure 0.3 Close up TGO layer for LZ/YSZ

Table 4 Data of elements in TGO layer LZ/YSZ

Coloured	Element	%Atomic
Dark Area	Al ₂	30.5
	O ₃	28.98
Gray Area	Cr	14.55
	Co	14.66
	Ni	11.31

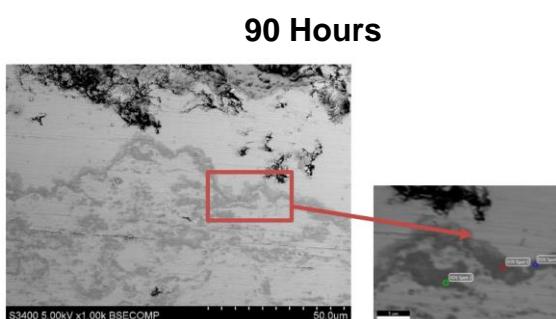


Figure 0.4 Close up TGO layer YSZ.

Table 5 Data of Elements in TGO layer of YSZ

Coloured	Element	%Atomic
Dark Area	Al ₂	18.77
	O ₃	31.98
Gray Area	Cr	19.01
	Co	14.3
	Ni	15.94

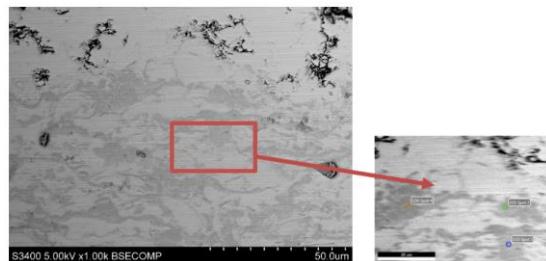


Figure 0.5 Close up TGO layer for LZ/YSZ

Table 6 Data of elements in TGO layer of LZ/YSZ

Coloured	Element	%Atomic
Dark Area	Al ₂	20.55
	O ₃	30.28
Gray Area	Cr	16.55
	Co	14.84
	Ni	17.78

The elemental composition analysis of the coated sample over 10 and 90 hours reveals significant changes in both dark and grey areas, reflecting material transformation over time. In the dark area, representing the primary coating, the percentage of Al₂O₃ decreased from 20.42% to 18.77%, and O₃ decreased from 42.68% to 31.98%, indicating ongoing oxidation processes. In the grey area, which includes mixed oxides like Cr, Co, and Ni, notable increases were observed: Cr from 17.92% to 19.01%, Co from 8.36% to 14.3%, and Ni from 10.62% to 15.94%. These changes suggest dynamic evolution due to oxidation and transformation during extended heat treatment. The increased percentages of Cr, Co, and Ni highlight their importance in the evolving composition of the grey area. Overall, this analysis provides valuable insights into material changes during high-temperature oxidation testing, enhancing understanding of the coating's behaviour over time.

Weight gain



Figure 0.6 Graph represent Weight Gain and Lost of Sample

Figure illustrates the weight changes over a 90-hour period for LZ and YSZ samples. The y-axis depicts weight in a narrow range from -0.003 to 0.003, while the x-axis represents time in hours (10 to 90). Peaks and troughs in the graph indicate variations in weight gain and loss, potentially associated with oxidation processes. Peaks suggest points of interest, likely indicating thickness increase during specific cycles, while weight loss at certain hours may signify processes resulting in reduced weight. The data implies that these specific hours are crucial for assessing sample performance. LZ, with a double coating layer (LZ/YSZ), outperforms YSZ with a single

layer, indicating more stable weight changes over the 90-hour period during high-temperature oxidation testing.

TGO Thickness

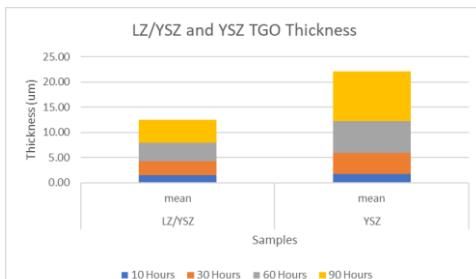


Figure 0.7 Comparative Analysis of LZ/YSZ and YSZ Samples by Layer Thickness in Micrometres (μm) with Mean Values

The provided stacked bar chart compares the thickness of thermally grown oxide (TGO) layers in LZ/YSZ and YSZ samples over four-time intervals: 10, 30, 60, and 90 hours. The mean thickness in micrometres (μm) shows an increase over time for both samples, consistent with TGO growth due to high-temperature oxidation. The YSZ sample consistently exhibits a significantly greater mean thickness across all time intervals compared to the LZ/YSZ sample. After 90 hours, the YSZ sample has the highest increase in TGO thickness, indicating a faster oxide growth rate or a different oxidation mechanism. This information is crucial for high-temperature oxidation testing, as TGO growth rates affect the performance and lifespan of protective coatings in turbines, engines, and other thermal barrier systems.

Conclusion

This study aimed to investigate key aspects related to the microstructure, Thermally Grown Oxide (TGO) growth, and the influence of heat treatment on different ceramic coating configurations, specifically comparing single-layer YSZ (Yttria-Stabilized Zirconia) coatings with double-layer LZ/YSZ (Lanthanum Zirconate/Yttria-Stabilized Zirconia) coatings. The results obtained shed light on the distinctive characteristics and performance of these coatings under high-temperature oxidation testing conditions.

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**(A-ST135) PORTABLE SOLAR-POWERED WEATHER OBSERVATION
MONITORING SYSTEM FOR SEA-TURTLE NESTING**

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ABSTRACT

The Portable Solar-Powered Weather Observation Monitoring System for Sea-Turtle Nesting aims to protect sea turtle eggs and monitor the weather conditions around their nesting sites using advanced sensor technology. The system employs the SR501 motion sensor to detect the hatching of sea turtle eggs, triggering immediate notifications to users via smartphones through the Blynk app. This enables real-time monitoring and timely intervention to ensure the safe journey of hatchlings to the beach. The DHT22 temperature sensor continuously monitors the temperature within the nesting sites, providing crucial data for analyzing hatchling gender, as temperature influences sex determination in sea turtles. Additionally, the DHT22 sensor records ambient temperature, offering valuable insights into the environmental conditions surrounding the nests. A raindrop sensor measures rainfall percentages to support conservation efforts further, helping users anticipate and respond to weather changes that could impact the nests. Powered by solar energy, this portable system ensures sustainable and uninterrupted monitoring. By integrating these sensors and utilizing the Blynk app for real-time monitoring, the project not only enhances the survival rates of young sea turtles but also gathers essential data for ongoing conservation initiatives. This comprehensive approach ensures that both immediate protective measures and long-term conservation strategies are effectively implemented, contributing significantly to the preservation of sea turtle populations.

Keywords: Sea-turtle conservation, solar-powered system, sensor technology, real-time monitoring, nesting site protection

1.0 INTRODUCTION

The world's biodiversity faces significant threats that have led numerous species to the brink of extinction.¹ These threats are prevalent in both marine and terrestrial ecosystems, including habitat destruction, pollution, climate change, and overexploitation, all of which are contributing to what is commonly referred to as the sixth mass extinction event on Earth.²

Sea turtles, a prominent group of large marine ectotherms, are influenced by temperature conditions both on land, where they deposit their eggs, and in the oceans, where they grow, feed, and reproduce. Consequently, it is anticipated that the expansions of foraging and nesting ranges in sea turtles are not synchronized, as the

alterations in isotherms differ between terrestrial and marine environments, thereby affecting the life history traits of sea turtles in distinct ways.³ Furthermore, the interaction of various traits, including ontogenetic habitat shifts, extensive migrations, natal philopatry, and temperature-dependent sex determination (TSD), renders sea turtles exceptional subjects for investigating and evaluating the effects of climate change. This issue remains inadequately understood, despite the growing focus from policymakers, researchers, and the general public.⁴ Refer to Figure 1 which show the generic life cycle of sea turtles with parameters expected to be impacted by climate change.

Sea turtles one of the reptilian species, the sex of the offspring is dependent on incubation temperatures and is not genetically determined at the time of egg deposition. This TSD is exhibited in different patterns among different reptile groups.⁵ In the marine turtle species studied to date, higher temperatures have been shown to produce a greater proportion of females, with cooler temperatures producing more males.⁶ The temperature experienced during the thermosensitive period, thought to occur during the middle third of incubation, is critical for sexual development.

The temperature at which a 1:1 sex ratio is produced is termed the pivotal temperature.⁷ Although the possibility for some degree of interpopulation variation in patterns of TSD in at least some sea turtle species exists pivotal temperatures have been shown to be conservative.⁸

Since marine turtles have TSD it is predicted that increases in incubation temperatures will eventually lead to feminization of some marine turtle populations.⁹ The majority of studies estimating current primary sex ratios reported female biases, for all species of marine turtles in all ocean basins in which they occur with few reports of balanced to slightly male biased primary sex ratios.

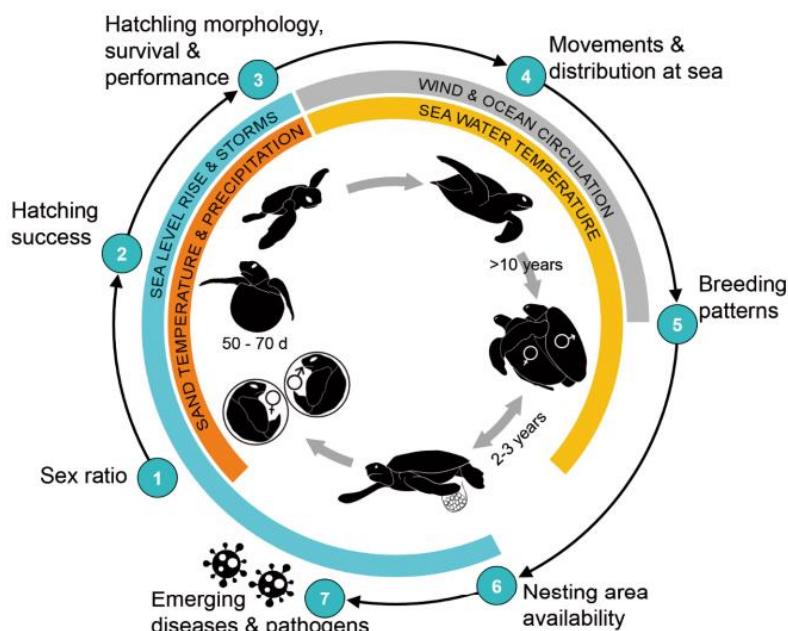


Figure 1: Generic life cycle of marine turtles with parameters expected to be impacted by climate change

2.0 OBJECTIVES

- **Enhance Sea Turtle Hatchling Survival:** To increase the survival rates of sea turtle hatchlings by providing real-time monitoring of nesting sites, allowing for timely interventions to protect hatchlings during their journey to the sea.
- **Continuous Environmental Monitoring:** To continuously monitor and record critical environmental parameters, such as temperature and rainfall, around sea turtle nests using advanced sensor technology, ensuring optimal conditions for egg incubation and hatching.
- **Data-Driven Conservation:** To gather and analyze data on temperature, humidity, and rainfall around nesting sites, providing valuable insights for understanding and influencing factors such as sex determination in hatchlings, which is temperature-dependent.
- **Sustainable and Uninterrupted Operation:** To develop a self-sustaining monitoring system powered by solar energy, ensuring continuous operation and data collection without reliance on external power sources.
- **Integration with Real-Time Notification Systems:** To integrate the system with the Blynk app for instant notifications to conservationists, researchers, and other stakeholders, enabling prompt action in response to environmental changes or the hatching of eggs.
- **Support Long-Term Conservation Efforts:** To contribute to the broader conservation initiatives by providing reliable data and insights that can inform and improve long-term strategies for protecting sea turtle populations.

3.0 METHODOLOGY

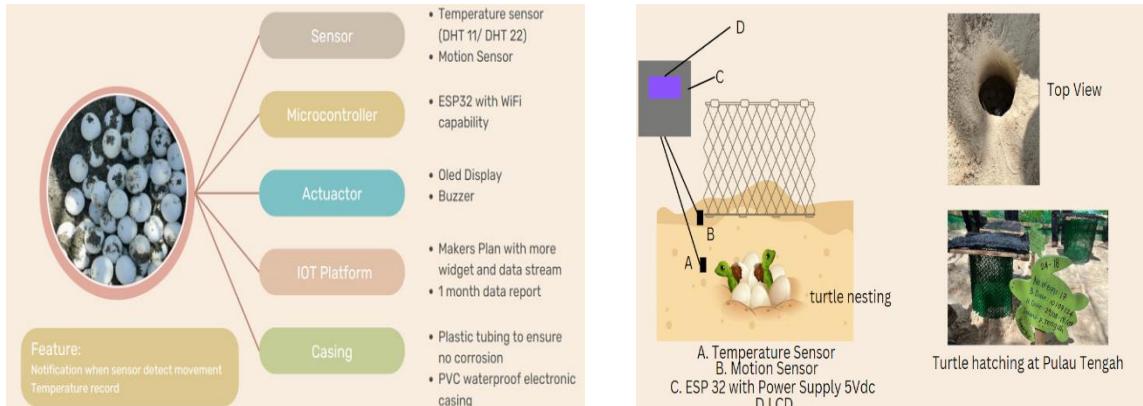
3.1 List of components

Here, the list of components:-

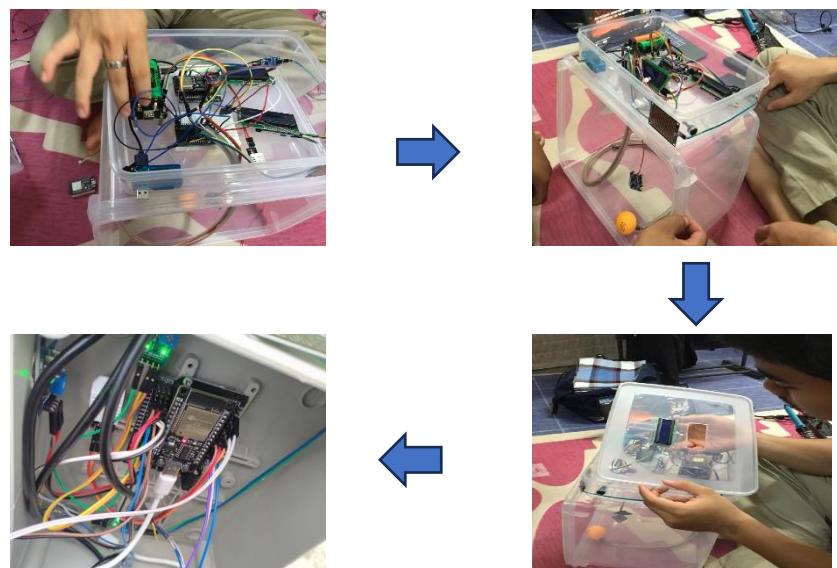
Table 1: List of Components

No.	Item	Quantity
1.	Lcd with i2c	2
2.	ESP32	3
3.	Expansion Board ESP32	3
4.	DHT 22	3
5.	Motion Sensor 501	3
6.	Jumper Wire Female to Male	1 Set
7.	Jumper Wire Male to Male	1 Set
8.	Jumper Wire Female to Female	1 Set
9.	Tiub Hose	1 Set
10.	Battery AA	5
11.	Battery Holder	1 Set
12.	Wind Direction	1
13.	Wind Speed	1
14.	LDR Sensor	1
15.	Raindrop Sensor	1
16.	Air Quality Sensor	1
17.	Panel solar	1

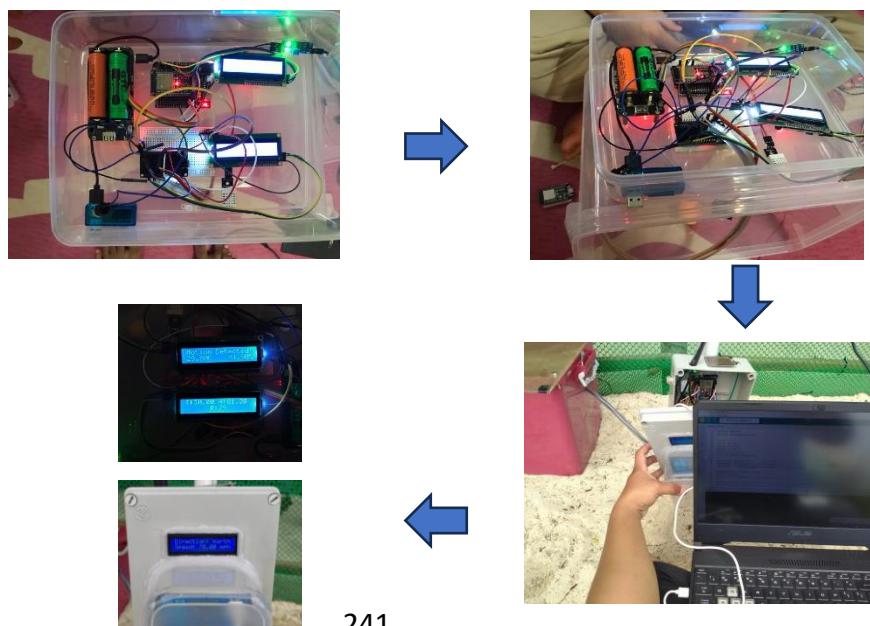
3.2 Project sketch



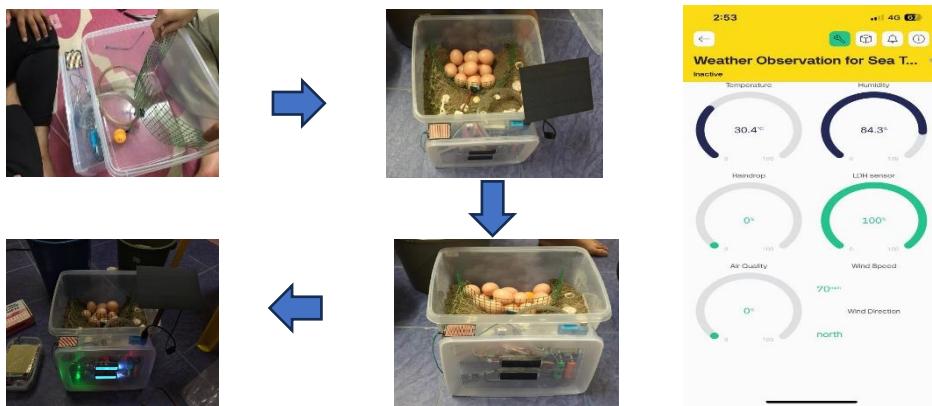
3.3 Project Installation



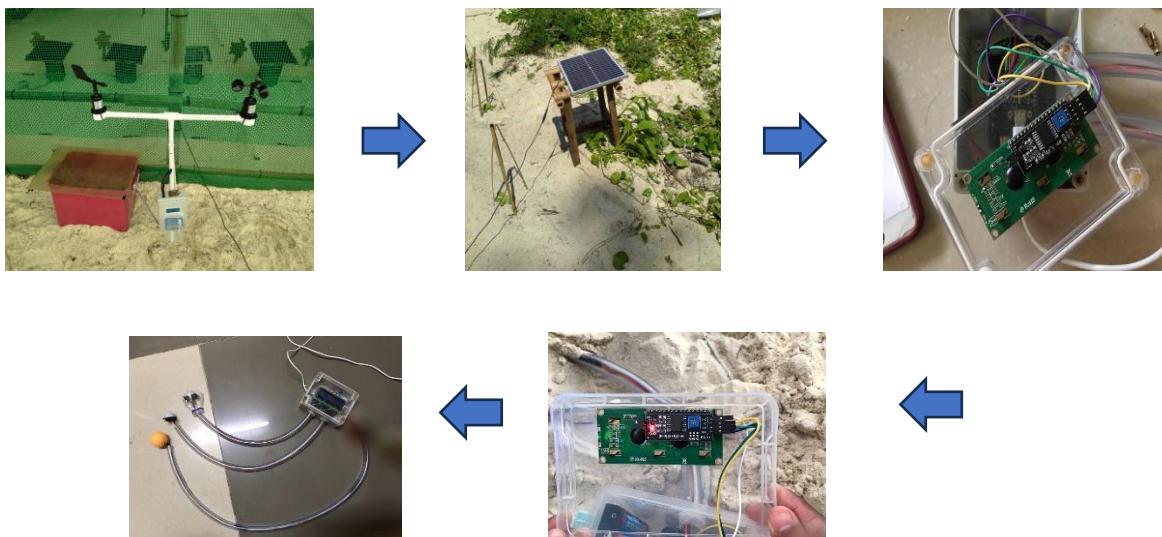
3.4 Project Testing



3.5 Installation Hardware & Blynk



3.3 On-Site Installation



4.0 RESULTS

Advantages/Impact:

❖ Real-time Monitoring and Immediate Response:

- The integration of the SR501 motion sensor with the Blynk app ensures that any movement, such as the hatching of sea turtle eggs, is immediately detected and communicated to conservationists via smartphones. This allows for prompt intervention, improving the chances of hatchlings safely reaching the ocean, significantly reducing mortality rates.

❖ Comprehensive Environmental Data Collection:

- The DHT22 temperature sensor's ability to continuously monitor the temperature within nesting sites is critical for understanding and managing the temperature-dependent sex determination of sea turtles. By recording both nest and ambient temperatures, the system provides crucial data that can influence conservation strategies, such as artificially adjusting temperatures to ensure a balanced gender ratio.

❖ **Rainfall Monitoring and Adaptive Conservation:**

- The inclusion of a raindrop sensor allows for the measurement of rainfall around nesting sites, helping conservationists anticipate and mitigate the effects of adverse weather conditions on the nests. This data is vital in adjusting protective measures and ensuring the nests remain undisturbed by environmental changes.

❖ **Sustainability and Portability:**

- The solar-powered design ensures that the system is both environmentally friendly and capable of operating in remote locations without reliance on external power sources. This portability is particularly advantageous in monitoring multiple nesting sites spread across vast and often inaccessible coastal areas.

❖ **Enhanced Survival Rates and Long-term Conservation:**

- By providing a comprehensive monitoring solution that covers real-time alerts, temperature analysis, and weather monitoring, the system contributes to both the immediate survival of hatchlings and the long-term sustainability of sea turtle populations. The data collected over time will inform future conservation policies and actions, leading to better protection strategies.

Novelty:

❖ **Integration of Multiple Sensors in a Single System:**

- While individual sensors for motion, temperature, and rain exist, their integration into a single, portable system specifically designed for sea turtle conservation is novel. This combination allows for a more nuanced and complete understanding of the nesting environment, enabling more effective protection measures.

❖ **Use of Blynk App for Real-time Data and Alerts:**

- The use of the Blynk app for real-time data transmission and alert systems is a novel application in the context of wildlife conservation. It allows for remote monitoring and rapid response, which is crucial in protecting vulnerable sea turtle populations.

❖ **Contribution to Sex Determination Research:**

- The DHT22 sensor's ability to monitor the precise temperature within nesting sites offers a unique advantage in studying and potentially influencing the sex ratios of sea turtle populations, an area of growing importance given the impact of climate change on gender ratios.

Results/Impact:

❖ **Increased Hatchling Survival:** The real-time monitoring and immediate notifications lead to timely interventions that significantly increase the chances of hatchlings reaching the ocean safely.

❖ **Data-driven Conservation Strategies:** The continuous collection of environmental data allows for the development of more informed and effective conservation strategies, ultimately contributing to the long-term survival of sea turtle species.

❖ **Global Applicability:** The portability and solar-powered nature of the system mean it can be deployed in various coastal regions around the world, making it a versatile tool in global sea turtle conservation efforts.

5.0 CONCLUSION

In conclusion, the Portable Solar-Powered Weather Observation Monitoring System for Sea-Turtle Nesting represents a significant advancement in conservation technology. By integrating the SR501 motion sensor, DHT22 temperature sensor, and a raindrop sensor, this system provides real-time, data-driven insights into the environmental conditions and critical events surrounding sea turtle nests. The use of solar power ensures a sustainable and reliable energy source, enabling continuous monitoring without environmental impact. Through the Blynk app, conservationists and researchers receive timely notifications, allowing for immediate protective measures and informed decision-making. This innovative system not only boosts the survival rates of hatchlings by facilitating their safe journey to the sea but also contributes valuable data for the ongoing study and preservation of sea turtle populations. The comprehensive and forward-thinking approach embodied in this project highlights its potential to make a lasting impact on sea turtle conservation efforts worldwide.

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(A-ST140) IMPLEMENTATION OF TRANSPORT LAYER SECURITY WITH AES ALGORITHM IN IOT NETWORKS USING MQTT PROTOCOL

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ABSTRACT

In the modern world of IoT (Internet of Things), data security is crucial as all technologies are now interconnected. While computing software and hardware have improved security, IoT devices still lack adequate protection. To address this issue, the researchers propose using Transport Layer Security (TLS) with the AES algorithm and the MQTT (Message Queuing Telemetry Transport) protocol to secure IoT devices. The goal is to prevent data theft by encrypting transmitted data, making it unreadable to attackers.

To test the impact of TLS implementation, the researchers evaluated RAM (Random Access Memory) usage, CPU (Central Processing Unit) utilization, and communication delay on the ESP32 microcontroller. With TLS enabled, the average remaining RAM was 180,256 bytes out of 520 KB, CPU usage was 0.53% out of 240 MHz, and the delay was 0.475 seconds. Without TLS, the average remaining RAM was 224,825 bytes out of 520 KB, CPU usage was 0.2% out of 240 MHz, and the delay was 0.248 seconds. These results indicate that the performance impact of TLS on the ESP32 is relatively small, suggesting that enhanced security measures can be implemented without significantly affecting system resources or performance.

Keywords: CPU, delay, Message Queuing Telemetry Transport, Transport Layer Security, RAM

1.0 INTRODUCTION

Internet of Things (IoT) is a concept where objects are embedded with technologies like sensors and software to facilitate communication, control, connectivity, and data interaction with other devices via the internet. Communication between devices requires protocols to transmit information and data securely. One of the protocols used in IoT devices is MQTT (Message Queuing Telemetry Transport). Generally, the MQTT protocol offers only basic authentication, which makes the device vulnerable to attack. With this basic security, a network can be easily attacked, resulting in data theft or other attacks such as denial of service, man in the middle attacks, and sniffing.

The 2022 Digital Defense Report by Microsoft highlights that while security in software and hardware computing has improved recently, IoT devices' security has lagged, resulting in numerous attack incidents. To prevent these threats, encryption is essential. Encryption aims to maintain the security of data in the form of information or

messages to prevent attackers from reading the contents of the information or messages.

Previous research has identified the security shortcomings of the MQTT protocol in IoT devices, which by default lacks robust security features, making them susceptible to attacks. Researchers have suggested solutions like implementing TLS/SSL to enhance the security of the MQTT protocol. One study implemented TLS/SSL with the RSA algorithm to prevent sniffing attacks on IoT devices. Another study applied the AES algorithm, suitable for devices with limited resources, successfully protecting databases from external attacks with minimal resource usage. Additionally, a comparative study found that the AES algorithm is more efficient and faster than RSA for encryption security.

This study proposes enhancing the security of the MQTT protocol using the AES algorithm, which is more efficient and can improve the integrity of IoT devices.

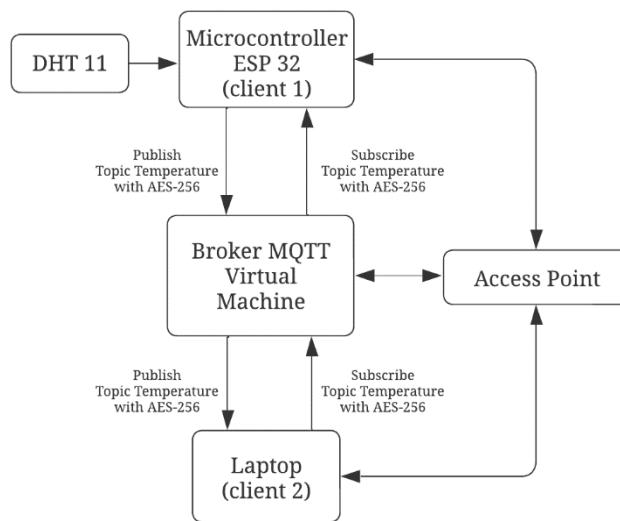
2.0 OBJECTIVE

The aim of this research is to secure the communication of IoT devices based on the MQTT protocol in terms of data integrity and to enhance the security of IoT devices during the data transmission process. The benefits of this research include providing information about security vulnerabilities in the MQTT protocol and knowledge about the weaknesses of IoT devices that use the MQTT protocol.

3.0 METHODOLOGY

3.1 Device System

This diagram is a design of the device that will be developed in this study.

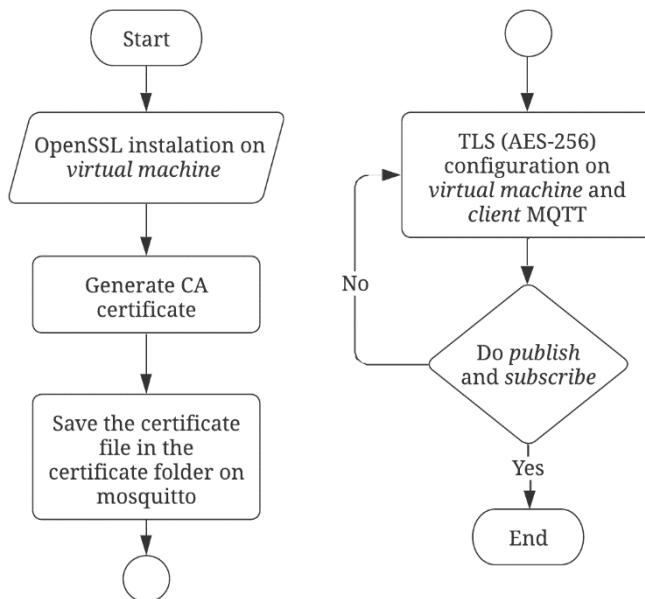


In the diagram above, client 1 acts as a publisher, which is an ESP32, and client 2 acts as a subscriber, which is a laptop. The broker is a virtual machine where the MQTT protocol is installed using Mosquitto. The broker's role is to receive and forward messages between the subscriber and publisher based on the designated topic. When the device operates, client 2 sends a subscribe message with a specific topic to the broker. The broker then forwards this subscription to its destination, client 1, which is the ESP32 with a DHT11 temperature sensor. Client 2 receives the message and

sends a response message containing a publish with the same topic to the broker, and the broker forwards the message to client 1.

3.2 Security System Design

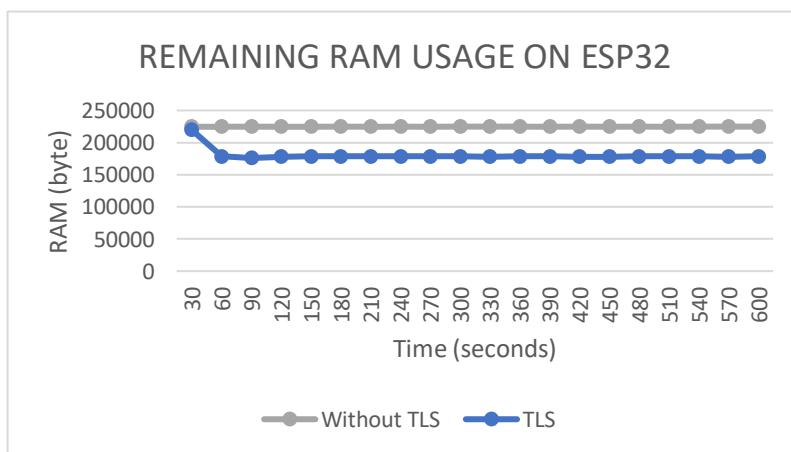
Communication between devices in the designed IoT system uses the MQTT protocol, which by default does not have security measures for its communication. Therefore, it is necessary to implement security to protect the communication of IoT devices. To achieve this, a certificate is required for the TLS handshake process. This certificate will be generated using OpenSSL and will contain an AES-256 key algorithm, which will be used for encryption and decryption processes. The certificate will be stored in a folder on the virtual machine that acts as the broker. Security will be applied to the communication between the broker and the client.



4.0 RESULTS

4.1 ESP32 RAM Usage

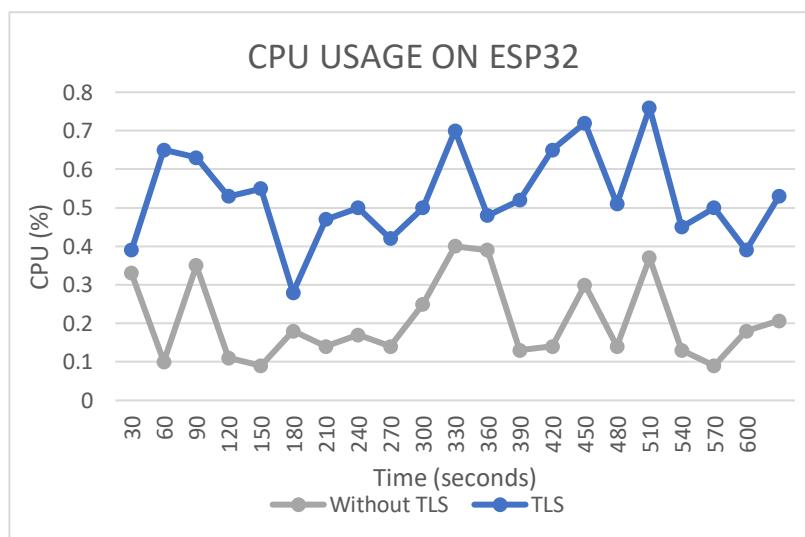
Performance testing on IoT devices is carried out by comparing the differences in RAM usage and delay before and after implementing TLS (Transport Layer Security) on the ESP32 microcontroller.



The performance test results of the IoT device based on RAM usage were tested for 10 minutes with data collection every 30 seconds. In the graph of Figure 4.33, the gray line indicates the remaining RAM usage on the ESP32 without implementing TLS with the AES algorithm, while the blue line shows the remaining RAM usage on the ESP32 with TLS implementation using the AES algorithm. In the first 30 seconds, RAM usage with the AES algorithm (219,884 bytes) and without the AES algorithm (224,800 bytes) is almost the same due to the initial communication process still performing validation between the client and broker, which does not use many resources from the ESP32 before proceeding with data transmission communication. Overall, the average remaining RAM usage on the ESP32 is around 180,256 bytes with TLS implementation and 224,825 bytes without TLS implementation.

4.2 ESP32 CPU Performance

Performance testing on IoT devices is conducted by comparing the differences in CPU usage before and after implementing TLS on the ESP32 microcontroller.



The performance test results of the IoT device based on CPU usage were tested for 10 minutes with data collection every 30 seconds. In the graph of Figure 4.34, the gray line indicates CPU usage on the ESP32 without TLS implementation, while the blue line shows CPU usage on the ESP32 with TLS implementation. CPU performance using TLS is higher compared to without TLS, as TLS requires multiple processes to secure data before sending it to the broker. In contrast, without TLS, data is sent directly to the broker without security measures. Overall, the average CPU usage with TLS is 0.53%, while without TLS it is 0.2%.

4.3 Client and Broker Delay Communication

The test measures the delay values produced before and after implementing TLS.

Table 7 : Delay Communication Comparison

	Pakcets	Time Span (s)	Delay (s)
TLS	285	600.381	0.475
Without TLS	145	585.761	0.248

Table 1 shows the number of packets and time span obtained from data collection over 10 minutes before and after implementing AES. The delay measured during AES implementation was 0.475 seconds, whereas without AES it was 0.248 seconds. The data indicates that implementing AES approximately doubles the delay compared to using the system without AES.

5.0 CONCLUSION

Based on the test results, the following conclusions can be made:

1. Communication using the MQTT (Message Queuing Telemetry Transport) protocol has security vulnerabilities that allow attackers to view the data being transmitted during the publish-subscribe communication process.
2. Implementing TLS (Transport Layer Security) with the AES algorithm has been shown to enhance the security of MQTT protocol by providing data integrity through encryption, for both the client and the broker.
3. The performance differences in IoT devices based on MQTT (Message Queuing Telemetry Transport) before and after implementing TLS (Transport Layer Security) are not very significant. This is reflected in the average remaining RAM usage of 180,256 bytes out of 520 KB, CPU usage of 0.53% out of 240 MHz, and a delay of 0.475 seconds with TLS implementation, compared to an average remaining RAM usage of 224,825 bytes out of 520 KB, CPU usage of 0.2% out of 240 MHz, and a delay of 0.248 seconds without TLS implementation.

(A-ST153) DEVELOPMENT OF CHAFF COLLECTOR FOR DRUM COFFEE ROASTER MACHINE FOR HOME APPLICATION

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ABSTRACT

This project aims to enhance the efficiency of home coffee roasting, a growing trend among coffee enthusiasts seeking to achieve high-quality results in their own kitchens. Traditional drum coffee roasters often face significant challenges that can affect the quality of the final product, such as excessive chaff buildup leading to uneven roasting and burnt coffee beans. The objective of this project is to design a unique chaff collector that effectively removes excess chaff during the roasting process, utilizing the mechanical engineering design process to create a fan-like device that can be easily integrated into existing drum coffee roasters. The novelty of this project lies in its inventive approach to solving the chaff problem, which has the potential to revolutionize the home coffee roasting experience by providing a simple yet effective solution that not only enhances roasting quality but also reduces health hazards associated with chaff buildup and supports sustainable practices by allowing for the potential reuse of chaff. The market potential for this invention is promising, as it caters to the increasing demand for high-quality home coffee roasting equipment, offering a cost-effective and efficient solution that aims to significantly improve the home coffee roasting experience for enthusiasts and professionals alike.

Keywords: chaff collector, drum coffee roaster machine, mechanical engineering design process

1.0 INTRODUCTION

Coffee roasting is an essential step that transforms green coffee beans into aromatic roasted coffee. This process enhances flavour and releases the pleasant aromas associated with fresh coffee. However, traditional roasting methods produce a byproduct called chaff, which is the thin skin that separates from the beans during roasting. The disposal of coffee chaff creates several problems. It can be challenging to dispose of properly, leading to waste management issues, and it contributes to a messy roasting area.

2.0 OBJECTIVE

The objective of this innovation is to develop a chaff collector that helps with the removal of excess chaff during coffee roasting, thereby improving the overall roasting experience and efficiency.

The objective of this project is:

1. To design a unique chaff collector for drum coffee roasters that effectively integrates with existing roasting equipment.
2. To effectively remove excess chaff during the roasting process, minimizing mess and improving operational efficiency.
3. To enhance the efficiency and quality of home coffee roasting, enabling users to achieve superior flavour profiles and aromas in their coffee.

3.0 METHODOLOGY

The chaff collector, designed for easy assembly onto existing drum coffee roasters, is a key component of this innovation. It improves the functionality of the roasting process by effectively gathering chaff, the byproduct produced during roasting. This collection prevents chaff from interfering with the roasting process and reduces fire hazards associated with chaff buildup.

Table 1 outlines the features, functionality, usefulness, and practicality of the chaff collector. Figure 1 presents a 3D model of the chaff collector machine assembled with the drum coffee roaster, demonstrating its compatibility and design. This innovation streamlines the roasting process and contributes to a cleaner and safer environment for coffee roasting.

Table 1: Description the features, functionality, usefulness and practicality of the chaff collector.

No	Category	Feature	Description
1	Features	Durability	Constructed using durable materials, ensuring long-lasting performance and minimal maintenance requirements.
2		Compatibility	Designed to be compatible with various drum coffee roasters, offering flexibility and versatility for users.
4	Functionality	Seamless Integration	Integrates seamlessly with the drum coffee roaster, providing a streamlined and efficient roasting experience.
5		Noise Reduction	Engineered to operate quietly, minimizing distractions and providing a pleasant roasting experience.
6	Usefulness	Effective Chaff Removal	Ensures a clean working environment and minimizes mess, enhancing the overall roasting process.
7	Practicality	Compact Design	Space-efficient design that complements the overall size and weight of the drum coffee roaster, making it convenient for home use.

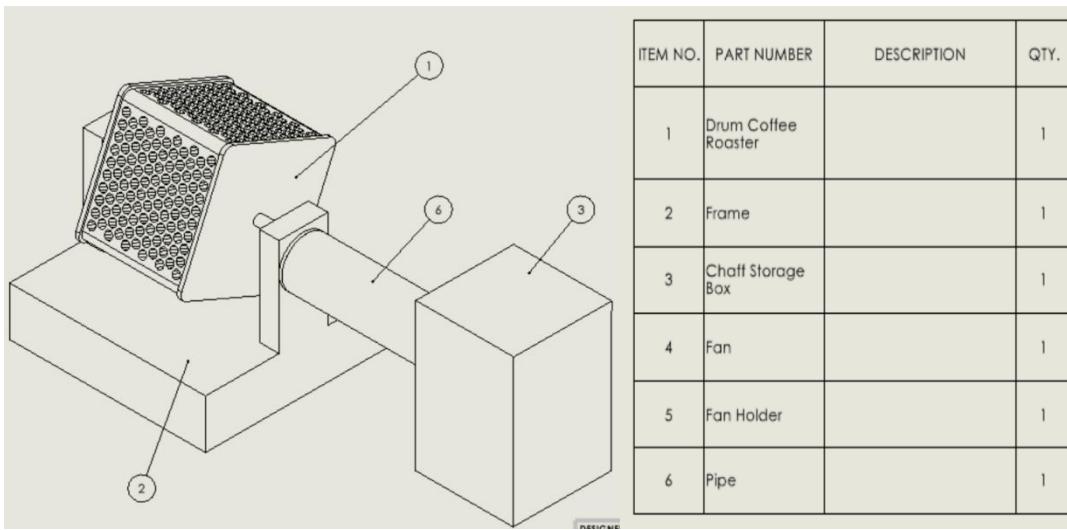


Figure 1: 3D model of the chaff collector machine assemble with the drum coffee roaster machine

4.0 RESULTS

The chaff collector for coffee bean roaster machines delivers key results that enhance the coffee roasting process. It improves roasting quality and reduces health hazards associated with chaff buildup. By addressing the chaff problem, this equipment ensures a cleaner roasting process, benefiting both the flavor of the coffee and the environment.

The design supports sustainable practices by allowing for the potential reuse of chaff, promoting environmentally responsible behavior among coffee enthusiasts and aligning with consumer preferences for sustainable products.

These features enhance the user experience, making home coffee roasting equipment a valuable option in the specialty coffee market. As demand for high-quality, fresh coffee increases, this equipment meets those needs while promoting health and sustainability.

The prototype of the chaff collector machine, shown in Figure 2, has been successfully produced and tested. It can be easily assembled onto existing drum coffee roasters through straightforward steps. Figure 3 illustrates the internal configuration of the chaff collector machine, displaying the collected chaff and confirming its effectiveness in gathering chaff during the roasting process.

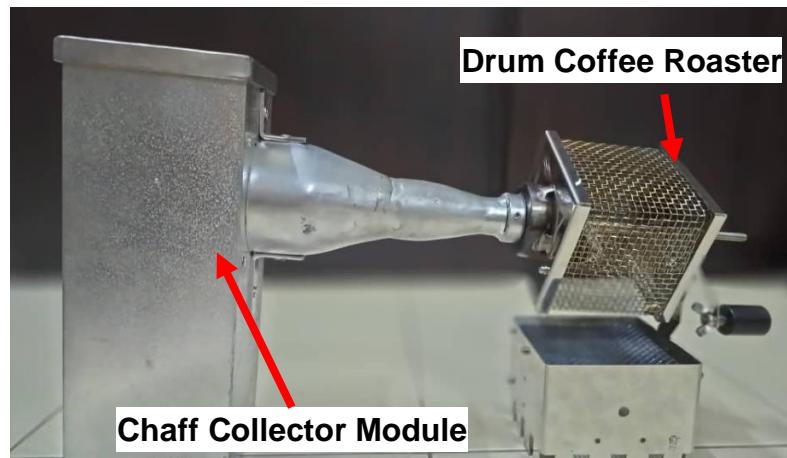


Figure 2: The Chaff Collector Prototype Machine with Drum Coffee Roaster Machine



Figure 3: The Internal Layout of Chaff Collector Machine with Chaff Collected

5.0 CONCLUSION

In conclusion, the development of the chaff collector for drum coffee roaster machines marks a significant improvement in home coffee roasting. This innovative device provides a practical solution to the common issue of chaff buildup, enhancing the overall roasting process. By efficiently collecting chaff, the chaff collector not only improves the quality of the roasted coffee but also promotes a cleaner and safer roasting environment. Its ease of assembly and compatibility with existing roasters make it a cost-effective option for both coffee enthusiasts and professionals. Overall, the chaff collector represents a valuable addition to the market, addressing the needs of a growing community of coffee lovers seeking to elevate their roasting experience.

(A-ST154) ENHANCING VIBRATION ATTENUATION THROUGH MATERIAL OPTIMIZATION IN DYNAMIC VIBRATION ABSORBERS

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ABSTRACT

This research presents an innovative methodology for enhancing vibration attenuation in fixed-fixed beam systems through the application of dynamic vibration absorbers (DVAs) fabricated from various materials. Employing an advanced Experimental Modal Analysis (EMA), our study meticulously identifies the natural frequencies, mode shapes, and Frequency Response Functions (FRFs) of the system to precisely tune the DVAs. We investigate the vibrational performance of aluminium, stainless steel, brass, and titanium DVAs at motor speeds of 14.8 Hz, 35 Hz, and 46.5 Hz. Our findings reveal that these materials exhibit unique vibration attenuation properties, with aluminium demonstrating superior effectiveness at higher frequencies. This significant improvement in vibration reduction highlights the critical role of material selection in DVA design. This study provides valuable insights for optimizing vibration-sensitive systems, offering a robust framework for enhancing stability and performance across various industrial applications.

Keywords: Dynamic Vibration Absorbers (DVA), Vibration Attenuation, Fixed-Fixed Beam Systems, Experimental Modal Analysis (EMA), Structural Dynamics

1.0 INTRODUCTION

Dynamic Vibration Absorbers (DVAs) are critical in managing and mitigating unwanted vibrations in mechanical systems. The choice of material for DVAs significantly influences their performance. This study explores the efficacy of DVAs made from aluminium, stainless steel, brass, and titanium across different motor speeds, highlighting the innovation of using aluminium for superior vibration attenuation.

2.0 OBJECTIVE

To develop and evaluate dynamic vibration absorbers (DVAs) made from different materials to optimize vibration attenuation in fixed-fixed beam systems across varying motor speeds, thereby enhancing the performance and reliability of vibration-sensitive industrial applications.

3.0 METHODOLOGY

3.1 Experimental Modal Analysis (EMA)

The primary goal of the Experimental Modal Analysis (EMA) conducted in this research was to determine the natural frequencies, modal shapes, and Frequency Response

Functions (FRFs) of the unbalanced motor-beam structure. This analysis ensures that the Tuned Dynamic Vibration Absorber (TDVA) is tuned to the target mode most affected by the motor's unbalance. Solving this eigenvalue problem provides insights into the vibrational characteristics and dynamic behavior of structural systems, essential for optimizing design and mitigating undesired vibrations.

3.2 Instrumentation and Measurement Setup

An accelerometer (Kistler type 8776A) was attached to the motor-beam assembly to measure the output acceleration in the Z-axis direction. An Impact Hammer (Kistler type 9724A5000) was used to impart a precise input force to the structure at 22 designated points along the beam's length to ensure comprehensive modal excitation. Both the accelerometer and the impact hammer were interfaced with the LMS SCADAS Data Acquisition (DAQ) system to capture and transmit the data with high fidelity.

3.3 Data Collection Procedure

After setting up and calibrating the measurement system, a series of impacts were administered using the impact hammer. Each impact point was struck multiple times, and the data was averaged to reduce variability and enhance reliability. The accelerometer continuously recorded the structure's response to the excitation forces. The DAQ system facilitated the synchronous recording of the input and output signals, essential for analyzing the system's dynamic characteristics.

3.4 Analysis of the Measured Data

The acquired signals were imported into the LMS Test.Lab software for analysis. The first step was identifying and isolating the natural frequencies of the beam by examining the peaks in the FRFs. The corresponding mode shapes were then calculated, revealing the deformation patterns of the beam at different frequencies. The FRFs were extracted to understand the resonance phenomena of the unbalanced motor, encapsulating the relationship between the input force and output vibration across a range of frequencies.

3.5 Vibration and Transmissibility Measurement

The aim of the Vibration and Transmissibility Measurement was to establish the input-output vibrational relationship within the unbalanced motor-beam assembly, quantifying the beam's dynamic response to vibrational forces originating from the unbalanced motor.

3.6 Instrumentation and Setup

Tri-axial accelerometers (Kistler type 8776A) were mounted on the beam to capture the most pertinent dynamics. One accelerometer was affixed at point 19, closest to the unbalanced motor, to record the vibrational input. Additional accelerometers were placed at select points along the beam to measure the propagated vibrational responses. The Italvibras M3/4 Micro 240V Rotary Vibrator motor was used to generate controlled vibrating forces. The motor specifications, including a single-phase

power supply at 240 volts and an adjustable frequency of 50/60 Hz, allowed for precise application of vibrational energy to the beam.

3.7 Data Collection and Operational Modal Analysis

The LMS SCADAS system captured vibration data from the physical structure without artificial stimulation, replicating real-life circumstances. The system was configured for frequency domain analysis using Fast Fourier Transform (FFT) data, with a frequency resolution of 0.195313 Hz over a range of 0 to 200 Hz, and a sampling rate of 400 Hz. Signal smoothing and averaging techniques were employed to reduce the impact of random noise and enhance data reliability.

3.8 Data Analysis and Interpretation

The vibrational data was analyzed to elucidate the transmissibility of the unbalanced motor's vibration through the beam, focusing on the magnitude and frequency content of the vibrations under different operational conditions. The FRFs provided a detailed map of the vibrational energy transmission pathways and nodal points of the beam structure.

3.9 Validation and Reliability

The acquired vibrational data was statistically analyzed to ensure repeatability and low variance. The consistency of observed natural frequencies and mode shapes across repeated trials validated the measurement protocol's robustness. The empirical data was compared to theoretical predictions and previous empirical findings to reinforce the validity of the results.

3.10 Application of TDVA to an Unbalanced Motor-Beam System

The previous EMA identified resonant frequencies crucial for the current investigation. Accurate measurements of the motor-beam system's response at specified speeds were essential for assessing the TDVA's efficacy in reducing excessive vibrations.

3.11 Impact Testing of TDVA Mass's Beam

Impact testing, a non-destructive method, was used to identify resonant frequencies by observing the system's response to a sudden transient force as in Figure 2. The testing was conducted across four different Dynamic Vibration Absorber (DVA) mass's beam configurations made from distinct materials, offering variations in damping and stiffness properties.



Figure 2: Impact testing to a mass's beam.

3.12 Adjustment of TDVA Mass Positions

The TDVA features a beam with adjustable brass masses. Based on impact testing results, the optimal positions of the brass masses were determined to fine-tune the TDVA to the identified resonant frequencies for each operational speed of the motor.

3.13 Interchangeable Beam Materials for Comparative Analysis

The TDVA involved interchanging the beam with alternatives made from stainless steel, aluminium, brass, and titanium. The vibrational characteristics of each material were analyzed to determine their effectiveness in reducing vibrations.

3.14 Vibration Measurement with TDVA Implementation

The TDVA was mounted on a fixed support at the beam's midpoint to optimize vibration attenuation as shown in Figure 3. The vibration measurement procedure was repeated under identical test conditions to ensure the reliability and comparability of the results.



Figure 2: The TDVA attachment of the unbalanced motor-beam system.

3.15 Analysis of Vibration Attenuation Performance

The vibrational response of each beam material configuration was analyzed to quantify the reduction in vibration amplitude at resonant frequencies compared to the system

without the TDVA. The results were used to validate theoretical predictions and assess the TDVA's effectiveness.

The findings were compiled into a comprehensive report discussing each material's performance under various conditions, with practical recommendations for implementing TDVA in industrial settings and suggestions for future research.

4.0 RESULTS

The summarized results are presented in Table 1.

Table 1: Summary of Attenuation at 14.8Hz, 35Hz, and 46.5Hz Motor Speeds.

Material	Motor Speed (Hz)	Peak Acceleration (m/s ²)	Percentage Attenuation
Aluminium	46.5	1.50	93.18%
Stainless Steel	46.5	1.72	92.19%
Titanium	46.5	2.27	89.68%
Brass	14.8	0.24	78.57%
Brass	46.5	7.77	64.70%
Titanium	35	1.52	65%
Aluminium	35	3.14	28%
Stainless Steel	14.8	0.86	23.21%
Stainless Steel	35	4.21	3%
Aluminium	14.8	1.24	-10.71%
Titanium	14.8	1.21	-8.04%

This comparative analysis highlights several key findings regarding the performance of various materials used in dynamic vibration absorbers. Aluminium exhibits the highest percentage attenuation, achieving 93.18% at 46.5Hz, making it particularly suitable for high-frequency applications due to its lightweight nature and excellent damping properties. Both stainless steel and titanium demonstrate consistent performance across varying frequencies, with titanium slightly outperforming stainless steel overall. Brass, while highly effective at lower frequencies with a 78.57% attenuation at 14.8Hz, proves less effective at higher frequencies.

5.0 CONCLUSION

The findings from this study underscore the importance of material selection in the design and implementation of DVAs. Aluminium emerges as a superior material for high-frequency applications, while brass is more suitable for low-frequency scenarios. Stainless steel and titanium provide balanced performance across a broad range of frequencies. This innovation in using aluminium for enhanced vibration attenuation can significantly impact the design of vibration-sensitive systems, offering a path to optimized performance.

Further research should explore the long-term durability and cost-effectiveness of these materials in real-world applications. Additionally, investigating composite

materials and advanced manufacturing techniques could yield further improvements in DVA performance.

(A-ST155) A MATLAB GUI FOR THE FIRST ORDER POLARIZATION TENSOR OF ROTATED SPHEROIDS

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ABSTRACT

When a conducting object presents in an electric or electromagnetic field, the perturbation on the field due to the presence of the object can be mathematically modelled as an asymptotic series, where, the dominant term of the series is called as the Polarization Tensor (PT). In the applications of electric and electronic, PT has been adapted for many purposes such as to improve reconstruction of image in medical scanning and geophysics, as well as, to enhance metal detection for security screening or landmine clearance. Besides, PT also appears in neuroscience after some researchers have used PT to study object recognition from electrical sense by electric fish. For each application, the PT might able to describe some physical properties of the presented object such as the size, material or orientation of the object. In this study, the PT, specifically the first order PT, when the conducting object is a spheroid, will be presented. First of all, given the conductivity and all semi axes of the spheroid, a method to determine the first order PT for the spheroid will be discussed. Then, a Matlab GUI that can easily execute the computation will be presented. We focus on spheroids as previous studies have shown that the first order PT for many objects in the related applications are actually similar to the first order PT for the spheroids. Thus, understanding the first order PT for spheroids could be useful to describe the actual objects. With the proposed GUI, the first order PT for any spheroid can be computed when the size and the conductivity that represents the material of the spheroid are specified. Not only that, if the spheroid is rotated around the vertical axis, the GUI is also able to compute the related first order PT if the angle of rotation is given. Finally, some examples will be also included in this study to demonstrate the capability of the recent developed GUI.

Keywords: prolate spheroids, oblate spheroids, conductivity, semi axes, matrices

1.0 INTRODUCTION

The PT can be used to improve electrical imaging or metal detection and also to study electric fish with a lower computational cost to characterize and describe objects in those applications (Ammari dan Kang (2007), Ahmad Khairuddin and Lionheart (2016), Ledger and Lionheart (2023)). This is because the PT does not require a full

image or object reconstruction. In this case, PT contains significant information about the object such as size, material and orientation of the object (Ammari and Kang, 2007). Moreover, it can be shown that, the first order PT of any object presented in the electric or electromagnetic field can be related to an ellipsoid, such the first order PT related to the ellipsoid is similar to the first order PT of that object (see Ahmad Khairuddin and Lionheart (2016) for example). Therefore, describing the ellipsoid could be useful in identifying the original object as they might have similar size or orientation when their first order PT is the same.

In this study, an invention that can easily calculate the first order PT of spheroids, which are a type of type of ellipsoid, is proposed. The invention as a MATLAB Graphical User Interface (GUI), is an extension of our previous intellectual property, copyrighted by MyIPO with reference number LY2024J02487. In this invention, a new feature is included that allows the calculation of the first order PT for a spheroid, after the spheroid is rotated one time around any of the coordinate axis. It is believed that there is no software or product in academia that allows with a single application for the calculation of the first order PT for an object and its rotation. Now, in the next section, the related formulation of the first order PT for spheroid will be presented.

2.0 MATHEMATICAL FORMULATION OF THE ROTATION OF THE FIRST ORDER POLARIZATION TENSOR

This section reviews the formula for the rotation of the first-order PT, specifically for the spheroid. The formula for the first order PT for a spheroid has been simplified by Mohamad Yunos and Ahmad Khairuddin (2017). According to them, that first order PT can now be expressed in terms of a function called as the depolarization factor. Assume that the object B is a spheroid, represented in the Cartesian coordinate system as $\left(\frac{x^2}{a^2}\right)^2 + \left(\frac{y^2}{b^2}\right)^2 + \left(\frac{z^2}{c^2}\right)^2 = 1$, with the semi axes denoted as a and b such that they are either in the condition of $a > b$ or $a < b$. Then, the first order PT for B is given by

$$M(k, B) = (k - 1)|B| \begin{bmatrix} \frac{1}{(1-d_1)+kd_1} & 0 & 0 \\ 0 & \frac{2}{(1+d_1)+k(1-d_1)} & 0 \\ 0 & 0 & \frac{2}{(1+d_1)+k(1-d_1)} \end{bmatrix}, \quad (1)$$

where k is the conductivity of B that satisfies $k > 0$ and $k \neq 1$, $|B|$ is the volume of B and d_1 is the depolarization factor of B , as given by Stoner (1945) and it is restated here in Proposition 1.

Proposition 1 Let a, b and c be the semi principal axes of an ellipsoid given by $\left(\frac{x^2}{a^2}\right)^2 + \left(\frac{y^2}{b^2}\right)^2 + \left(\frac{z^2}{c^2}\right)^2 = 1$.

- i. If $a > b = c$, then $d_1 = \frac{1-\psi^2}{\psi^2} \left(\frac{1}{2\psi} \ln \left(\frac{1+\psi}{1-\psi} \right) - 1 \right)$, where $\psi = \sqrt{1 - \left(\frac{b}{a} \right)^2}$,
 - ii. If $a < b = c$, then $d_1 = \frac{1}{\varphi^2} \left(1 + \frac{\sqrt{1-\varphi^2}}{\varphi} \sin^{-1} \varphi \right)$, where $\varphi = \sqrt{1 - \left(\frac{a}{b} \right)^2}$,
- where, d_1 is the depolarization factor for the spheroid.

Therefore, in order to determine the first order PT for spheroid using Eq. (1), the semi axes and the conductivity of the spheroid must be known. These values will become the inputs of our proposed GUI. In addition, the conductivity, k of B plays a crucial role in classifying either the first order PT for spheroid in the form of Eq. (1) is a positive definite or negative definite matrix (Ammari and Kang, 2007), where, these conditions are explained here in Proposition 2.

Proposition 2 If $k > 1$, then the first order PT for any object is positive definite, whereas it is negative definite if $0 < k < 1$.

Furthermore, when a spheroid rotates, the first order PT for the spheroid also rotates. The relationship between the first order PT for an object before and after rotation is discussed by Ammari and Kang (2007) and is given here in Proposition 3. Based on Proposition 3, if the first order PT for a spheroid B before it is rotated is given by $M(k, B)$ then the first order PT for the spheroid after it is rotated can be obtained by multiplying $M(k, B)$ with the appropriate rotation matrix.

Proposition 3 Let B be a domain and $B' = RB$ where R represents an orthogonal matrix transformation and R^T represents the transpose of R . If $M(k, B)$ and $M(k, B')$ are the first order PT corresponding with domain B and B' respectively at any conductivity k such that $k > 0$ and $k \neq 1$, then $R^T M(k, B) R = M(k, B')$.

In our new GUI, the spheroid is allowed to rotate one time around any of the coordinate axes before the first order PT of the rotated spheroid can be computed. The rotation matrices with an angle θ° that represent rotation counterclockwise around x -axis, y -axis, and z -axis, denoted by R_x , R_y and R_z respectively, are given by

$$R_x(\theta^\circ) = \begin{bmatrix} 1 & 0 & 0 \\ 0 & \cos \theta^\circ & -\sin \theta^\circ \\ 0 & \sin \theta^\circ & \cos \theta^\circ \end{bmatrix}, \quad (2)$$

$$R_y(\theta^\circ) = \begin{bmatrix} \cos \theta^\circ & 0 & \sin \theta^\circ \\ 0 & 1 & 0 \\ -\sin \theta^\circ & 0 & \cos \theta^\circ \end{bmatrix}, \quad (3)$$

$$R_z(\theta^\circ) = \begin{bmatrix} \cos \theta^\circ & -\sin \theta^\circ & 0 \\ \sin \theta^\circ & \cos \theta^\circ & 0 \\ 0 & 0 & 1 \end{bmatrix}. \quad (4)$$

Thus, if a spheroid is rotated one time around any of the coordinate axes, our GUI implements either Eq. (2), (3) or (4) to Eq. (1) to obtain the first order PT of the rotated spheroid based on Proposition 3.

3.0 THE MATLAB GRAPHICAL USER INTERFACE

The proposed invention as a MATLAB GUI is called as the Spheroidal First Order Polarization Tensor Calculator with One Time Rotation. Similar to our previous GUI, this new GUI is designed for spheroids with semi axes $a > b = c$ (prolate spheroids) or $a < b = c$ (oblate spheroids). It offers two main functions which are calculating the first order PT for both prolate and oblate spheroids, before and after the spheroids are rotated, as well as visualizing the original spheroid in a three-dimensional graph.

Figure 1 illustrates the overall layout of the Spheroidal First Order Polarization Tensor Calculator with One Time Rotation in MATLAB. The layout started from the

descriptions about the calculator at the top. Then, each function was separated using the panel for better interface and easy to understand by users.

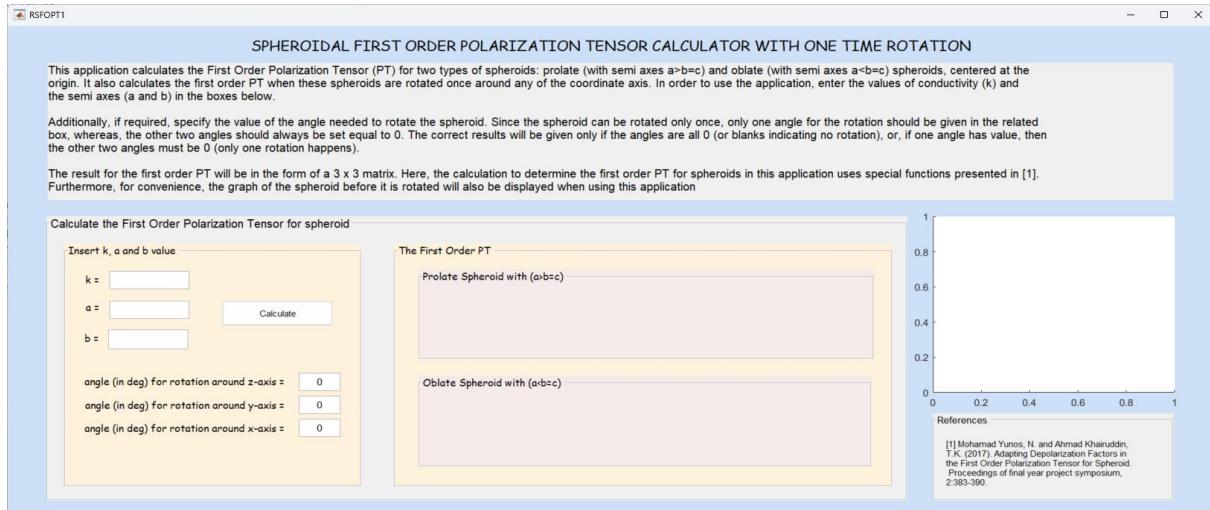


Figure 1: The overall layout of the Spheroidal First Order Polarization Tensor Calculator with One Time Rotation in the MATLAB

Meanwhile, Figure 2 briefly describes all three functions of each panel. In order to compute the first-order PT for a spheroid using this GUI, the values for the semi axes (a and b) and also the conductivity, k must be inserted. Additionally, if the spheroid is rotated one time around one of the coordinate axes, user also need to specify the angle (in degree) of the rotation. By the default, all angles are set equal to 0 so that, user can straight away calculate the first order PT for a spheroid without rotation by clicking the button Calculate after the values for a , b and k are given. Note that the GUI only allows one rotation for the spheroid along any of the coordinate axes so, to get the correct result for the first order PT, if one angle is specified in the GUI then the other two angles must be set equal to 0.

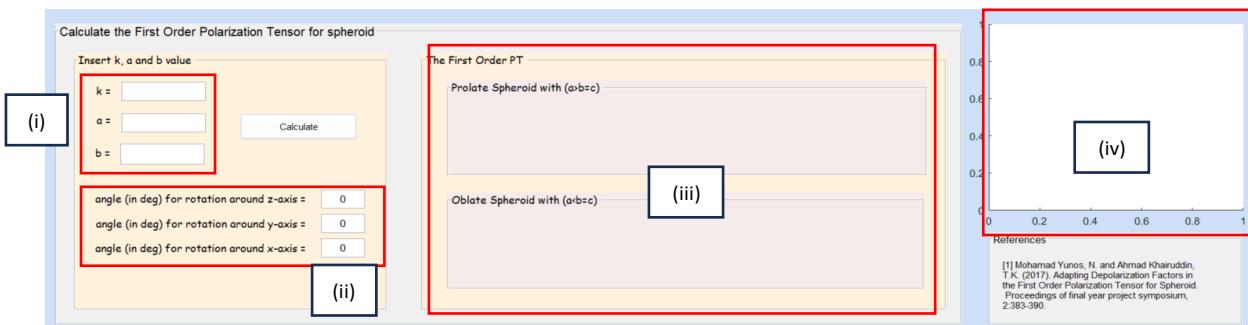


Figure 2: The interface of the Spheroidal First Order Polarization Tensor Calculator with One Time Rotation that includes the following functionality: (i) Users are required to insert the values of conductivity, k and semi axes, a and b . (ii) Users are required to insert the angle of rotation (in degree) if necessary. (iii) The output which is the first order PT is displayed according to the type of the specified spheroid, after all the required information, either in (i) only (no rotation) or in both (i) and (ii) (has rotation) are given. (iv) The 3-dimensional graph is plotted based on the input inserted in (i), which is the graph of a spheroid before it is rotated.

After the button Calculate is clicked, the values of the first order PT will be displayed based on the type of the spheroid, which is either prolate or oblate. If no rotation happens, the first order PT will be a diagonal matrix, as depicted by Eq. (1) whereas the first order PT could be a non-diagonal matrix if the spheroid is rotated. In addition, the graph of the spheroid without rotation will also be displayed by the GUI to further clarify the type of spheroid that is related to the computed first order PT.

4.0 SOME EXAMPLES

In order to demonstrate the reliability of this GUI, we firstly consider the first order PT of a spheroid with semi axes and conductivity given by $a = 1$, $b = 2$ and $k = 0.05$, respectively, with no rotation happens to the spheroid. Figure 3 illustrates the interface after the button Calculate is clicked with all specified inputs and calculated outputs. As can be seen in the figure, the first order PT calculated, that is negative definite according to Proposition 2, is actually for the oblate spheroid.

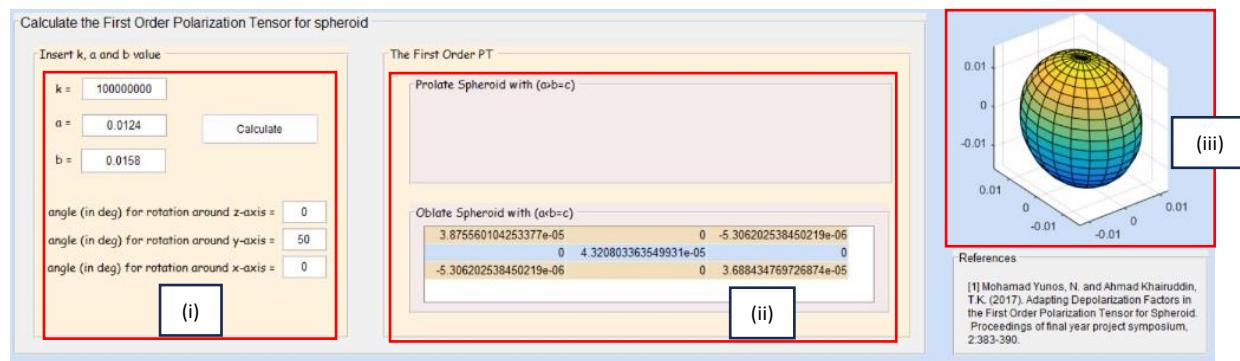


Figure 3: The interface when using the GUI. (i) A user inserts the values for conductivity, $k = 0.05$ and semi axes, $a = 1$, and $b = 2$ with no rotation happens such that all angles equal to 0. (ii) Upon clicking the Calculate button in (i), the first order PT is displayed and classified as an oblate spheroid. (iii) Additionally, upon clicking the Calculate in (i), a 3-dimensional graph for the spheroid is also generated.

Besides, a cone is considered for the next example, where, the cone and the spheroid (with semi axes $a = 0.0140$ and $b = 0.0128$) has the similar first order PT at $k = 100000000$. These objects are based on the studies by Ahmad Khairuddin and Lionheart (2016). Now, if the cone is rotated 120° around the z-axis, the first order PT of the cone after the rotation can be obtained by using the first order PT for the related spheroid and Proposition 3. Figure 4 illustrates the interface for calculating the first order PT for the rotated prolate spheroid, which is the desired first order PT for the cone, after the cone is rotated. In this case, the GUI can help to easily and quickly determine the first order PT for the cone if a spheroid that is related to the cone is known.

Finally, a pyramid also from Ahmad Khairuddin and Lionheart (2016), that is related to the spheroid with semi axes $a = 0.0124$ and $b = 0.0156$, is considered. Figure 5 shows the first order PT of the spheroid after at conductivity $k = 100000000$, after the oblate spheroid is rotated 50° around the y-axis. This first order PT is also the first order for the pyramid after it undergoes the same rotation.



Figure 4: The interface when using the GUI with inputs conductivity, $k = 100000000$, semi axes, $a = 0.014$, and $b = 0.0128$ with $\theta^\circ = 120^\circ$.



Figure 5: The interface when using the GUI with inputs conductivity, $k = 100000000$, semi axes, $a = 0.0124$, and $b = 0.0156$ with $\theta^\circ = 50^\circ$.

5.0 CONCLUSION

As a summary, the GUI provides a faster way to compute the first order PT for a spheroid, whether or not the spheroid is rotated. The GUI can also be used to compute the first-order PT for other objects, provided that the spheroid with the same first-order PT is known. Thus, the GUI could be useful in ongoing research or related applications of PT.

Acknowledgment

This research is supported by the Universiti Teknologi Malaysia Encouragement Research (UTMER) grant scheme with the reference number PY/2023/01442.

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(A-ST161) SMART SAFEGUARD CANE

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ABSTRACT

Blindness and vision impairment remains one of the major problems in Malaysia present among the population in substantial percentages. The latest available figures show that there are 180,000 blind and more than half a million living with moderate to severe vision impairment in Malaysia. Vision impairment challenges include access barriers to information, mobility, social interaction, comprehensive support and healthcare. In response to these challenges, an innovative solution "Smart Safeguard Cane" has been developed. The cane has built-in GPS for navigational assistance, a fall detection system with emergency notification alert, and an user-friendly mobile application designed for visually impaired. The app allows users to find such facilities as toilet or bus stops on their own, which improves equality and sense of secure. The most distinctive characteristics of the Safeguard Cane consist of a fall detector that employs IMU sensors, which trigger GPS-based emergency notifications through Bluetooth to emergency contacts. The emergency buttons on cane also ensure safety by producing an alarming sound and getting attention of surrounding people. The mobile application, created with Kodular, allows simple interaction using swipe and tap gestures and includes text-to-speech option. It supports customizable fonts and high contrast visual themes that help the user to navigate through without any assistance so as to enhance independence. Thus, the low-cost Safeguard Cane not only increases the mobility but also provide the second chance for disabled people in Malaysia to gain independency, and it also can achieve the SDG goals 10 to reduce inequalities.

Keywords: emergency, fall detection, GPS, mobile application, navigation

1.0 INTRODUCTION

According to the 2023 survey of World Health Organization (WHO) about 2.2 billion of people have near or distance vision impairment (WHO, 2023). In Malaysia alone, the latest available figures show that there are 180,000 blind and more than half a million living with moderate to severe vision impairment (IAPB, 2023). In 1996, the Malaysian National Eye Survey (NES I) reported blindness at 0.29% and low vision at 2.44% (IAPB, 2023). The number of blind Malaysians climbed to 1.2% by the year 2022 (IAPB, 2023).

When faced with unfamiliar environments or terrains, visually impaired people have difficulty navigating to their desired destinations and can feel unsafe without pedestrian tactile facilities (Kim and Cho, 2013; Ramirez *et al.*, 2012; Hoogsteen, 2022; Nazri *et al.*, 2021; Mai *et al.*, 2023). Consequently, calling emergency services requires

more time. This might lead to a delay when crucial assistance is needed. In situations where a person with vision impairments falls and is unable to get in touch with the person responsible, things may get worse if they are in an area with few people. In addition, if the person's cane falls free from them, urgent action needs to be taken.

While some of them rely on guide dogs but this solution has limitations (Hoogsteen, 2022; Nazri *et al.*, 2021; Kumar *et al.*, 2021; Mai *et al.*, 2023). Guide dogs need to be well trained and taken care; it will make mistakes due to lack off effective communication with humans (Hoogsteen, 2022; Nazri *et al.*, 2021; Kumar *et al.*, 2021; Mai *et al.*, 2023). Beside of visually impaired individuals, elderly is also one of the populations that highly need attention (WHO, 2021; Kim and Cho, 2013). Falls are a significant global public health issue, causing an estimated 684,000 deaths annually, the second highest for unintentional injuries after road traffic accidents (WHO, 2021).

In contrast, a smart emergency cane that goes under the name "Smart Safeguard Cane" helps people with various types of vision impairments feel secure. For individuals with vision impairments, the Safeguard Cane with GPS for precise navigation, a fall detector with an automated emergency alert system, and a smart mobile app with a feature that allows them to navigate to the closest restroom or bus stop is the ideal way to train themselves independently, regain their sense of equality like normal people, and boost their self-esteem and sense of security

2.0 OBJECTIVE

The primary goal is to create a Smart Safeguard Cane equipped with navigation and fall detection systems. This cane will be integrated with a user-friendly app designed for individuals with low vision, blindness, the elderly, patients, and hikers in Malaysia.

3.0 METHODOLOGY

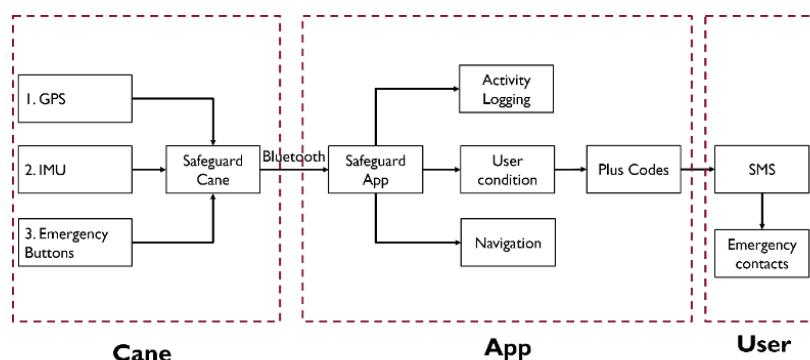


Figure 1: Overall Block Diagram

Figure 1 displays the overall block diagram of the Safeguard Cane and Safeguard App. The Smart Safeguard Cane is equipped with hardware components including a LilyGo microcontroller, GPS, IMU sensor, micro SD card, and battery. This cane provides robust emergency features alongside advanced navigation capabilities, designed to improve safety and independence for visually impaired individuals. A key feature is the integrated fall detector, which continuously monitors user movements through the IMU sensor. The app's "Automatic Emergency Alert System" effectively manages notifications, ensuring swift assistance during emergencies.

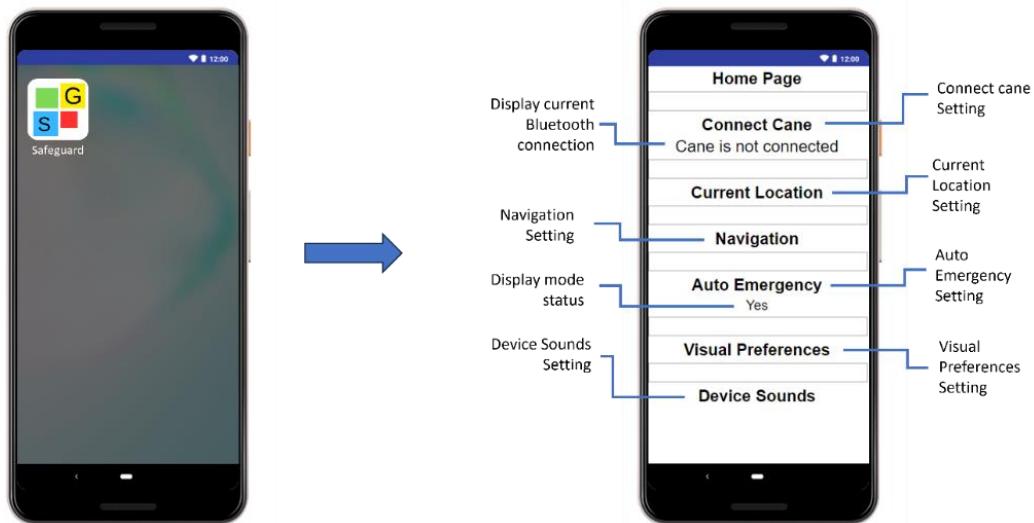


Figure 2: Smart Safeguard App features

Figure 2 presents the features of the Safeguard App, including navigation mode, cane connection, auto-emergency mode, and various other settings. The Smart Safeguard App is designed with gesture detection, text-to-speech capabilities, and high-contrast text options, making it especially accessible for users with visual impairments. The user interface is streamlined to allow navigation through swipe and tap gestures anywhere on the screen, removing the need for precise button presses or touches on the phone.

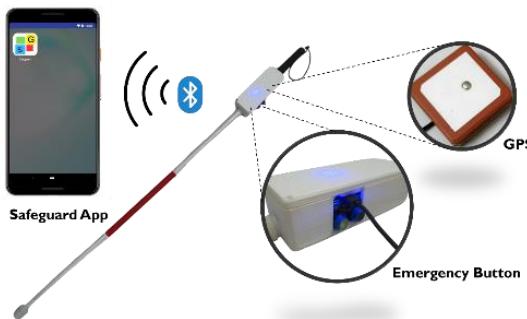


Figure 3: Overview of Smart Safeguard Cane and Smart Safeguard App

Figure 3 illustrates the Smart Safeguard Cane, which features a GPS and an emergency button. These components are integrated with the Smart Safeguard App to facilitate navigation and emergency situations. The emergency button, equipped with a buzzer function, allows the user to summon assistance when needed.

4.0 RESULTS

Figure 4 shows the Safeguard App preference setting. The app offers visual customization for low vision users, including theme options and font size adjustments for accessibility. The app provides three themes: default black on white, white on black, and yellow on black. These high-contrast visual themes enhance visibility and accommodate different user needs.

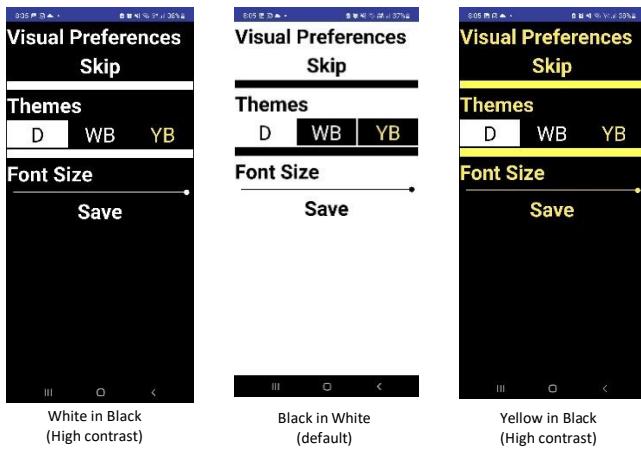


Figure 4: Visual Preferences Themes in Safeguard App Setting

Figure 5 shows the auto emergency mode enabled and fall detected. During auto-emergency mode, the cane's fall detector triggers GPS data transmission to the mobile app via Bluetooth. Coordinates are converted into Plus Codes, quickly notifying emergency contacts via SMS within seconds.

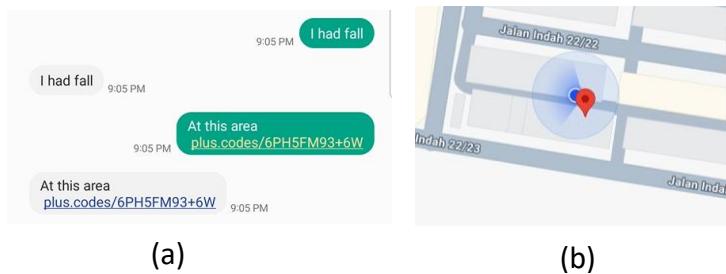


Figure 5: Auto-Emergency Mode Enabled and fall detected (a)SMS (b)Plus Codes

Figure 6 shows the route when the user enables the navigation mode. The route will be shown in the screen as shown in Figure 6. The path will be converted into voice to inform the user through “text-to-speech” function. This can assist the vision impairment patient to increase their mobility and travel to work as a normal people.

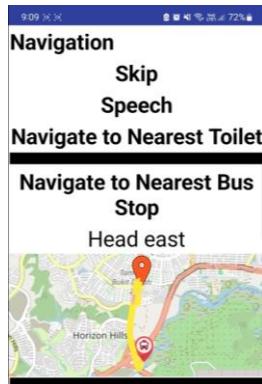


Figure 6: Navigation

5.0 CONCLUSION

In conclusion, the Smart Safeguard Cane and Smart Safeguard App empower the blind and visually impaired with advanced navigation features, enhancing independence and safety while saving time and costs. By seamlessly integrating advanced features like GPS, navigation, and intuitive mobile app functionalities, this innovative cane redefines the navigation experience for the blind community.

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(A-ST165) SIGN GLOVE WITH IOT SYSTEM

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ABSTRACT

This paper details the development of an IoT-enabled sign glove designed to facilitate communication for individuals utilizing sign language. The glove incorporates an array of sensors, including flex sensors, gyroscopes, and accelerometers, to accurately capture and quantify hand gestures. These gestures are subsequently translated into text or speech in real-time, leveraging IoT technologies such as Wi-Fi and Bluetooth for wireless communication with external devices including smartphones, tablets, and computers. The principal aim of this work is to design, engineer, and validate the sign glove as an effective assistive communication tool for the deaf and hard-of-hearing community. The glove's capability to bridge communication barriers across diverse environments—ranging from educational and healthcare settings to routine social interactions—underscores its potential to enhance accessibility and inclusivity, thereby promoting greater autonomy and participation for its users.

Keywords: IoT Systems, sensors, and sign gloves.

1.0 INTRODUCTION

The "Sign Glove with IoT" project aims to develop an innovative wearable device that can translate sign language gestures into text or speech, facilitating communication for individuals who are deaf or hard of hearing. Utilizing advanced sensors like flex, gyroscope, and accelerometer, the glove captures the precise movements of the user's hands. These movements are then processed and translated into recognizable language, bridging the communication gap between sign language users and non-users. The integration of IoT technology ensures seamless connectivity with devices such as smartphones and tablets, making the glove a versatile tool in various settings, including educational institutions, healthcare, and daily interactions.

The exploration of communication technologies for individuals with disabilities has highlighted significant challenges and gaps in existing solutions. While various approaches have been developed, including wearable sensor gloves and innovative sign language recognition systems, many devices still struggle with accuracy, universality, and practical usability (Sharma et al., 2013; Bhatnagar et al., 2015; Tanyawiwat & Thiemjarus, 2012). The research reviewed demonstrates the ongoing evolution of assistive technologies, with advancements in sensor integration, gesture recognition, and signal processing playing crucial roles in improving communication for deaf, mute, and other non-verbal individuals (Sharma et al., 2013; Vutinuntakasame et al., 2011; Akkineni et al., 2024).

Innovations such as the wearable sensor gloves for British, Indian, and American Sign Language, as well as systems incorporating statistical template matching,

electromyography, and deep learning models, represent promising strides toward more effective and accessible communication tools (Bhatnagar et al., 2015; Al-Ahdal & Nooritawati, 2012; Mohammad et al., 2023). However, these advancements also underscore the complexity of creating universally applicable solutions that can address the diverse needs of the disabled community (Sharma et al., 2013; Luqman & Mahmoud, 2017).

Moving forward, the continuous refinement of these technologies, particularly in enhancing accuracy and expanding their applicability across different sign languages and contexts, will be vital. The reviewed literature, supported by recent developments in progression learning and sensor fusion, points to the necessity of further research and development to bridge the communication gap fully and provide more inclusive and reliable tools for individuals with disabilities (Al-Ahdal & Nooritawati, 2012; Luqman & Mahmoud, 2017; Mohammad et al., 2023; Akkineni et al., 2024).

2.0 OBJECTIVE

1. To design a Sign Glove with IoT capabilities.
2. To develop a functional prototype of the Sign Glove.
3. To validate the effectiveness of the Sign Glove in translating sign language gestures into text or speech.

3.0 METHODOLOGY

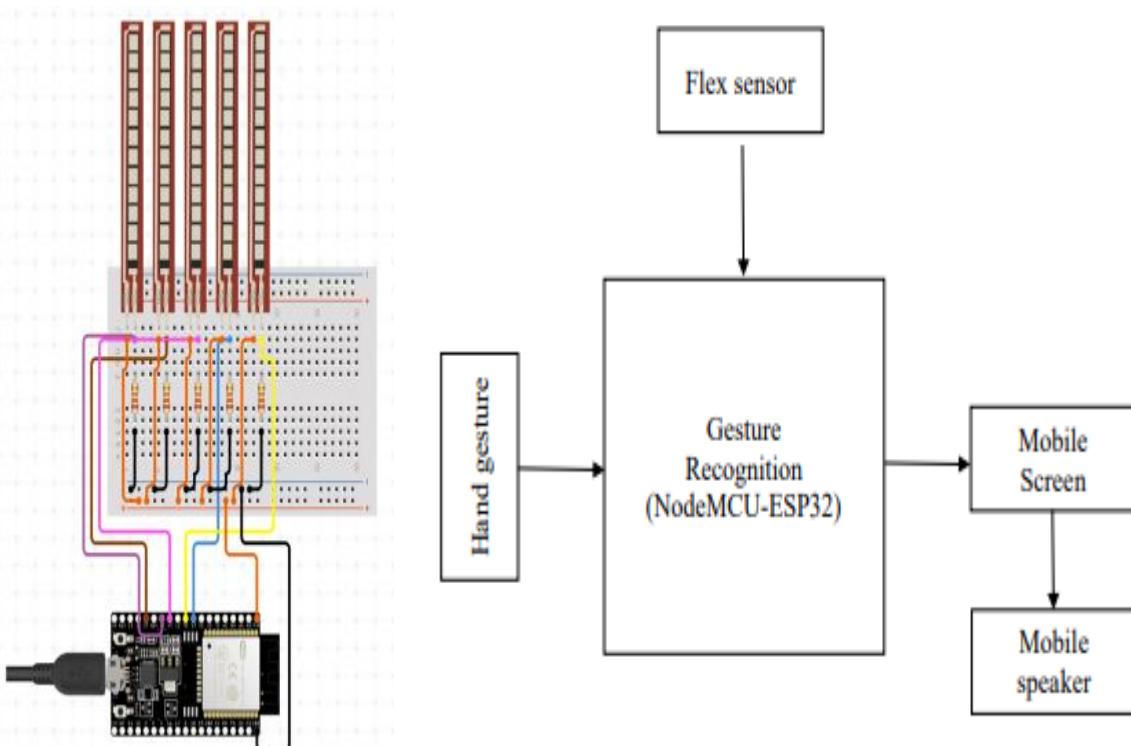


Figure 1: Circuit and Block Diagram Sign Glove with IoT

Figure 1 illustrates the role of the ESP32 microcontroller as the central processing unit, facilitating the interface between input and output devices. The input devices, as depicted, include flex sensors and hand gestures, while the output devices consist of

the mobile screen and speaker. This phase entails the collection of hand gesture data through sensors, primarily utilizing flex sensors for precise motion detection. The acquired data is processed through a gesture recognition algorithm, which systematically analyzes the extracted features to accurately identify distinct gestures or gesture sequences. Upon successful recognition of a gesture, the system triggers the corresponding output, which includes displaying text on the mobile screen and generating audio feedback through the mobile speaker.

4.0 RESULTS

The Sign Glove prototype successfully demonstrated its ability to accurately translate sign language gestures into text and speech in real-time. The integration of IoT technology enabled seamless connectivity with mobile devices, allowing for effective communication across different platforms. The testing phase showed a high level of accuracy in gesture recognition, with users reporting significant improvements in communication efficiency. The glove's ability to cater to various sign languages and its application in multiple settings, including education and healthcare, highlights its potential as a valuable tool for the deaf and hard-of-hearing community.

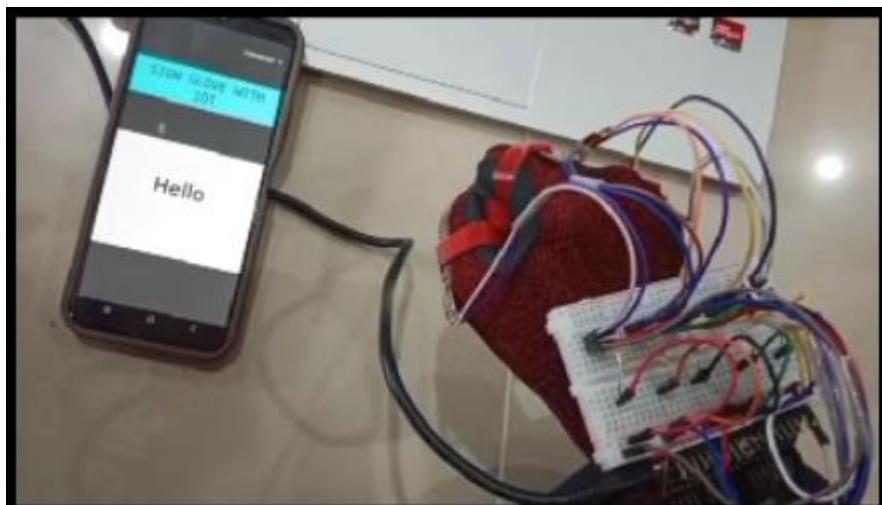


Figure 2: The prototype model of Sign Glove with IoT

5.0 CONCLUSION

The Sign Glove with IoT represents a significant advancement in assistive technology, offering a practical solution to the communication barriers faced by individuals who are deaf or hard of hearing. By converting sign language gestures into text or speech, the glove enhances inclusivity and fosters better communication in various social, educational, and professional settings. The success of this project opens the door for further development, with possibilities for expanding its capabilities and improving its design. Future iterations of the glove could incorporate additional features, such as support for more sign languages and improved portability, to further enhance its usability and impact.

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(A-ST169) A MATLAB APPLICATION TO VISUALIZE AND DESCRIBE A PARABOLOID SHAPED OBJECT

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ABSTRACT

The paraboloid is one of the most important three dimensional (3D) geometries in many real-life applications. In the fields of engineering and technology, paraboloid-shaped antennas are used for communications, while paraboloid solar dishes are designed to generate solar energy. The shape of a parabola is also investigated when studying the mechanics of a fluid inside a rotating bottle, as the fluid may form a parabolic surface due to the rotation. Besides, in architecture, parabola is used to build arches or domes of buildings. For some buildings, such as charcoal kilns, instead of using a straight flat roof, a paraboloid-shaped dome is placed on top to ensure faster heat circulation inside the building, resulting in better charcoal production. Due to these motivations, this project proposes an application that is able to easily visualize and describe a paraboloid-shaped object using MATLAB software. When using this application, users only need to specify the radius and the height of the object in order to display the 3D graph of a paraboloid with circular base that represents the object. The application will also present a two dimensional (2D) visualization of the paraboloid from either the top (the base of the paraboloid) or the front (the body of the paraboloid shaped object). For further characterization of the object, the surface area and the volume are also given by the application. We believe our proposed application has an advantage in visualizing and characterizing paraboloids, as it provides graphs, surface area, and volume within a single user-friendly interface that can be utilized in related applications in the future.

Keywords: multivariable functions, volume, surface area

1.0 INTRODUCTION

A paraboloid possesses several distinctive features that make it suitable for a range of applications. Its single extremum point is particularly useful in constructing satellite dishes, where it focuses signals to a single point, thereby enhancing precision and communication effectiveness. Similarly, paraboloid solar dishes use this focusing ability to concentrate sunlight onto a single focal point, leading to more efficient conversion of solar energy into heat or electricity. Additionally, understanding physical properties of a paraboloid, such as its surface area and volume, is useful for studying the mechanics of rotating water in a glass. This is because the forces acting on the water during rotation cause it to form a parabolic surface.

In architecture and structural design, a building with a paraboloid shape is chosen for its visually striking appearance and its ability to create an elegant, modern look. The paraboloid shape is ideal for constructing domes due to its inherent strength and efficient load distribution, allowing for minimal material use while maintaining stability. Additionally, from a mathematical perspective, the uniform curvature of the paraboloid simplifies the analysis of stress and load distribution, making it easier to work with in design and engineering.

Due to our current work involving paraboloid geometries, this research proposes an application, in which a MATLAB Graphical User Interface (GUI), that can visualize and compute the volume as well as the surface area of a paraboloid with a circular base. While there are many software programs that can visualize the graph of a paraboloid, they do not include functions to compute the surface area and volume of the paraboloid. Moreover, in order to use that software, users need to define the correct mathematical equation representing the parabola before any computation can be done. Therefore, the GUI has the advantage of incorporating graphs and several parameters of a parabola into only a single application while requires only two inputs for the computation, which are the radius of the base and the height of the paraboloid. Now, before introducing the GUI, the next section will review several mathematical formulas used in the computations

2.0 MATHEMATICAL FORMULAS

In this study, a circular parabola with height, h and radius, r , as given in Figure 1, is considered. In this case, the base of the parabola is a circle of radius, r . In order to visualize the paraboloid in the 3D Cartesian coordinate system, the solid G is used, so that G lies above the xy -plane and bounded above by the equation

$$z = -\frac{h}{r^2}(x^2 + y^2) + h. \quad (1)$$

A MATLAB code is then written to plot the graph using Eq. (1) for $0 \leq z \leq h$ for displaying the paraboloid with the proposed application. The application will also present the 2D visualization for the base of G as a circle using the equation

$$x^2 + y^2 = r^2, \text{ for } z = 0, \quad (2)$$

while the 2D visualization of G from the front is also given based on the equation

$$z = -h \frac{x^2}{r^2} + h \text{ or } z = -h \frac{y^2}{r^2} + h. \quad (3)$$

Either one of the two equation in (3) can be used to visualize the body of the paraboloid from the front as a parabola, depending on the position of the viewer.

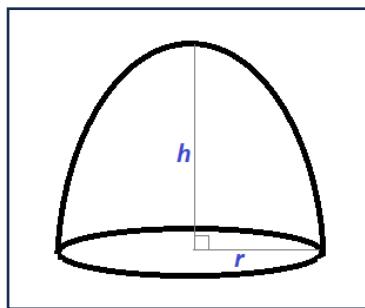


Figure 1: A schematic diagram of a circular paraboloid with height, h and radius, r

Next, in order to find the volume, V of the paraboloid given in Figure 1, the formula

$$V = \frac{\pi r^2 h}{2} \quad (4)$$

can be used. Meanwhile, the surface area, S of the paraboloid is given by

$$S = \frac{\pi r [(4h^2 + r^2)^{3/2} - r^3]}{6h^2} + \pi r^2. \quad (5)$$

Both formulas (4) and (5) can actually be derived using triple integral and surface integral, respectively, where, they are topics from multivariable calculus (see Osman and Yaacob (2008) as an example).

3.0 THE PROPOSED MATLAB GUI

Figure 2 shows the interface of the application, which is a MATLAB GUI. The application has three main functions. First of all, it receives the values of radius and height from the user and then, after the button ‘RUN’ is clicked once both inputs are given, it calculates and gives the volume and the surface area of the paraboloid, as well as displaying the related graphs.

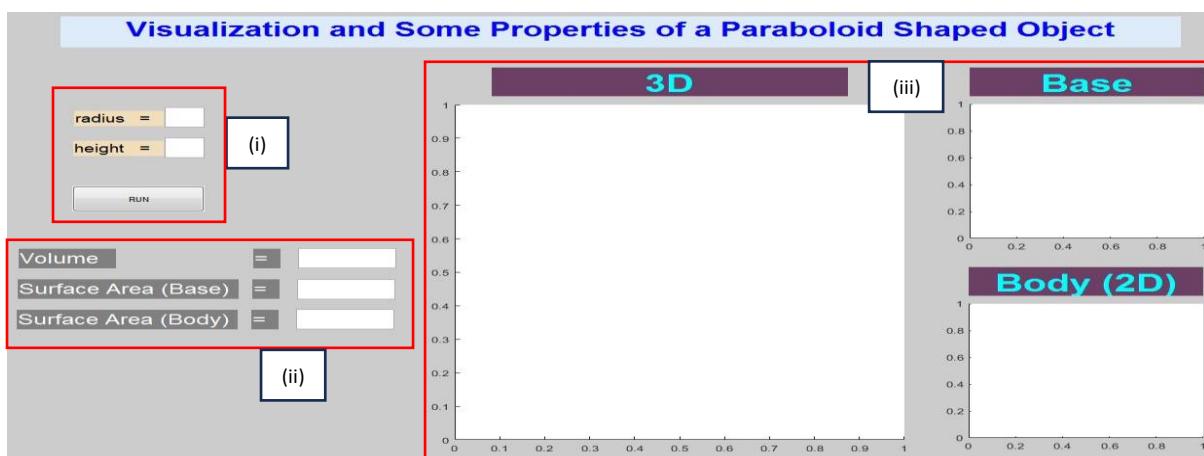


Figure 2: The interface of the proposed MATLAB GUI that has three main functions : (i) receiving inputs from a user and a push button called ‘RUN’ is provided to execute all calculations after it is clicked, (ii) displaying some properties of the paraboloid shaped object, which are the volume and the surface area, (iii) presenting the 3D graph and 2D graphs of the paraboloid shaped object

In this application, the surface area is divided into the surface area of the base and the surface area of the body. This division is necessary because the paraboloid shaped

object might not be open at the bottom. Therefore, if the object is closed at the bottom, the user needs to manually add both surface areas to get the total surface area of the object. Furthermore, for convenience, besides the 3D graphs of the object, the application also provides the graph of the object when the object is viewed from above, which displays the base as a circle. In addition, the 2D graph of the body, which is the graph of the object when viewed from the front or from the side, is also given.

4.0 EXAMPLES

This section provides three examples on using the proposed application. First of all, the application is used to alternatively investigate part of the dome of the building Palau Güell in Barcelona, Spain (see Cortés et. al. (2020)). The graphs of the dome after they are generated by the application, together with the surface area and the volume of the dome, are shown in Figure 3. Here, the inputs used are scaled according to the graph used by Cortés et. al. (2020). Note that the model provided by our application differs from the one in Cortés et al. (2020), which considers an elliptic paraboloid.

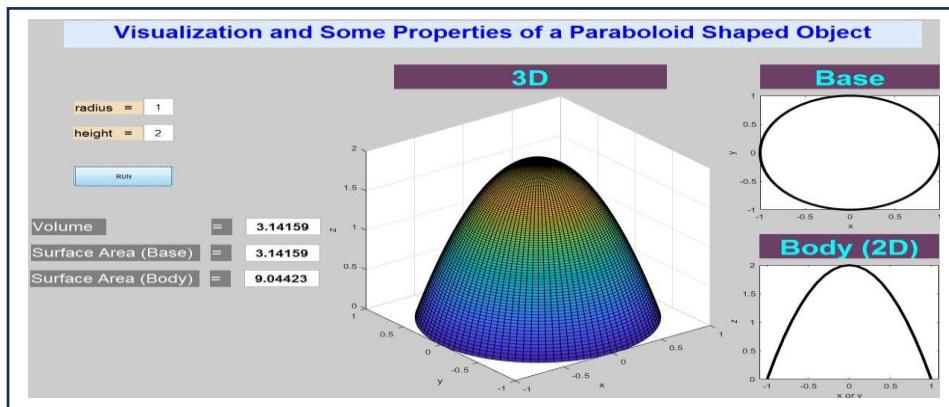


Figure 3: The outputs of the proposed MATLAB GUI after it is run with inputs radius, $r = 1$ and height, $h = 2$, where the graph is a model of a dome of Palau Güell in Cortés et. al. (2020) that has dimension approximately $h = 2r$

In Figure 4, the graphs that model a satellite dish is given together with the values for its surface area and volume. The satellite also appears as an application of parabola in the online study of algebra at <https://www.algebra.com/>. While the application maintains the 3D shape of the parabola, a clear justification that it is a satellite dish can be seen from the 2D view of the body. Here, our application extends the parameters of the satellite dish presented in the website by considering it as a 3D object and not a 2D object. The only difference between the dish in the website and the dish modelled here is the website shows an upward opening parabola, whereas our application displays a downward opening parabola.

Furthermore, the last example given in Figure 5 describes the possible full form, as well as the surface area and the volume of a charcoal kiln in Kubang Badak at the Langkawi Island. The information could be useful for rebuilding the charcoal kiln, which is only partially remaining on the island, to further boost tourism prospects. The inputs are based on our previous research in Ahmad Khairuddin et. al. (2023).

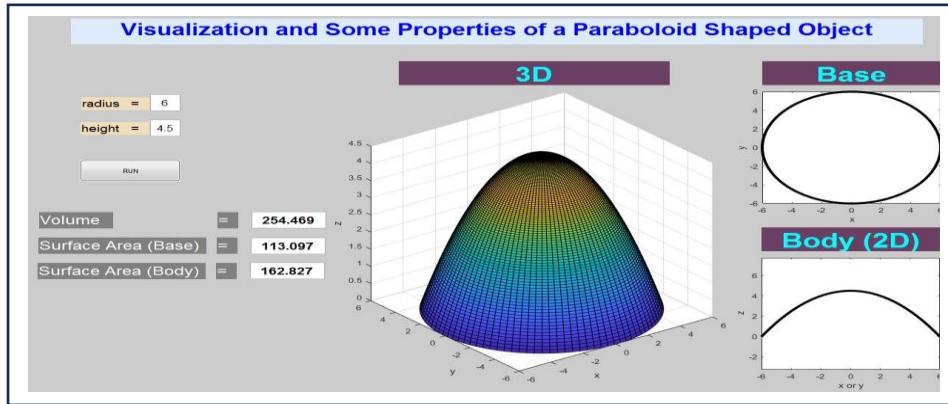


Figure 4: The outputs of the proposed MATLAB GUI after it is run with inputs radius, $r = 6$ and height, $h = 4.5$, where the graph is a model of the satellite dish used in the study of algebra from <https://www.algebra.com/>

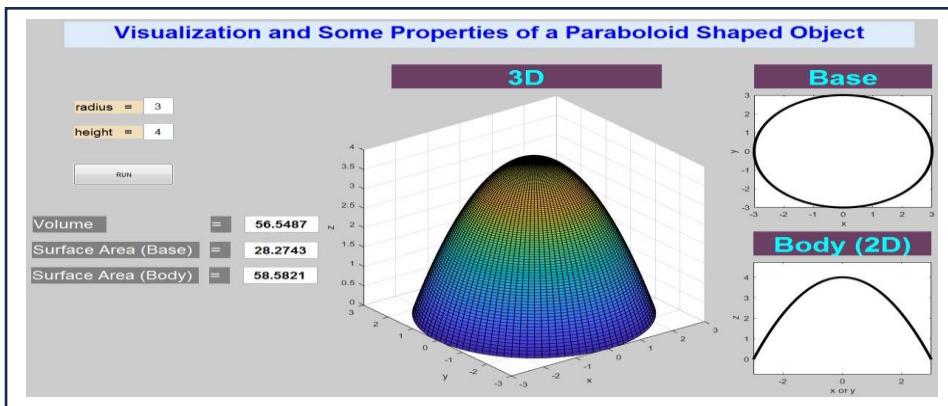


Figure 5: The outputs of the proposed MATLAB GUI that alternatively models the full form of a charcoal kiln described in Ahmad Khairuddin et. al. (2023)

5.0 CONCLUSION

The suggested application as a MATLAB GUI might be useful not only in academia but also for real world problems. It can serve as a tool to enhance the teaching of science and engineering courses in school and higher level of institution. At the same time, the information provided by the GUI might be referred by professionals for many purposes such as to build or describe the paraboloid shaped object.

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(A-ST170) DISCOVERING SHAPES: A SHAPE LEARNING SYSTEM FOR YOUNG CHILDREN

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ABSTRACT

This project focuses on the development of an interactive shape learning system specifically designed for early childhood education. The system aims to address the challenges associated with traditional methods of teaching shapes, which often fail to engage young learners and can lead to inaccuracies in their understanding of geometric concepts. The project seeks to create a user-friendly application that not only enhances children's learning experiences but also provides accurate shape detection using image processing techniques. The background of the problem lies in the limitations of conventional shape learning tools such as physical toys and books, which can be costly, require significant resources, and may contain inaccuracies that impact children's long-term understanding of shapes. Traditional educational methods often struggle to maintain the interest of young learners, leading to suboptimal educational outcomes. Additionally, there is a growing need for integrating technology into early education to make learning more interactive and engaging. The primary objective of this project is to develop a robust and interactive shape learning system for children aged 4 to 6. This system aims to enhance engagement and learning outcomes by providing an interactive platform that combines shape learning modules, quizzes, and real-time shape detection. The proposed system utilizes the latest advancements in image processing to provide an accurate and efficient tool for shape education. To achieve this objective, the system is designed to include three main modules: Learn Shape, Quiz, and Detect Shape. The Learn Shape module introduces children to various geometric shapes through interactive lessons. The Quiz module tests their understanding and retention of shape concepts through engaging and age-appropriate questions. The Detect Shape module uses image processing techniques, such as edge detection and contour analysis, to identify and classify shapes in real-time using the device's camera. This module enhances the learning experience by allowing children to interact with their environment and apply their knowledge practically. In conclusion, this project contributes to the advancement of educational technology by providing a practical and innovative solution for shape learning in early childhood education. By integrating interactive modules and accurate shape detection, the system not only improves the efficiency and effectiveness of shape education but also makes learning fun and engaging for young children. This project showcases the potential of combining educational strategies with technology to create meaningful and impactful learning experiences for children.

Keywords: Interactive shape learning, Early childhood education, Image processing, Geometric concepts, Educational technology.

INTRODUCTION

This project focuses on the development of an interactive shape learning system tailored for early childhood education. It aims to overcome the limitations of traditional methods, which often fail to engage young learners and can be both costly and resource-intensive. Traditional tools, such as shape toys and educational booklets, are expensive, require substantial physical resources, and often lack the interactivity needed to maintain the attention and motivation of young children. Additionally, these methods demand considerable preparation from educators and parents, making them inefficient and difficult to scale.

The goal of this project is to create a cost-effective, engaging, and resource-efficient shape learning system for children aged 4 to 6. By utilizing technology, specifically Android devices, the system will offer interactive learning modules, quizzes, and real-time shape detection.

To achieve these objectives, the project has outlined specific goals. The first goal is to analyse various shape learning methods to understand user needs, enabling the development of effective educational modules. Second, design and develop an interactive, user-friendly shape learning system that includes features like interactive shape learning, quizzes, and a shape detection module. Finally, the performance of this system will be evaluated through comprehensive testing and feedback from users, ensuring it meets the educational needs of young children.

The scope of the project is clearly defined, with the primary target users being children aged 4 to 6. The content will be developed in English to ensure broad accessibility. The system will focus on teaching four basic shapes: circle, triangle, square, and rectangle. It will be developed exclusively for Android devices, taking advantage of their widespread use and accessibility. The system will include several modules, such as an interactive shape learning module, a quiz module for reinforcing knowledge, and a shape detection module that enables real-time interaction with the environment.

The significance of this project lies in its potential to revolutionize shape learning by providing a personalized, engaging, and accessible platform that supports early skills development. By integrating technology into the learning process, the project aligns with current trends in educational technology, demonstrating how innovative approaches can enhance traditional learning methods.

METHODS

The methodology employed in the development of the "Discovering Shapes" system follows a structured approach based on the Waterfall Model, a traditional software development process. This model was selected due to its sequential nature, which ensures that each phase is completed before the next one begins, thereby reducing the likelihood of errors and ensuring a clear progression from concept to deployment (Carlos A. Crespo-Santiago et al.,

2022). The key phases include requirement analysis, design, implementation, testing, and deployment & maintenance. The Waterfall Process software development life cycle is depicted in Figure 1.1.

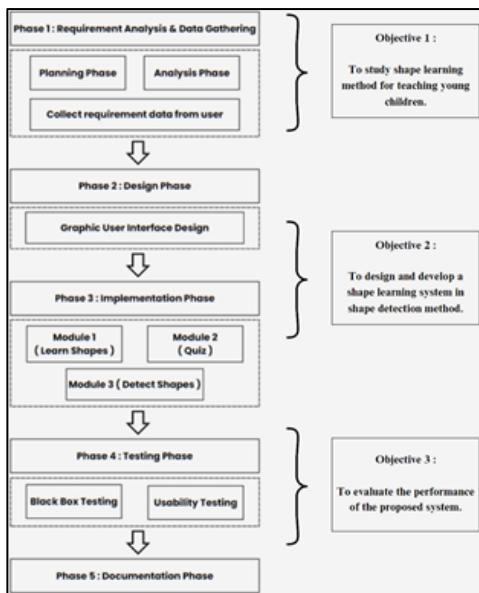


Figure I Phase of Waterfall Process

In the requirement analysis phase, the needs of the system were carefully identified, focusing on the development of interactive modules and the incorporation of real-time shape detection capabilities. The design phase involved planning the system's architecture, with a particular emphasis on the user interface and the integration of image processing techniques necessary for shape detection. During the implementation phase, the actual coding of the system took place, ensuring that the interactive features were effectively integrated with the shape detection module. This was followed by the testing phase, where the system's functionality, usability, and accuracy—especially in shape detection—were thoroughly evaluated to ensure that it met the project objectives. Finally, the deployment & maintenance phase involved launching the system and providing updates as needed to ensure its continued effectiveness and relevance.

A key component of the system is its ability to detect shapes in real-time using a contour-based method. Contours are essentially curves that join all continuous points along a boundary that share the same color or intensity. By detecting these contours, the system can identify geometric shapes based on their boundary properties (Grigorescu, C., Petkov, N., & Westenberg, M. 2003). This method is particularly effective in accurately recognizing shapes, which is crucial for an educational tool aimed at young children. To implement this contour-based detection, OpenCV—a powerful tool for real-time image processing—was employed. The image processing workflow begins with converting the captured image to grayscale, which simplifies the image by reducing it to shades of gray. Following this, a binary threshold is applied, which differentiates the shapes from the background by converting the image into a binary format. OpenCV's `findContours` function is then used to detect the contours within the image. Finally, the system identifies the shape by analyzing these contours and comparing them to predefined geometric models, ensuring accurate shape

recognition (J. Sigut, Miguel Castro, R. Arnay, and M. Sigut, 2020). The combination of the contour-based method and OpenCV ensures that the "Discovering Shapes" system is both efficient and effective in real-time shape detection, significantly enhancing the learning experience for young children by making it interactive and engaging.

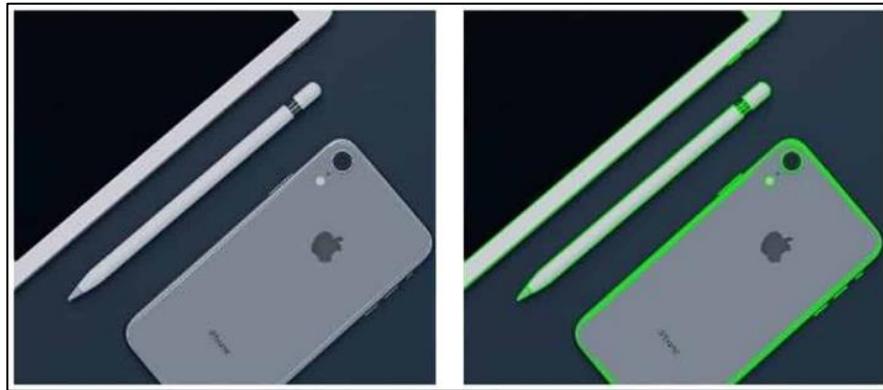


Figure II Example of Image After Applying Contour Based Detection

System requirements are critical to ensure the smooth development and functioning of the shape learning system. These requirements are divided into two main categories: hardware and software. The purpose of specifying these requirements is to outline the necessary tools and resources needed for the development, testing, and deployment of the system. The hardware requirements are essential to provide the computational power and resources needed for running the development tools, processing images, and testing the application. The specified hardware ensures that the system can handle the demands of real-time image processing and shape detection, which are computationally intensive tasks. The software requirements encompass the operating system, development platforms, and programming languages that will be used to build the system. These software tools are chosen to provide a robust and efficient development environment, enabling the creation of a reliable and high-performance shape learning application. The following tables list the detailed hardware and software requirements for the project:

Table I The Hardware Requirement

Hardware	Model / Version
System Model	MSI GF66 KATANA
Central Process Unit (CPU)	11th Gen Intel(R) Core (TM) i7-11800H @ 2.30GHz 2.30 GHz
Random Access Memory (RAM)	16.0 GB
Graphic Processing Unit (GPU)	NVIDIA GeForce RTX 3050 Ti

Table II The Software Requirement

Software	Model / Version
PC OS	Windows 11 with 64-bits
Application Development Platform	Android Studio, OpenCV
Language	Java

RESULTS AND DISCUSSION

The testing phase of the "Discovering Shapes" system was crucial in ensuring that the application met user requirements and maintained high quality. Two primary testing methods were employed: Black Box Testing and Usability Testing.

Black Box Testing focused on verifying the system's functionality without considering the internal code structure. The test cases covered various features, including the sign-in process, main menu navigation, learning modules, quiz functionality, and shape detection. The results demonstrated that all features performed as expected, with all test cases passing successfully. For instance, the system accurately detected and highlighted shapes like circles, squares, rectangles, and triangles, and the navigation between modules was seamless and error-free. This confirmed that the system's functionality aligned with the specified requirements, enhancing its reliability and usability.

Usability Testing evaluated the user-friendliness and overall experience of the system. Feedback from participants, particularly young users, indicated strong satisfaction with the application. The interface was found to be intuitive, and the interactive features, such as shape detection and quizzes, were both engaging and educational. The majority of respondents rated the navigation, functionality, and overall user experience highly.

Cadangan penambahbaikan aplikasi
7 responses

Quiz medium dan hard perlu diubah menjadi lebih mudah bersesuaian dengan kanak kanak

App yang bagus

Improve detect shape

Best

Add more activity

Quiz perlu lebih mudah untuk pelajar tadika

Teruskan usaha

Figure III Result of the open-ended section.

Moreover, the usability testing included an open-ended section where users could provide additional comments or suggestions and the result is on the figure III above. Out of the responses received, several users offered specific ideas for enhancing the application, such as introduce additional fun activities into the system to attract and engage children, making the learning experience more enjoyable. These constructive suggestions are valuable for future iterations of the system. Additionally, some users expressed overall satisfaction, indicating that the application already functions well as it is. Figure IV below shows the user that is young children is using the application.



Figure IV User using the “Discovering Shapes” application

CONCLUSIONS

The project successfully developed an early educational tool for shape detection, meeting the intended objectives by creating a system that accurately identifies and classifies shapes. To further enhance the system, recommendations for future improvements include refining the user experience with age-appropriate quizzes, increasing shape detection accuracy, and incorporating interactive activities. Additionally, integrating a database for personalized learning and providing detailed insights for parents and teachers are suggested to enhance the system's effectiveness and impact on early childhood education.

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(A-ST172) PROTOTYPE OF HIJAB DRYER

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ABSTRACT

Hijabs, essential to many women's modest fashion, require meticulous care to maintain their appearance and longevity. Traditional drying and ironing methods often result in wrinkles. Working women with tight schedules and housewives managing multiple responsibilities struggle to find time for proper hijab care. The market lacks specialized appliances for efficient hijab drying and wrinkle prevention. Addressing this gap, the prototype of the hijab dryer aims to provide a comprehensive solution that saves time and keeps hijabs pristine. This project focuses on designing, analysing, and fabricating a hijab dryer. SolidWorks software facilitated detailed digital modelling and airflow simulations during the initial phase by optimizing the design. With these special features, the product has a huge potential for commercial value in household appliances.

Keywords: hijab, dryer

1.0 INTRODUCTION

Hijab is an important clothing in modest fashion for many women. It is a form of headscarf that comes in a plethora of styles, designs, and colours. There is even a variety of choices when it comes to fabrics such as chiffon, cotton, silk, viscose, jersey, crepe, satin, polyester, nylon, and spandex.

With all of these varieties, the hijab requires meticulous care to prevent damage and ensure its longevity. The hijab is also ironed before it is worn to keep it looking crisp and presentable. However, after ironing, the hijab is often laid on the surfaces such as the bed, sofa, chair, or table which can cause wrinkles to form again and may potentially damage the fabric. This is because women, whether they are staying at home or working at office, face challenges in dedicating time to properly care for their hijab. They have limited time but must manage multiple responsibilities daily.

Hence, it is a necessity to design an innovative household appliance to suit the needs of hijab wearing individuals. The specialised appliance can integrate drying and wrinkle prevention, as well as efficiently keep the hijab in place. Conversely, a prototype of hijab dryer is created.

2.0 OBJECTIVE

The objectives of this project are:

- 1) To design and analyse a hijab dryer.
- 2) To fabricate a prototype of a hijab dryer.

3.0 METHODOLOGY

Project flowchart was designed to ensure that the project will run smoothly. Figure 1 displays the project flowchart. This project begins by finding a problem statement and then proceed to objectives. Based on the research made, the market lacks specialised appliances for efficient hijab drying and wrinkle prevention. To solve this problem, the project was set with objectives to design, analyse, and fabricate a prototype of a hijab dryer.

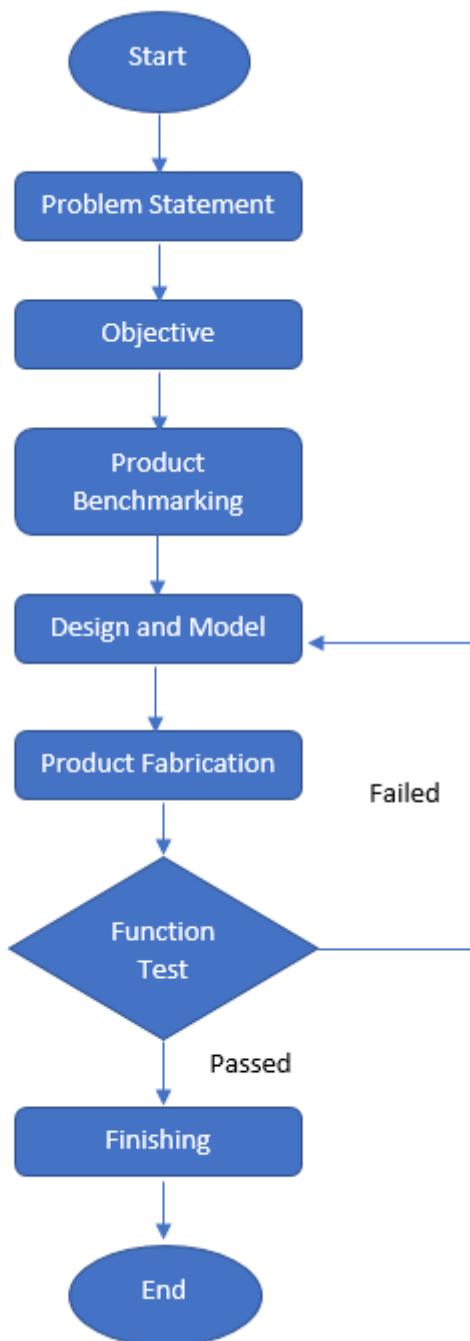


Figure 1: Project Flowchart

Prior to design stage, the benchmarking has been conducted to identify the available product of drying function and how the features available in the market. Based on the findings, the current dryer available in the market was not suitable as per demand. A total of 20 women participated in the survey, and 80% of them demand to have a product of hijab that comprises drying and dresser functions. Besides, most of them also demand to have special function of odour remover.

According to this demand, the project proceeds with the concept design and modelling the product as per parameter shown in Table 1. Additionally, Figure 2 depicts the concept design of the product by using Solidworks software. The heating elements are strategically positioned at the centre of the bottom section, ensuring that the heated air is distributed evenly and maintained a balanced temperature throughout the device.

Table 1: Design Parameter of Prototype Hijab Dryer

Main dimension (length, width, height)	500mm, 300mm, 640mm
Power input	220 Volts
Power output (heating)	120 Watts
Hijab drying capacity	2 units per time
Drying input humidity	30% RH
Main material	Acrylic 3 mm thickness
Special function	Odour remover

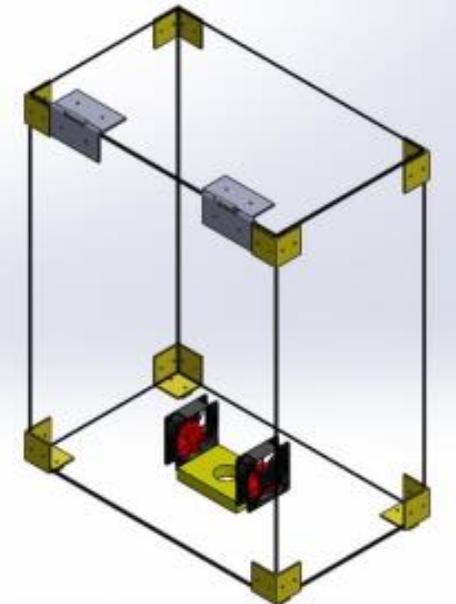


Figure 2: Concept Design of Prototype Hijab Dryer

The project proceeds with the fabrication stage which are cutting the acrylic, drilling the require holes for fastener, and wiring of heating and ventilation unit. For this project, the L bracket was specially designed and fabricated by using 3D printing to enhance the strength of main structure. Then, the fabricated product will be tested as per demand functions and if all the functions passed at this stage, the product will proceed to finishing stage and will product as a final prototype or product.

4.0 RESULTS

The hijab dryer can accommodate 1 to 2 hijabs simultaneously. The operation of the hijab dryer is automatically on when detecting 30% humidity of hijab. Drying rate is differ compare to humidity levels of hijab. It can also be concluded that drying time is direct proportion to the hijab humidity levels. Table 2 presents the result of drying time. Figure 3 illustrates the final product fabricate and product testing.

Table 2: Result of Drying Rate According to Humidity Levels

Humidity Levels (%)	Time Consume (Minutes)
30-40	5
41-50	8
51-60	10
61-70	15
71-80	17
81-90	20
91-100	36



Figure 3: Final Product of Prototype Hijab Dryer

5.0 CONCLUSION

In conclusion, hijab dryer prototype is a must have household appliance for women. They do not have to worry that their hijab will be damaged because the prototype can dry it according to different temperature for different fabrics. They also do not have to worry if their hijab will be wrinkled because the prototype can keep the hijab after it is dried. Thus, it will save their time.

(A-ST173) AUTISM EMOTION INTERACTIVE LEARNING

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ABSTRACT

Autism Spectrum Disorder (ASD) is a neurodevelopmental condition characterized by difficulties in social communication, particularly in recognizing and interpreting facial expressions. Traditional methods for teaching emotional recognition, such as self-reporting and physiological measurements, often lack engagement and practicality for children with ASD. This project addresses these limitations by developing an interactive app designed to enhance the social and emotional skills of children with ASD. The primary objectives of this project are to study the requirements for recognizing and learning emotion expressions in children with autism, design and develop an interactive emotion app tailored to these needs, and to validate the system's ability to recognize emotions such as Angry, Happy, Sad, Surprise, and Neutral. The app comprises three key modules: the Learn Module, offering educational content on emotions; the Activity Module, providing interactive games and exercises to reinforce learning; and the Scan Module, using real-time facial emotion detection with advanced computer vision and machine learning techniques, including convolutional neural networks (CNNs) and cascade classifiers for face detection. The app's interactivity is designed to be engaging and user-friendly for children with ASD. The validation process involves questionnaires and surveys administered to children at Sekolah Taman Universiti 1, gathering valuable feedback on the app's interactivity and effectiveness. This feedback highlights how well the app facilitates learning and engagement, providing insights into its impact on users' emotional and social development. The findings from the validation indicate that the app successfully enhances emotional recognition skills and provides an engaging learning experience for children with ASD.

Keywords: Emotion Learning Application, Malaysian University Student, Mobile - Based Application.

INTRODUCTION

Autism Emotion Interactive Learning for autism children is a mobile application designed specifically to support individuals with mild autism in recognizing and understanding emotions. Utilizing computer vision and machine learning techniques, this application can identify and interpret facial emotions in real-time, providing immediate feedback to the user. By capturing and analyzing facial expressions and visual cues, the app helps users learn about emotional states through interactive and engaging activities.

This application is intended for direct use by individuals with mild autism, with guidance from their parents or caregivers. The interactive nature of the app allows users to

engage in activities and quizzes that teach them to recognize and understand different emotions. Additionally, the app features a real-time emotion detection system that uses the device's camera to capture the user's facial expressions, analyze them, and provide feedback on the detected emotion.

Autism Emotion Interactive Learning focuses on the unique needs of its users by providing a supportive learning environment. Parents and caregivers can also use the app to monitor progress and guide their children through the learning process. By offering an accessible and user-friendly interface, the app makes it easier for users to interact with and learn from the technology.

The emotion detection system within the app works by analyzing various facial features such as the position of the eyebrows, the shape of the mouth, and the movement of the eyes. These features are compared to a database of facial expressions to determine the user's emotional state. The system can detect a range of emotions including happiness, sadness, anger, surprise, and neutrality.

Overall, Autism Emotion Interactive Learning aims to provide valuable tools for individuals with mild autism to improve their emotional awareness and understanding, fostering better social interactions and personal development.

Autism spectrum disorder (ASD) is a neurodevelopmental disorder characterized by difficulties in social communication and interaction, as well as restricted and repetitive behaviors or interests. Individuals with ASD often struggle with identifying and interpreting facial expressions, which can hinder their ability to communicate effectively and understand social cues. (Lord, C., Elsabbagh, M., Baird, G., & Veenstra-Vanderweele, J. (2018)). People with autism spectrum disorder (ASD) usually have their own therapy sessions. One of the activities from the session they received is learning about emotions.

Traditional emotion detection methods, such as self-reporting and physiological measurements, often fall short in accuracy and practicality. (Beran, T. N., & McLaughlin, T. (2019)). These methods can be subjective, require extensive training, or rely on the individual's ability to articulate their emotions, which can be challenging for those with ASD. Additionally, traditional methods may not provide real-time feedback, limiting their effectiveness in dynamic social interactions.

Moreover, traditional methods are often too monotonous and may fail to engage individuals with ASD, who may not find these approaches interesting or motivating. This lack of engagement can hinder the learning process and limit the improvement of emotional recognition skills.

The development of an app that leverages advanced technologies such as machine learning and computer vision can address these gaps. Such an app can provide a more interactive and engaging platform, capturing the interest of individuals with ASD and motivating them to learn and improve their emotional recognition. The app's real-time feedback and user-friendly design can enhance the learning experience, making it more effective and enjoyable for individuals with ASD.

Autism Emotion Interactive Learning aims to support individuals with mild autism by providing a comprehensive tool that analyzes facial expressions and other visual cues in real-time. This app seeks to address the challenges associated with teaching

emotional recognition and understanding to individuals with autism by offering interactive and immediate feedback. While the primary focus is on real-time emotion detection and feedback, the app also includes a variety of engaging activities designed to enhance the learning experience.

These activities are specifically tailored to be enjoyable and educational, helping users to learn about emotions in a fun and interactive way. The app's modules cover a range of topics and skills, providing a holistic approach to emotional education. By offering a diverse array of activities, Autism Emotion Interactive Learning ensures that users remain engaged and motivated throughout their learning journey.

This application is intended for use in various settings, such as at home, in schools, therapy sessions, and social skills training programs. By providing immediate feedback and guidance, Autism Emotion Interactive Learning can help individuals with mild autism develop stronger social and emotional skills, ultimately improving their overall quality of life. The app provides a platform where users can learn to identify and understand different emotions through real-time interaction and diverse educational modules.

Other than that, the ethical implications of using real-time facial emotion detection technology must be carefully considered. Issues such as privacy, data security, and the potential for misuse are significant concerns. It is crucial to address these ethical considerations to ensure that the benefits of the technology are maximized while minimizing any potential risks and drawbacks. The app is designed with these ethical considerations in mind, aiming to provide a safe and supportive learning environment for its users.

The primary objectives of the project are to study the requirements for recognizing and learning emotional expressions in children with autism, to design and develop an interactive emotion app specifically tailored for these children, and to validate the app's effectiveness in identifying and teaching five key emotions: anger, happiness, sadness, surprise, and neutrality. The scope of the project includes several critical components. The proposed system will focus on detecting these five types of facial emotions using cascade classifiers to identify frontal views of faces. Users will interact with the system through input devices such as a camera, which will capture and analyze their facial expressions. The application is designed with the goal of helping children with autism learn about and understand emotions more effectively. By combining these objectives and scope elements, the project aims to create a comprehensive and engaging tool for emotional education.

METHODS

The selection of an appropriate development method is crucial in ensuring the success of a project. It plays a significant role in determining the project's feasibility and aligning the project organization's objectives with the chosen method. In the case of this project, the Waterfall model has been identified as the ideal choice. The Waterfall model follows a sequential and linear approach, making it suitable when the project's objectives remain stable throughout the entire development process. With a clear and well-defined goal in mind, the Waterfall model's structured phases can be executed smoothly, eliminating the need for frequent and drastic changes in the system requirements. This allows the project team to proceed methodically, progressing

through each phase in a logical order, from requirements gathering and system design to implementation and testing. By adopting the Waterfall model, the project benefits from a systematic and predictable development process that facilitates effective project management and ensures the delivery of a robust and reliable facial emotion detection system.

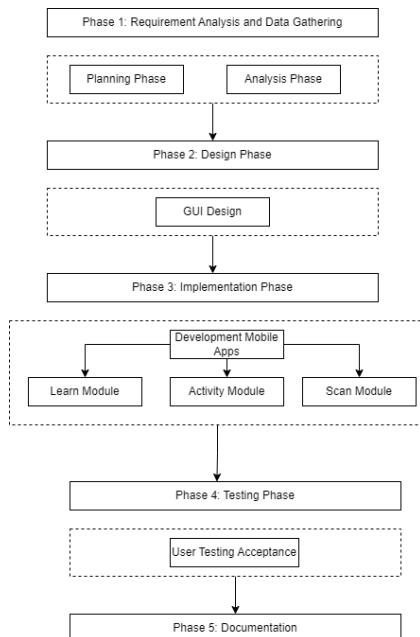


Figure 1: System Framework Diagram

In the first phase of the Waterfall methodology, requirement gathering and analysis were conducted through comprehensive research rather than direct stakeholder meetings. This research focused on evaluating existing manual and web-based emotion detection systems to identify their limitations and functionalities. By analyzing these solutions, the project team derived a set of requirements for a new mobile application. This approach provided insights into necessary features and improvements, resulting in a Requirement Specification Document that outlines the project's needs for accessibility, efficiency, and user-friendliness.

The design phase aimed to develop a detailed architectural blueprint for the application, ensuring both user-friendliness and technical feasibility. This phase involved defining the overall system architecture, including major components and their interactions. Special attention was given to designing intuitive UI and UX layouts and planning data flow to support the application's functionality. Tools such as TensorFlow Lite were selected for emotion detection, and interactive features like quizzes, flashcards, and an emotion board were included to enhance user engagement. The phase resulted in a System Design Document, UI mockups, and data flow diagrams to guide development.

During the implementation phase, the design documents were translated into a functional application using Android Studio, XML, and Java. The phase was divided into three modules: Learn, Activity, and Scan. The Learn Module provided educational content through interactive flashcards. The Activity Module reinforced learning with quizzes and an emotion board, with future plans to enhance quizzes dynamically. The Scan Module focused on real-time emotion detection using TensorFlow Lite, enabling

the app to analyze facial expressions captured by the camera and provide instant feedback.

The testing phase was crucial for ensuring the application's functionality and performance. It involved unit testing individual components, integration testing to ensure seamless interaction between components, and system testing against specified requirements. The TensorFlow Lite model's performance was evaluated for real-time accuracy in emotion detection. Interactive features were rigorously tested, including user acceptance testing (UAT) with children with ASD, parents, and educators. Feedback from a local autism school was used to make final adjustments, resulting in a thoroughly tested and validated application.

RESULTS AND DISCUSSION

The Autism Emotion Interactive Learning App underwent extensive testing with children diagnosed with Autism Spectrum Disorder (ASD), educators, and parents, revealing significant improvements in emotional recognition among the children. The app's interactive features, particularly the emotion board game and quizzes, effectively engaged the users, making the learning process both enjoyable and immersive. The user interface was well-received for its simplicity and accessibility, allowing users to navigate the app with ease.

The integration of TensorFlow Lite and OpenCV for real-time facial expression recognition proved successful, with the model demonstrating high accuracy across different devices. Educators noted the app's educational value, highlighting its potential for seamless integration into existing curricula to support emotional learning in classroom settings. Overall, the app's ability to enhance emotional recognition in children with ASD showcases the potential of leveraging technology in special education. The positive feedback from all user groups validates the app's effectiveness, though future improvements, such as expanding the range of emotions and refining detection capabilities, were identified for further development.



Figure 2: User (with autism) learning and playing with the app

Before using the app, each participant completed a pre-test questionnaire designed to capture their initial impressions, expectations, and familiarity with similar technology. This questionnaire helped establish a baseline for evaluating the app's impact and usability.

Below pie chart in Figure 3, show all 13 respondents from guidance indicated that they had never used any applications to teach emotions to their child, student, or

themselves before this testing. This highlights the uniqueness of the Autism Emotion Interactive Learning App in providing a new tool for emotional learning.

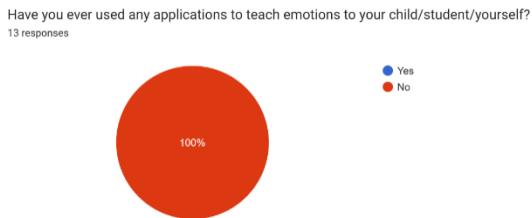


Figure 3: Respondent answer for using any emotion apps before

After the testing session, participants completed a post-test questionnaire. This survey focused on gathering feedback about their experience using the app, including its usability, effectiveness, and overall satisfaction. Participants were asked to rate various aspects of the app and provide open-ended feedback on what they liked or disliked, and any suggestions for improvement.

The total responses shown in below Figure 4 are 14 participants. Interactive games were the most engaging feature. Nearly two-thirds of the participants found them appealing. These games likely provide an enjoyable and interactive way to learn about emotions. Flashcards that was refer to emotion cards in the apps received the highest engagement. Almost all respondents (92.9%) interacted with the emotion cards. These visual aids are effective for reinforcing emotional concepts and memory retention.

Quizzes were the least popular feature, with only 21.4% engagement. Participants might prefer other methods over quizzes for emotional learning. Facial expression recognition was well-received, with 78.6% engagement. This feature likely helps users understand emotions through visual cues.

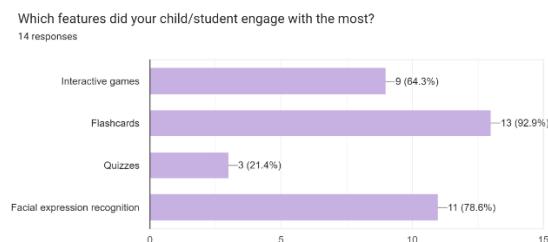


Figure 4: Respondent's answer on features their child/student engage the most

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(A-ST174) FEATURE SELECTION FOR CHRONIC KIDNEY DISEASE CLASSIFICATION MODEL USING CONVOLUTIONAL NEURAL NETWORK

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ABSTRACT

A complicated and common medical disorder, chronic kidney disease (CKD) has a big impact on public health. Early and accurate classification of CKD is crucial for effective management and treatment and late of treatment may lead to serious problem that may cause death. However, determining an accurate classification of CKD is challenging. Using a deep learning as a method for the classification of the targeted disease. In this research, an approach for classifying CKD using a Convolutional Neural Network (CNN) will be proposed. Experiments will be conducted to study the performance of CNN in the classification of CKD. After collecting the dataset of CKD, the raw data will be pre-processed before the action of deep learning can be taken. Several feature selections will be done to target the important attribute that contribute to the CKD. After that, CNN model architecture design will be implemented to the experiment in getting the result for performance evaluation. To evaluate the performance of the result, employment of various performance metrics, including accuracy, precision, recall, and F1 score are recorded. The successful implementation of the proposed CNN model for clinical data classification in CKD can have significant clinical implications, enabling personalized treatments, disease monitoring, and facilitating the development of targeted therapies. This research helped advance the practise of precision medicine for CKD and enhance patient outcomes.

Keywords: Chronic kidney disease, Machine learning, Convolutional Neural Network

INTRODUCTION

The kidneys are vital organs responsible for filtering waste from the blood, maintaining fluid and electrolyte balance, and producing essential hormones. Damage to the kidneys can lead to serious health issues, including chronic kidney disease (CKD), a condition characterized by a gradual loss of kidney function. CKD is a global health concern, affecting over 10% of the population and potentially leading to end-stage renal disease (ESRD), requiring dialysis or transplantation.

CKD is a long-term condition that affects kidney function, commonly linked to aging and prevalent in certain populations. The global prevalence of CKD was 9.1% in 2017, affecting over 700 million people. Machine learning techniques, including CNN, have been explored for CKD prediction, using patient data to develop models that improve early detection and personalized treatment. Various studies have demonstrated the effectiveness of these approaches, with models achieving high accuracy in CKD classification, thus supporting better management of the disease.

This study focuses on improving CKD diagnosis by targeting important features and using Convolutional Neural Networks (CNN), a deep learning technique that leverages clinical data for more accurate disease classification. By enhancing diagnostic accuracy, this approach aims to facilitate earlier intervention, improve patient outcomes, and reduce the burden of CKD.

Classifying chronic kidney disease using CNN has the potential to improve diagnosis accuracy and efficiency, allowing for earlier intervention and improved disease management. The results from this study demonstrate that using Recursive Feature Elimination (RFE) for feature selection yielded the highest accuracy (0.9917) and F1 Score (0.9933), surpassing the performance of models utilizing all features, Chi-Square Test, and Ridge Regression. This suggests that careful feature selection can significantly enhance the performance of machine learning models in CKD classification. Ultimately, this approach aims to improve patient outcomes and reduce the burden of this chronic illness.

METHODS

A research employ needs to get started by gathering materials and data. At this point, the research's references have been found. Usually, information and resources are obtained via the Internet by utilising a browser such as Google Scholar, which provides pertinent content from both the academic and professional domains. Obtaining journals mostly from ScienceDirect and conference papers primarily from IEEE Xplore is the next stage. For this research, the database chosen is chronic kidney disease dataset from UCI Machine Learning Repository. The dataset consists of 400 samples. In this research the performance measurement using convolutional neural network for chronic kidney disease is measured based on accuracy, precision, recall and f1 score. Below is the research framework.

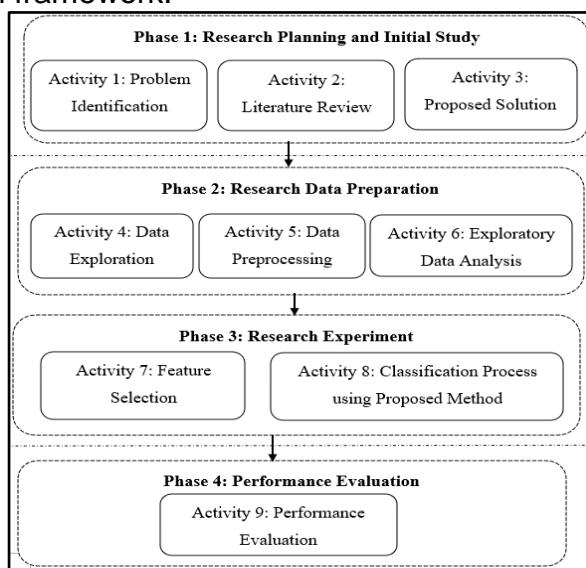


Figure 1 Research Framework

Phase 1: Research Planning and Initial Study

Research planning and conducting an initial study are essential steps in the research process. These stages involve careful preparation and groundwork to ensure the successful execution of the research project. In this phase, there are three actions that need to be initiate to gain information details in specific research. The first action is the identification of the problem for gaining the purpose and objective for doing the

experiment. The next action that needs to be done is doing a literature review based on previous research to get better understanding about machine learning technique that can be used on the classification of CKD model. The third action which is the last action that need to be carry out for the phase is concluding a solution for suitable machine learning technique for the research. Overall, research planning and conducting an initial study are critical steps that set the foundation for a successful research project. It will ensure that the research is well-prepared, feasible, and capable of generating reliable and valid results. Figure below shows the list of activities that can be done on phase 1.

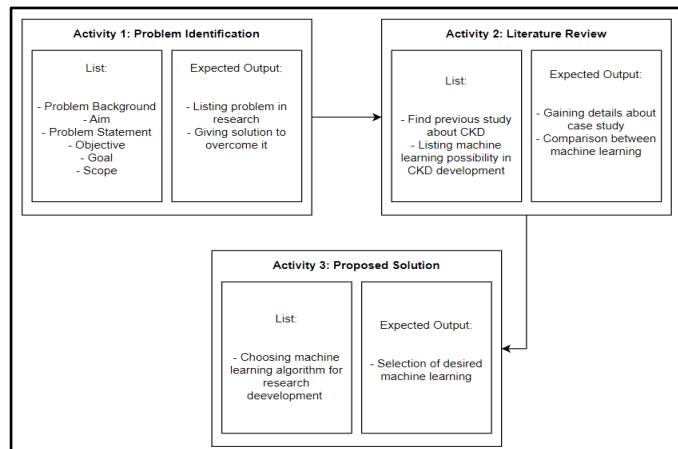


Figure 2 Phase 1

Phase 2: Research Data Preparation

Research data preparation is a crucial step in the research process that involves organizing, cleaning, and transforming raw data into a format suitable for analysis. This stage ensures that the data is accurate, consistent, and ready for meaningful interpretation. The first and foremost step is getting a dataset of chronic kidney disease is an important task for this research experiment so that the guideline will be able to follow the following data. The dataset that gets from websites can be considered raw and it needs to be clean which can improve the result. Follow to the next action that are need to be taken which is data preprocessing. There are two steps of actions that need to be taken at a same time which are data pre-processing and exploratory data analysis. Data pre-processing encompasses a series of techniques and procedures aimed at improving data quality, addressing inconsistencies, and enhancing the effectiveness of data analysis while exploration of data will help to get an understanding of the data. In the phase 2, it will ensure the data is in a state of accurate, reliable and usable that can improve the accuracy in research development finding. Figure below shows the list of activities that can be done on phase 2.

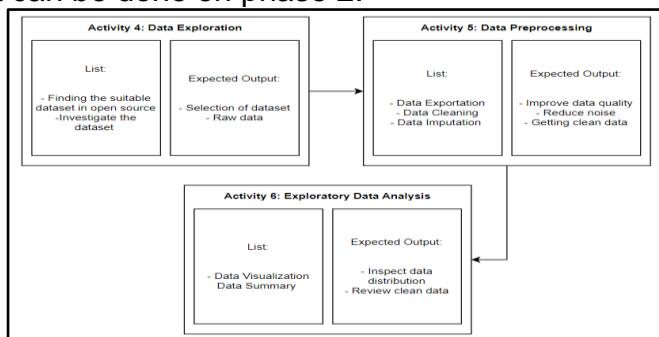


Figure 3 Phase 2

Phase 3: Research Experiment

Research development is an important step for research process that will advancing the research experimentation. This phase helps to get the result for the classification. For the phase 3, feature selection by selecting the most relevant and informative features to improve model performance, reduce overfitting, and enhance interpretability will be conduct. Then, convolutional neural network deep learning algorithm will be implemented across the research. Layers that involved in CNN such as convolutional layer, pooling layer and fully connected layer need to be initiate in etiquette manner. Research development is a dynamic and iterative process that requires implementation of machine learning technique with the proposed data. Outstanding development will help getting a result that will be evaluate in the next phase. Figure below shows the list of activities that can be done on phase 3.

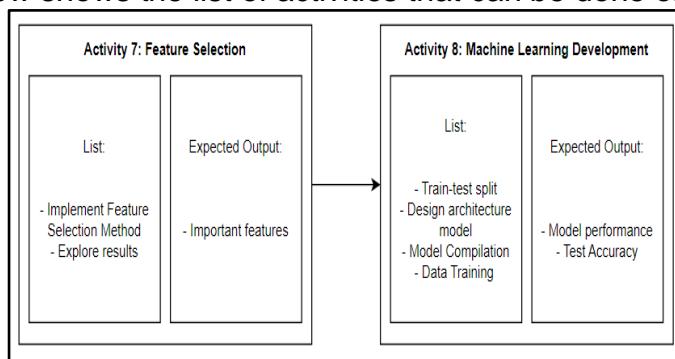


Figure 4 Phase 3

Phase 4: Research Evaluation

Research evaluation is a process that finding the performance of the experiment that are need to be conclude. The last phase, which is phase four will be comparison of the result of the development with other research that using different machine learning technique that has been done. It will help to compare which machine learning technique that is better for classification of chronic kidney disease model. Figure below shows the list of activities that can be done on phase 4.

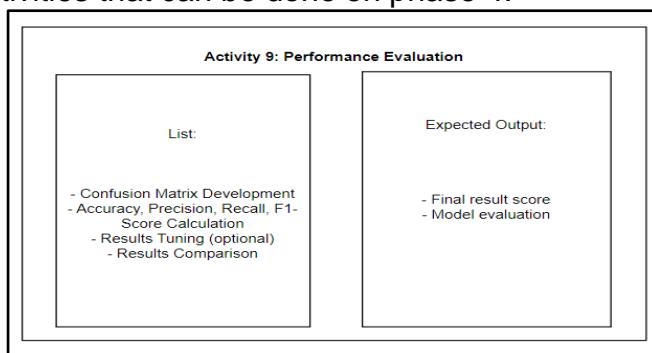


Figure 5 Phase 4

RESULTS AND DISCUSSION

Metrics scores need to be calculated in order to assess how well machine learning models perform. Metrics like recall, accuracy, precision, and F1-score reveal how effectively the model predicts results in comparison to the real data. Precision evaluates the accuracy of positive predictions, or the number of relevant instances selected, whereas accuracy represents the overall percentage of correctly classified instances. Conversely, recall evaluates the model's accuracy in identifying every positive instance. The F1-score is a single metric that measures the overall

performance of the model by balancing precision and recall through a harmonic mean. The dataset is conducted through 4 different method which are All Features, Chi-Square Test, Recursive Feature Elimination and Ridge Regression. The dataset being tested and compared using with Convolutional Neural Network. The results for each experiment was collected based on accuracy, precision, recall and F1 score. Table 1 shows the metrics score of it.

Table 1 Metrics Score

Evaluation Metrics	All Features	Chi-Square Test	RFE	Ridge Regression
Accuracy	0.9833	0.9833	0.9917	0.9833
Precision	1.0	1.0	1.0	0.9740
Recall	0.9733	0.9733	0.9867	1.0
F1 Score	0.9865	0.9865	0.9933	0.9867

1. Result Comparison

The performance of a chronic kidney disease classification model based on Convolutional Neural Networks was assessed using four feature selection techniques: All Features, Chi-Square Test, Recursive Feature Elimination (RFE), and Ridge Regression. Evaluation parameters included accuracy, precision, recall, and F1 score, revealing significant performance variation depending on the feature selection strategy. RFE exhibited the highest accuracy of 0.9917, while the other methods, including using all features, Chi-Square Test, and Ridge Regression, demonstrated an accuracy of 0.9833, indicating similar effectiveness in correct classifications but a slight edge for RFE. Precision was a perfect 1.0 for models using all features, Chi-Square Test, and RFE, but slightly lower for Ridge Regression at 0.9740, suggesting minor false positives. Recall was perfect (1.0) for Ridge Regression but slightly lower for other methods, showing Ridge Regression's ability to identify all chronic kidney disease instances correctly. The F1 score was highest for RFE at 0.9933, balancing precision and recall effectively. Feature selection analysis showed the Chi-Square Test prioritized critical medical conditions and laboratory results, RFE emphasized a broader range of laboratory and demographic features, and Ridge Regression combined essential lab tests and vital signs. 'Specific gravity,' 'albumin,' and 'hypertension' were common across all methods, indicating their importance in predicting chronic kidney disease. The results suggest that while the Chi-Square Test prioritizes specific medical conditions, RFE and Ridge Regression incorporate a broader range of variables, with RFE offering the highest accuracy and F1 score, demonstrating the benefits of a comprehensive feature selection approach in enhancing the CNN model's classification ability. This underscores the significant impact of careful feature selection on the effectiveness of machine learning models for CKD classification, with RFE emerging as the most successful method.

2. Previous Research Result Comparison

In comparing our chronic kidney disease (CKD) classification model using Convolutional Neural Networks (CNN) with previous research, notable differences and similarities in performance metrics emerge. Our CNN model with Recursive Feature Elimination (RFE) achieved an exceptional accuracy of 0.9917, surpassing all other techniques, including those from earlier studies. This highlights RFE's effectiveness in feature selection, enhancing the CNN model's predictive power. While CNN models using all features, the Chi-Square Test, and Ridge Regression demonstrated a consistent accuracy of 0.9833, underscoring the CNN architecture's robustness even without advanced feature selection. This performance is competitive with previous models such as XGBoost and LGBM, which achieved an accuracy of 0.983, and outperforms models like Ada Boost, Stochastic Gradient Descent, and Extra Tree, which achieved accuracies of 0.975. Traditional models like Decision Tree and Naïve Bayes showed lower accuracies of 0.96 and 0.94, respectively, while simpler models like KNN (0.65), ANN (0.60), and SVM (0.93) performed notably worse. The hybrid approach of GA+SVM, with an accuracy of 0.9833, illustrates the benefits of combining feature selection with machine learning models, though it does not match the accuracy of our CNN with RFE. Overall, our findings demonstrate that CNNs, particularly when paired with effective feature selection methods like RFE, offer superior classification performance in CKD prediction, emphasizing the importance of advanced feature selection in enhancing deep learning models. Table 8 shows the result comparison of it.

Table 8 Result Comparison

Method	Current Research	Previous Research
CNN–All Features	0.9833	-
CNN–Chi-Square Test	0.9833	-
CNN–Recursive Feature Elimination	0.9917	-
CNN–Ridge Regression	0.9833	-
Ada Boost	-	0.975
Decision Tree	-	0.96
XgBoost	-	0.983
CatBoost	-	0.966
KNN	-	0.65
Naïve Bayes	-	0.94
Stochastic	-	0.975
LGBM	-	0.983
Extra Tree	-	0.975
SVM	-	0.93
ANN	-	0.60
GA + SVM	-	0.9833

CONCLUSIONS

The experimentation with feature selection methods for chronic kidney disease (CKD) classification using Convolutional Neural Networks (CNN) provided valuable insights into their effectiveness. Recursive Feature Elimination (RFE) achieved the highest accuracy of 0.9917, surpassing other methods including the use of all features, the Chi-Square Test, and Ridge Regression, which all attained an accuracy of 0.9833. This underscores the crucial role of effective feature selection in enhancing model performance. RFE, Ridge Regression, and the Chi-Square Test each identified distinct feature subsets, with Chi-Square focusing on significant medical conditions and laboratory results, while RFE and Ridge Regression included a broader range of continuous variables and vital signs. Common features like 'specific gravity,' 'albumin,' and 'hypertension' were consistently identified, highlighting their importance in predicting CKD. RFE's superior accuracy and F1 score of 0.9933 reflect its effectiveness in balancing precision and recall, while Ridge Regression, despite perfect recall, showed slightly lower F1 scores and precision compared to RFE. These findings demonstrate that a comprehensive and balanced feature selection approach is essential for optimizing model performance, emphasizing the need for careful selection to enhance predictive accuracy and efficacy in disease classification models.

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(A-ST175) SIGN LANGUAGE TRANSLATION SYSTEM

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ABSTRACT

A sign language translation system is a mobile application designed to identify hand gestures in real-time using computer vision and machine learning techniques. It translates sign language gestures into text, facilitating communication for individuals who are speech and hearing impaired. Unlike existing systems that require specialized hardware or are limited to specific environments, this mobile-based solution leverages the smartphone camera and integrates TensorFlow Lite for efficient on-device processing. The application consists of three modules: a real-time translation module, a learning module for teaching the ABCs of sign language, and an interactive quiz module. The project employs a waterfall approach, ensuring organized development and consistent goals. Usability testing indicated positive feedback, confirming the system's effectiveness. Further testing and validation will enhance its utility for diverse user groups.

Keywords: Sign Language Translation, Computer Vision, Machine Learning, Real-Time Translation, Social Integration.

INTRODUCTION

A sign language translation system is a mobile application designed to identify hand gestures in real-time using computer vision and machine learning techniques. This system translates images of sign language into the corresponding meaning behind the gestures, facilitating communication for individuals who are speech and hearing impaired.

The purpose of this project is to develop a comprehensive sign language translator application. The application leverages the mobile camera, capturing hand movements and detecting gestures through image detection technology. This real-time translation module enables users to communicate effectively by translating sign language into text.

In addition to the sign language translation system, the application includes two other valuable modules: a learning module and a quiz module. The learning module is designed to teach the ABCs of sign language, making it accessible for individuals without hearing impairments to learn and understand the basics of sign language. The quiz module provides interactive quizzes to test users' knowledge of sign language, reinforcing their learning and providing a fun way to practice.

This application aims to bridge the communication gap between sign language users and those who do not know sign language. It can be utilized in various settings such

as schools, workplaces, and healthcare facilities, making it a versatile tool for enhancing interactions in the deaf and hard-of-hearing community. By enabling easier and more effective communication, this sign language translation system has the potential to revolutionize the way the deaf and hard-of-hearing community interacts with the world around them.

Communication can be challenging for the deaf and hard-of-hearing, who commonly use sign language. The World Health Organization reports that around 1.5 billion people experience hearing loss, with 430 million having hearing disabilities. By 2050, over 700 million people may have disabling hearing loss. This can lead to fewer educational and career opportunities, social withdrawal, and emotional issues due to impaired communication. [1]

Gesture recognition technologies can convert hand gestures into text, enhancing communication and facilitating the learning of sign language. This is particularly helpful as most deaf children are born to hearing parents. The Sign Language Translation System aims to assist both beginners and those with deaf family or friends in learning sign language using machine learning.

Sign language detection can be challenging due to variations in age, size, and gender. However, machine learning algorithms, especially neural networks, have proven effective in pattern recognition and classification. Training on datasets, such as those from Kaggle, improves the system's accuracy in recognizing gestures.

This project aims to develop an efficient system for translating sign languages so that non-signers and sign language users can communicate more efficiently. Through the use of machine learning algorithms and computer vision techniques, the system will recognize and interpret the movements and gestures of users of sign language.

In the development process, choosing the appropriate system development methodology is essential since it affects the project's organization and rationality. This project is best suited to a waterfall approach because the goal remains constant throughout. As long as the project aim is taken into account, it is simple to implement the waterfall model SDLC.

The project focuses on developing a sign language translation system using a dataset that includes the signs for "hello," "yes," and "I love you." The software tools employed for this project include Android Studio, Kaggle, OpenCV, TensorFlow Lite, and Java. The system will leverage deep learning and machine learning techniques to achieve accurate translations. The target audience for this application is non-signers who wish to easily understand sign language. The application's camera will be directed towards the person signing to capture and translate real-time gestures effectively.

The objectives of the project are to identify the requirements for a Sign Language Translation System, to design and develop the system, and to validate its effectiveness in translating sign language.

METHODS

The Waterfall methodology is a traditional project management approach often used

in software development and other engineering disciplines. It is a linear and sequential model that consists of distinct phases. Each phase must be completed before the next one begins, and there is usually no going back to a previous phase once it is finished. The key phases of the Waterfall methodology would be Requirements Analysis, this is the initial phase where the project's requirements are gathered and documented. The second one would be System Design. In this phase, the requirements from the first phase are used to design the system architecture. Next is Implementation, this phase involves the actual development of the software or system. Developers write code according to the specifications created in the design phase. Then Integration and Testing, once the system is implemented, it needs to be tested as a whole. Deployment, after testing is complete and the system is considered stable, it is deployed to the production environment. Lastly, maintenance, for the final phase involves maintaining and supporting the system post-deployment.

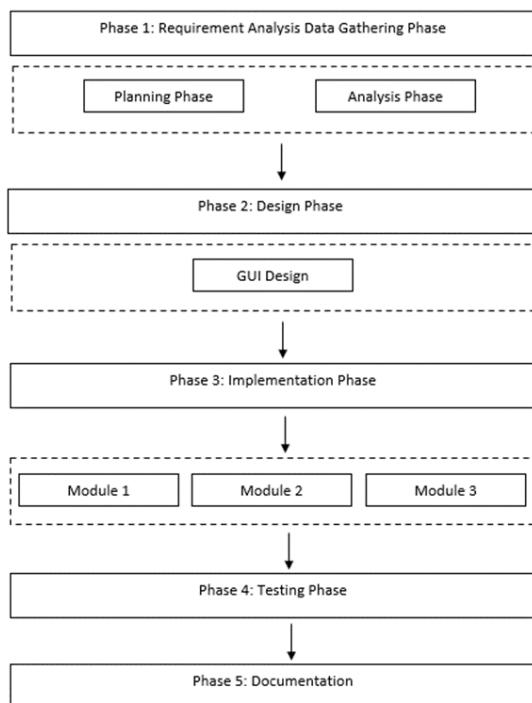


Figure 1: Waterfall Modelling for Sign Language Translation System

RESULTS AND DISCUSSION

The usability testing of the sign language translation system, conducted with 29 special needs students, 7 teachers, and 2 parents from SK Taman Universiti 1, yielded overwhelmingly positive results. Participants expressed satisfaction with the application's ease of use, user-friendliness, and overall effectiveness in translating sign language into text.



Figure.2: Result of user testing

Pre-testing Familiarity: Before using the application, the majority of participants (90%) had no familiarity with sign language, though they were generally comfortable with mobile apps (60%) and recognized the importance of such a tool for effective communication (100%).

Post-testing Feedback: After testing, 60% of users found the system easy to understand, and 50% rated their overall satisfaction at the highest level. The system was considered user-friendly and effective for learning and communication, with 80% rating its effectiveness at the highest level. Although most users had no suggestions for improvement, a few recommended enhancements like adding more child-friendly features and expanding the vocabulary.

Before Using Sign Language Translation System Questionnaire

Table 1: Before using sign language translation system questionnaire

Item	Question
1.	How familiar are you with using mobile apps for communication?
2.	How familiar are you with sign language (any sign language system)?
3.	How important do you think a sign language translation app is for effective communication?
4.	How comfortable are you with using technology to assist with language translation?
5.	How effective do you expect a sign language translation app to be in translating sign language accurately?
6.	How likely are you to use a sign language translation app in your daily life?

After Using Sign Language Translation System Questionnaire

Table 2: After using sign language translation system questionnaire

Item	Question
1.	How easy was it to understand how to use the sign language translation system?
2.	The sign language translation system interface is user-friendly

3.	The sign language translation system kept me engaged while using it.
4.	I found the sign language translation system to be an effective tool for learning or communicating.
5.	Overall, I am satisfied with my experience using the sign language translation system.
6.	I would recommend the sign language translation system to others.
7.	What you would suggest for improvement?

CONCLUSIONS

The Sign Language Translation System project successfully demonstrated that real-time translation of sign language into text can be effectively achieved using TensorFlow Lite and OpenCV, making communication between signers and non-signers more accessible. The system's success underscores key principles, such as the importance of integrating advanced gesture recognition algorithms and the utility of user-centric design in creating intuitive and efficient communication tools.

Generalizations and Principles: The project highlights that with the right technological approach, it is possible to create applications that bridge communication gaps between different language users, particularly in special needs education.

Exceptions and Challenges: However, the system's accuracy and effectiveness depend heavily on the quality of the datasets and the algorithms used, which may not yet handle more complex or nuanced sign language variations. Additionally, the initial version supports a limited range of sign languages, which constrains its broader applicability.

Theoretical and Practical Implications: Theoretically, this work contributes to the field of assistive technology by demonstrating that AI and machine learning can be effectively applied to enhance accessibility. Practically, it offers a tangible solution to communication barriers faced by the deaf and hard-of-hearing community, with potential for integration into educational and communication platforms.

Recommendations and Future Directions: To further advance the system, future work should focus on expanding language support, refining the gesture recognition algorithms, and incorporating voice output for a more comprehensive communication tool. Additionally, implementing user customization options and optimizing performance will enhance the system's usability and accessibility. Integrating a feedback loop and enabling dynamic content in educational modules are also recommended to ensure continuous improvement and engagement.

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(A-ST179) E-SOLAR

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ABSTRACT

This green innovation known as E-SOLAR stands for Educational Electronic (E); Sustainable (S); Orang Asli (O); Lighting; (L) Area; (A) and Resilience (R). It involves the application of an Edu-digital platform for electronic gadgets that cater to the education of solar lighting applications in Orang Asli communities in Malaysia. In collaboration with JAKOA, this project addresses insufficient electricity supply during blackouts in remote areas. The idea of disseminating solar educational programs in Orang Asli communities is significant since solar energy education has received relatively little attention in the educational sector. Sustainable Development Goal 7 (SDG7), Industrial Revolution 4.0 (IR 4.0), and the concept of Malaysia MADANI aim to provide affordable, reliable, and sustainable energy, reducing maintenance expenses and securing more sustainable solutions. This innovation aims to enhance the understanding of DIY installation and maintenance of solar panels among the Orang Asli communities. This Edu-digital platform will help to educate the Orang Asli across Malaysia to have sustainable energy in order to mitigate the issue of power interruption. The innovation will demonstrate step-by-step procedures for installing the solar technologies on their own. It comprises a QR code that is easier for these communities to refer to, as the innovation has included teaching videos and infographics via QR codes that allow easy understanding of any level of people. This approach supports various learning styles through multimedia, while also offering on-the-go access to materials and expert support. Additionally, QR codes streamline progress tracking and feedback, making the education process efficient and cost-effective. E-SOLAR significantly improves the accessibility, interactivity, and practicality of solar installation training, leading to better learning outcomes for Orang Asli communities.

Keywords: E-Learning, Orang Asli, Solar Technologies, Sustainable Energy

1.0 INTRODUCTION

The combination of digital solutions and environmentally friendly practices has become increasingly essential in today's fast-paced technological environment to address urgent problems. Using QR codes to inform and empower underprivileged groups, such as Malaysia's Orang Asli, on sustainable energy practices is one such creative solution. The indigenous people of Malaysia, known as Orang Asli, frequently live in isolated locations where it is difficult to get dependable electricity (Soon et al., 2019). Power outages frequently disrupt daily routines, educational programs, and business endeavors. To address these issues, QR code technology provides a special and user-friendly way to spread important knowledge on sustainable energy measures.

Community members can quickly access a multitude of information, such as instructional manuals, video lessons, and real-time updates on solar energy systems, by scanning a QR code with a smartphone.

The use of QR codes as an instructional tool is especially beneficial because it is affordable, user-friendly, and sensitive to the differing literacy levels of Orang Asli populations. QR codes that link to educational videos and infographics, to make solar energy education accessible to individuals of all educational levels. The E-SOLAR innovation is strongly related to Sustainable Development Goal 7 (SDG7), which is to guarantee that everyone has access to modern, cheap, dependable, and sustainable energy. E-SOLAR directly advances SDG7's goals by teaching Orang Asli communities in Malaysia about solar lighting applications. As mentioned by A. Rahim et al. (2012), the invention encourages the adoption of sustainable solar energy solutions, which helps to address the problem of insufficient electricity supply in rural places, especially during blackouts. By including multimedia learning resources, E-SOLAR supports SDG7's focus on sustainability and inclusivity.

Additionally, E-SOLAR embodies the spirit of Industrial Revolutions 4.0 (IR 4.0) by offering the latest technological solutions to rural regions, which eventually leads to more resilient and sustainable energy systems. The invention uses three IR 4.0 principles; automation, data interchange, and digitalization through its Edu-digital platform. Furthermore, by emphasizing DIY solar panel installation and maintenance, E-SOLAR helps communities become more self-sufficient and less reliant on fossil fuels or any dangerous energy sources to generate electricity. This innovation encouraged Orang Asli communities to produce their clean energy, encouraging sustainable growth in addition to automation and decentralization. Besides, E-SOLAR improved learning and made it more interactive and individualized by offering films and infographics that can be accessed through QR codes. Hence, this introduction highlights how innovative QR codes can help with long-term sustainability and the empowerment of Orang Asli communities throughout Malaysia, in addition to providing an urgent solution to the problem of power outages (Mahmud et al., 2022).

2.0 OBJECTIVES

The main goal of utilizing breakthroughs in QR codes is to empower Orang Asli communities throughout Malaysia by giving them easily accessible and useful knowledge about sustainable energy practices. In particular, the objectives are:

- i) To enhance the understanding of DIY installation and maintenance of solar panels among the Orang Asli communities through accessible instructional materials.
- ii) To educate the Orang Asli across Malaysia to have sustainable energy to mitigate the issue of power interruption.
- iii) To provide the Orang Asli with a better awareness of sustainable energy sources, especially solar energy.
- iv) To close the gap in technology by offering the Orang Asli a low-cost, straightforward tool (QR codes) that they can readily incorporate into their daily lives for continued education and assistance.

3.0 METHODOLOGY

The methodology used for this innovation is mainly to determine the community's preferred methods of learning and information access. The communities of Orang Asli are peaceful and amiable, but they also have inadequate social skills, which makes them shy and prone to avoid situations involving strangers. Hence, a focus group was conducted by the researcher with the Orang Asli communities to initiate the innovation more effectively. The focus group process used is shown in Figure 1 below. QR code is created that consists of instructional videos and infographics that make the subject matter simple to comprehend and available to a wide range of learners, especially youngsters.

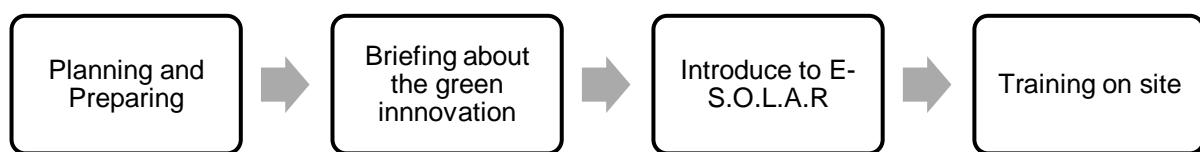


Figure 1: The process of E-SOLAR application.

4.0 RESULTS

The reliance on conventional, unreliable power sources has decreased due to the widespread adoption of solar energy solutions by the Orang Asli families. The introduction of solar energy technologies helped to raise awareness in the Orang Asli communities through instructional programs emphasizing the hands-on elements of setup, upkeep, and troubleshooting will enable the Orang Asli to maintain and manage these systems on their own. Moreover, the information and instructions provided about the innovation, the problem statement, the installation and maintenance process for solar lighting technologies, and all previous projects in rural communities are in the QR code, as shown in Figure 2 below. The participants and the communities can find out more about the contents by scanning the QR code provided.

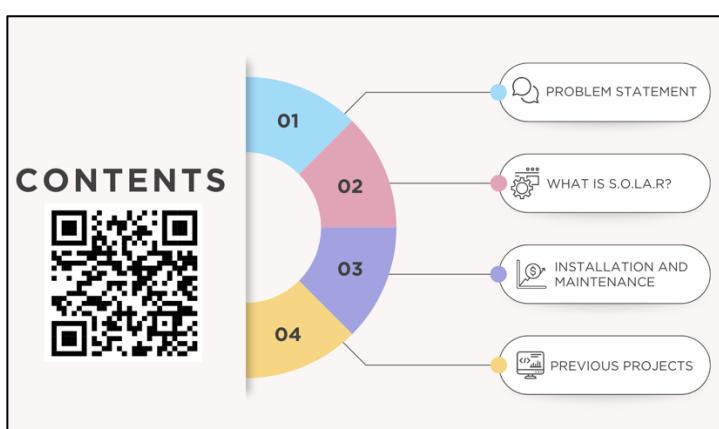


Figure 2: The contents of the QR code.

The Orang Asli communities in Malaysia have benefited greatly from the deployment of E-SOLAR, as shown in Figure 3 where the conditions of selected case studies before E-SOLAR implementation with no solar installation. Meanwhile, Figure 4 shows the current condition after E-SOLAR implementations and a few solar installations. The

project's success also demonstrates how digital platforms can successfully deliver education in remote locations, creating opportunities for other regions to start similar initiatives.



Figure 3: Before solar lighting installation in previous project



Figure 4: After solar lighting installation in previous project

Furthermore, the situation before E-SOLAR implementation, information in terms of components like knowledge, awareness, and installation was collected during the focus group to identify the communities' level of understanding and awareness of solar technologies application. After the implementation of E-SOLAR, the knowledge and awareness among the Orang Asli community indeed increased. The number of communities that can independently build and maintain solar lighting systems has risen, which is one of the most noteworthy outcomes of this innovation.

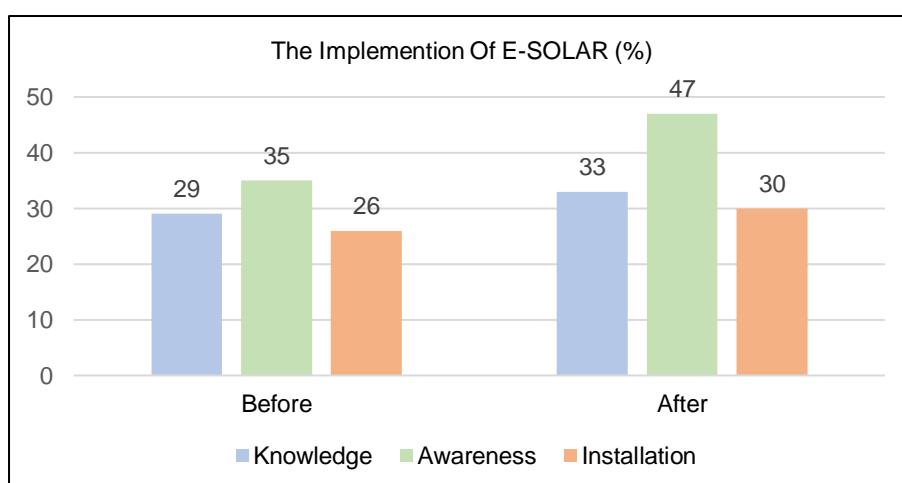


Figure 5: Before and after E-SOLAR implementation

5.0 CONCLUSION

In a nutshell, teaching the Orang Asli communities in Malaysia about sustainable energy practices with QR codes is a crucial step towards solving the recurring issue of power outages in remote locations. Through the use of straightforward, user-friendly technology, this innovation makes vital knowledge accessible, enabling the Orang Asli to embrace and sustain sustainable energy solutions. The application of the innovation eventually increased their knowledge and awareness regarding the source of energy and upgraded their maintenance skills, hence no investment was made to get maintenance services from outsiders. This innovation promotes increased community safety and resilience in addition to improving their energy literacy and self-sufficiency. In the end, QR code technology provides an efficient and scalable solution that is consistent with the more general objectives of sustainability and community empowerment for indigenous communities.

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(A-ST183) AN INTERACTIVE TOOL OF QUADRATIC TRIGONOMETRIC B-SPLINE IN DESIGNING OBJECTS

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ABSTRACT

Choosing the right spline algorithm significantly influences the quality and efficiency of the design process in CAGD. Designers and engineers often face difficulties in selecting between different spline techniques due to their specific benefits and drawbacks. This research aims to bridge this gap by evaluating the performance of Quadratic Trigonometric B-Spline (QTBS) in resolving specific design issues using *Wolfram Mathematica* software. The study begins by exploring the methods employed by QTBS for two-dimensional curve, assessing their ability to generate desired shapes with supreme smoothness. The research extends into three-dimensional surface design, analysing the capabilities of QTBS in crafting three-dimensional surfaces of an object using Sweep surface method with controlled curvature and flawless continuity. The paper demonstrates the advantages and disadvantages of each approach for handling design difficulties by a thorough analysis of the mathematical models and real-world applications. By designing curves of an object, the study integrates an interactive application for both methods to demonstrate the curve behaviour by modifying the shape parameters and control points of the objects. The integration of QTBS in CAGD enhances the designer's ability to create sophisticated and accurate geometric models. The final phase of the study focuses on determining the most effective B-spline method for enhancing smoothness in both two-dimensional and three-dimensional spaces which is QTBS method.

Keywords: Quadratic Trigonometric, B-Spline, Sweep Surface, Design

1.0 INTRODUCTION

The field of Computer-Aided Geometric Design (CAGD) enables designers and engineers to generate and manipulate complex two-dimensional curves and three-dimensional surfaces with precision and ease. Each spline technique has distinct advantages and drawbacks, making it challenging to select the optimal method for achieving the desired levels of smoothness and control. This study investigates the effectiveness of Quadratic Trigonometric B-Splines (QTBS) in addressing these specific challenges.

The selection of an appropriate spline algorithm is critical in CAGD, as it directly impacts the overall quality and efficiency of the design process (Lim, 2023). Choosing among various spline techniques, such as QTBS, can be a daunting task for designers and engineers due to the unique benefits and limitations of each method (Amini & Abbas, 2022, Samreen et al., 2022). This study aims to address this gap by evaluating the capabilities of QTBS in overcoming specific design challenges.

This research delves into the complex realm of two-dimensional curve creation, exploring the methods employed by QTBS. The investigation analyzes the effectiveness of QTBS in generating the desired shapes and achieving supreme smoothness (Abbas et al., 2021). By deconstructing the mathematical foundations of QTBS and comparing its practical applications, the study provides a comprehensive understanding of the viability of this approach in handling various two-dimensional design challenges.

In the context of three-dimensional design, this study examines the process of creating intricate surfaces using QTBS. It investigates the ability of QTBS to design aesthetically pleasing and functionally robust geometries with controlled curvature and seamless surface continuity (Choi et al., 2020). Through a thorough analysis of their mathematical models and practical demonstrations, the strengths and weaknesses of QTBS in addressing a range of three-dimensional design problems are explored.

2.0 OBJECTIVE

According to the problem statement, there are three objectives that must be met:

- i. to design a two-dimensional curve for an object by using Quadratic Trigonometric B-Spline (QTBS) and Cubic B-Spline (CBS),
- ii. to design three-dimensional surfaces for an object by using sweep surface method
- iii. to identify the most effective method that enhances the smoothness of curves and surfaces.

3.0 METHODOLOGY

3.1 Quadratic Trigonometric B-Splines

Quadratic Trigonometric B-Splines are a type of spline function used in computer graphics and geometric modelling. They are defined using trigonometric functions which provide smoother curves compared to polynomial splines. QTBS are particularly useful in designing objects where smooth transitions and continuity are important. QTBS offer smoother transitions due to the inherent properties of trigonometric functions. However, QTBS are computationally more complex due to the use of trigonometric functions making them more challenging to implement and less flexible in terms of shape approximation.

This section contains the definitions and characteristics of the basis functions for the QTBS. Hussain et al. (2017) defined the piecewise Quadratic Trigonometric Spline function $T(t)$ with shape parameters $\alpha, \beta \in [0, \pi]$ over sub interval $t \in [t_i, t_{i+1}], i = 0, 1, \dots, n$. The variable $Q_i, i = 0, 1, 2, 3$ are the co-efficient of interpolation. are as follows:

$$T_i(t) = \sum_{i=0}^3 A_i(\theta, \alpha, \beta) Q_i \quad (1)$$

where

$$0 \leq \theta \leq \frac{\pi}{2}, \theta(t) = \left(\frac{t - t_i}{h_i} \right) \frac{\pi}{2}, h_i = t_{i+1} - t_i$$

Now the quadratic trigonometric are rewrite as:

$$T_i(t) = A_0(\theta, \alpha, \beta)F_i + A_1(\theta, \alpha, \beta)V_i + A_2(\theta, \alpha, \beta)W_i + A_3(\theta, \alpha, \beta)F_{i+1} , \quad (2)$$

where

$$\begin{aligned} A_0(\theta, \alpha, \beta) &= (1 - \sin \theta)(1 - \alpha \sin \theta) , \\ A_1(\theta, \alpha, \beta) &= (1 + \alpha) \sin \theta (1 - \sin \theta) , \\ A_2(\theta, \alpha, \beta) &= (1 + \beta) \cos \theta (1 - \cos \theta) , \\ A_3(\theta, \alpha, \beta) &= (1 - \cos \theta)(1 - \beta \cos \theta) . \end{aligned}$$

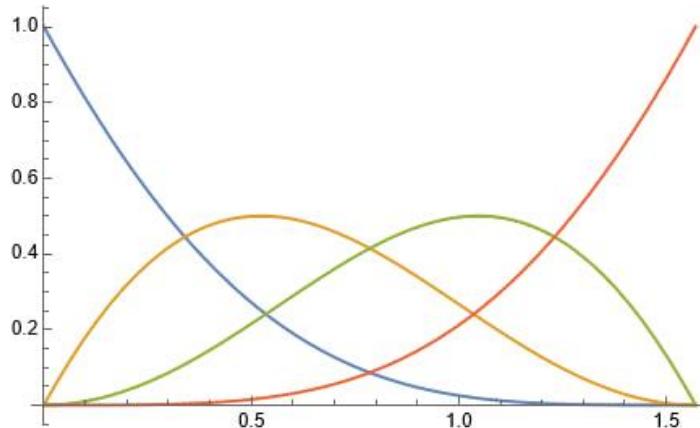


Figure 1: Graph of Quadratic Trigonometric B-Spline basis function

QTBS basis function as shows in figure 1 combines trigonometric and polynomial components to form smooth curves. These splines are defined piecewise by quadratic polynomials that include trigonometric terms, such as sine and cosine functions. The primary advantage of this approach is its ability to capture oscillatory behaviour more naturally than purely polynomial splines, making them particularly useful in applications where periodic or wave-like patterns need to be modelled. QTBS ensure continuity and smoothness at the joints of the spline segments, providing a flexible yet precise way to approximate complex shapes and functions.

3.2 Sweep Surface Method

Creating a three-dimensional surface using the swept surface method with QTBS involves defining a profile curve and a trajectory curve. The profile curve is a two-dimensional shape described using QTBS, constructed from a set of control points and an appropriate knot vector, which ensures the desired level of smoothness and continuity. The trajectory curve is a three-dimensional path, also defined by control points and a knot vector, which dictates the movement of the profile curve through space. To generate the swept surface, both the profile and the trajectory curves are parameterize, denoted by parameters u and v , respectively as follows:

$$S(u, v) = C(u) \cdot T(v) \quad (3)$$

where $S(u, v)$ is the point on the surface, $C(u)$ is the point on the profile curve at parameter u and $T(v)$ is the transformation matrix at parameter v that was derived from the trajectory curve

4.0 RESULTS

The curves of the table lamp created using QTBS method as show in figure 2. In the interactive application, users are presented with a graphical interface where they can adjust the shape parameter and certain control point through a slider and input box. As the shape parameter and the control points changes, the QTBS curve is recalculated and displayed in real-time. This dynamic interaction helps users visualize the impact of the shape parameter on the curve's form. The applications are designed with simple, easy-to-understand interfaces that allow users to quickly learn how to manipulate control points to shape the curve.



Figure 2: Interactive Application of two-dimensional curve using QTBS

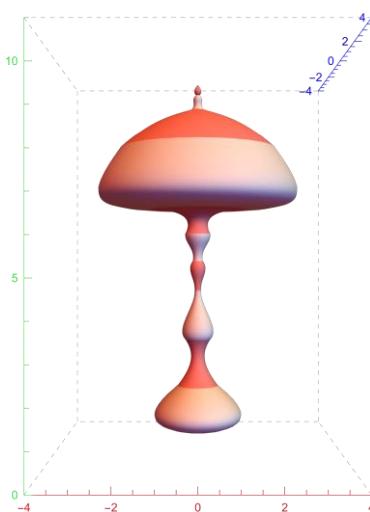


Figure 3: Three-dimensional curve of table lamp using QTBS with shape parameter
 $\alpha, \beta = \frac{\pi}{4}$

Figure 3 shows the result of the table lamp's surface using QTBS and sweep surface method. The QTBS surface appointed is created using shape parameter $\alpha = \frac{\pi}{4}$ and $\beta = \frac{\pi}{4}$ which create better smoothness compared to other shape parameters. It also produces shape that are closer to the actual image of the table lamp.

5.0 CONCLUSION

Designing curves and shapes using Quadratic Trigonometric B-Spline (QTBS) methods is successfully implemented and evaluated, resulting in smooth and aesthetically pleasing two-dimensional curves. The analysis demonstrated that the QTBS can produce various curves with different shape parameters build nearly identical curve with QTBS method using shape parameter $\alpha = \frac{\pi}{4}$ and $\beta = \frac{\pi}{4}$.

Furthermore, QTBS is able to create smooth and continuous three-dimensional surfaces of the table lamp. The methods showed fulfilling performance in capturing the intricate details and complex geometries of the objects. The ability of QTBS to maintain a high level of accuracy and smoothness in three-dimensional designs underscores its potential for advanced surface modelling applications.

Moreover, the integration of interactive applications in *Mathematica* not only enhances the design process but also opens avenues for future research and development. These tools can be expanded to include more complex modelling tasks, potentially incorporating additional parameters and advanced features to further enhance their utility and effectiveness. These tools provide immediate visual feedback, allowing users to see the effects of their changes instantly. This helps in making quick adjustments and achieving the desired shape more efficiently.

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(A-SS002) DEVELOPING THE "SOCIALSUCCESS AUTISM APP": A MOBILE APPLICATION FOR ENHANCING SOCIAL FLUENCY IN CHILDREN WITH AUTISM SPECTRUM DISORDER

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ABSTRACT

Children with Autism Spectrum Disorder (ASD) often face challenges in developing social skills, which can significantly impact their ability to communicate and interact effectively in various social settings. This paper outlines the development and innovation of a mobile application, "SocialSuccess Autism App," designed to assist caretakers in supporting children with ASD in their journey towards social fluency. The app aims to provide a comprehensive digital platform that encompasses the key concepts and strategies outlined in the book "Social Fluency for Autism: A Caretaker's Handbook." By leveraging the power of mobile technology, the app offers a user-friendly and accessible resource for caretakers to help their children navigate the complexities of social interactions.

Introduction

Autism Spectrum Disorder (ASD) is a neurological condition characterized by difficulties in social communication, restricted interests, and repetitive behaviors. Children with ASD often struggle with interpreting social cues, understanding nonverbal communication, and engaging in reciprocal conversations. Developing social skills is crucial for their overall well-being and successful integration into various social settings. While there are numerous innovation resources available, the "SocialSuccess Autism App" aims to provide a comprehensive and user-friendly digital platform that combines the insights from the book "Social Fluency for Autism: A Caretaker's Handbook" with the convenience and accessibility of mobile technology.

Literature Review

The literature review section will explore existing research on the use of mobile applications in supporting individuals with ASD, particularly in the area of social skill development. It will highlight the benefits of utilizing technology-based interventions and the potential impact on improving social fluency. Additionally, this section will examine the challenges faced by caretakers in supporting children with ASD and the need for accessible and engaging resources.

The use of mobile applications and technology-based interventions for supporting individuals with Autism Spectrum Disorder (ASD) has gained significant attention in recent years. Researchers have explored the potential of mobile apps in enhancing social skills, communication, and overall development for individuals on the autism spectrum (Hassan et al., 2024). Several studies have highlighted the benefits of using mobile apps in social skill training for children with ASD (Ramdoss et al., 2012; Wainer & Ingersoll, 2013). Wainer and Ingersoll (2013) conducted a systematic review and found that technology-based interventions, including mobile apps, can effectively teach social and communication skills to individuals with ASD. Additionally, Ramdoss et al. (2012) reviewed the use of computer-based interventions and reported positive outcomes in improving social skills, such as emotion recognition and conversational abilities.

Mobile apps have also been found to be engaging and motivating for children with ASD. Khowaja and Salim (2019) investigated the use of a gamified mobile app for teaching social skills and observed increased engagement and motivation among the participants. Furthermore, Parsons et al. (2019) explored the use of augmented reality (AR) in a mobile app for social skill training and reported positive results in terms of user experience and skill acquisition. Researchers have emphasized the importance of caregiver involvement and support in the successful implementation of mobile app interventions for children with ASD. Ingersoll et al. (2016) conducted a study on a parent-mediated mobile app intervention and found significant improvements in social communication skills. Similarly, Hassan et al. (2022) and Vismara et al. (2018) examined the effectiveness of a caregiver-assisted mobile app for teaching imitation skills and reported positive outcomes.

While the literature highlights the potential benefits of mobile apps in supporting social skill development for individuals with ASD, challenges and limitations have also been acknowledged. Boyd et al. (2018) identified issues related to app quality, usability, and lack of empirical evidence for some apps. Additionally, Bouck et al. (2019) emphasized the need for app developers to consider accessibility features and user preferences when designing mobile interventions for individuals with ASD.

Developing the "SocialSuccess Autism App"

This section will outline the process of developing an innovation about the "SocialSuccess Autism App," including the methodology, design considerations, and the integration of the book's content into the app's structure. It will describe the app's features, such as interactive modules, visual aids, and progress tracking tools, designed to cater to the unique learning needs of children with ASD. Additionally, this

section will discuss the user interface and user experience aspects of the app, ensuring a seamless and intuitive experience for caretakers.

Methods

To evaluate the effectiveness and acceptance of the "SocialSuccess Autism App," a pilot study was conducted involving 12 instructors, including 3 teachers, 3 parents, 3 therapists, and 3 counsellors. The methods section will provide details on the study design, participant selection criteria, data collection techniques (e.g., surveys, observations, interviews), and data analysis approaches.

Table 1 explaining the method and total number of respondents involved in the pilot study to evaluate the "SocialSuccess Autism App":

Method	Description	Total Respondents
Survey	A structured questionnaire was administered to the instructors to gather quantitative data on the app's effectiveness and acceptance. The survey included rating scales and closed-ended questions.	12
Observation	The instructors were observed while using the app with children with ASD, and their interactions were documented through field notes and observational checklists.	12
Interview	Semi-structured interviews were conducted with the instructors to obtain qualitative insights, feedback, and suggestions regarding the app's features, usability, and potential improvements.	12

Table 2 listing the structured questionnaire items, observational checklist items, and semi-structured interview questions used in the pilot study to evaluate the "SocialSuccess Autism App":

Structured Questionnaire Items	Observational Checklist Items	Semi-structured Interview Questions
Rate the app's effectiveness in supporting social skill development (1-5 scale)	Child's engagement with the app	What are your overall impressions of the "SocialSuccess Autism App"?
Rate the app's user-friendliness and ease of use (1-5 scale)	Instructor's ability to guide and support the child	What features of the app did you find most useful?
Rate the app's visuals and interactive elements (1-5 scale)	Child's understanding of the app's content	Were there any challenges or difficulties

		you encountered while using the app?
Rate the app's alignment with the book's content (1-5 scale)	Instructor's use of the app's resources and tools	How did the app support your goals for social skill development?
Rate the app's potential for integration into educational/therapeutic settings (1-5 scale)	Child's progress and skill acquisition	What improvements or additional features would you suggest for the app?
Likelihood of recommending the app to others (1-5 scale)	Overall session flow and effectiveness	How did the app compare to other resources or methods you have used?
Areas for improvement (open-ended)		In what ways did the app facilitate your interactions with the child?
		How can the app be better integrated into your educational/therapeutic setting?
		Would you continue using the app in the future? Why or why not?

The structured questionnaire items were designed to gather quantitative data on the app's effectiveness, usability, visual appeal, content alignment, and potential for integration. The observational checklist items focused on documenting the child's engagement, understanding, and progress, as well as the instructor's ability to use the app effectively during the sessions.

The semi-structured interview questions aimed to elicit qualitative insights, feedback, and suggestions from the instructors. These questions explored the instructors' overall impressions, useful features, challenges faced, alignment with goals, recommendations for improvement, comparisons with other resources, facilitation of interactions, integration possibilities, and future usage intentions.

By combining these three data collection methods, the pilot study aimed to gather a comprehensive evaluation of the "SocialSuccess Autism App" from multiple perspectives, including quantitative ratings, observational data, and in-depth qualitative feedback from the instructors involved.

Findings

The findings section will present the results obtained from the pilot study, highlighting the feedback and experiences of the instructors who utilized the "SocialSuccess Autism App." It will analyze the app's effectiveness in helping caretakers support children with ASD in developing social skills, as well as the acceptance and usability of the app's features. The findings will be presented in a structured manner, potentially including quantitative data (e.g., ratings, scores) and qualitative insights (e.g., testimonials, observations).

Table 3 present the findings from the pilot study involving 12 instructors (3 teachers, 3 parents, 3 therapists, and 3 counsellors) who evaluated the effectiveness and acceptance of the "SocialSuccess Autism App":

Instructor Type	Effectiveness Rating (1-5)	Acceptance Rating (1-5)	Key Feedback
Teachers	4.3	4.7	Engaging visuals and interactive modules - Aligns well with school curriculum - Needs more progress tracking features
Parents	4.5	4.2	Convenient for home practice - Intuitive interface - More customization options needed
Therapists	4.8	4.6	Comprehensive coverage of social skills - Effective for reinforcing therapy sessions - Additional resources for advanced users
Counsellors	4.2	4.4	Useful for building rapport with clients - Supports counseling goals - More guidance on app integration
Overall	4.5	4.5	Positive response from all instructor types - Effective in supporting social skill development - Opportunities for feature enhancements

The table presents the average effectiveness rating and acceptance rating (on a scale of 1-5) for each instructor type, along with a summary of their key feedback. The overall ratings indicate a positive response to the "SocialSuccess Autism App," with an average effectiveness rating of 4.5 and an average acceptance rating of 4.5. The findings suggest that the app was deemed effective in supporting social skill development in children with Autism Spectrum Disorder (ASD) by all instructor types. Teachers appreciated the engaging visuals and interactive modules, while therapists found the app comprehensive and effective for reinforcing therapy sessions. Parents valued the convenience of home practice, and counselors found the app useful for building rapport with clients and supporting counseling goals.

While the overall response was positive, the table also highlights areas for improvement, such as additional progress tracking features, more customization options, resources for advanced users, and guidance on app integration into various settings. This table provides a concise summary of the pilot study findings, highlighting the app's strengths, areas for improvement, and the overall positive reception from the instructors involved in evaluating the "SocialSuccess Autism App."

Conclusion

The conclusion will summarize the key findings and implications of the study, emphasizing the potential impact of the "SocialSuccess Autism App" in enhancing social fluency in children with ASD. It will also discuss the limitations of the study and provide recommendations for future research and app development. Additionally, this

section may highlight the app's potential for broader adoption and integration into various educational and therapeutic settings.

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(A-SS005) PHONE CASE WITH LCD WRITING TABLET

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ABSTRACT

Phone case with LCD Writing Tablet is a product that we produce especially for students, housewives and also office workers. This product is also produced with a combination of phone case and LCD Writing Tablet. The problem faced by students, housewives and even officers is that they forget about the work they need to do. For example, they use sticky notes to write their assignments but the paper is lost. Not only that, our phone also has 'notes' but some people forget to check the 'notes' again. As a step to overcome the problem, today's society spends more time holding and using their phones all the time. What's wrong with changing their phone case by placing an LCD Writing Tablet so that they can write their assignments and after completing all their assignments they can just match the writing on the LCD Writing Tablet. With this product, it will make it easier for students, housewives and officers to carry out their daily tasks. This product can be sold at a reasonable price depending on the respective phone model.

Keywords: Phone case, LCD Writing Tablet

1.0 INTRODUCTION

The Innovative Phone Case with LCD Writing Tablet is designed for students, housewives, and office professionals who struggle to remember tasks. This sophisticated gadget combines phone safety with the functional advantages of an LCD Writing Tablet. The integrated writing tablet allows users to write down notes, reminders, and to-do lists with the included pen, simulating the tactile sensation of pen and paper. Deleting tasks is as simple as pressing a button, providing a fresh start for organising thoughts and handling everyday duties. Despite its improved functions, the casing remains sleek and portable, effortlessly blending into hectic lifestyles. Our cheaply priced Phone Case with LCD Writing Tablet works with a variety of phone models and provides a practical answer to the common problem of forgetting assignments and tasks. Stay organized, efficient, and in control of your daily endeavors while keeping your phone easily accessible.

2.0 OBJECTIVE

The Phone Case with LCD Writing Tablet is designed to optimize user experience by:

- To navigate and that seamlessly incorporates the LCD writing tablet into the phone case, optimizing convenience, portability, and use by offering a design that is easy for users.
- To record notes, reminders, and to-do lists directly on their phone case. It enhances users' organization and productivity by providing a handy platform.
- To monitor projects and deadlines by offering users a visual and tangible approach.
- To Advocate for eco-friendly alternatives by diminishing dependence on paper and promoting sustainable methodologies.

3.0 METHODOLOGY

This Phone Case with LCD Writing Tablet is a versatile and useful tool for students, housewives, office workers, and anybody with a hectic schedule. Here's a closer look at its characteristics. Users can write directly on the Writing Tablet with the provided stylus or any other acceptable writing instrument. The sensitive writing surface enables smooth and accurate writing, ensuring that notes are legible and easy to understand. When activities are completed or no longer required, users can easily delete the writing with the touch of a button, freeing up the Writing Tablet for new entries. Furthermore, this phone cover is intended to give both usefulness and protection for customers' devices. It has a small and lightweight design that adds little bulk to your phone, allowing for simple handling and portability. The sturdy design protects your phone from bumps, scratches, and normal wear and tear. At last, by using this Phone Case with LCD Writing Tablet, you are making a sustainable choice that contributes to the reduction of paper waste connected with traditional note-taking methods. The Writing Tablet is reusable and can be wiped and rewritten multiple times, making it an environmentally responsible alternative to throwaway paper notebooks and sticky notes

Example of Figure is given below.

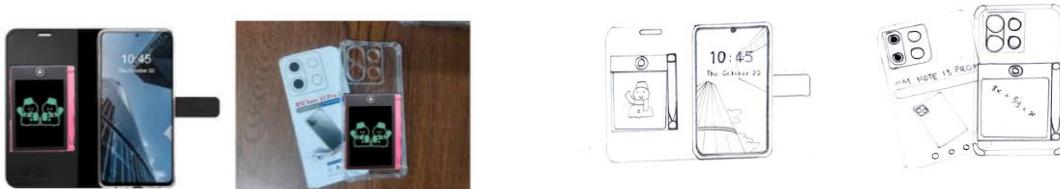


Figure 1: LCD Writing Tablet put at the back transparent case and at the foldable leather case

4.0 RESULTS

With the Phone Case with Integrated LCD Writing Tablet, users can effortlessly scribble down notes, reminders, and to-do lists right into their phone case, providing unmatched convenience. It is perfect for people on the go because of its integrated

design, which guarantees that crucial information is always available. This device, which blends in perfectly with users' everyday routines, increases productivity and encourages sustainability by lowering the consumption of single-use paper items. It's the ideal tool for remaining organized and on top of things in today's hectic world thanks to its fashionable design and configurable features.

5.0 CONCLUSION

The Phone Case with LCD Writing Tablet is a unique device designed to help students, housewives, and office workers remember tasks and assignments. It combines the functionality of a phone cover with the practicality of an LCD Writing Tablet, allowing users to write notes, reminders, and to-do lists directly onto the case's integrated writing tablet. The tablet offers a natural writing experience similar to pen and paper, and can be erased with a button. The case is sleek and portable, ensuring organization, productivity, and control over daily life. It encourages sustainability by reducing single-use paper use and is an ideal tool for staying organized and on top of things in today's hectic world.

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(A-SS006) The AUTOMATIC BELT ROLLING: Promoting Belt Rolling

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ABSTRACT

Want to show our product innovation which is automatic belt rolling. This is because found that there are a few people who tend not to keep their belts in the right place and in the wrong way. Develop an automatic belt rolling mechanism that seamlessly rolls and unrolls with the press of a button, providing convenience and ease of use for the wearer.

Keywords: Belt, Press button to rolling belt

1.0 INTRODUCTION

The Roll and Store Belt represents the latest innovation in belt design, engineered for optimal comfort and convenience. Featuring a user-friendly mechanism, these belts can be easily stored in luggage or drawers with the simple press of a button. Crafted from premium Nigan fabric, celebrated for its durability and stylish patterns, these belts offer a seamless fusion of comfort and sophistication. This innovative design ensures users can effortlessly achieve a harmonious balance between style and functionality.

2.0 OBJECTIVE

The Roll and Store Belt represents the latest innovation in belt design, engineered for optimal comfort and convenience. Featuring a user-friendly mechanism, these belts can be easily stored in luggage or drawers with the simple press of a button. Crafted from premium Nigan fabric, celebrated for its durability and stylish patterns, these belts offer a seamless fusion of comfort and sophistication. This innovative design ensures users can effortlessly achieve a harmonious balance between style and functionality

3.0 METHODOLOGY

The creation of the Automatic Roll Belt originated from the acknowledgment of the shared difficulty encountered by individuals in effectively storing and preserving their belt. In order to tackle this problem, a dedicated function was devised to optimise the process of winding the belt. This innovation was motivated by observations that are revealed a significant number of individuals that have the difficulties in maintaining the belt in a n organised manner and frequently storing them improperly.

Additionally, in terms of functionality, the innovation that has been made for this product is to add button features on the side of the head of the plate strap for the automatic roll function to work. The designed button works automatically when the user presses it after using the belt. The automatic mechanism of these belts saves time and

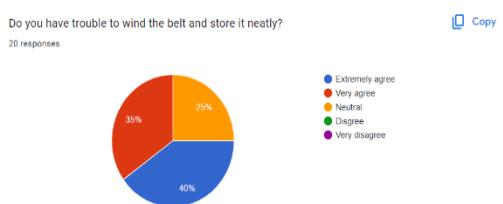
effort, especially in situations where need to quickly adjust or remove the belt. Whether went rushing to get ready in the morning or need to adjust throughout the day, automatic rolled belts offer efficiency in dressing. Automatic roll belt is very practical because it provides convenience to the user by pressing a button only, the belt will be rolled automatically and ready to be stored in the drawer.



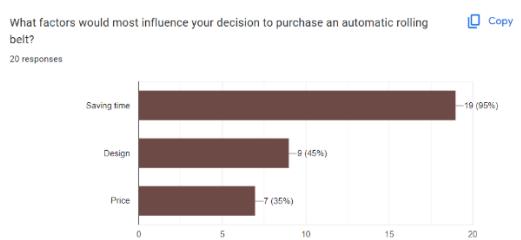
Figure 1: The picture of automatic roll belt with the button.

4.0 RESULT

A survey conducted at UiTM Dungun's campuses revealed a high level of awareness regarding automatic belt rolling. While 40% of respondents extremely agree reported that have trouble to wind the belt and store it neatly, over 35% of respondent are very agree and 25% respondent are neutral have trouble to wind the belt and store neatly.



95% of respondent vote saving time that factors would most influence their decision to purchase an automatic rolling belt, 45% of respondent vote design and 35% of respondent vote price that factors would most influence their decision to purchase an automatic rolling belt.



5.0 CONCLUSION

In summary, the purpose of the automatic rolled belt is to help people overcome their challenges of saving suitcase space when traveling. Users can also efficiently manage their time when hurrying to get ready for work. As a result, they do not have to deal with traffic bottlenecks on their way to work because they can get ready quickly. Finally, due to its contemporary design and ability to make the wearer appear sophisticated and fashionable in line with current trends, young generations can also purchase it. Eventually, we hope that our innovative products will help users and provide solutions to their issues. Furthermore, we hope that our product will find a home in the market and, more importantly, in the hearts of the community.

(A-SS007) FUSION SLIDE

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ABSTRACT

Fusion Slide is a revolutionary slipper design concept that seamlessly merges flip flops and sliders, providing wearers with the convenience of slip-on easiness while preserving the stability of a slider design. This groundbreaking fusion improves comfort and versatility, avoiding the need to carry two types of slippers for those who prefer the two distinct styles. Fusion Slide's ergonomic design and flexible fit options make it suited for people of all ages, while also improving foot health and alignment. This unique product promises to enhance comfort and daily living, marking an important development in slipper design and user happiness. Fusion Slide seeks to be innovative in style and design, as well as increase comfort and foot care. It is made of synthetic rubber, breathable fabric, a slushy section, hyper foam, a carbon fiber plate, soft rubber, and a rubber outsole to provide long-lasting comfort. The breathable fabric drains away drip and odors, while the hyper foam absorbs shocks and delivers a comfortable ride. The slushy part cushions the feet, the carbon fiber plate adds stability, and the soft rubber parts provide comfort. The influence of Fusion Slide can be observed in the positive comments of customers, who like its 2-in-1 design, which allows them to modify their footwear, making it a popular choice among consumers. Finally, Fusion Slide is a game-changing innovation that provides a versatile and comfortable footwear choice, transforming the slipper market and becoming a vital part of footwear collections around the world.

Keywords: Fusion Slide, slipper, design, comfort, innovation

1.0 INTRODUCTION

Fusion Slide is a breakthrough slipper design concept that seamlessly combines flip flops and sliders, giving wearers the ease of slip-on simplicity while maintaining the stability of a slider design. This revolutionary fusion provides greater comfort and adaptability, removing the trouble of carrying two types of slippers for individuals who love both styles. Fusion Slide's ergonomic design and adjustable fit options are suitable for people of all ages, enhancing foot health and alignment. Fusion Slide's new materials and industry knowledge provide great income prospects across a wide range of customer classes. This innovative invention promises to improve comfort and daily life, representing a big step forward in slipper design and user well-being. (Sri Widystuti & Muhammad Said, 2017)

2.0 OBJECTIVE

Hence, the innovation of the Fusion Slide intended:

- 1) To create style and design innovation. Add innovative design components to Fusion Slide, such as fashionable aesthetics, adaptable colour schemes (Man, 2013), and elegant profiles, to appeal to a range of customer tastes. (Linda O, 1996)
- 2) To enhance functionality. The Fusion Slide design offers many uses, including both indoor and outdoor adaptability, movable straps for a specific fit, and solid outsoles for stability and traction.
- 3) To comfort enhancement. Fusion Slide was designed with comfort in mentality. Its features, which include breathable materials, arch support, and plush cushioning, ensure that users will be comfortable for extended periods of time (Malki, J. Verkerke, Dekker, & M. Hijmans, Use, effectiveness, usability, appearance and prescription process of TF, 2023).
- 4) To improve foot health. Include orthopaedics elements in Fusion Slide, like shock-absorbing midsoles, arch support, and contoured footbeds, to encourage good foot alignment and lower the chance of common foot conditions.

3.0 METHODOLOGY

Fusion Slides are an adaptable footwear option that combine sliders and flip flops for durable and long-lasting support. Its construction (Price, 2014) guarantees prolonged comfort with synthetic rubber (Qianwen, 2017), breathable fabric, hyper foam, carbon fibre plate, soft rubber, and a rubber outsole. In addition to improving shock absorption for a smooth ride, the breathable fabric (Mukhopadhyay & Midha, 2008) keeps moisture out which lessens odour and discomfort. While the carbon fibre plate increases movement efficiency and stability, the slushy portion offers support and cushioning. Reliable traction is provided by the rubber outsole and soft rubber sections absorb shocks (N.J.MILLS, 2003). To keep feet cool and dry, Fusion Slide offers free orthopaedic support (Malki, J. Verkerke, Dekker, & M. Hijmans, Factors influencing the use of therapeutic footwear in persons with diabetes mellitus and loss of protective sensation, 2023). Waterproofing technology and anti-slip soles offer confidence (Mukhopadhyay & Midha, 2008) and protection in any weather while adjustable straps guarantee a personalised fit. Fusion Slide revolutionizes slipper design offering a comfortable and versatile footwear option for all. (Owen N.Beck, Pawel R. Golyski, & Gregory S.Sawicki, 2020)

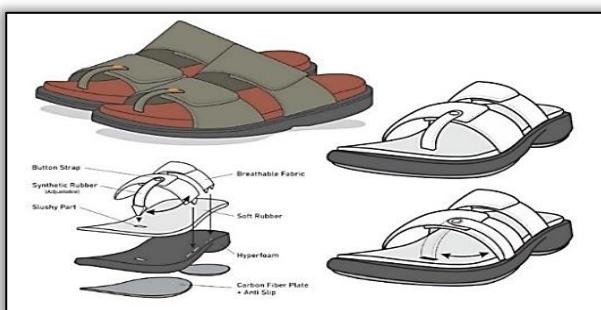


Figure 1: Fusion Slide detailing for each compartment

4.0 RESULTS

The survey's results reveal that 45.3% of respondents choose flip-flops, 37.7% prefer slides, 9.4% prefer sandals, and 7.5% prefer Crocs. These statistics show a strong preference for flip flops and slides, slip-on models stated for their ease of use. The majority of these closure types indicates that respondents appreciate convenience and simplicity in their footwear selections. Sandals and Crocs, while less popular, yet remain an uncommon appeal, maybe due to their unique design elements and capabilities.

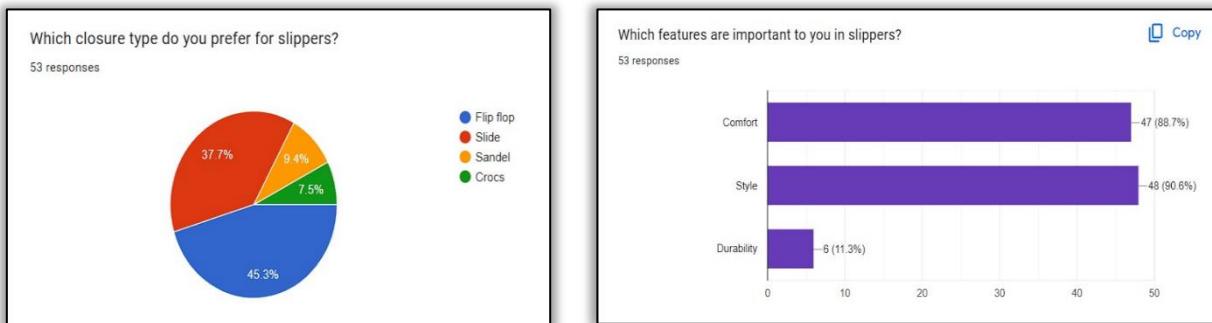


Figure 2 and 3: Survey of people interested in the type of slipper closure and Survey of people's needs in slippers features

Based on the survey, 88.7% of respondents prioritize comfort when choosing slippers, followed by 90.6% for style and 11.3% for durability. Comfort is highlighted since it gives a comfortable and supportive fit, and style is viewed as a means to match personal style. The decreased emphasis on durability implies that consumers value immediate comfort and style above long-term durability, emphasizing the significance of comfort and style in slipper selection.

5.0 CONCLUSION

In a nutshell, the Fusion Slide is a game-changing breakthrough in slipper design, providing a versatile 2-in-1 solution that combines the top qualities of flip flops and slides. This unique design not only gives customers a choice in footwear style, but it also improves comfort and improves foot health. The survey results show the Fusion Slide's capacity to satisfy modern consumers' needs and preferences with a particular focus on comfort and style. With its unique combination of style, comfort, and utility, the Fusion Slide has the power to completely transform the slipper industry and become a key component in footwear collections all over the world.

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(A-SS008) BEAUWATER

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ABSTRACT

BEAUWATER is a mini water dispenser that has been transformed into an electronic product that can instantly provide both hot and cold water in different environments. The purpose of this electronic device is to cater to the needs of modern lives that demand quick and easy hydration options. Because it can be recharged and works with batteries, it can continue to function even when there is no electricity. This makes it suitable for a wide range of uses, from everyday home use to outdoor activities like camping. This article gives a brief history of BEAUWATER and highlights its features, emphasizing how it can make a variety of user demographics' lives easier, including parents looking to care for their newborns at night, students who struggle with a shortage of water dispensers, and anyone looking for space-saving solutions. BEAUWATER combines engineering, design, and functionality to deliver a dependable and efficient water dispensing experience. This encourages the intake of water and ecological durability. This book places a strong emphasis on BEAUWATER as a workable answer to the problems associated with getting hot and cold water in today's fast-paced, modern culture.

Keywords: Mini water dispenser, Electronic device, Rechargeable, Innovation

1.0 INTRODUCTION

Today, most people want everything quickly and easily. Not to mention if it can reduce the daily burden. Due to that, through this project, a product has been specially designed to overcome the daily problem, introducing BEAUWATER. BEAUWATER is an electrical product that was inspired by a water dispenser. A product such as this will come in handy given the current weather. Meanwhile, summer has arrived in Malaysia, which means that most people will naturally be looking for ways to cool off. Cold water is a common choice. Besides, moms out there can use it. This is due to the fact that women no longer need to use a thermos to hold hot water for making milk for their kids. Considering that this product can be recharged and also uses batteries, then this product is suitable for use in various situations such as camping. Furthermore, the

product has an advantage because it is travel-sized. Saving space and light-weight constitutes a few of them.

2.0 OBJECTIVE

Therefore, the objective for this project is to make life easier for people like students and newborn parents for example the students will always have a problem with the water dispenser that were provided by the University to the collage because there are many students who want to drink the water but the machine will always run out of water so with this innovation the students can enjoy the cold and hot water without problem. As for the parents, it will make life easier when the parents need to wake up in the middle of the night to prepare the milk for the newborn baby. The next one is, to save space, as the common water dispenser is big and it will take a lot of space too. The size of the BEAUWATER is small and can be kept in a small space like the table near the bed or the study table as it will leave a lot of space so that the user can use the space to put other things. Other than that, it is to provide another alternative for people so that they can have hot and cold water easily as the product can be kept inside the room or anywhere that seems fit, as long as there is electric power to keep the BEAUWATER function properly. And the last one is, to have easy access to cold and hot water, this is because the BEAUWATER can be used by using the USB so that the people can enjoy the hot and cold water even in the jungle.

3.0 METHODOLOGY

The main goal of this study is to explain the complicated design process behind mini water dispensers, with a focus on combining usefulness, design, and engineering principles to make sure the devices are strong and safe. The method puts a lot of weight on a few key factors that are essential for the creation of these new devices.

For starters, great care is taken when choosing the materials, which is an important step that makes sure the product will last and be safe for a long time. Adding modern filtration systems is also a very important part of our method because it improves the quality of the water that is dispensed, which leads to higher health standards and happier customers.

In addition, the method puts a lot of emphasis on including features that control temperature, mechanisms that save energy, and strict safety rules. These parts work together to meet the needs and preferences of a wide range of users, making sure that the water dispensing process is smooth and effective in all situations.

Basically, this study goes into great detail about the complicated parts of designing a small water dispenser. It shows the many problems that come out, the creative ways that they are solved, and the close attention to detail that goes into the process. By going into detail about these things, hope to show how creative and technically skilled you have to be to make cutting-edge gadgets that change the way you get water every day.

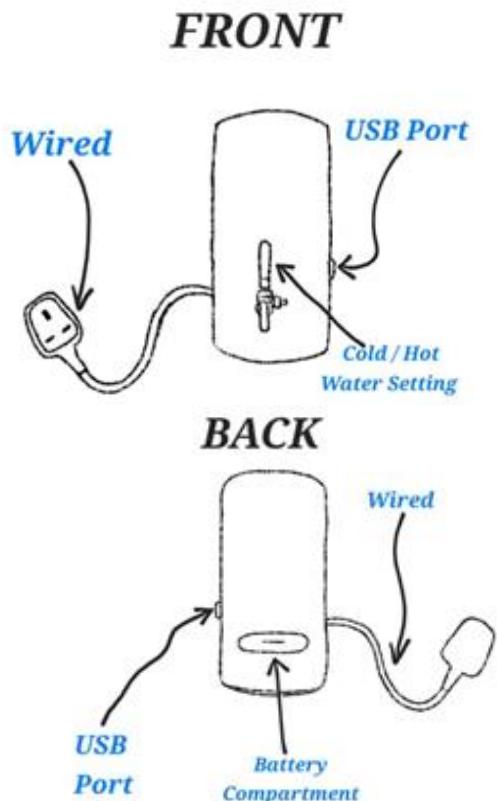


Figure 1.0: BEAUWATER

4.0 RESULTS

The discussion section goes into detail about how BEAUWATER might change people's lives by making it easier for them to access hot and cold water in many places, showing how important it is for the student that want hot and cold water in college or parents to wake up in the middle of the night to prepare the milk for the newborn baby. This part talks about a few important points:

BEAUWATER could cause big changes in users' lifestyles because mini water dispensers are lightweight and portable, the products are simple to move and set up wherever they are needed. This product can be carried to camping or travel because this product provides convenient access to water without taking up much room and can be placed on desks, worktops, or small tables. Mini water dispensers are far more portable than larger water coolers or dispensers. These products can carry them with customers to various spaces, gatherings, or even outside to guarantee that customers always have access to safe drinking water.

Compared to larger models, mini water dispensers use less energy since these products often run-on gravity or low-power electric pumps. This lowers energy use while simultaneously lowering the price of electricity and electric consumption. Compared to larger water coolers or dispensers, mini water dispensers are typically less expensive. This product is an affordable way to supply tiny spaces with safe drinking water without having to pay for pricey installations or upkeep.

One of the best things that BEAUWATER has is it has a high-quality mini water dispenser that has a stylish, robust design, a small footprint, and adequate capacity. It should efficiently provide hot and cold water, with an energy-efficient technology and superior filtration to ensure safe drinking water. Positive customer feedback emphasizes dependability, while a comprehensive warranty and responsive customer service provide value. Overall, it strikes an excellent balance between price, performance, and convenience of use, making it a worthwhile addition to any home or business.

5.0 CONCLUSION

In conclusion, the BEAUWATER represents a significant advancement in the field of tiny water pumps. There are numerous locations where individuals can obtain hot and cold water. Through the integration of engineering, design, and function, BEAUWATER was able to address the changing demands of contemporary living. It is intended for a wide variety of users, like parents searching for a simple way to watch their children after school or students who are unsure of where to find water at the vending machine.

BEAUWATER's primary characteristics, like its battery compatibility, rechargeability, and compact size, make it adaptable and ideal for a variety of applications, including outdoor activities like camping as well as inside use in homes and companies. Its energy-efficient design and adherence to safety regulations demonstrate our commitment to the environment and user well-being. By ensuring that customers can access clean, refreshing water whenever and wherever they need it, BEAUWATER has grown to be a dependable companion. Paying will enable you to do this.meticulous attention to every aspect while designing, closely adhering to all regulations and certifications.

BEAUWATER is simple to use, lightweight, and environmentally friendly, it's more than simply a toy. It's a game-changing device that lessens environmental harm while making it easier to stay hydrated every day. Looking ahead, BEAUWATER's success demonstrates how innovative and committed our team is to pushing the envelope of what is conceivable. We remain committed to providing our customers with solutions that not only meet but also beyond their expectations even as we continue to develop and enhance our technology.

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<https://www.lawinsider.com/dictionary/water-dispenser#:~:text=Save,distribution%20system%20of%20the%20premises>

(A-SS009) EZEFOLD HIJAB

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ABSTRACT

The traditional practice of Muslim prayer, while profoundly significant, faces challenges in modern times, particularly when travelling or having hectic schedules that prevent the carrying of burdensome prayer attire. This research paper introduces the "EzeFold Hijab," a novel approach developed to tackle these obstacles and enhance the act of praying. This collapsible telekung offers convenience without compromising comfort or functionality through the ingenious construction and use of lightweight, foldable materials. By employing a combination of internet surveys and library research, our methodology revealed a pressing demand within the Muslim community, specifically among women, for a practical prayer apparel that accommodates contemporary requirements. To meet this need, the EzeFold Hijab provides a portable, wrinkle-free solution that is easily transportable in purses or luggage, ensuring unrestricted access to prayer facilities irrespective of location or circumstance. This device promotes religious observance and empowerment among Muslim women through the incorporation of inclusive features and a user-friendly design. This empowers individuals to engage in daily prayers with assurance and simplicity. Based on our investigation, it appears that the EzeFold Hijab fulfils a significant market demand by offering a modernised rendition of conventional garments that harmonises effectively with the demands of contemporary, fast-paced lifestyles. In essence, this development represents a significant advancement in the realm of Muslim apparel, facilitating and expanding the accessibility of prayer observances while empowering women to carry out their religious responsibilities with dignity and sophistication.

Keywords: convenient, perform an obligatory, daily life, travel friendly

1.0 INTRODUCTION

The practice of Muslim prayer, integral to the faith, encounters challenges in contemporary settings, particularly amidst travel or busy daily routines. Central to this challenge is the cumbersome nature of traditional prayer garments, such as the telekung, which often proves impractical for modern lifestyles. In response to this dilemma, this study introduces the concept of the "EzeFold Hijab," a revolutionary solution aimed at bridging the gap between religious observance and practicality. Traditional telekungs, while essential for prayer, present logistical hurdles for individuals on the move, including students, travelers, and professionals. The need for a more convenient and portable alternative is evident, reflecting a desire to integrate

religious practices seamlessly into everyday life. This paper explores the development and implications of the EzeFold Hijab, examining its design, functionality, and impact on Muslim women's prayer experiences. By addressing the challenges associated with traditional prayer garments, this innovation aims to enhance accessibility to prayer facilities and promote religious adherence among Muslim women, regardless of their location or circumstances. Through a combination of online surveys and library research, this study seeks to understand the specific needs and preferences of Muslim women regarding prayer attire, informing the development of a practical and user-friendly solution. The subsequent sections will delve into the objectives, methodology, results, and implications of this research, culminating in a comprehensive analysis of the EzeFold Hijab and its implications for contemporary religious practices.

2.0 OBJECTIVE

The objective of this study is to introduce a practical solution—the EzeFold Hijab—enabling Muslim women to maintain their prayer schedules, even during travel or busy periods. The objectives are diverse, all aimed at addressing challenges associated with traditional prayer garments. Firstly, the aim is to enhance the portability of telekungs, facilitating the fulfillment of religious obligations for Muslim women without hindrance. Secondly, the objective is to reduce the bulkiness of prayer clothes for easy integration into everyday items like backpacks and handbags. Additionally, the goal is to offer a practical yet comfortable solution by designing a compact, iron-free telekung. The overarching aim is to empower Muslim women to practice their faith confidently, regardless of location or circumstances, thereby fostering inclusivity within communities. Through an in-depth exploration of the wants and needs of Muslim women, the study seeks to develop a culturally sensitive and user-friendly solution tailored to the diverse requirements of the target audience.

3.0 METHODOLOGY

The study utilises a combination of internet questionnaires and library research to collect extensive data and get valuable insights into the requirements and choices of Muslim women about prayer dress. The method commences with a comprehensive literature analysis to comprehend the prevailing difficulties encountered by Muslim women in upholding their religious beliefs while travelling or managing demanding lifestyles. This evaluation will guide the creation of survey questions designed to accurately capture the precise requirements and expectations related to prayer clothing.

The online surveys are disseminated to several cohorts of Muslim women, encompassing students, professionals, and travellers, in order to guarantee a representative sample. The surveys collect data on variables such as preferred materials, design characteristics, and pragmatic considerations for prayer apparel. In addition, participants are asked to offer feedback regarding their experiences with conventional telekungs and propose enhancements or advancements.

Concurrently, library research is undertaken to investigate current solutions and advancements in prayer dress, encompassing both the Muslim community and other

sources. This study offers valuable insights into the latest trends, technology breakthroughs, and cultural factors that could impact the design and development of the EzeFold Hijab.

The data obtained from the surveys and library research is further examined to ascertain prevalent patterns, preferences, and challenges concerning prayer dress among Muslim women. The study serves as the foundation for the design of the EzeFold Hijab, integrating characteristics that cater to the particular needs and requirements emphasised by the research findings.

During the development process, feedback loops are created with participants and stakeholders to guarantee that the final product corresponds to their expectations and preferences. This iterative methodology enables ongoing enhancement and advancement through user feedback, ultimately leading to a culturally sensitive, user-friendly, and practical solution for Muslim women who need easy prayer apparel for both travel and daily activities.

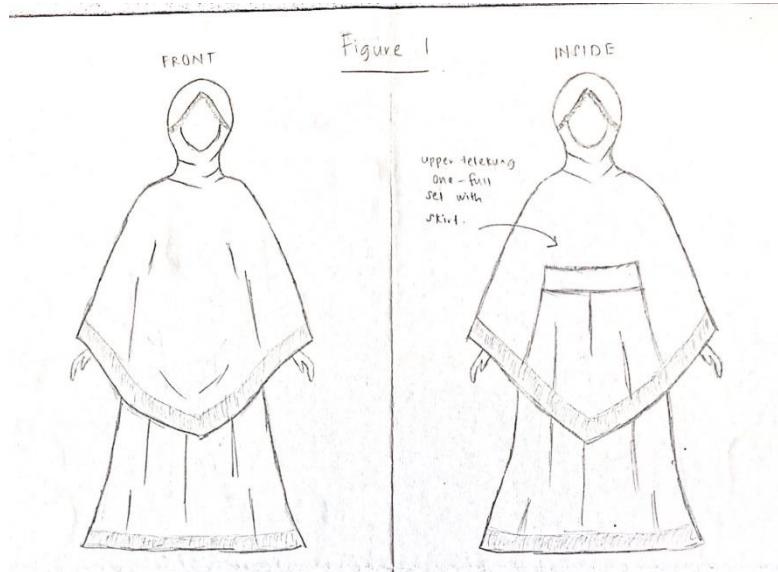


Figure 1: Instant Travel Telekung in one full set

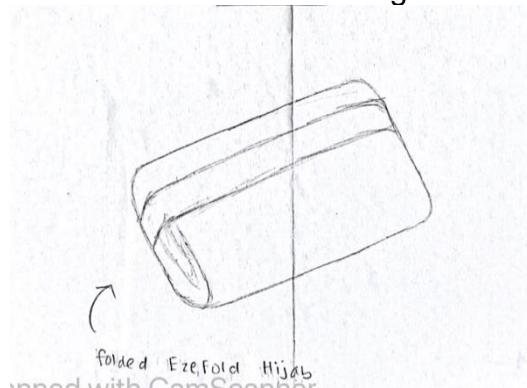


Figure 2: Ezefold Hijab in instant travel size.

4.0 RESULTS

The EzeFold Hijab is the result of years of research and development. It is a revolutionary tool that gives Muslim women the power to keep up with their prayer routines even when they are travelling or living a busy life. We learned a lot about what Muslim women want and need when it comes to prayer clothes by using a thorough method that included both online surveys and library study. As a big step forward from traditional prayer clothes, the EzeFold Hijab is easier to carry around and doesn't take up as much space. It also has features that make it useful while still being comfortable. Our new idea supports inclusivity and empowerment within Muslim communities by bridging the gap between religious duty and practicality. Our iterative product development process also makes sure that the EzeFold Hijab meets the wide range of needs of our target audience. This shows that we are committed to cultural awareness and user-centered design. In the end, our study led to a revolutionary solution that lets Muslim women practise their faith with ease and confidence, no matter where they are or what is going on.

5.0 CONCLUSION

To sum up, the process of making the EzeFold Hijab has been one of discovery, creation, and empowerment. The complex needs and preferences of Muslim women regarding prayer attire were found through a careful method that included online surveys and a lot of library study. These results were used as a guide to create this ground-breaking answer, which cleverly and effectively solves the problems with traditional prayer clothes.

The EzeFold Hijab is more than just a useful item; it shows that Muslim groups care about being open to everyone, making things easy, and respecting different cultures. This new invention makes it easier for Muslim women to practise their faith with confidence, no matter where they are or what their lifestyle requires. It's lighter, easier to carry, and comfier. It shows how dedicated people are to bridging the gap between religious duty and everyday life so that no one is stopped from performing their spiritual duties.

The EzeFold Hijab changes to meet the needs and expectations of a wide range of users because it is focused on constant improvement and user-centered design. Imagine a world where all Muslim women can start their spiritual journey with ease and grace, with new technologies helping them along the way to make their daily lives better.

In its core, the EzeFold Hijab is not just a garment; it is a tool for empowerment that helps Muslim women fully accept their faith while navigating the challenges of modern life. The goal of this book is to encourage more community discussion, teamwork, and new ideas, leading to a future where religious practice is fully integrated into all parts of life.

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(A-SS010) SMART TRACK APPS

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ABSTRAK

Projek inovasi ‘Smart Track Apps’ yang dibangunkan oleh pelajar-pelajar UiTM Sarawak dengan Kerjasama Jabatan Penjara Malaysia, Penjara Puncak Borneo Kuching, bertujuan untuk mengatasi masalah akses informasi yang terbatas dan lamban yang dihadapi oleh pegawai-pegawai penjara sebelum perlaksanaan inovasi ini. Sebelum penggunaan aplikasi ini, informasi mengenai banduan hanya boleh diakses melalui sistem komputer yang berpusat sahaja dan tidak dapat diakses menggunakan peranti mudah alih. Selain itu, proses pengiraan muster harian juga terpaksa dilakukan secara manual, iaitu melalui kaedah bertulis diatas helaian kertas sahaja disebabkan ketiadaan inovasi digital untuk mendapatkan maklumat dan jumlah banduan dengan kadar yang segera. ‘Smart Track Apps’, sebuah sistem yang berasaskan teknologi digital, memudahkan akses ke data banduan yang cepat dan tepat melalui peranti mudah alih, yang menggantikan penggunaan kertas dan mengurangkan kesukaran dalam aspek logistik. Inovasi ini secara signifikan mampu meningkatkan tahap efisiensi pengurusan data prospek banduan, mengurangkan masa yang diperlukan untuk mengakses maklumat banduan, dan memperbaiki tahap kepuasan penggunanya, iaitu pegawai penjara yang bertugas. Dengan mengadopsi pendekatan digital, projek ini juga mempromosikan keberlanjutan dan pengurangan sumber daya, yang seajar dengan aspirasi nasional untuk memajukan digitalisasi. Kejayaan aplikasi ini tidak hanya relevan dalam konteks jabatan penjara tetapi juga menawarkan potensi penggunaan di jabatan-jabatan lain dengan keperluan pengurusan data yang serupa, serta menunjukkan potensi yang besar untuk pengkomersialan. Kesimpulannya, ‘Smart Track Apps’ merupakan langkah maju yang signifikan dalam transformasi digital pengurusan jabatan penjara dan peningkatan kualiti layanan kepada masyarakat.

(Kata Kunci: Smart Track Apps, Jabatan Penjara, banduan, pengurusan data)

1.0 PENGENALAN

"Smart Track Apps" ialah sistem aplikasi yang direka untuk meningkatkan kecekapan pengurusan dan pemantauan banduan dalam Institusi Penjara Puncak Borneo Kuching. Dibangunkan oleh pasukan InnoCreative Borneo (ICB) dari Universiti Teknologi MARA (UiTM) Cawangan Sarawak, aplikasi ini bertujuan memudahkan capaian data banduan secara digital dan masa nyata menggunakan peranti mudah alih seperti telefon bimbit atau tablet. Inovasi ini adalah sebahagian daripada inisiatif untuk memodenkan pengurusan data dalam sistem penjara, yang sebelum ini bergantung kepada penggunaan kertas dan sistem maklumat yang kurang fleksibel.

MASALAH-MASALAH YANG DIHADAPI

Terdapat beberapa masalah yang dihadapi oleh pegawai-pegawai di Institusi Penjara Puncak Borneo sebelum pelaksanaan "Smart Track Apps".

i. **Kesukaran Mengakses Maklumat**

Pegawai mengalami kesukaran untuk mendapatkan maklumat yang tepat dan segera berkaitan bilangan dan lokasi banduan, kerana sistem yang digunakan hanya boleh diakses melalui komputer dengan sambungan internet yang stabil.

ii. **Gangguan Infrastruktur Internet** Keadaan capaian data menjadi lebih rumit apabila gangguan berlaku seperti kecurian kabel internet, yang mengakibatkan tiada akses kepada sistem maklumat penting (SMPP V2).

iii. **Penggunaan Proses Manual dengan Kertas**

Proses manual menggunakan kertas untuk merekod data menyebabkan risiko kehilangan data dan kesukaran mengurus maklumat banduan dengan cekap.

2.0 OBJEKTIF

"Smart Track Apps" ini telah direka oleh pasukan InnoCreative Borneo (ICB) untuk memudahkan capaian maklumat oleh pegawai di Institusi Penjara Puncak Borneo, Kuching melalui peranti mudah alih, meningkatkan kecekapan pengurusan data dengan mengautomasikan proses anggaran dan dokumentasi, mengurangkan penggunaan kertas untuk menyokong kelestarian alam sekitar, dan memastikan keselamatan dan penyeliaan yang lebih ketat dengan keupayaan pemantauan masa nyata. Aplikasi ini juga menyokong inisiatif pendigitalan nasional dan global, serta menyediakan penyelesaian yang berkesan untuk kecemasan seperti gangguan infrastruktur, yang mengesahkan komitmen pasukan untuk mengatasi masalah operasi sambil meningkatkan kualiti perkhidmatan dan mengukuhkan inovasi dalam pengurusan banduan penjara.

3.0 METODOLOGI

Penerangan Produk

"Smart Track Apps" ialah sistem aplikasi berdasarkan digital yang direka untuk memudahkan pengurusan data banduan di Institusi Penjara Puncak Borneo, Kuching. Fungsi utama aplikasi ini adalah untuk memantau, mengumpul dan

mengakses maklumat banduan dalam masa nyata, melalui peranti mudah alih seperti telefon pintar atau tablet.

Fungsi dan Kegunaan

i. **Pemantauan Masa Nyata**

Aplikasi ini membolehkan pemantauan masa nyata kehadiran dan aktiviti banduan dalam institusi penjara. Ini termasuk data masuk dan keluar petunjuk, serta maklumat lokasi khusus mereka dalam blok peletakan.

ii. **Penyepadan Data**

Mengintegrasikan data daripada pelbagai sumber untuk menyediakan maklumat yang lengkap dan terkini tentang setiap banduan, termasuk status sabitan, program pemulihan yang dihadiri dan rekod kehadiran.

iii. **Akses Mudah dan Cepat**

Boleh diakses melalui peranti mudah alih, memudahkan pegawai mengakses maklumat pada bila-bila masa dan di mana-mana sahaja tanpa perlu bergantung pada komputer atau sambungan internet yang stabil.

iv. **Pengurangan Penggunaan Kertas**

Menghapuskan keperluan untuk rekod kertas, yang mengurangkan risiko kehilangan data akibat kerosakan fizikal atau kesilapan manusia, dan menyokong inisiatif kelestarian alam sekitar.

v. **Keselamatan Data Tinggi**

Mempunyai ciri keselamatan data lanjutan untuk melindungi maklumat sensitif banduan dan menghalang capaian yang tidak dibenarkan.

vi. **Kelancaran Operasi**

Permudahkan operasi harian dengan mengautomasikan tugas seperti merekod dan memantau, mengurangkan ralat manusia dan meningkatkan kecekapan.

Kepraktisan

i. **Kemudahan Pemasangan dan Penggunaan**

Aplikasi ini direka bentuk dengan antara muka pengguna yang intuitif, memudahkan pegawai penjara yang mungkin tidak begitu fasih menggunakan teknologi untuk menggunakan dengan mudah.

ii. **Adaptif dan Fleksibel**

Boleh disesuaikan dengan pelbagai jenis peranti dan sistem pengendalian, menjamin fleksibiliti penggunaan dalam pelbagai situasi dan keadaan infrastruktur teknologi.

iii. **Sokongan dan Penyelenggaraan Teknikal**

Diurus dan disokong oleh pasukan InnoCreative Borneo dengan memastikan aplikasi sentiasa dikemas kini dan bebas daripada gangguan teknikal, serta bersedia untuk memberikan sokongan teknikal apabila diperlukan.

4.0 DAPATAN

Kebaikan/Impak

i. Kecekapan Operasi

Aplikasi ini meningkatkan kecekapan operasi dengan mengautomasikan proses pengumpulan dan pemantauan data, yang sebelum ini memerlukan banyak tenaga kerja dan masa. Ini membolehkan kakitangan memberi tumpuan kepada tugas lain yang lebih penting, dengan itu meningkatkan produktiviti keseluruhan.

ii. Peningkatan Keselamatan dan Pengawasan

Membolehkan pemantauan banduan yang lebih baik dan selamat di dalam penjara, serta membantu dalam pengurusan keselamatan yang lebih berkesan. Dengan data yang sentiasa dikemas kini dan tersedia, keputusan mengenai keselamatan boleh dibuat dengan lebih cepat dan tepat.

iii. Kemudahan Akses Data

Aplikasi ini menyediakan akses cepat dan mudah kepada data banduan melalui peranti mudah alih, mengurangkan pergantungan pada sistem berasaskan komputer yang memerlukan sambungan internet yang stabil. Ini amat penting dalam situasi kecemasan atau apabila gangguan infrastruktur berlaku.

iv. Pengurangan dalam Kos Operasi

Mengurangkan penggunaan kertas dan kos percetakan, serta menghapuskan keperluan untuk pengendalian fizikal dokumen, yang mengurangkan kos operasi dengan ketara.

v. Peningkatan Kepuasan Pelanggan

Dalam konteks institusi penjara, "pelanggan" ialah termasuk kakitangan penjara, kerajaan dan orang awam yang mendapat manfaat daripada peningkatan kecekapan dan ketelusan dalam pengurusan data petunjuk.

Pembaharuan

a. Pendekatan Digital Bersepadu

"Smart Track Apps" memperkenalkan pendekatan bersepadu kepada pengurusan data dalam persekitaran penjara, menggabungkan teknologi digital dengan keperluan khusus sistem penjara. Ini merupakan langkah utama dalam pendigitalan sektor awam, yang sering ketinggalan dari segi penggunaan teknologi terkini.

b. Penggunaan Peranti Mudah Alih

Peranti mudah alih sebagai alat untuk mengakses dan mengurus data ialah inovasi yang agak baharu dalam konteks pengurusan penjara. Pendekatan ini membolehkan fleksibiliti dan akses yang tidak terikat pada lokasi tertentu, yang merupakan perubahan ketara daripada sistem warisan tegar.

c. Keterkaitan dan Kemas Kini Masa Nyata

Aplikasi ini menyediakan maklumat masa nyata yang merupakan sesuatu yang baharu dalam pengurusan penjara. Ketersambungan dan keupayaan untuk mengemas kini dan mengakses data serta-merta meningkatkan responsif dan keberkesanan pengurusan institusi.

d. Fokus pada Kelestarian dan Inovasi Alam Sekitar

Dengan menghapuskan keperluan untuk kertas, aplikasi ini bukan sahaja menjimatkan kos tetapi juga menggalakkan operasi yang lebih hijau. Ini mencerminkan inovasi yang turut mengambil kira aspek kemampuan dalam reka bentuknya.

5.0 KESIMPULAN

Projek "*Smart Track Apps*" yang dibangunkan oleh pasukan InnoCreative Borneo (ICB) dari Universiti Teknologi MARA (UiTM) Cawangan Sarawak ini merupakan satu kejayaan besar dalam mengurus dan mendigitalkan data di Institusi Penjara Puncak Borneo, Kuching. Inisiatif ini berjaya menangani beberapa cabaran yang dihadapi oleh institusi penjara dalam menguruskan maklumat utama dengan cara yang cekap dan selamat.

(A-SS011) MIX CRETE TROLI

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ABSTRAK

MIX CRETE TROLI ialah tempat bencuhan mortar mudah alih yang direkabentuk dengan ukuran tersendiri menggunakan cantuman besi c-channel serta papan lebihan kerja amali Teknologi Binaan. Mixer elektrik simen berfungsi bagi mempercepatkan bencuhan mortar dan digunakan sebagai peralatan kerja tambahan dalam MIX CRETE TROLI. Objektif MIX CRETE TROLI direka bagi menyelesaikan masalah ketika melaksanakan amali kemasan bangunan, dimana para pelajar sukar untuk membencuh dan mengangkut mortar selepas dibencuh. MIX CRETE TROLI juga adalah produk yang di inovasikan khas untuk memudahkan pelajar yang baru nak mempelajari bencuhan mortar, dapat menggaul campuran tersebut dalam masa yang singkat, dengan sukatan yang betul, tanpa perlu menggunakan tenaga yang banyak. Produk ini sangat selamat digunakan kerana ia meminimakan risiko kecederaan semasa kerja bencuhan mortar dilaksanakan. MIX CRETE TROLI direkabentuk seperti troli yang mempunyai empat roda di setiap sisi bagi memudahkan ia bergerak dan pengguna boleh membawa bencuhan ke lokasi amali binaan yang diperlukan. Dari segi pengkomersialan, MIX CRETE TROLI berkeupayaan dijual dengan harga mampu milik dengan nilai RM 100 tidak termasuk, mesin mixer. Berdasarkan analisis soal selidik mendapati, purata min MIX CRETE TROLI adalah 4.670, ini membuktikan produk ini diterima dengan baik dan sangat memudahkan semua pengguna dari segi masa, tenaga dan keselamatan semasa membuat kerja amali bencuhan simen.

Kata Kunci: bencuhan, mortar, besi c-channel, troli, kemasan bangunan

1.0 PENGENALAN

MIX CRETE TROLI ialah tempat bencuhan mortar mudah alih yang direkabentuk dengan ukuran tersendiri menggunakan cantuman besi c-channel serta papan lebihan kerja amali Teknologi Binaan. Mixer elektrik simen berfungsi bagi mempercepatkan bencuhan mortar dan digunakan sebagai peralatan kerja tambahan dalam MIX CRETE TROLI.

1.2 LATAR BELAKANG PROJEK

Mix Crete Troli merupakan produk bencuhan untuk sebatikan konkrit. Bekas bencuhan (besin) di perbuat daripada plastik. Seterusnya, tempat bencuhan konkrit itu di letak pada bahagian tengah troli yang mempunyai roda untuk menampung berat bekas bencuhan . Pada bahagian penutup pula mempunyai 5 batang pengadun yang akan menyebatikan bencuhan.

1.2 PENYATAAN MASALAH

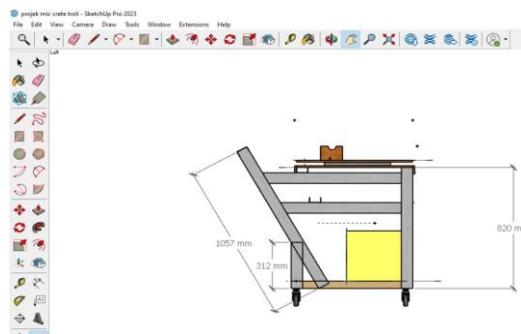
1. Kesukaran untuk memperolehi kandungan isipadu konkrit yang tepat seperti yang diperlukan dalam objektif amali konkrit.
2. Sukar untuk mengangkut bahan bahan ke tempat pembinaan kerana berat.
3. Boleh berlakunya kecederaan pada tangan seperti melecel kerana perlu sebatikan bahan bahan dalam masa yang lama.

2.0 OBJEKTIF

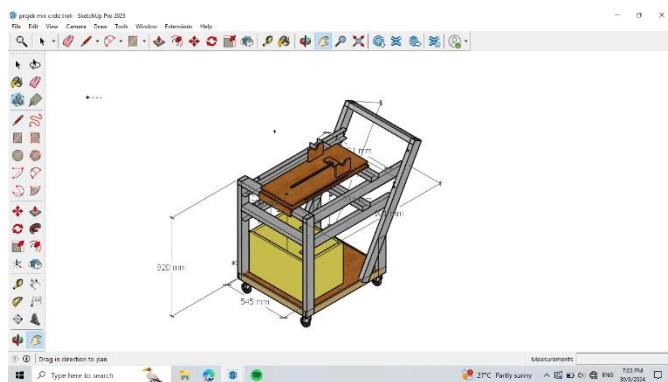
Menghasilkan produk bahan bahan konkrit yang dapat membantu pelajar memperolehi isipadu yang ditetapkan seperti yang diperlukan dalam objektif amali konkrit.

3.0 METODOLOGI

Penggunaan bahan terpakai sisa amali C-Channel yang digabungkan dengan papan plywood tebal untuk membentuk ruang bahan bahan konkrit.



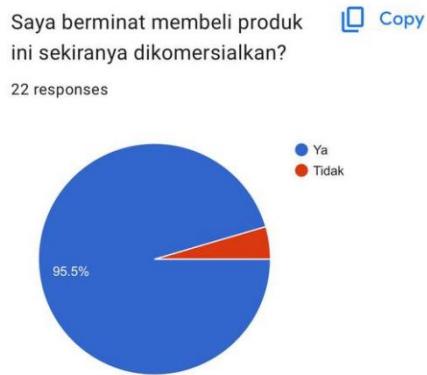
Rajah 3.1 : Rekabentuk Mix Crete Troli menggunakan perisian SketchUP



Rajah 3.2 : Rekabentuk Mix Crete Troli dalam pandangan 3D SketchUP

4.0 DAPATAN

Rajah 4.1 dibawah menunjukkan maklumbalas pengguna berkaitan kebolehpasaran komersial produk Mix Crete Troli



Rajah 1 : Penerimaan responden terhadap kebolehpasaran Mix Crete untuk dikomersialkan

5.0 KESIMPULAN

Produk ini sesuai diguna pakai untuk membuat banguhan konkrit dalam nisbah kecil kerana produk ini menggunakan baldi kecil dan ringan untuk mengeluarangkan banguhan konkrit. Produk ini juga dapat sebatikan konkrit secara manual dan selamat diguna pakai oleh pelajar .

(A-SS021) TEMPERATURE CONTROL STRAW

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ABSTRACT

ThermoSip is a temperature-regulating straw that was developed in response to issues with maintaining beverage temperature and environmental sustainability related to conventional plastic straw use. ThermoSip uses cutting-edge technology—a rechargeable battery and integrated micro-controller—to regulate drink temperature while reducing waste. In comparison to traditional straws, this study emphasizes the practicality, environmental clarity, and ease of use of ThermoSip. Temperature-regulating straws are necessary since research indicates that people enjoy their drinks at the right temperature, particularly in hot weather. ThermoSip provides a way to keep beverages at the right temperature while on the go through the combination of cutting-edge materials and technology, improving customer satisfaction and encouraging the use of reusable alternatives.

Keywords: environmental, plastic, technology, temperature control straw, weather

1.0 INTRODUCTION

Drinking straws, made from various materials like plastic, paper, metal, or bamboo, are designed for easy sipping without tilting the container. Concerns about their environmental impact arise because people are often used once and contribute to plastic pollution (FloWater, 2020). To address this, a temperature-controlling straw called ThermoSip was invented. It can adjust water temperature as desired, offering cold, hot, and warm options. Made from stainless steel, it comes with a charging case containing a power-storing button and cable. When the straw is placed inside, it connects to the case battery, transferring power.

This is because several problems are occurring in our environment. Firstly, it's difficult to maintain the temperature of water. Since the water is inside a bottle, it cannot retain the temperature that people desire. Secondly, the unpredictable weather. The environment is very hot, so people can control the water temperature inside the bottle. Next, electricity usage. These straws have a case that conducts electricity to the straw, maintaining electrical energy for a long time. So, it does not use much electricity.

As students, they face issues with the weather and the campus environment not being suitable for some students. In the current situation, the weather is very hot, and the students often need cool water to refresh themselves. Additionally, the campus environment, which is a bit far from the dormitories, requires some students to walk, leading them to need water at a cool temperature.

2.0 OBJECTIVE

1. To provide convenience, the ThermoSip offers a compact size that saves space and can easily fit inside a bag. Additionally, its casing ensures it is not easily lost.
2. To promote environmental friendliness, this product abstains from using plastic, thus significantly reducing its ecological footprint. By utilizing stainless steel material, it minimizes waste and contributes to sustainability efforts.

3.0 METHODOLOGY

ThermoSip, a temperature control straw, features a built-in microcontroller within its central portion, serving as a temperature sensor and regulating the heating and cooling elements accordingly. Additionally, it is rechargeable and includes a charger case that doubles as a power bank for the straw. When placed inside the case, the straws connect to internal charging pins, enabling the case battery to charge the straw's battery. ThermoSip is particularly beneficial for beverages sensitive to temperature changes, such as hot coffee or tea, or cold drinks like iced coffee or smoothies, as it maintains the beverage at the desired temperature throughout consumption. Designed for everyday practicality, ThermoSip comes with a case, facilitating portability for users to take it wherever they go.

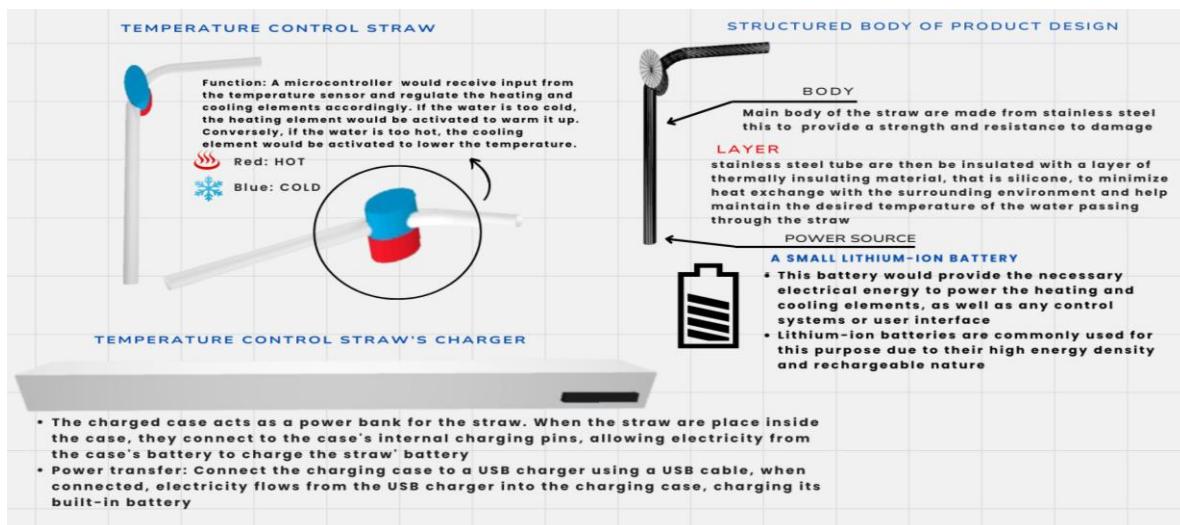


Figure 1: Temperature control straw detailing for each component

4.0 RESULT

Research reveals that temperature-control straws are still never used, prompting humanity to improve on existing straws (plastic straws). ThermoSip allows customers to enjoy their drinks while saving money in the long run, resulting in enjoyment, convenience, and satisfaction. Meanwhile, ThermoSip aids in waste reduction as compared to single-use plastic straws because it is environmentally sensitive and will feel more responsible. Furthermore, folks will prefer cold water to hot water, particularly during the summer. As a result, temperature control straws can be used at two different water temperatures because ThermoSip combines innovative technologies including vacuum insulation, phase change materials, and electrical heating elements to accomplish temperature control but not with regular straws, which do not have these capabilities. Overall, this straw innovation can enhance the user experience and promote the usage of reusable alternatives.

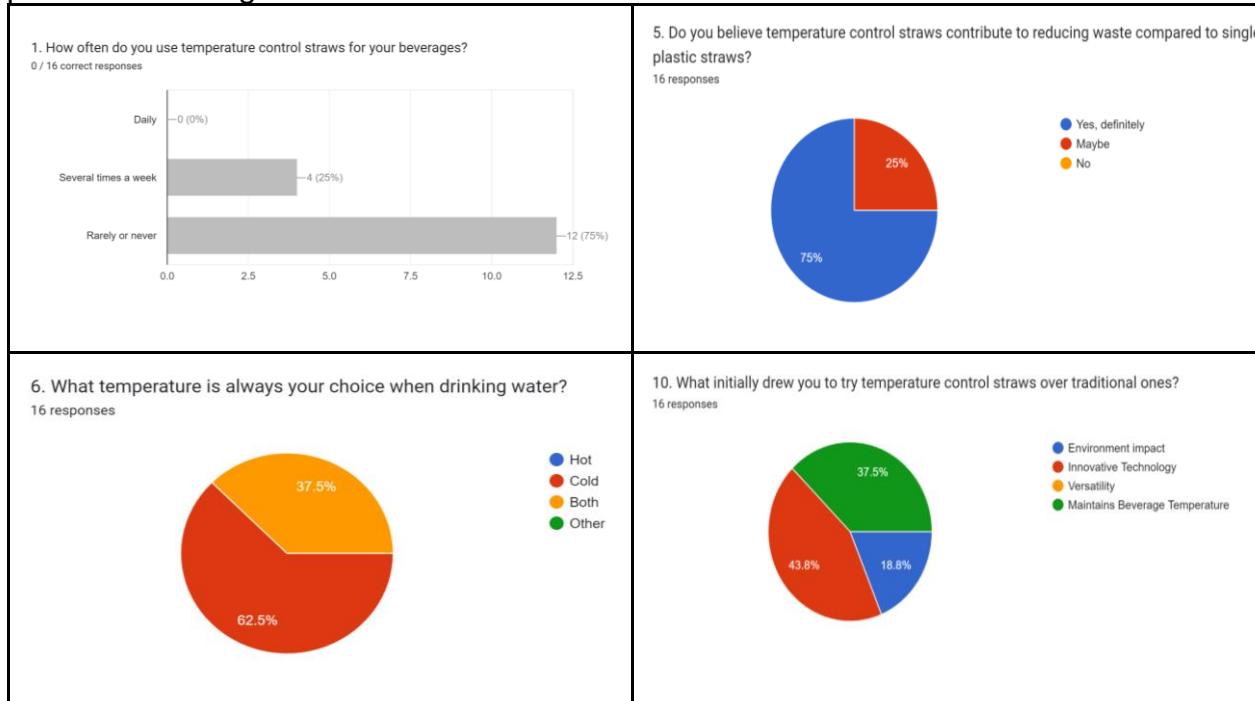


Figure 2: Survey on the improvements that can be made to existing straws and opinions on the creation of a new straw called "ThermoSip"

5.0 CONCLUSION

ThermoSip, a temperature- controlling straw, emphasizes its innovative features and potential benefits. It highlights the practicality and necessity of temperature-regulating straws, particularly in hot weather, as people enjoy their drinks at the right temperature. ThermoSip is designed to keep beverages at the desired temperature on the go, thereby enhancing customer satisfaction and promoting the use of reusable alternatives. The conclusion also emphasizes the environmental friendliness of ThermoSip, as it aids in waste reduction and contributes to sustainability efforts.

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(A-SS028) FITFLEX

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Mohmmad Suhaimi ², Rafiqin Salihin Bin Rosmadi ³, Muhammad Na'im Najmi Bin
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ABSTRACT

Introducing our cutting-edge Modular Cleat System, meticulously designed to enhance player performance and safety across diverse playing surfaces. Athletes can effortlessly customize their footwear by switching between longer, conical cleats for firm grass pitches and shorter, bladed cleats for wet or muddy fields, ensuring exceptional traction and stability in every situation. The key advantage of our system lies in its adaptability, allowing players to fine-tune their traction to match specific conditions, thereby boosting their competitive edge while minimizing injury risks. Additionally, our ergonomic design prioritizes player comfort and endurance, reducing fatigue and discomfort during prolonged play and enabling quicker recovery between sessions. In summary, our Modular Cleat System offers a comprehensive solution to elevate player performance and safety, providing adaptability, stability, and ergonomic support to empower athletes to excel in any environment.

Keywords: Footwear, Detachable, Versatility, Performance, Safety, Adaptability

1.0 INTRODUCTION

Introducing FitFlex, our latest innovation in athletic footwear designed to revolutionize comfort, performance, and versatility for football players. These boots address the need for adaptable footwear across different playing surfaces and weather conditions by featuring detachable cleats. The central challenge in traditional football boots is the necessity for multiple pairs for various terrains, resulting in increased costs and inconvenience. Our solution overcomes this by allowing athletes to switch between three types of cleats Firm Ground (FG), Soft Ground (SG), and Hard Ground (HG) with a simple twist-lock system. This enables players to customize their traction and stability without purchasing additional boots, providing a cost-effective and convenient solution for optimal performance on any field.

2.0 OBJECTIVE

The addition of a Modular Cleat System to FitFlex boots enhances player performance and safety by enabling easy stud customization for various surfaces. With longer, conical studs for firm grass and shorter, bladed studs for wet or muddy fields, players can adjust stability and traction as needed. This adaptability not only improves confidence and speed but also reduces slipping risks during quick movements. Moreover, the ergonomic design of FlitFlex boots minimizes fatigue, ensuring sustained peak performance. Overall, the Modular Cleat System enhances flexibility, reduces falling hazards, and promotes comfort and agility, empowering athletes to excel across diverse playing conditions.

3.0 METHODOLOGY

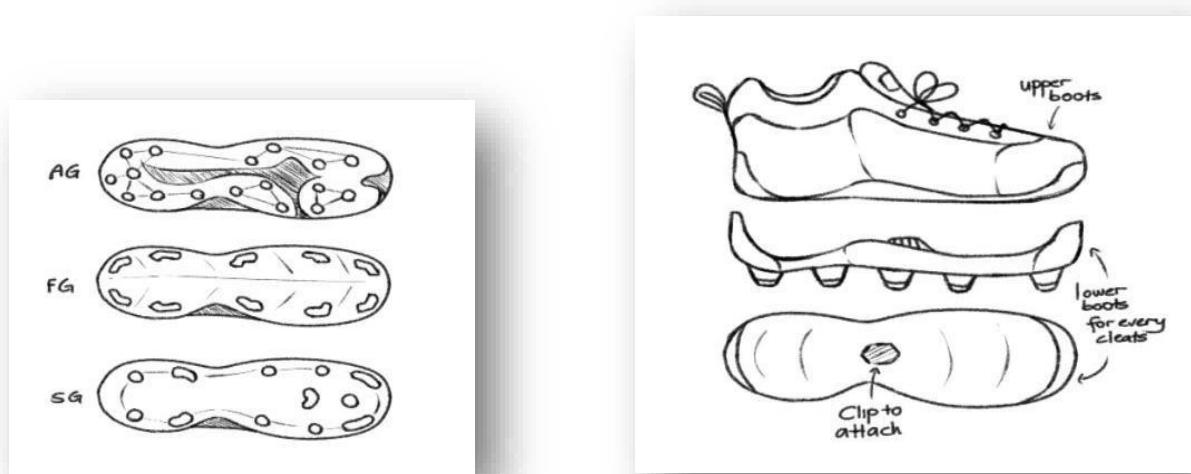


Figure 1: Shoe Sole Picture

The FlitFlex is an innovative football boot designed to address the problem of varying pitch types and unpredictable weather conditions, providing players with a customizable solution for optimal performance. This unique boot features a detachable soleplate system that allows players to adapt their footwear to different playing surfaces. Using a Velcro mechanism, players can easily attach and align the desired soleplate, then secure it with a twist-lock system for added stability. This design ensures a snug and reliable fit, whether on firm ground, artificial turf, or soft ground after rain. By offering this flexibility, FlitFlex gives players the freedom to switch between soleplates to match pitch conditions without the need for multiple pairs of boots. The innovative mechanism makes it practical and convenient, enhancing safety and performance while allowing players to focus on their game, not their footwear.

4.0 RESULT

The FlitFlex innovation lies in its unique design with interchangeable sole plates, allowing players to adapt to three different types of football pitches with a single pair of boots. This modular approach enables players to select soleplates for firm ground, soft ground, or artificial turf, offering versatility that improves performance and safety.

Despite some concerns about the comfort and feel of a two-piece design raised during interviews with university football players the concept was met with overall positive feedback, particularly due to its cost-saving benefits and practicality.

The image shows the results of a survey with 37 respondents about the practicality and potential purchase of boots with interchangeable soleplates for different types of ground. In the first pie chart, 81.1% of respondents believe it is practical to have such boots, 18.9% are unsure, and none think it is impractical. In the second pie chart, 73% of respondents would buy these boots if the innovation were available, 24.3% might consider buying them, and 2.7% would not buy them. There is unanimous interest among respondents in football boots with interchangeable sole plates. Overall, the data from both pie charts indicate a strong market interest in the innovative football boots, with a majority willing to purchase and unanimous interest in the specific feature of changeable soleplates. This positive feedback highlights the potential success of the product in meeting consumer needs and preferences.

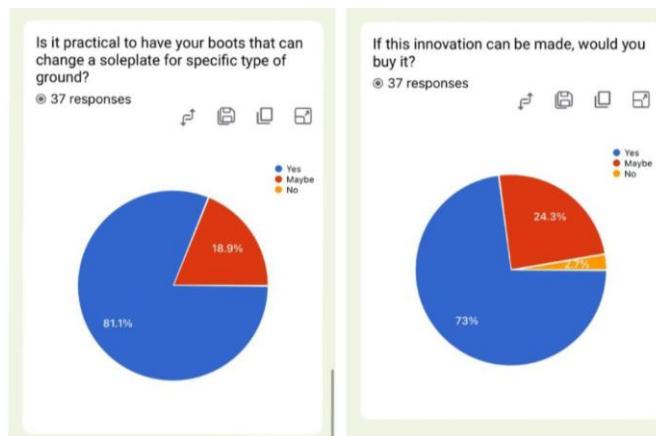


Figure 2: Survey on how much students are interested in FitFlex.

5.0 CONCLUSION

In conclusion, FlitFlex revolutionizes football footwear by addressing longstanding issues of adaptability and comfort. Its removable soleplates and Modular Cleat System allow athletes to tailor their boots to various playing surfaces, enhancing both performance and safety. Despite some initial concerns about comfort from college-level athletes, the overall feedback highlights the practicality and cost-saving benefits of the design. As further refinements are made to enhance comfort, the FlitFlex stands as a groundbreaking technology in football footwear, offering flexibility and affordability that could reshape the industry and empower athletes with greater control over their gear without compromising support or grip.

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(A-SS029) POCKET POWER

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ABSTRACT

The world today is now facing the challenge of how to maintain comfort in a warming climate and how to reduce dependence on non-renewable energy sources. Therefore, the purpose of the project to be carried out is to develop a pocket power, a portable device that uses solar energy to provide personal cooling. The innovation of the pocket power idea offers a refreshing alternative, harnessing the power of the sun to provide a cool breeze while traveling or in off-grid situations. Pocket power offers a promising alternative because the product uses solar energy, a clean and accessible resource. By collecting solar energy, it will significantly reduce dependence on the electricity system, especially during periods of high demand. This energy is also one of the energies that preserves the environment without polluting it. In conclusion, the innovation of the idea to create this pocket power design can solve the problems faced well and will be well received.

Keywords: Pocket power, Portable device, Innovation, Objective, Solar energy

1.0 INTRODUCTION

The pocket power project aims to provide a sustainable and portable cooling solution for individuals without access to a power grid. By harnessing the sun's power, it addresses the market gap for portable and sustainable cooling options. Traditional battery-powered fans have limited runtime and contribute to electronic waste, leading to higher energy consumption and greenhouse gas emissions (El-Sebaii, 2012). Pocket power uses clean, readily available solar energy, reducing reliance on electrical grids during high demand periods (Brown, 2023). The project aims to create a user-friendly, efficient device that caters to the increasing demand for environmentally friendly cooling alternatives, making it beneficial for outdoor activities, travellers, and those facing power outages.

2.0 OBJECTIVE

To develop and observe a pocket power, a portable device that uses solar energy to provide personal cooling (Smith, 2023). The project objective is focused on creating a sustainable, efficient, and user-friendly solution. In addition, several other objectives can be highlighted to create this pocket power including:

- i. To demonstrate the effectiveness of pocket powers in providing personal cooling.

- ii. To evaluate solar energy conversion efficiency and battery life when using additional solar charging.
- iii. To promote the practical application of pocket powers and explore how this sustainable and portable cooling solution will benefit people.
- iv. To design and build a working pocket power. The design will prioritize portability, ensuring the fan is easy to transport and has longer ventilation.

3.0 METHODOLOGY

A pocket power is a portable and sustainable cooling device that harnesses the sun's power to provide a refreshing breeze without the need for batteries or electrical outlets. This small, compact device is lightweight, easy to carry, and ideal for outdoor activities like camping, hiking, or picnics (Johnson, 2022). It operates silently, allowing users to enjoy its cooling effects without disturbance.



Figure 1: Design idea for this Pocket Power.

Additionally, pocket powers offer a sustainable and portable solution for staying cool. These compact devices can be a trusty companion for individuals lounging at the beach, sitting in parks, or simply relaxing at home, ensuring comfort and a refreshing breeze (Hospers, 2020). Additionally, pocket powers promote cost-effectiveness by eliminating the need for battery purchases or reliance on electricity. This translates to not only financial savings but also a reduced carbon footprint (Parsons, 2023). Furthermore, pocket powers boast user-friendly operation. Simply positioning the device in direct sunlight allows the solar panels to convert sunlight into energy, powering the fan (Siecker, 2017). As a result, users can enjoy a cool breeze without incurring additional costs or environmental burdens (Li, 2013). In conclusion, the pocket power is a practical and sustainable cooling solution that can be used in various settings, from outdoor adventures to everyday use. It is an eco-friendly and cost-effective solution that eliminates the need for batteries or electricity, allowing individuals to enjoy a cool breeze without contributing to pollution or relying on traditional energy sources.

4.0 RESULTS

The purpose of this survey was to assess the interest of students and lecturers at UiTM Cawangan Terengganu, Campus Dungun in discussing the idea of implementing mini solar fans to address power supply issues. The survey consisted of 10 questions

covering various aspects of decision to purchase, environmental sustainability, features and prices. We got 76 respondents and 70 from them are students and 6 lecturer. Next this survey aimed to gauge interest levels and identify potential benefits of such an initiative. Interestingly, 44.6% of respondents were aware of the concept of solar-powered mini handy fans before participating in the survey, suggesting a potential gap in knowledge or market awareness. Among the factors influencing the decision to purchase a mini handy fan with solar power integration, effectiveness in cooling (60.5%) and environmental sustainability (59.2%) emerged as the most significant considerations.

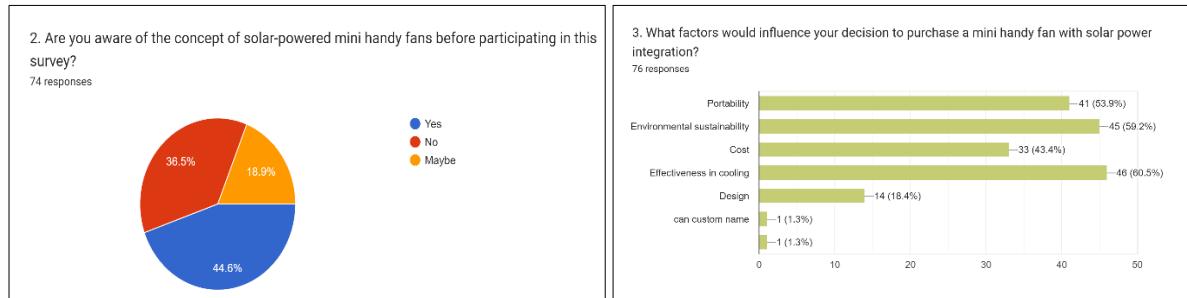


Figure 2&3: Data survey on students and lecturers' behaviour toward this pocket power and their influencing decision to purchase this product.

Additionally, this survey found that the most essential features in portable cooling devices like mini handy fans were size and weight (69.7%), cooling effectiveness (65.8%), and power source (e.g., solar, battery) (60.5%). Results also indicated that 79% of respondents were moderately to extremely concerned about the environmental impact of disposable batteries used in traditional portable fans, underscoring a growing awareness of sustainability issues.

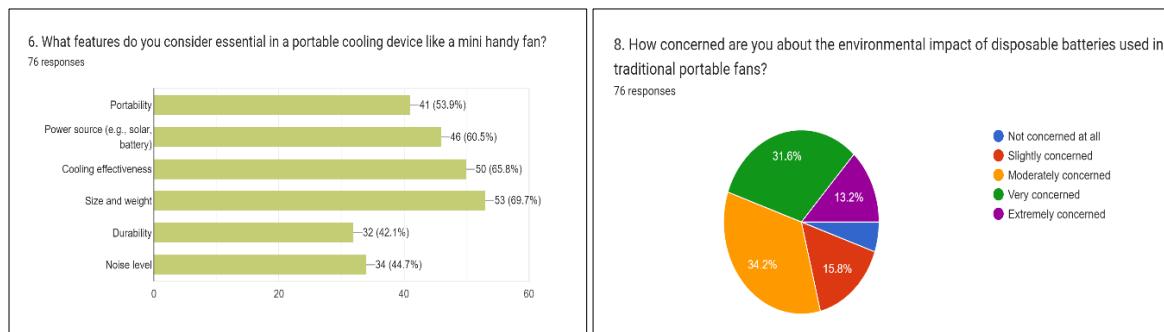


Figure 4&5: Survey on features of this pocket power and environmental impact of disposable battery.

These summary results provide insights into consumer attitudes, preferences, and behaviors related to solar-powered mini handy fans, offering valuable information for market analysis and product development strategies. Handheld solar-powered fans are portable, environmentally friendly, and offer energy efficiency, mobility, and less impact on the environment (Johnson, 2022). However, they rely on sunlight, have low power output, and may have durability issues. Solutions include improving durability, increasing battery capacity, and increasing solar panel efficiency. These fans are ideal

for outdoor use and disaster preparedness, and with further innovation, they could become more popular and efficient cooling options (Hematian, 2011).

5.0 CONCLUSION

The pocket power with solar power is a revolutionary personal cooling device that uses solar energy to provide a sustainable, cost-effective, and versatile cooling solution. This innovative device reduces reliance on traditional energy sources and enhances portability, making it ideal for outdoor activities, travel, and emergencies. It sets a new standard for eco-friendly personal appliances, inspiring awareness and action towards a greener future. The pocket power with solar power is a practical, forward-thinking solution for staying cool while minimizing environmental impact (Chen, 2024).

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(A-SS030) CALLO.BOX: REVOLUTIONIZING HEALTHY EATING HABITS WITH REALTIME CALORIE TRACKING AND NUTRITIONAL GUIDANCE

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ABSTRACT

In a world where obesity rates are soaring, the need for innovative solutions to promote healthy eating habits has never been greater. Callo.Box emerges as a beacon of hope, offering real-time calorie tracking and personalized nutritional guidance to individuals striving for better health. Developed to address the pressing need for mindful eating practices, Callo.Box provides users with instant feedback on their meal's calorie content, empowering them to make informed dietary choices. Through its advanced technology and user-friendly design, Callo.Box not only enhances nutritional awareness but also facilitates weight management and fosters a culture of mindful eating. This paper explores the development, functionality, and potential impact of Callo.Box, shedding light on its role in promoting healthier lifestyles and empowering individuals to take control of their dietary habits.

Keywords: healthy eating, calorie tracking, nutritional guidance, weight management, real-time feedback, innovative technology

1.0 INTRODUCTION

In today's fast-paced world, maintaining a healthy lifestyle amidst the chaos of daily life can be challenging. With the rise of obesity and related health issues, the importance of adopting healthy eating habits has become increasingly apparent. Recognizing this need, Callo.Box emerges as a groundbreaking solution, revolutionizing the way individuals approach food consumption. By providing real-time feedback on calorie intake and nutritional content, Callo.Box empowers users to make informed choices about their diet, promoting a culture of mindful eating and improved overall health. This introduction delves into the significance of Callo.Box in addressing the pressing need for healthier eating habits, highlighting its potential to transform the way we view and interact with food.

2.0 OBJECTIVE

The creation of Callo.Box products aims to respond to the growing concern over unhealthy dietary habits and rising obesity rates. The development of Callo.Box represents a significant step towards promoting healthier lifestyles and empowering individuals to make informed dietary choices. Other than that, the objective of this

product is also to encourage consumers to adopt healthy eating practices by providing real-time calorie information for meals, to improve nutritional knowledge by offering information on macronutrients and facilitating weight management through calorie intake monitoring, and to promote mindful eating behaviors by encouraging users to focus on food choices and portion sizes. Lastly, the purpose of this product is to strengthen personalized nutrition guidance to ensure tailored advice and support for improved diet and overall health.

3.0 METHODOLOGY

Callo.Box incorporates a multi-faceted approach to revolutionize the way individuals track their dietary intake and make informed nutritional choices. The methodology encompasses the following key features as battery Life and Durability: Designed with a long-lasting battery and steel-made body, Callo.Box ensures reliability and resilience for daily use. Advanced Technology is equipped with sensors and a built-in camera, Callo.Box employs image recognition technology to detect and identify food items accurately. Functionality offers extended battery life, calorie calculation, and heat resistance, Callo.Box provides users with a convenient and reliable tool for tracking their dietary intake and promoting healthier eating habits.

Example of figure is given below.

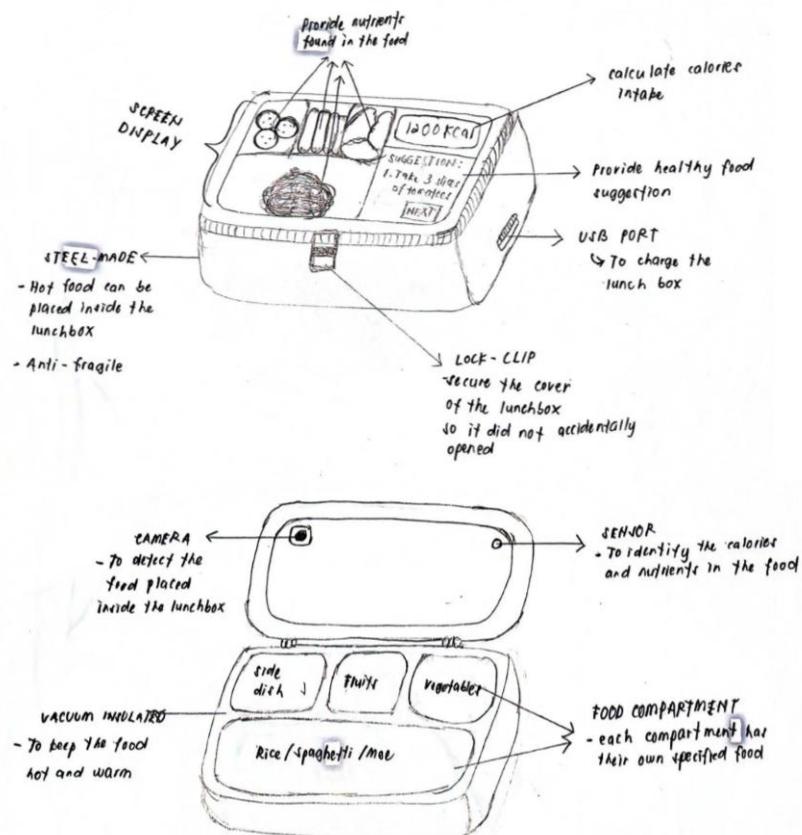


Figure 1: Callo.Box healthy food

4.0 RESULTS

The discussion section goes into detail about how Callo.Box might change people's eating habits and health, showing how important it is for encouraging healthier lifestyles and giving people the information they need to make smart food decisions. This part talks about a few important points:

Callo.Box could cause big changes in users' behaviour by making them more aware of how many calories they're eating and what nutrients are in food. Callo.Box encourages people to rethink their food decisions and start eating healthier by giving them feedback in real time. This leads to better overall health outcomes. Callo.Box does more than just track calories; it's also a great way to learn about macronutrients, serving sizes, and dietary needs. By helping people learn more about nutrition, Callo.Box gives them the power to make better food choices and take action to reach their health goals.

Using Callo.Box to help you adopt mindful eating habits can have long-term health benefits, such as helping you lose weight, lowering your risk of chronic diseases, and making you feel better overall. People who use Callo.Box are given the tools they need to keep up good eating habits for a long time by encouraging moderation and portion control. Easy Access and Low Cost: One of the best things about Callo.Box is that it is easy to use and doesn't cost a lot of money. In contrast to traditional ways of keeping track of calories, which may require expensive tools or professional help, Callo.Box provides a cheap option that can be used by anyone, no matter their financial situation.

5.0 CONCLUSION

In conclusion, Callo.Box is a bright spot in the battle against bad eating habits and rising obesity rates. Callo.Box gives people the tools they need to take charge of their eating habits and make smart decisions about their health by tracking calories in real time and giving them personalized nutrition advice. Callo.Box's new features and easy-to-use design could change the way we eat and encourage healthier lives for future generations.

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(A-SS031) THIRSTY POD

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ABSTRACT

This study introduces a unique tumbler with a built-in monopod designed to meet the needs of energetic individuals such as adventurers and creatives. The design mixes flair and utility to provide stability and convenience wherever the users go. Traditional tumblers frequently lack stability and versatility, particularly in hands-free or precise placing scenarios. The goal is to overcome these issues by adding a monopod into the tumbler design, which will make it easier to use. The tumbler's design attempts to improve outdoor photography by securely placing cameras on a monopod and maximizing space efficiency with a water tumbler holder. The team created the tumbler with computer-aided design software, selecting lightweight materials for mobility and hydration functionality. Stability and adaptability were important considerations throughout the design process. The research discovered that the monopod tumbler provides stability and hands-free convenience, making it suitable for a variety of activities other than carrying drinks. (Hamel, n.d.) It can stabilize a camera for outside shooting, which participants love because it allows to take better images without fear of the camera toppling over. It also serves as a water tumbler holder, making outdoor adventures more convenient and space efficient. The team used modern computer technologies to create and test the monopod tumbler, ensuring its usefulness and durability. The result is a durable, practical, and versatile tumbler ideal for outdoor enthusiasts. Its built-in monopod assures that it works perfectly as a water tumbler, making it an excellent companion for journeys.

Keywords: Photography, outdoor adventures, hydrating stands, innovative gear, eco-friendly fixture.

1.0 INTRODUCTION

Experience the innovative tumbler with an inbuilt monopod, the perfect companion for hydration needs. Designed to help individuals who are constantly on the move, so it doesn't matter such as creatives and adventurers, this modern and inventive style effortlessly combines style with utility. This tumbler's robust monopod base keeps it upright on any surface and offers a steady surface for refreshment on the go. With the monopod-equipped tumbler, it can embrace ease, style, and hydration on all of adventures.

2.0 OBJECTIVE

There are several objectives of Thirsty Pod:

1. To improve outside photos by using the tumbler to hold camera securely on the monopod.
2. To present a water tumbler holder in the monopod design to maximise space when engaging in outdoor activities.
3. To enhance the monopod's stability and adaptability in a variety of settings by including the weight and usefulness of the tumbler,
4. To provide a useful and adaptable device that satisfies the needs of outdoor lovers for both photography and hydration in a small device.

3.0 METHODOLOGY

The Thirsty Pod product, which is a tumbler that has a monopod that brings convenience to the user of the product. Thirsty Pod, a tumbler with a monopod offers convenience by eliminating the need for a separate monopod during travel or outdoor activities. This Thirsty Pod product will reduce the user's problem which is the user does not need to carry a tumbler and monopod separately anymore because this product use 2 in 1 concept which is a water tumbler together with a monopod holder. It can reduce the amounts of items to carry and making it beneficial for users. When the user carries this tumbler, the user also can use their monopod in the place provided near the tumbler. The tumbler's main feature is its built-in monopod, allowing the users to take hands-free selfies or photos without the need for additional accessory. Other than that, the monopod also should be adjustable, allowing the users to easily extend and retract it to their preferred length. Detachable monopod from the tumbler for versatility which is allowing the users to use the tumbler independently without the attachment when desired. If the users do not want to use the monopod, the users can just remove the monopod from the tumbler.



Figure 1: This is an overview of the Thirsty Pod product.

The Thirsty Pod, a tumbler with an attached monopod, was created using a rigorous procedure to fulfill the demands of outdoor lovers and photographers. The objective was to integrate hydration and photography tools into a single product. The Thirsty Pod was created using CAD software to ensure its stability and versatility. They

selected robust materials for the tumbler, they want with stainless steel and Tritan plastic for the monopod, they went with aluminium alloy, carbon fibre, magnesium alloy, and premium plastic. Potential users created and tested prototypes in a variety of natural environments. In response to feedback, design changes were made to guarantee robustness and simplicity of use. Following design processing, the device was put into production under extensive quality control measures. Those who enjoy the outdoors and photographers were the target market for the Thirsty Pod. Regular client input allowed continuous development. This procedure made sure that the Thirsty Pod is a useful, long-lasting, and adaptable tool for taking pictures and staying hydrated on nature walks.

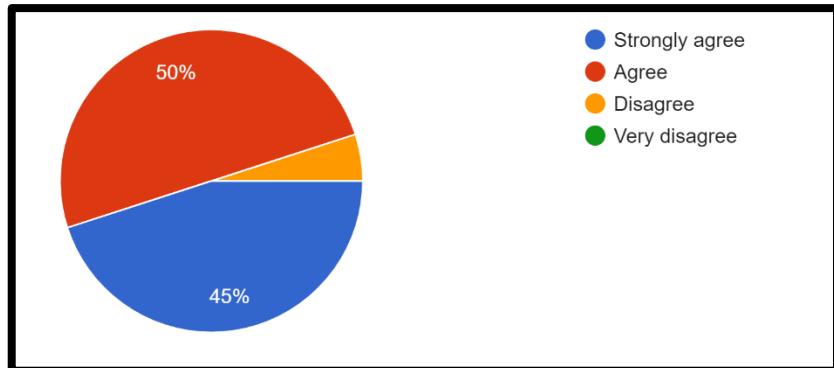
The Thirsty Pod product uses stainless steel for its tumbler, a durable, corrosion-resistant and offer excellent insulation properties, keeping drinks hot or cold for extended periods that's mean it can control the temperature based on water hot or cold. The material also easy to clean and maintain (Patriot Coolers, 2022). Other material for the tumbler is Tritan. Tritan is a BPA-free, impact-resistant plastic known for its clarity, toughness, and dishwasher-safe properties. It's commonly used in high-quality water tumblers due to its durability and lightweight nature (Patriot Coolers, 2022). The silicone rubber ring for water bottles is primarily used for ensuring waterproof sealing and maintaining freshness. It is commonly applied in various daily necessities such as water bottles, thermal boxes, thermal cups, ovens, and magnetized cups. This ring helps to preserve the temperature and freshness of the contents by providing a tight seal, preventing leaks and contamination. (Guangzhou Diller Daily Necessities Co.,Ltd, 2019)

Next, the material used to make the monopod is aluminium alloy. Aluminium alloys are lightweight, durable and offer excellent strength-to-weight ratio. The material are commonly used in monopod legs for outdoor photography equipment due to their stability and portability (Patriot Coolers, 2022), (Patel, 2024). Furthermore, the second material is carbon fiber. Carbon fiber is incredibly lightweight, yet strong and rigid. It provides excellent vibration damping properties, making it ideal for monopod legs to ensure stability and reduce camera shake during photography. The next material is magnesium alloy, the material offer a good balance of strength and lightweight properties. They're commonly used in monopod components to provide durability while keeping overall weight low for ease of transport. The last one is high-grade plastic. High-grade plastics like reinforced nylon or ABS are used in monopod components like quick-release plates and locking mechanisms due to their strength, durability, and weight reduction compared to metal alternatives. (Patriot Coolers, 2022) (accessories, 2020)

4.0 RESULTS

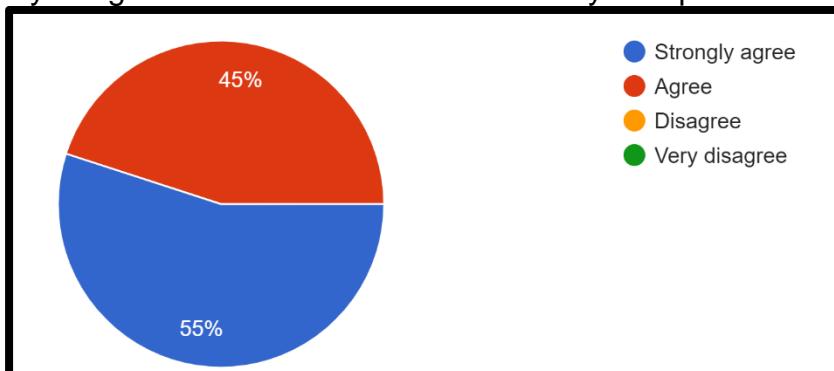
The versatile Thirsty Tumbler is highly recommended and suitable for a variety of activities and environments. Whether hiking in rugged terrain, camping in the forest and picnicking in the park, people can count on the stability and convenience of a monopod tumbler. The innovation of this idea can provide convenience to consumers in addition to supplying the water source in the tumbler, the product also provides a monopod holder for the user to use to capture their moments. From this, the result of Thirsty Pod is an innovative hydration solution that offers stability and hands-free function that enhance the user experience in various scenarios. The result from the survey that already done;

Question: Do you have trouble carrying a water bottle and monopod wherever you go?



For this question, only 5% respondent that vote disagree and majority all the respondents agree with this question.

Question: Do you agree with the release of this Thirsty Pod product?



The chart shows that all the respondent agree to release of Thirsty Pod product.

5.0 CONCLUSION

In conclusion, the research proposes a new solution in the design of a tumbler with an integrated monopod, designed to meet the dynamic needs of persons who lead busy lives. This innovative design ensures stability and convenience in any setting by perfectly combining style and practicality. The tumbler's robust monopod base provides a solid surface for hydration while participating in outdoor activities. The Thirsty Pod design aims include improving outdoor photography, increasing space efficiency, increasing stability, and delivering a versatile tool that effortlessly combines hydration and photographic needs for outdoor lovers. The method included considerable design development, meticulous material selection, consideration of hydration functionality, and tight production and quality control procedures. Although there are additional things to consider in designing, these are the main components of our strategy.

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(A-SS032) SIPNCHILL TUMBLER (MULTIFUNCTION TUMBLER)

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ABSTRACT

SipNChill Tumbler is an innovative design that combines a tumbler, portable fan, and a phone holder, enhancing user convenience and comfort. The tumbler serves as both a beverage container and a functional accessory, allowing users to enjoy their favourite drinks while staying cool and connected. The fan operates quietly, ensuring minimal disruption. The tumbler also features an adjustable phone holder, allowing users to securely place their smartphones in portrait or landscape mode. The ergonomic design optimizes the tumbler's shape and grip for comfortable handling. The benefits of the tumbler include portability, energy efficiency, and versatility. The lightweight and compact design allows for easy carrying, perfect for outdoor activities, travel, or daily commutes. The fan operates on low power, extending battery life, and allows users to enjoy a cool breeze without draining their devices. The tumbler adapts to various scenarios, allowing users to sip their favourite beverage, keep their phone within reach, and stay refreshed simultaneously.

Keywords: Tumbler, Portable Fan, Phone Stand, Innovative Design, Favourite.

1.0 INTRODUCTION

Presenting the newest invention, a tumbler with a built-in phone holder and portable fan, created especially to meet the changing needs of students. Students today are expected to be always on the go, balancing various duties while trying to stay connected and motivated in the fast-paced academic atmosphere of today. This innovative tumbler is more than just typical drinkware, it's a multipurpose friend made to improve students' everyday experiences. Besides, tumbler usage can reduce the rate of plastic waste. To-go cups (e.g. coffee) are essentially made of paper, yet they incur a thin coating of plastic or wax which makes the recycling process much more difficult than office paper (Earth911, 2014)(Pluim et al., 2015). Regarding physiology, the role of water in health is generally characterized in terms of deviations from an ideal hydrated state, generally in comparison to dehydration(Popkin et al., 2010). At the same time, students can stay hydrated, comfortable, and connected no matter where they go with this all-in-one solution, whether they are hurrying between classes, studying at the library, or just lounging outside. The detail special qualities and advantages of the innovation product emphasizing how it caters to the requirements and tastes of today's college students.

2.0 OBJECTIVE

The research can be summarized in the objectives, which highlight the significance of efficiency, improving user comfort, fulfilling market demand, ensuring satisfaction to users, and maintaining the go green concept.

- 1) To making life easier for users while they travel, attend outdoor events, and work.
- 2) To provide the buyers with a single product that fulfils various functions, saving them time and space by minimizing the need to carry multiple things.
- 3) To satisfy the increasing demand from customers for items with several functions packed into a small, portable package.
- 4) The phone holder offers hands-free function or entertainment, while the portable fan increases user comfort in hot weather.
- 5) To reduce the amount of waste generated by single-use plastics to help the environment. Disposable plastic bottles take hundreds of years to breakdown and contribute to environmental damage. This may greatly minimize the carbon footprint while contributing to environmental protection by using tumbler bottles.

3.0 METHODOLOGY

The design of a multipurpose tumbler focuses on students who prioritize simplicity, connectivity, and hydration. The product is designed to be effective, easy to use, and reliable, with marketing tactics highlighting its appeal to students. The tumbler can be used for personal cooling and as a phone holder, providing immediate relief from heat and humidity. It also aids in environmental initiatives by reducing the need for single-use fans and disposable plastic bottles. The design eliminates the need to carry multiple items, making it an eco-friendly and refreshing way to stay cool and hydrated while on the go. The product's creative features and practicality enhance customers' daily experiences, making it a valuable addition to their daily routine. The product's success is attributed to its ability to meet the needs of students and contribute to their overall well-being.



Figure 1: Product Innovation Image

4.0 RESULTS

A huge majority of respondents (88%) to the poll which outcomes are shown in the image appear to have never used a product that combines several functions, such as a tumbler, portable fan, and phone holder. The results show that most respondents had not come across a product that combines these attributes, which is presumably what the survey question asked participants if they had ever used. Subsequently, the poll revealed that a significant proportion of participants believed the multipurpose tumbler to be beneficial for both indoor and outdoor activities.

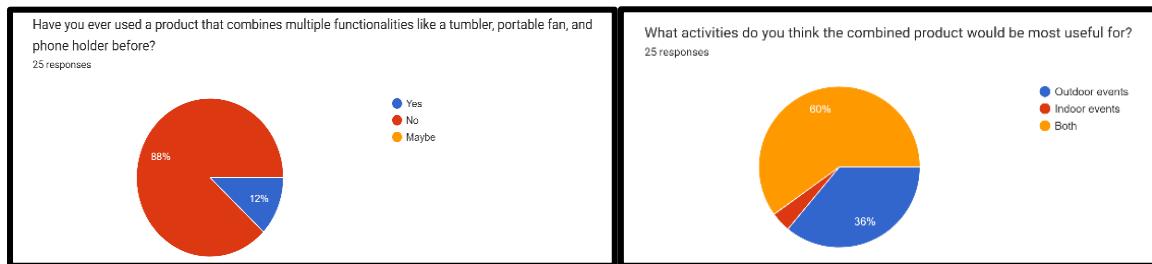


Figure 2 & 3: Respondent's data from survey

Next, the survey's findings reveal that 72% of participants consider price, brand reputation, and functionality when choosing a product. Nevertheless, 12% of respondents said that each aspect alone has an impact on them, indicating that buyers should evaluate products holistically. According to the survey, 56% of participants said that a portable fan and tumbler combination's phone holder feature was extremely significant, demonstrating a strong preference for its practicality and usefulness. The fact that 16% of respondents thought the feature was unimportant and 28% were neutral suggests that respondents had varying needs and preferences.

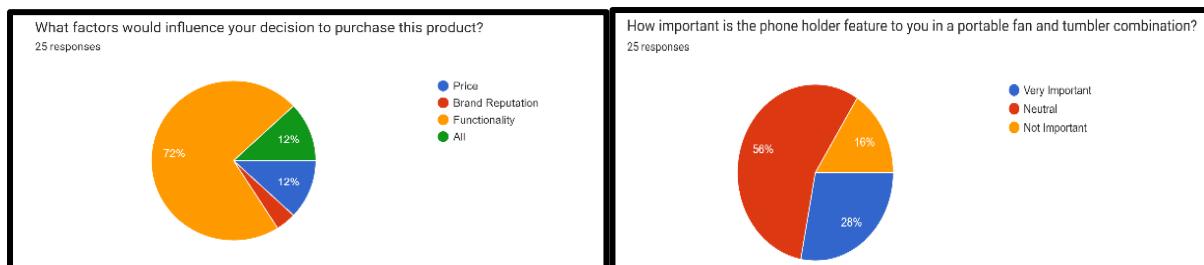


Figure 4& 5: Respondent's data from survey

5.0 CONCLUSION

The tumbler with a built-in phone holder and portable fan has received positive feedback from students due to its versatility and adaptability. The product is praised for its ability to accommodate students' busy schedules and constant mobility, providing a convenient phone holder, cooling fan, and tumbler for drinks. The tumbler also allows students to easily access their phones for studying, communication, or enjoyment, while freeing up hands for other tasks. Overall, students find the tumbler a useful and easy way to organize their daily schedules, making it a highly desired product in this market due to its adaptability, functionality, and versatility.

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(A-SS033) MULTILAYER OF INFLATABLE PILLOW

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ABSTRACT

A MULTILAYER INFLATABLE PILLOW is a combination of multilayer air compartments that are put inside one big pillow and can be filled by air easily. The multilayer will allow the users a choice of comfort based on their preferences. Its is also can be rolled and folded into a smaller size to fit in your normal backpack and be used for travel purposes. Whether you want to fill it by air machine or by your own mouth, the pillow can be used no matter what because of its convenient size. Its also can prevent the users from getting any neck pain or headache when they are not using the normal cushion pillow.

Keyword : Multilayer Inflatable Pillow, Rolled and Folded, Convenient Size, Prevent

1.0 INTRODUCTION

The increase in travel activities in Malaysia right now has sparked many ideas to create products that will give the users less work compared to the existing products. The travel activities include overseas travel, traveling inside the country by car and outdoor travel activities So the customers in the market are demanding for products that will simplify their daily activities and make their travel activities a lot more easier. Our company has come out with the innovation from the normal inflatable pillow and turning it into a pillow where the users are allowed to select their own level of comfortness and be washed and dry in less than 1 hour. For someone that loves to travel, they can bring this pillow everywhere because of its flexible shape that can be rolled and folded into a smaller size and will fit inside their normal backpack or hand carry bag. This pillow also helps the users with their body posture and prevents them from getting a neck pain and headache while sleeping or in sitting position. That is also the reason why we choose to create this multilayer pillow because the users also can pump the air inside for sleeping use and use it as a neck pillow. For a family member that is traveling by car and wants to bring their pillow along without using so much space in their car, this is the solution for the problems where you can put it inside your backpack and use it when arriving at your destination.

2.0 OBJECTIVE

Our product innovation here is not only focusing to meet the customer demand but we are also aiming to help reduce our customer burden while travelling. Not only they need to focus to bring their needs, but the users also need to consider their essential items like pillow. So for someone that are more likely to have a problem to bring pillow while traveling, this is the solution. For someone that loves to travel by flight and

wanted to bring their pillow together without adding so much weight and getting extra charged by the airline company, they can consider our product as their best solutions. As for the outdoor activities lover that afraid that their pillow will get dirty while using it on the ground, they do not have to worry anymore if they use this product. It is because the pillow is build by mixing few materials like polyethylene and cotton, it makes the product are washable and can be dry less than 1 hour but without sacrifice the comfortness. Without realizing this is the product that can be use in the room, car, flight and jungle. Not to forget, this product will also assist and help the users with their body posture while sleeping and reduce the chances of them from getting the neck pain and headache.

3.0 METHODOLOGY

Our product is different from any other inflatable pillow because of its structure where there are 3 different air compartments that can be filled up separately according to the user's preferences. All 3 compartments then combine inside one large compartment to make it look like a normal pillow. All 3 compartments are made of polyethylene the material that is used to make the inflatable pool and it has high thickness making it hard to be penetrated by anything when being used in outdoor environments. The outer surface was made out of a combination of polyethylene and cotton to provide not only a penetrate-proof surface but also the comfort for the users. The combination of the materials also takes the consideration for the pillow to be clean and wash easily when needed.

There are a variety of shapes for the pillow to provide the customer with a choice that they want. The shapes are focused on helping the users with their head placement and body posture. It will make the users feel comfortable when using the pillow for a long period of time. It also gives flexibility when the users want to use it on any surface that they want.



Figure 3.0 : Multilayer inflatable pillow

4.0 RESULTS

Based on the survey that has been conducted, the product manage to proof it's purpose and most of the users use the product for travelling and outdoor activities. The users also show satisfaction about out comfortness because more than half of the users stated that the pillow is giving high comfortness while being used. There are few recommendations suggested by the respondents that can be use for development purposes

5.0 CONCLUSION

For the summary of our product explanation, it is easy to say that this is the game changer for the pillow industry and also a big spark in traveling and outdoor activities where finally there is a pillow that can fit inside their bag and also maintain their body posture and avoiding the users from getting any back pain and headache. This is also an effective solution not only for convenient purposes but also to fulfill the market demand.

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**(A-SS034) THE CAMPUS CRUSH (COLLEGE RECYCLING UNIT SYSTEM HUB):
PROMOTING RECYCLING PRACTICES ON COLLEGE CAMPUSES**

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ABSTRACT

The Campus CRUSH (College Recycling Unit System Hub) is a novel recycling station at UiTM Cawangan Terengganu Kampus Dungun (UiTMCTKD) that offers rewards to students for recycling, encouraging better water bottle management and sustainability awareness. The lack of effective recycling practices at UiTMCTKD is causing significant environmental concern due to the widespread consumption of single-use mineral water bottles. The CRUSH system promotes recycling, educates students about sustainability, encourages green campus initiatives, boosts engagement, and tracks the impact of recycling. The CRUSH system, featuring ID scanners and weight tracking, will be integrated with existing student systems for e-merit rewards to ensure efficient collection and monitoring the effectiveness. A survey conducted among UiTMCTKD's students reveals a high interest in recycling with central collection points and reward systems impacting hostel eligibility. Implementing the Campus CRUSH and partnerships with local authorities could benefit campuses in the transformation toward a Green Campus.

Keywords: CRUSH, Sustainability, Recycle, Green Campus

1.0 INTRODUCTION

The Campus CRUSH system aims to address the issue of ineffective recycling methods on college campuses specifically within UiTMCTKD. Recycling must be engaged by all individuals (Md Zain, et al., 2012) and this system was designed to ensure the involvement of students and campus management including the local authority. The lack of marked recycling drop-off locations for items like paper, cans, and plastic bottles contributes to low recycling rates. Today, we produce about 400 million tonnes of plastic waste every year (Visual Feature | Beat Plastic Pollution, n.d.) and this is the most concerning issue worldwide. The innovation of this system is to address the environmental impact of single-use plastic water bottles. It provides an easy-to-use interface and intuitive features to encourage good recycling practices among students, fostering a sustainable and environmentally conscious culture on campus.

2.0 OBJECTIVES

2.1 Promote Convenient Recycling & Proper Sorting

To give students a central, easy-to-reach place to throw away recyclables and to make it easier for them to sort their trash correctly by having areas set aside for different types of recyclables.

2.2 Teach students about being environmentally friendly:

To add educational messages and interactive screens to the system so that students can understand better how recycling helps the earth and how it contributes to sustainability. Human-induced plastic pollution is causing undeniable devastation to Earth's natural resources (Auld, 2020).

2.3 Encourage green campus practices and projects that are good for the environment:

To support ethical waste management through the CRUSH system, which will help create a mindset of sustainability on college campuses and help Green Campus reach its goals.

2.4 Get Students More Involved:

To get students more involved in environmentally friendly activities by giving them e-merits for recycling, so it benefits both the students and the management team.

2.5 Keep track of how recycling works:

To gather information on recycled materials that have been processed through the CRUSH system so that it can be judged how well it works at raising recycling rates and figuring out its overall effect.

3.0 METHODOLOGY



Figure 3: Mock-up pictures of the Campus CRUSH

The Campus CRUSH system will be implemented using a set of procedures that are intended to maximize effectiveness and efficiency. First, the work will concentrate on creating a prototype that is easy to use and includes all of the elements that are necessary to make recycling easy. Several features will be included in this prototype:

- **Student ID Scanner:** Students can scan their IDs for identification and tracking purposes. Manual entry will also be an option.
- **Weighting System:** The system will weigh deposited recyclables to monitor the volume of materials collected.
- **Drop Slots:** Clearly labelled drop slots will guide students in sorting their recyclables appropriately.

Additionally, cooperation with local authorities will be developed to create an organized system for the collection frequency of recyclables deposited within the CRUSH system to guarantee the initiative's long-term success. Next, Students will receive e-merits for

their recycling participation. This point system can be integrated with existing student portals or databases for record-keeping. Lastly, frequent evaluations of the number of recyclables collected, student participation rates, and the success of instructional programs will offer important insights into the overall impact of the system.

4.0 RESULTS

A survey conducted at UiTMCTKD revealed a high level of awareness regarding recycling practices. While 58.6% of respondents reported that typically they would throw used water bottles in regular trash bins, over 80% expressed willingness to recycle plastic bottles if a central collection point with clear sorting instructions was available. This strong interest in recycling plastic bottles serves as a promising starting point to increase recycling efforts on campus.



Figure 2 & 3: Survey on students' behaviour towards used water bottles & what students' interest in central recycling point.

Furthermore, a significant majority (92.9%) indicated an interest in a system that scans student IDs upon recycling and awards them e-merit. As e-merit points influence hostel eligibility, participation in this program would provide students with a direct benefit that could enhance their campus life.

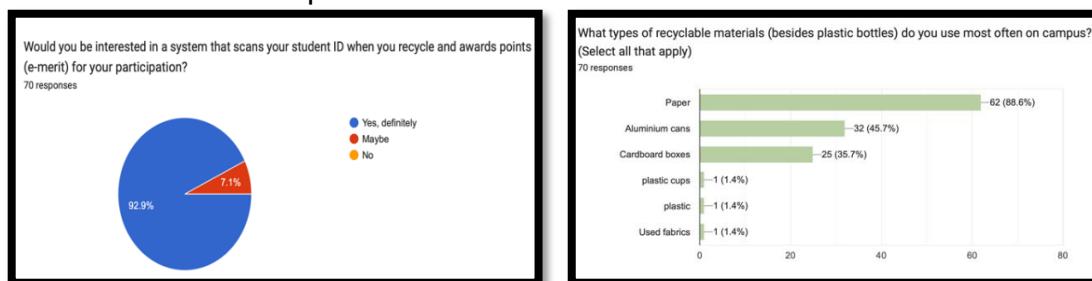


Figure 4 & 5: Data survey on how much students are interested in e-merit recycling system & survey over what kind of recycled materials are used the most.

The survey also identified paper, aluminium cans, and cardboard boxes as the most common recyclable materials on campus. By implementing a comprehensive recycling program like CRUSH (College Recycling Unit System Hub), the proper disposal of these and other recyclable materials could be significantly improved. Capitalizing on this enthusiasm, UiTMCTKD could explore a collaborative partnership with the local authority, Majlis Perbandaran Dungun (MPD) to establish a comprehensive waste management program, specifically targeting recycling initiatives on campus.

5.0 CONCLUSION

The Campus CRUSH system tackles ineffective recycling on college campuses. It provides a central location with clear sorting for recyclables like plastic bottles and paper. Educational displays encourage sustainable behaviour. It also collaborates with local authorities for collection and rewards students for participating, promoting a

greener campus culture. A survey at UiTMCTKD showed high interest in recycling with a central location and rewards. It is time to change how we produce, consume and dispose of the plastic we use (Visual Feature | Beat Plastic Pollution, n.d.). This system can significantly improve recycling on campus and potentially lead to a wider program among UiTM campuses nationwide with local authorities.

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(A-SS035) SUSTAINABLE INTEGRATION: BUILDING A DIRECT COMPOST TUNNEL TO PRODUCE CHICKEN BRAN AND ENHANCE RESOURCE EFFICIENCY

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ABSTRACT

This project aspires to create a sustainable waste management system by constructing a direct compost tunnel to the chicken coop and producing chicken bran from the compost waste simultaneously. It suits those who want to breed chicken by using organic waste. By minimizing organic waste, compost waste is added to poultry feed to increase its nutritional value and encourage resource efficiency. Through this innovative approach, the project aims to improve the environmental sustainability of the chicken coop while also providing a cost-effective method for feed production. This procedure includes developing and constructing the compost tunnel, monitoring the composting process, and analyzing the chicken bran's nutritional quality. We expect that this technology will have a major positive impact on feed savings, waste reduction, and overall environmental effect mitigation. This product is useful to anyone especially those who wish to begin farming chickens on a small scale.

Keywords: compost, organic waste, cost-effective, sustainable

1.0 INTRODUCTION

Building A Direct Compost Tunnel to Produce Chicken Bran and Enhance Resource Efficiency. Introducing a new product that is not sold yet in the market. a product built specifically for chicken breeders or people who like raising chickens for fun. This innovation is designed to increase the chicken coop's environmental sustainability while offering an affordable feed production alternative. According to (Agrifoods, 2021), this is in line with this article that states poultry feeding system will ensure chicken get their daily portion at the right time. So, the modern features of this product help ease the process of feeding chickens. The features include the design and construction of the composting tunnel, the observation of the composting process, and the nutritional analysis of the chicken bran. These modern and advanced features help solve problems like the hassle of transporting compost from the compost pile to the chicken coop, waste food that often goes to waste, inconsistent feeding time, etc. With its sophisticated features and stylish design, this device

makes the daily tasks of a chicken breeder easier.

2.0 OBJECTIVE

This objective is to provide an overview of the project, emphasizing the importance of sustainability, chicken health, and environmental care. Firstly, this system is to promote sustainability and waste reduction. According to (Klaudia.H, 2023), this study aims to develop a direct compost tunnel system integrated with chicken coops to recycle organic waste into nutrient-rich compost effectively. By fostering a circular economy approach, our objective is to minimize organic waste generation and promote sustainable farming practices. Next is to improve chicken health and nutrition. Our objective is to enhance the nutritional content of chicken feed by incorporating compost-derived chicken bran. According to (Lewis, 2021), through the utilization of natural nutrients found in compost, such as black soldier fly larvae and organic materials, we seek to improve chicken health and well-being while reducing reliance on commercial feed additives. Lastly, is to foster environmental stewardship. This study seeks to promote environmental stewardship by encouraging composting as a means of waste management, reducing reliance on synthetic fertilizers, and minimizing environmental pollution associated with conventional farming practices. By integrating waste reduction with feed production, our objective is to contribute to a more sustainable and environmentally conscious approach to poultry farming aligned with (Klaudia.H, 2023).

3.0 METHODOLOGY

The methodology includes choosing a suitable site for the chicken coop for the construction of a compost tunnel to ensure easy access and proper drainage. After a site is selected, the compost tunnel is built with basic materials like wire mesh and wood with a focus on providing enough insulation and ventilation. According to (US EPA, 2015), Organic waste materials such as kitchen scraps, green waste, and chicken manure, are then layered inside the tunnel to initiate the composting process. Regular turning of the compost pile facilitates decomposition and aeration. As the compost matures, it observes the temperature and moisture levels to ensure optimal conditions for microbial activity. After matured, the compost is collected and turned into chicken bran via a grinder or other such machinery. Feeding trials take place to determine the hens' health response and acceptance of the new bran. Throughout the whole process, the evaluation of feed production efficiency, waste reduction, and chicken performance metrics during the process offers important information about the compost tunnel system's overall effectiveness. Details documentation procedures and outcomes are included to allow ongoing enhancement and replication of the procedure in similar contexts.

An example of a Figure is given below.

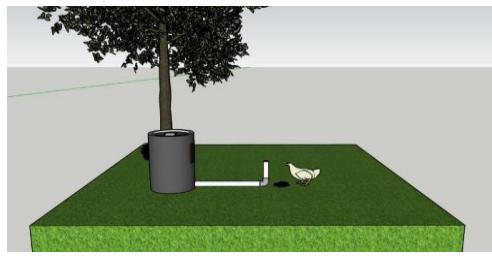


Figure 1: Mock-up of the direct compost to chicken coop

4.0 RESULTS

According to (Run-Chicken, 2023), one of the issues for chicken producers is environmental contamination. Chicken coops produce a lot of rubbish, including droppings, bedding, and food scraps. Improper disposal can produce unpleasant aromas, attract bugs, and harm the environment. Furthermore, many poultry owners face space constraints while composting, especially in urban or suburban regions with little outdoor space. Chicken excrement contains nutrients that can be collected and used to improve soil fertility.

Direct compost to the chicken coop with tunnel is the solution to this problem. Implementing a direct composting system within the chicken coop, particularly with a tunnel design, may solve food waste issues while increasing space efficiency and nutrient recycling. A designated area within the coop is allocated for composting, featuring multiple bins or compartments for different stages of the composting process. This area is strategically placed to allow easy access for adding new waste materials, turning the compost, and harvesting finished compost.

A recent survey on direct composting to chicken coops showed highly satisfied replies from those who found it advantageous. This indicates that the innovative idea of adding compost directly to the chicken coop will result in healthier chickens.

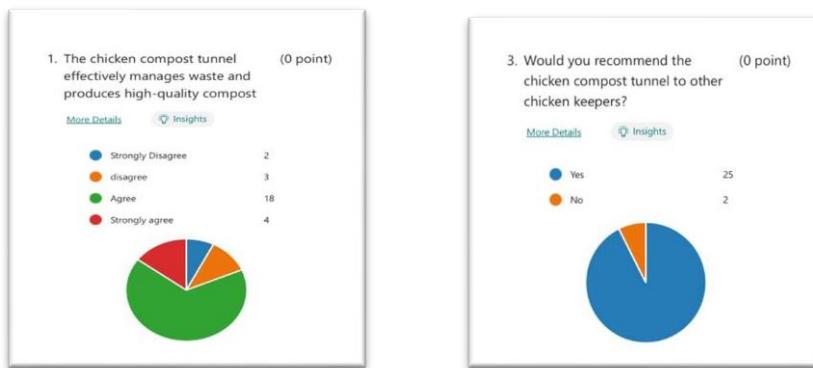


Figure 2: The result shows how interested respondents are in building a direct compost to chicken coop and how far the agree with this product.

5.0 CONCLUSION

To sum up, this project is able to compost directly to the chicken coop using the tunnel system which is a great idea for addressing the critical issue of food waste problem and chicken health. This project also shows that composting, raising chickens, and soil enrichment are all combined into a single, harmonious system in this method, which has several advantages, from cost savings and organic pest control to trash reduction and nutrient recycling. This direct-compost-to-chicken coop using a tunnel system is a new creative method that can be used to reduce the environmental effects of food production and waste generation. Therefore, this project shows that the use of this new system will give many benefits such as saving the breeder's time and chicken feeding schedule more organized. Lastly, hopefully, this new system will receive a high response from all parties, especially for new breeders.

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(A-SS036) STEPGUARD BOX

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ABSTRACT

StepGuard Box is an innovative product that addresses typical shoe-related difficulties such as unpleasant odors and fungal growth. This concept reimagines the traditional shoe box by including sophisticated elements designed to improve shoe storage cleanliness. The StepGuard Box combines fan ventilation, UV lamp technology, and long-lasting solar-powered batteries to offer a shoe storage solution that is both efficient and environmentally beneficial. The key goals of this invention are to produce a portable, sustainable solution that minimizes odors and avoids fungus growth. The StepGuard Box seeks to alter the shoe storage experience by using solar energy for electricity, fan ventilation to increase air circulation, and UV light to kill bacteria and fungi. The methodology entails combining various technologies into a compact, user-friendly design. According to the results, the StepGuard Box significantly reduces odor and fungal concerns while providing a high-quality, portable, and sanitary shoe storage option. Finally, this innovation encourages a more sanitary and sustainable approach to shoe storage, hence increasing user experience and shoe cleanliness.

Keyword : Shoe storage, Uv lights, Solar, Fan ventilation

1.0 INTRODUCTION

When it comes to storing shoes, shoe owners all around the world are always fighting against smells and fungal overgrowth. Seeing this recurring problem, creative efforts have been undertaken to transform traditional shoe storage options. The innovative idea presented in this abstract is a redesigned shoe box with cutting-edge features to fight odour, stop fungal development, and improve overall shoe storage cleanliness. This concept aims to raise the bar for shoe storage to previously unheard-of levels of simplicity and efficacy by combining fan ventilation, UV lamp technology, and sustainable solar-powered batteries.

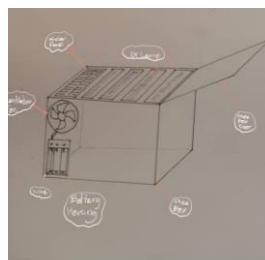
2.0 OBJECTIVE

The primary objective of this invention is to introduce a multipurpose shoe box with cutting-edge capabilities in order to overcome the inadequacies of traditional shoe storage techniques. The idea is to give shoe owners a solution that is portable, sustainable, and reduces odour and fungal development. The goal is to completely transform the shoe storage experience by utilising solar-powered batteries for

sustainable energy, fan ventilation to improve air circulation, and UV lamp technology to eradicate germs and fungus. With a focus on sustainability in both product design and usage, this invention aims to provide a holistic solution that enhances shoe hygiene.

3.0 METHODOLOGY

Our products are innovative in that they incorporate fan ventilation and a UV lamp into a shoe box powered by solar and small batteries. Shoe box included these elements to address issues like odors, fungi, and other concerns, ensuring that the shoes are even better protected. First, the fan. Fan ventilation effectively removes scents by increasing air circulation, which helps distribute and dilute the odor molecules in the air. As the air flows, the concentration of odor molecules drops, resulting in a lower perceived smell.



Next, there are UV lights, which are a form of electromagnetic radiation that has shorter wavelengths than visible light. We use UVC (short-wave ultraviolet): These have the shortest wavelengths and are the most toxic to living things. Shoes are often infected with fungi, thus UV light can kill them by destroying their DNA and interfering with their capacity to reproduce. (The Asahi Shimbun Asia & Japan Watch. (n.d.). The Asahi Shimbun)

Our shoe box uses solar with a tiny battery in which solar panels generate power during the day and then store it in a small battery for use when the sun is not shining, such as at night or on cloudy days. Furthermore, solar's flexibility and scalability combined with a compact battery make it ideal for powering portable and mobile inventions such as our shoe box.

4.0 RESULTS

Shoe boxes were upgraded to be high-quality, portable, and odor-resistant, perfect for travelers. Shoe Box includes a built-in fan to dry damp shoes, with future plans for transparent mirrors, UV lamps, and additional fans.

This shoe box includes a fan to help dry shoes and prevent rotting or bad odors, as moisture is the main cause of smelly shoes according to the research process. Next, Shoe Box incorporates UV lamps to combat bacterial growth, enhancing visibility in low light and eradicating microorganisms in 20 to 30 minutes based on studies.

Furthermore, Shoe Box comes with a battery container that serves as the "heart" of the device. It can facilitate the successful operation of all of its features. Furthermore, Shoe Box supplies solar energy for this project as a "backup" in case the batteries run out of power or if customers are unable to find a place to purchase batteries while away from the area. This is highly stressed in order to ensure that customers are happy with Shoe Box. Shoe Box Incorporate works hard to deliver the greatest experience possible to each and every user and will never compromise on quality.

5.0 CONCLUSION

In conclusion, the invention offers a complete solution to enhance shoe storage by successfully resolving issues with odour and bacterial development and fostering mobility and sustainability through the use of solar-powered batteries. This innovative shoe box might improve user experience and help create a more sanitary and clean shoe storage environment.

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(A-SS037) REVOLUTIONIZING HYDRATION WITH SELF-CLEANING WATER BOTTLE

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ABSTRACT

This abstract introduces “ Self-Cleaning Water Bottle” which is designed to address the pressing challenges associated with traditional water bottles. For the main objective, this study investigates the competitive landscape of innovation that surrounds self-cleaning water bottles, aimed at meeting the increasing demand for easy and clean hydration options. Through market research and prototype design based on consumer choices, the research assessed the effectiveness of self-cleaning mechanisms and compared them with conventional alternatives. The prototype achieves high consumer satisfaction, effectively removes impurities and offers environmental benefits through reduced reliance on waste bottles, all at competitive price points. To sum up all the information, Self Cleaning Water Bottle is a highly attractive option for individuals who are seeking a reliable and efficient hydration solution.

Keywords: Water Bottle, Self Cleaning, Convenience, Innovation, Hydration.

1.0 INTRODUCTION

The most effective way to ensure the water stays clean and pure with minimal effort on your part. Other than that, the percentage is above 90% can confirm that by using the UV-C Light surely eliminates the harmful germs and bacteria. The product will be lame without a good performance in any situation. The vacuum insulation to maintains your drink's temperature and a spill-proof lid for added convenience. No more hassle of constantly washing and scrubbing your water bottle, start the new era of effortless hydration. There are several factors to develop this self-cleaning water bottle. First and foremost, we need to prioritize the health and well being of users. But at the same time reducing the likelihood of illness caused by contaminated water bottles. Secondly, a self-cleaning water bottle helps to save time while people nowadays may not have time to clean their water bottle regularly. This pursuit of innovation not only enhances the users experience but also set new standards for product hygiene and functionality. We aim to create a product that meets the needs of today's consumers.

2.0 OBJECTIVES

These objectives serve as an outline for the whole product development process, guaranteeing that the final product satisfies standards for usability, sustainability, hygienic design, and technical innovation. Our main goal is to lower the danger of pollution and waterborne illnesses while giving customers access to safe and clean drinking water. In order to lessen the amount of single-use plastic waste, we also hope to promote environmental sustainability by promoting the usage of reusable water bottles. Self-cleaning water bottles maximize convenience by offering a hassle-free way to keep bottles clean, making them a sustainable alternative for long-term use. Ultimately, the goal of this research is to improve UV-C sterilization technology so that self-cleaning water bottles can use it more affordably and effectively while also increasing its effectiveness.

3.0 METHODOLOGY

This innovative self-cleaning water bottle involves a systematic approach to designing an innovative product that prioritizes cleanliness, convenience and sustainability. The following methodology will detail the key features, functionality, usefulness and practicality of the self-cleaning water bottle.

Table 1: Table above shows that the features, functionality, usefulness and practically of Self-Cleaning Water Bottle

Features	Functionality, Usefulness and Practically
UV-C Light Technology	This water bottle's interior is sterilized using UV-C light technology, which successfully gets rid of dangerous germs, viruses, and other diseases.
Antibacterial Materials	Antibacterial materials actively prevent the formation of mold and germs, guaranteeing that the water is always safe to drink.
Self-Cleaning Mode Button	Pressing this button activates the UV-C light technology, to sanitize the inside surface and get rid of any bacteria or smells that could still be there.
Leak-Proof Design	The bottle's built-in leak-proof construction keeps the surrounding area clean by preventing any unintentional spills or leaks.
Insulated Double-Wall	Featuring an insulated double-wall design, the bottle holds the beverage's temperature well within.

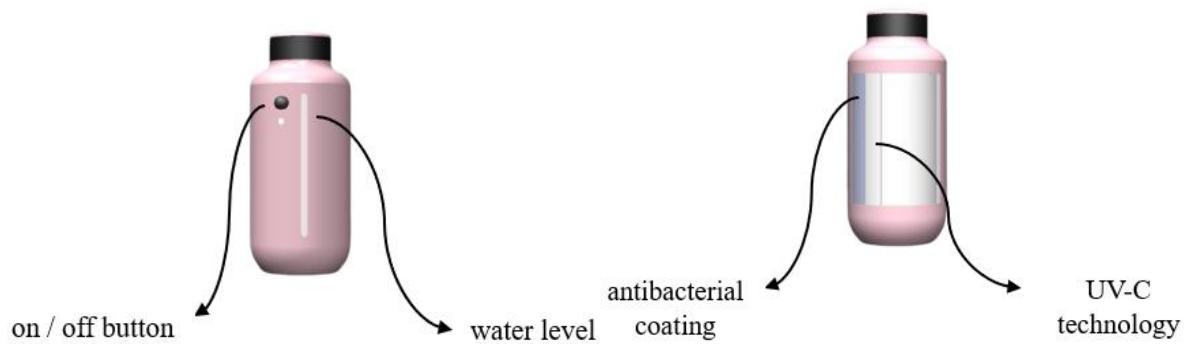


Figure 1 and 2: Self-Cleaning Water Bottle design from outside and inside

4.0 RESULTS

In a recent survey conducted show that the majority with 92.1% respondents expressed that they are very concerned about the cleanliness of their water bottles. Since the condition of their water bottles will affect the level of cleanliness of the water they will drink, 55.3% respondents agreed that they should consider to purchase a self-cleaning water bottle meanwhile 39.5% respondents think that they might purchase a self-cleaning water bottle but it depends on the price that will be offered later. This shows that the innovation idea of self-cleaning water bottle will be one of the people's choice as one of the steps to ensure their health is guaranteed.



Figure 1 and 2: The respondents very concerned about their water bottle and consideration to purchase a self-cleaning water bottle

Furthermore, 42.1% respondents choose features/functionality offered as one the factor that influence their decision to purchase a water bottle. Additionally, the majority with 42.1% responds shows that they prefer UV-C Light as one of the self-cleaning method in their water bottle. Other than that, 39.5% and 18.4% respondents decided on antibacterial coating and filter-based coating for their preferred self-cleaning method. This can conclude that the features that offer by self-cleaning water bottle can give big impact to its users.



Figure 3 and 4: Respondents appoint the factors and self-cleaning method that they preferred

5.0 CONCLUSION

In conclusion, Self-Cleaning Water Bottle is a good solution to the challenges by traditional water bottles, offering enough hygiene, convenience , sustainability and cost effectiveness. Self-Cleaning Water Bottle ensures people of consistent water cleanliness, reducing the risk of bacterial defects and promoting safe hydration for users by using this self cleaning water bottle. With the new features, self cleaning water bottles can fulfill the consumer needs and their ability to minimize plastic waste through long term reuse aligns with environmental sustainability goals.

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(A-SS038) THE SMART BACKPACK

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ABSTRACT

Smart backpacks are an innovative development in travel gear because they combine modern technology with useful features to make traveling more enjoyable. At its foundation, sustainability is important, and an integrated solar panel uses clean energy to power electronics on the go. This cuts down on reliance on traditional power sources and is in line with environmental awareness. The ability to charge wirelessly makes traveling even easier by letting you get power without having to deal with lines or adapters. Safety and usefulness are improved by built-in LED lights that provide illumination for trips at night and improve visibility when there isn't much light. A smart organization system makes the best use of storage space and ease of entry, reducing clutter and making it easier to find things. Bluetooth connection makes the backpack more useful by letting it work seamlessly with smartphones and other smart devices, which makes tracking and remote access easier. In essence, the smart backpack is the perfect example of innovation, sustainability, and connection, and it promises a more enjoyable and efficient trip.

Keywords: Smart Backpack, Sustainability, Solar Power, Wireless Charging, Bluetooth Connectivity

1.0 INTRODUCTION

Introducing the smart backpack: a revolution in travel gear that seamlessly blends modern technology with practicality. With a focus on sustainability, its integrated solar panel powers electronics on the go, reducing reliance on traditional energy sources. Wireless charging enhances convenience, while built-in LED lights improve safety during night travels. An intuitive organization system minimizes clutter, and Bluetooth connectivity adds seamless integration with smartphones. In essence, the smart backpack embodies innovation, sustainability, and connectivity for an enhanced travel experience.

2.0 OBJECTIVES

The Smart Backpack is designed with a strong emphasis on sustainability and environmental responsibility, integrating several features that highlight the company's commitment to minimizing environmental impact throughout the product's lifespan.

One of the key eco-friendly elements is the incorporation of solar panels, which harness solar energy to charge devices. This feature not only promotes energy efficiency but also aligns with broader efforts to reduce reliance on conventional power sources and lower fossil fuel dependency. By adopting such a design strategy, the

Smart Backpack not only raises awareness about environmental issues but also meets the growing consumer demand for more sustainable product choices.

Safety and visibility are paramount in the Smart Backpack's design, addressing the need for enhanced user protection. The integration of LED lights significantly improves visibility in low-light conditions or complete darkness, making users more noticeable to other road users, cyclists, pedestrians, and drivers. This feature plays a crucial role in reducing the risk of accidents or collisions, thereby enhancing overall safety and well-being.

Organization and security are also key priorities in the Smart Backpack. The advanced smart organization system utilizes RFID tags or smart sensors, allowing users to track and manage their belongings more efficiently. This system reduces the likelihood of lost or forgotten items, providing users with greater peace of mind. Additionally, Bluetooth connectivity enables various services, such as inventory management, GPS tracking, and anti-theft alarms, further enhancing the security and convenience for users.

Moreover, the Smart Backpack's use of solar energy for charging devices exemplifies a commitment to energy conservation and reduced environmental impact. By relying on solar power instead of traditional electricity, the backpack supports sustainable living initiatives and helps decrease dependency on fossil fuels. This approach not only conserves energy but also contributes to broader environmental conservation efforts.

In summary, the Smart Backpack is designed to promote eco-friendly practices, enhance user safety, ensure efficient organization and security of personal items, and support energy conservation. These features collectively reflect the company's dedication to sustainability and user well-being, catering to the needs of environmentally conscious consumers.

3.0 METHODOLOGY

The Smart Backpack is an innovative product that meets the demands of modern, environmentally conscious customers with multiple functions capable of solving everyday problems.

The Smart Backpack incorporates a high-efficiency solar panel seamlessly integrated into its exterior. This solar panel collects solar energy during the day and converts it into usable electrical power, stored in a built-in battery. This stored energy can later be used to charge electronic devices such as portable speakers, tablets, cell phones, and cameras while on the move. The solar panel is designed to be weather-resistant and durable, ensuring reliable operation in various outdoor conditions.

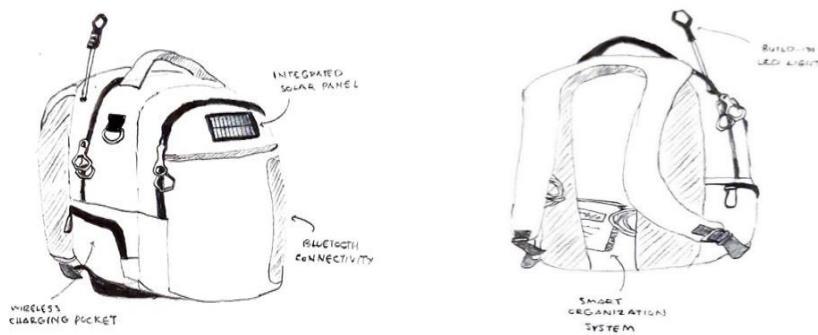
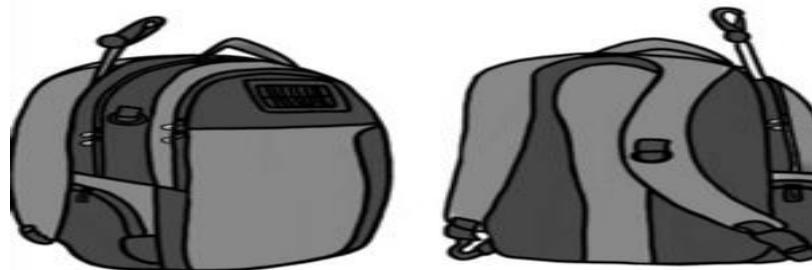
In addition to the solar panel, the Smart Backpack features a specialized wireless charging pocket. This pocket allows users to charge their devices, such as smartphones and wireless earbuds, without the need for cables or adapters. By simply placing their devices into this pocket, users can enjoy the convenience of wireless charging, eliminating the hassle of tangled cords and enabling them to stay connected and fully charged while traveling.

To enhance visibility and safety, the Smart Backpack is equipped with built-in LED lights. These lights improve the visibility of the user in low-light or nighttime conditions, making them more noticeable to other road users, cyclists, pedestrians, and drivers. The LED lights are designed for long-lasting durability and energy-efficient operation, ensuring consistent illumination when it is most needed.

The Smart Backpack also includes an advanced smart organization system to facilitate better management and tracking of items. Interior compartments are equipped with RFID tags or smart sensors connected to a smartphone app. This app allows users to easily locate specific items within the bag, reducing the likelihood of lost or forgotten belongings. The organization system enhances efficiency and saves time by enabling users to find and retrieve items quickly.

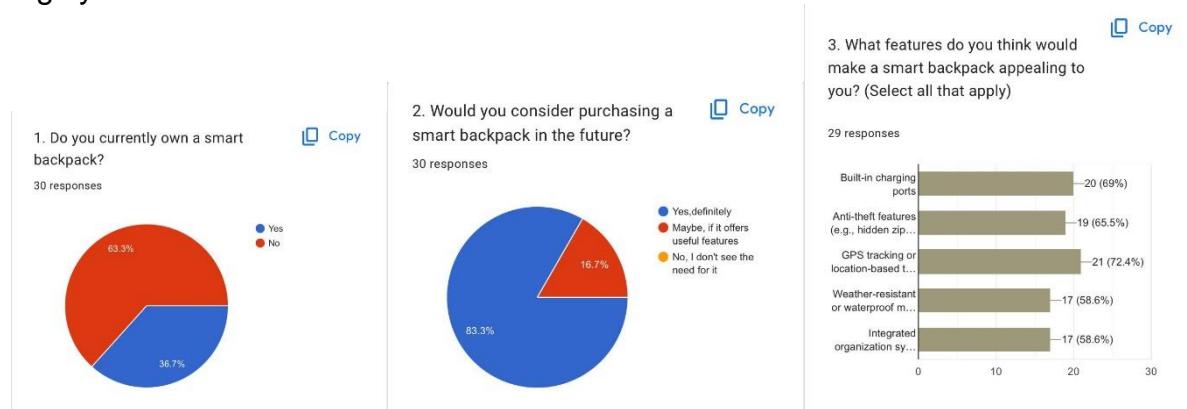
Furthermore, the Smart Backpack is equipped with Bluetooth connectivity, enabling seamless communication with a mobile application. This app provides several services, including inventory management, anti-theft alerts, and GPS tracking. Users can manage the contents of their backpack, remotely track its location, and receive notifications in case of theft or unauthorized access. Bluetooth connectivity offers users added security and peace of mind, ensuring their valuables are protected while they are on the go.

In summary, the Smart Backpack's methodology revolves around integrating cutting-edge technology to enhance functionality, convenience, and safety. The incorporation of a high-efficiency solar panel, wireless charging pocket, built-in LED lights, smart organization system, and Bluetooth connectivity collectively ensures that users can stay organized, secure, and connected in an eco-friendly manner.

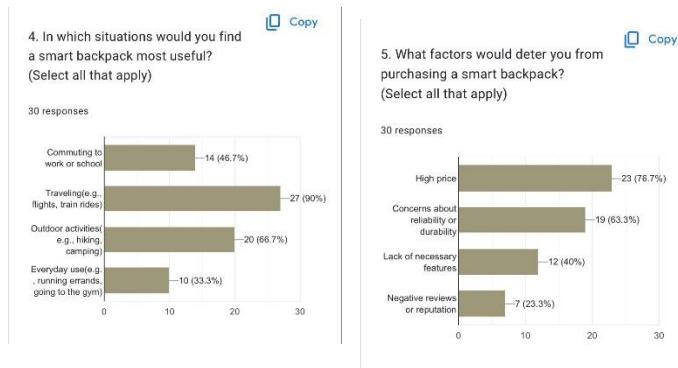


4.0 RESULTS

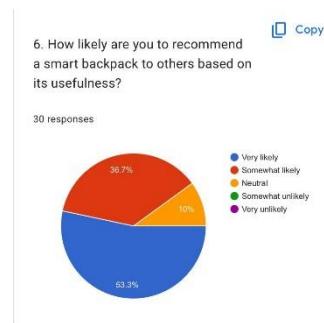
Based on a survey that has been conducted among students and the publics, a majority of respondents, with 63.3%, currently owning one and 83.3% expressing definite interest in purchasing in the future, with an additional 16.7% considering it if the features are appealing. This keen interest is fuelled by features like built-in charging ports (69%), anti-theft measures (65.5%), GPS tracking (72.4%), weather resistance (58.6%). These features cater to various needs, making smart backpack highly versatile.



Smart backpacks are deemed most useful for traveling (90%) and outdoor activities (66.7%), with a smaller percentage seeing them as essential for everyday use (33.3%). However, potential buyers are deterred by factors such as high prices (76.7%), concerns about reliability (63.3%), lack of necessary features (40%), and negative reviews (23.3%).



Despite these concerns, 53.3% are very likely and 36.7% somewhat likely to recommend smart backpacks based on their perceived usefulness, with only 10% remaining neutral.



This indicates a positive user experience and satisfaction with the utility provided by smart backpacks. Addressing affordability and reliability concerns while continuing to innovate on features could further drive adoption in the future.

5.0 CONCLUSION

In conclusion, smart backpacks blend modern technology with practicality, focusing on sustainability, convenience, safety, and connectivity. Survey results show a strong consumer interest, despite challenges such as pricing and reliability concerns. Overall, smart backpacks promise to redefine travel with innovation and efficiency.

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(A-SS040) TUFFAH-TREATS: Repurposing Wholesome Delights from Apple Peels

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ABSTRACT

In recent years, the global food industry has been grappling with the pervasive issue of food waste, where significant portions of edible biomass are discarded at various stages of production and consumption. This includes the disposal of nutrient-rich apple peels during apple product processing. Tuffah-Treats addresses this issue by repurposing apple peels into nutritious and sustainable snacks, aligning with ethical and wholesome (*Halalan Thayyiban*) food practices. Tuffah-Treats reduces food waste and environmental impact while promoting better health outcomes by transforming discarded apple peels into a healthy snack alternative. Apple peels, rich in dietary fibre, vitamins C and K, and antioxidants, offer benefits such as improved digestion, blood sugar regulation, and reduced risk of chronic diseases. These snacks, with their low-calorie, low-fat profile, provide health-conscious consumers with a balanced and nutritious option. The creation of Tuffah-Treats involves cleaning and preparing apple peels, infused with olive oil, sea salt, and cinnamon seasonings, then air-frying them to preserve their nutritional value. The choice of air frying is deliberate, as it significantly reduces the use of oil, thereby enhancing the health profile of the snack, and making the preparation process more energy-efficient. Additionally, Tuffah-Treats exemplifies sustainability by fostering responsible consumption and supporting a circular economy. This innovative approach not only enhances consumer wellness but also contributes to a more sustainable food ecosystem, which contributes to several Sustainable Development Goals (SDGs), including SDG 3 (Good Health and Well-being) by offering healthier snack options, SDG 12 (Responsible Consumption and Production) by reducing food waste, and SDG 13 (Climate Action) by minimising environmental impact through sustainable practices.

Keywords: Apple Peels, Food Waste, Halalan Thayyiban, Sustainable Snacks

1.0 INTRODUCTION

The global food industry faces significant food waste, with large quantities of edible biomass discarded during production and consumption. Approximately one-third of all food produced globally is lost or wasted, translating to about 1.3 billion tons annually. This waste occurs across various stages of the food supply chain, including production, processing, and consumption, leading to economic losses and environmental impacts, such as increased greenhouse gas emissions and resource depletion (United Nations, n.d; Goodwin, 2023). The food industry's waste has been extensively examined in the literature, with the suggestion of utilising it not only for organic fertilisation or animal feed but also as raw materials for innovative food items (Ayala-Zavala et al., 2010). Therefore, it is imperative to enhance the utilisation of fruits by fully exploiting their many species to generate novel food resources and reduce food wastage. Typically,

the outer parts of the fruit, such as the peels, contain a substantial quantity of biopolymers, bioactive compounds, and functional nutrients. Unfortunately, these components are often thrown away during processing, leading to a considerable loss of nutritional value. (Ayala-Zavala et al., 2010).

Concurrently, awareness of the need for sustainable and healthier food choices is increasing. Hence, numerous researchers are employing the fruit peel waste produced by agro-industries to create food products with enhanced value. By incorporating fruit peels, it is possible to create novel functional food products such as fruit bars. They could offer additional calories and vital nutrients, specifically protein, fats, fibre, vitamins, and minerals. (Gupta et al., 2023).

Fruit peel bars are delectable, dried fruit slabs that are delicious, chewy, rich in fibre, naturally low in fat, energy-dense, and possess health-enhancing benefits (Kumar et al., 2020; Gupta et al., 2023). They serve as a cost-effective and practical alternative to value-added natural bars produced through a complicated process using dried fruit peels and other materials (Gupta et al., 2023). The objective of the current investigation was to create apple peel as a nutritious and satisfying snack option.

Apple peels, rich in fibre, vitamins, and antioxidants, are often wasted despite their nutritional value. Hence, apple peel can be leveraged to create healthy and tasty snacks. Thus, Tuffah-Treats offers an innovative solution using apple peels to create new and healthy delights. Named from the Arabic word "*Tuffah*," meaning "apple," these treats align with *Halalan Thayyiban* principles, promoting ethical and sustainable food practices. Moreover, apples are nutritious, and their peels, high in dietary fibre and antioxidants, offer substantial health benefits (Hyson, 2011; Feretti et al., 2014). By repurposing apple peels, Tuffah-Treats provides a delicious, low-calorie snack while reducing food waste and supporting environmental sustainability. This approach not only addresses the issue of food waste but also adheres to Islamic values of responsible consumption and resourcefulness.

2.0 OBJECTIVES

The primary objective of this research is to develop a nutritious snack using apple skins and to evaluate its nutritional content and consumer acceptability. This involves preparing Tuffah Treats, conducting tests for fats, sugars, iodine, and proteins to ensure the snack's healthfulness, and performing a sensory evaluation to understand consumer preferences regarding taste, texture, appearance, and overall acceptability.

3.0 METHODOLOGY

3.1 Material

The materials used in this study include apple skins, spices and flavourings such as cinnamon and salt, and basic baking supplies like baking sheets. To enhance the crunchiness of the snacks, olive oil was evenly coated on the apple skin, and cornstarch was added to improve shelf life. Laboratory equipment for food tests included test tubes, reagents, and other standard lab tools. Additionally, materials for sensory evaluation, such as survey forms and scoring sheets, were utilised to collect participant feedback.

3.2 Method

The research methodology comprises the preparation of Tuffah Treats, conducting food tests to analyse their nutritional content, and performing sensory evaluations to assess their acceptability among consumers. This structured approach ensures that both the health benefits and consumer preferences of Tuffah Treats are comprehensively evaluated.

3.3 Preparation of Tuffah Treats

The preparation process for Tuffah Treats begins with collecting apple skins from organic apples, ensuring they are thoroughly cleaned and free from pesticide residues. The apple skins are then spread evenly on a baking sheet and sprinkled with cinnamon and salt. To enhance the crunchiness of the snacks, olive oil was evenly coated on the apple skin, and cornstarch was added to improve shelf life. Olive oil contributes to a crunchier texture by creating a barrier that reduces moisture absorption during cooking, similar to its use in crispy potato skin chips (Drawbaugh, 2023). Cornstarch, on the other hand, aids in creating a crispy coating and extending shelf life by reducing moisture content (Kylene, n.d.).

Moreover, recent studies indicate that cornstarch can also act as a carrier for antioxidant compounds, which suggests that it not only improves texture and shelf life but can also enhance the antioxidant properties of the product by delivering beneficial compounds (Garcia et al., 2020). This combination of olive oil and cornstarch thus proves effective in enhancing the quality and prolonging the shelf life of snacks. The apple skins were then air-fried until they achieved a crispy texture to promote a healthier preparation, as this method reduces the amount of oil required compared to traditional frying techniques. Once done, the apple skins are allowed to cool and stored in an airtight container to maintain their freshness and crispiness.

3.4 Food Tests

Four primary food tests were conducted to evaluate the nutritional content of Tuffah Treats: the fats test, sugars test, iodine test, and protein test. Each test was designed to identify the presence and concentration of specific nutrients. The indicators for these tests are shown in Table 1. The Tuffah Treats were analysed at the Ibnu Sina Laboratory, Universiti Islam Sultan Sharif Ali, Sinaut Campus, on July 6, 2024.

Table 1. Chemical Test for Nutrients and Results Indicator

Test	Indicator of Presence	Indicator of Absence
Ethanol Test (Fats)	Cloudy solution	Clear solution
Benedict's Test (Sugars)	Green (very low), Yellow (low), Orange (high), Red (very high)	Blue
Iodine Test (Starch)	Blue-black colour	Brown colour
Biuret Test (Proteins)	Violet or purple	Blue

3.5 Sensory Evaluation

A sensory evaluation was conducted with a panel of five participants to gauge the acceptability of Tuffah Treats. Each participant assessed the product using a 10-point

hedonic scale, where ratings ranged from “strongly dislike” (1) to “strongly like” (10). Feedback was collected on attributes such as colour, texture, flavour, appearance, and overall acceptance. This evaluation was essential for refining the product to better align with consumer preferences and plays a critical role in the ongoing research and development process, informing further improvements before bringing Tuffah Treats to market.

4.0 RESULTS

4.1 Tuffah Treats

The final product of Tuffah Treats is illustrated in Figure 1.



Figure 1. Tuffah Treats

4.2 Food Test Analysis of Tuffah Treats

4.2.1 Ethanol Test: Test for Fats

The fats test was conducted using ethanol to determine the presence of lipids in Tuffah Treats. A small sample of Tuffah Treats was crushed and placed in a test tube. 2 mL of ethanol was then added to the test tube, and the mixture was shaken thoroughly to ensure the extraction of any lipids present. The ethanol solution was observed for any changes after allowing the mixture to settle for 5 minutes. As shown in Figure 2, the solution remained clear, indicating a negative result, which means that Tuffah Treats contain no detectable fats (see Table 1).

The absence of fats in Tuffah Treats is significant for individuals monitoring their fat intake for weight management or health reasons. This aligns with the product's positioning as a healthy snack option and with the Thayyib aspect of Halalan Thayyiban, which emphasises the consumption of wholesome and health-promoting foods. While the test does not account for trace amounts of essential fatty acids, the lack of detectable fats supports the idea of Tuffah Treats as a beneficial choice for health-conscious consumers.



Figure 2. Results of Fats Test for Tuffah Treats

4.2.2 Benedict's Test: Test for Sugars

The sugars test was conducted using Benedict's reagent to detect reducing sugars in Tuffah Treats. Initially, a sample of Tuffah Treats was crushed and mixed with distilled water to create a solution. A portion of this solution was then placed in a test tube, and Benedict's reagent was added. The mixture was heated in a water bath for a few minutes. As shown in Figure 2, the solution turned green, indicating the presence of a deficient concentration of reducing sugars. This highlights that Tuffah Treats contain only a minimal sugar content, which is advantageous for consumers managing their blood sugar levels, such as people with diabetes, while reducing the risk of health issues like obesity.



Figure 3. Results of Sugars Test for Tuffah Treats

4.2.3 Iodine Test: Test for Starch

The iodine test was conducted to detect the presence of starch in Tuffah Treats. A sample of the apple skin extract was mixed with an iodine solution. The solution turned brown upon mixing, indicating the absence of starch in Tuffah Treats, as shown in Figure 3. The brown colour observed confirms that Tuffah Treats do not contain starch, which supports the idea that they are a low-calorie snack.

Additionally, the lack of starch means that Tuffah Treats are less likely to contribute to rapid spikes in blood glucose levels, making them an appropriate choice for individuals managing their blood sugar levels. Refined carbohydrates and added sugars cause blood sugar spikes due to their high glycemic index and lack of fibre, vitamins, and minerals (Rowles, 2024). In contrast, foods high in fibre, such as non-starchy vegetables, whole grains, and legumes, help stabilise blood sugar levels by slowing

the digestion and absorption of carbohydrates (Mayo Clinic, 2023). Tuffah Treats can provide a healthier alternative for those monitoring their blood glucose by minimising the use of refined carbs and added sugars.



Figure 4. Results of Starch Test for Tuffah Treats

4.2.4 Biuret Test: Test for Protein

Finally, the protein test was conducted using the Biuret reagent to determine the presence of proteins in Tuffah Treats. The Biuret reagent, a copper sulfate and sodium hydroxide mixture, reacts with protein peptide bonds to form a complex. If proteins are present, the solution changes colour from blue to purple (Aryal, 2024). The Biuret reagent was mixed with the apple skin extract during the food test analysis, and the resulting solution was observed. As shown in Figure 4, the solution remained blue, indicating the absence of proteins in Tuffah Treats.

This finding is pertinent for those requiring a controlled protein intake, such as individuals with certain kidney conditions or those following specific dietary regimens. While the absence of protein may be a limitation for those seeking protein-rich snacks, it aligns well with the product's intended use as a low-calorie, low-fat, and low-sugar snack option. Tuffah Treats can be paired with other protein sources for consumers who need protein to create a balanced snack. This flexibility ensures that Tuffah Treats can fit into various dietary needs, adhering to the Halalan Thayyiban principle of wholesome consumption.



Figure 4. Results of Protein Test for Tuffah Treats

4.3 Sensory Analysis of Tuffah Treats

A sensory evaluation was conducted with a panel of five participants to assess Tuffah Treats regarding taste, texture, appearance, and overall acceptability. Participants

rated each attribute on a scale of 1 to 10, where 1 is the least favourable and 10 is the most favourable. The results, summarised in Table 2, indicate an overall positive reception of the product.

Table 2. Average Sensory Score of Tuffah Treats

Sensory Attribute	1 st Judge	2 nd Judge	3 rd Judge	4 th Judge	5 th Judge	Avg.
Taste	8	7	9	9	8	8.2
Texture (Crispiness)	7	7	8	9	7	7.6
Appearance	7	8	8	7	7	7.4
Overall Acceptance	7	8	10	8	8	8.2

The taste of Tuffah Treats received consistently high ratings, ranging from 7 to 9. This suggests that the flavour, derived from the combination of organic apple peels, cinnamon, and salt, is highly appealing and meets consumer expectations. The positive feedback highlights the effectiveness of these ingredients in delivering a satisfying and enjoyable taste, aligning with findings that emphasise the importance of flavour in consumer acceptance of food products (Rai et al., 2023; Baker et al., 2024). Studies indicate that taste is a crucial determinant of consumer preferences, with consumers often unwilling to compromise on flavour, even for health benefits (Verbeke, 2006).

Similarly, texture scores ranged from 7 to 9, reflecting general satisfaction with the snack's mouthfeel. Adding olive oil and cornstarch is likely instrumental in achieving this positive texture. Olive oil enhances crunchiness, while cornstarch contributes to a desirable crispy coating. These components are essential for a pleasurable eating experience and are consistent with the high ratings observed. Research indicates that the texture of snacks significantly influences consumer preferences, emphasising the need for optimal texture in product development (Food Research Lab, 2022).

Appearance scores were also favourable, with participants rating the visual appeal between 7 and 8. This can be attributed to the air-frying process, which imparts a golden-brown colour, and the inclusion of spices, which enhance the snack's visual attractiveness. Studies show that visual appeal plays a significant role in food choice, as consumers often rely on appearance to indicate quality (Schaub, 2015; Rai et al., 2023). Hence, a pleasing appearance is crucial for consumer acceptance, and these results indicate that Tuffah Treats are well-received in this regard.

Finally, the overall acceptability scores, which ranged from 7 to 10, reflect broad approval of Tuffah Treats. This high overall satisfaction level suggests that the combination of favourable taste, texture, and appearance aligns well with consumer preferences. The variation in scores, with one participant providing a perfect score of 10, highlights the potential for even greater consumer enthusiasm. Sensory evaluations are fundamental in understanding consumer preferences and guiding product development, as they provide insights into the attributes that drive acceptance (Food Research Lab, 2022). These positive feedbacks indicate that the selected ingredients and preparation methods effectively meet consumer expectations. Continued attention to these attributes will ensure the product's success in the market.

5.0 CONCLUSION

The evaluation of Tuffah Treats highlights its distinctive integration of sustainability and health-conscious principles. By utilising apple peels, Tuffah Treats addresses the global issue of food waste. Besides, the positive results from the sensory evaluation, where Tuffah Treats received high scores for taste, texture, and appearance, show its success in combining environmental responsibility with consumer satisfaction. The product's low fat and minimal sugar content enhances its appeal to health-conscious consumers, aligning with the growing preference for nutritious and sustainable snacks (Hoek et al., 2017). Additionally, from a Halal perspective, the adherence to permissible ingredients and Islamic dietary laws further supports the product's market suitability. The food test results confirm that Tuffah Treats align with the Thayyib principle, offering a nutritious and health-promoting snack.

Overall, the innovative approach of Tuffah Treats exemplifies a triumphant delight of sustainability, health, nutrition, and consumer appeal. Its ability to transform food waste into a desirable product demonstrates its potential for significant market impact. As consumer awareness of the environmental effects of their food choices increases, products like Tuffah Treats, which emphasise sustainability and health, are expected to resonate strongly in the marketplace. Sensory evaluation studies support this, showing that appealing sensory attributes are crucial for consumer acceptance and purchasing decisions (Food Research Lab, 2022).

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(A-SS041) TRANSFORMING EDUCATION THROUGH POSITIVE EMOTIVE LANGUAGE AND TECHNOLOGY

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ABSTRACT

Traditional teaching approaches often overlook the importance of emotional support and positive reinforcement, leading to disengagement and diminished learning outcomes. To address this, our innovation integrates Positive Emotive Language (PEL) principles with technology, offering educators a comprehensive module to cultivate supportive learning environments. By equipping educators with practical strategies and diverse technology tools, such as multimedia presentations and mindfulness apps, our innovation enhances classroom.

Keywords: Positive Emotive Language (PEL), Technology Integration, Classroom Engagement, Educational Innovation, Sociology-emotional Development

1.0 INTRODUCTION

Engagement and motivation are pivotal for effective learning experiences, yet classrooms often struggle to cultivate environments conducive to these factors (Reeve, 2013). Recognizing this challenge, our innovation proposes a transformative approach to education through the integration of Positive Emotive Language (PEL) and technology. The motivation behind our product lies in addressing the need for fostering supportive classroom cultures that enhance student well-being, motivation, and emotionalism development (Eccles & Wang, 2016).

2.0 OBJECTIVE

The objective of our innovation is twofold: first, to equip educators with the knowledge and skills to integrate PEL into their teaching practices, and second, to leverage technology to amplify the impact of PEL on student engagement and well-being (Guo et al., 2019).

3.0 METHODOLOGY

Our product offers a comprehensive module designed to empower educators with practical strategies and tools for incorporating PEL into classroom communication. The module begins with an introduction to PEL, outlining its principles, theoretical

framework, and significance in education (Meyer et al., 2020). Strategies for integrating PEL into classroom communication are explored, emphasizing language choice, feedback mechanisms, rapport building, and fostering gratitude. The module further delves into the utilization of technology tools across various categories, including multimedia presentations, interactive whiteboard applications, communication platforms, gamification systems, storytelling platforms, mindfulness applications, positive reinforcement platforms, AR/VR experiences, feedback and assessment tools, and social media platforms. Practical applications and classroom implementation are emphasized through case studies, collaborative brainstorming sessions, role-playing exercises, and reflective practices.

4.0 RESULTS

The integration of PEL and technology offers numerous advantages and impacts. By fostering a positive classroom environment, our innovation promotes student engagement, motivation, and socio-emotional development (Liew et al., 2018). The novelty of our approach lies in the seamless integration of PEL principles with diverse technology tools, offering educators a comprehensive toolkit for creating inclusive and supportive learning environments. Through real-life examples and practical applications, our innovation empowers educators to transform their teaching practices and enhance student outcomes.

5.0 CONCLUSION

In conclusion, our innovation presents a pioneering approach to education, combining the power of Positive Emotive Language with cutting-edge technology tools. By equipping educators with the knowledge, skills, and resources to integrate PEL into their teaching practices, we aim to foster a culture of sustainable innovation and excellence in education, ultimately enhancing student engagement, motivation, and well-being (Kupersmidt et al., 2021).

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(A-SS044) BPM HEALTH WAQF

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ABSTRACT

This project presents the development of a Best Practices Model (BPM) for Health Waqf aimed for the State Islamic Religious Council (SIRC). Using a case study approach, the research involved a sample of 12 participants, selected through purposive sampling. The primary data was collected through in-depth interviews with key stakeholders from the SIRC and analyzed using thematic analysis to identify main themes and best practices. The findings suggest several best practices that can enhance the effectiveness and sustainability of health waqf initiatives, including strategic development, financial planning, transparent governance, and continuous monitoring and evaluation. The BPM developed in this study provides a comprehensive framework that can be adapted by other waqf institutions to optimize their health waqf programs. The implementation of this model is expected to benefit the SIRC by improving the management and impact of health waqf, ensuring better allocation of resources, enhancing community trust, and ultimately contributing to improved community health outcomes. This project contributes to the limited body of knowledge on health waqf and offers practical insights for policymakers and practitioners within Islamic religious.

Keywords: Best practices, Health Waqf, Sustainability

1.0 INTRODUCTION

Waqf is the act of dedicating property to be kept in trust and utilised for charity or religious purposes (Muhammad, 2017). This practice has significantly influenced the socio-economic progress of Muslim communities throughout history. Health waqf, specifically aimed at improving health services and outcomes, represents an innovative application of this traditional practice. However, the management and implementation of health waqf require meticulous planning, strategic governance, and continuous evaluation to ensure their effectiveness and sustainability.

The State Islamic Religious Council (SIRC) is responsible for the management and supervision of waqf assets and activities under its authority (Haron et al., 2021). As health issues become increasingly complex and resources more constrained, there is a pressing need for a structured approach to maximize the impact of health waqf initiatives. The importance of implementing best practices in health waqf is crucial due to various challenges impacting the effective provision of healthcare resources through waqf institutions. These challenges include issues of transparency, trust, and misuse

of donations within waqf management (Huang & Nordin, 2021). State waqf institutions face financial sustainability challenges, necessitating the adoption of best practices by trustees (Sulaiman & Alhaji Zakari, 2019). Furthermore, the socio-economic functions of waqf should not just focus on reducing poverty, but also embrace other objectives of sustainable development, such as healthcare (Medias et al., 2021).

Waqf has been utilized in various Muslim countries to provide healthcare equipment and support to those affected by the pandemic, showcasing its potential in addressing healthcare needs (Kasri & Chaerunnisa, 2022). However, optimizing the impact of waqf in healthcare requires designing models tailored to the specific conditions of each region, such as developing micro-fintech models for Islamic micro financial institutions (Ascarya & Sakti, 2022).

In conclusion, the complexities surrounding health waqf underscore the necessity of implementing best practices to ensure effective and sustainable healthcare provision through waqf institutions. By addressing issues of transparency, accountability, and governance, and adapting waqf models to contemporary needs, healthcare resources can be efficiently channelled to support communities in need. This necessitates the development of a Best Practices Model (BPM) that can provide a systematic framework for the SIRC to optimize their health waqf programs.

2.0 OBJECTIVE

To develop a comprehensive Best Practise Model (BPM) that incorporates identified best practices and addresses existing challenges.

3.0 METHODOLOGY

The primary objective of this research is to develop a Best Practices Model (BPM) for Health Waqf designed to the needs and context of the State Islamic Religious Council (SIRC). Specific objectives include identifying and documenting current practices and challenges in the management of health waqf within the SIRC, exploring stakeholders' perspectives on effective strategies for optimizing health waqf programs, developing a comprehensive BPM that incorporates identified best practices and addresses existing challenges, and providing practical recommendations for the implementation and improvement of health waqf initiatives by the SIRC and similar organizations. The outcomes of this research aim to enhance the effectiveness, sustainability, and impact of health waqf programs, contributing to better health outcomes for the communities served by the SIRC.

4.0 RESULTS

The development of a Best Practices Model (BPM) for Health Waqf designed to the State Islamic Religious Council (SIRC) offers significant advantages by enhancing management efficiency, improving resource allocation, and increasing transparency and accountability. This structured framework ensures that health waqf activities align with best practices, leading to more efficient use of resources and better administrative practices. It promotes sustainable health initiatives by adopting strategic planning,

continuous evaluation, and transparent governance, thereby fostering stakeholder engagement and community trust. The BPM's novelty lies in its innovative application of traditional waqf concepts to modern health challenges, customized specifically for the SIRC to ensure relevance and effectiveness. Additionally, its scalability and adaptability make it a valuable resource for other Islamic religious councils. Overall, the BPM is expected to improve health outcomes, ensuring long-term benefits and impactful health waqf programs that serve the broader community.

5.0 CONCLUSION

In conclusion, this BPM health waqf is able to benefit the State Islamic Religious Council (SIRC) in governance to maintain the sustainability of health waqf in the future. The BPM Health Waqf provides comprehensive guidance to the SIRC for strategizing from various aspects, including finance, management, and asset management. By adopting this model, SIRC can ensure efficient use of resources, enhance transparency and accountability, and promote active stakeholder engagement. This innovative approach not only addresses current health challenges but also adapts traditional waqf principles to modern needs, ensuring long-term impact and better health outcomes for the community.

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(A-SS046) "WONDER SEAT: ECO-FRIENDLY PEDIATRIC CHAIR"

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ABSTRACT

Nowadays, the recent environmental woes that also stem from the healthcare sector is concerning. Thus, "Wonder Seat: Eco-friendly Pediatric Chair" has turned out to be an almost perfect practice to incorporate sustainable practice in the healthcare setting. Also, this project helps create awareness of eco-friendly practice from an earlier age while decreasing its ecological footprint. Through this conversion, we hope to demonstrate the viability to produce standard, healthy furniture of excellent quality and most importantly support sustainability. Our product focuses that recycled pediatric chairs were cost-effective, reduce waste and have environmental benefits that we should be encouraging more widely. This project epitomizes the potential use of eco-friendly materials in making core medical furniture.

Keywords: Eco-friendly, Pediatric Chairs, Sustainable

1.0 INTRODUCTION

In the face of escalating environmental concerns, the imperative for sustainable solutions has become increasingly urgent (Chien & Wang, 2022). The healthcare sector, traditionally associated with significant waste and resource consumption, is no exception. Addressing this challenge, the "Wonder Seat: Eco-friendly Pediatric Chair" initiative aims to revolutionize the production of pediatric furniture by utilizing recycled materials (Sweeney & Han, 2021). Traditional methods of manufacturing healthcare furniture often involve high waste levels and reliance on non-renewable resources, contributing to environmental degradation (Smith & Patel, 2020). By integrating recycled components, including repurposed drip tubes for backrests, this project not only addresses these issues but also sets a benchmark for sustainable practices within healthcare settings (Williams & Davis, 2019).

The need for eco-friendly solutions is underscored by the substantial ecological footprint of conventional medical furniture (Jones & Stewart, 2023). The "Wonder Seat" project seeks to mitigate this impact by demonstrating that it is possible to produce pediatric chairs that are both environmentally friendly and compliant with rigorous healthcare standards. This initiative aligns with the broader goal of reducing waste and conserving resources, while promoting the adoption of sustainable practices from an early age (Chien & Wang, 2022). By focusing on the intersection of high-quality, safe, and durable medical furniture and sustainability, the project aims to foster a shift towards more responsible and eco-conscious healthcare environments.

2.0 OBJECTIVE

2.1 Promote Eco-Friendly Practices:

Set an example of sustainable innovation in the healthcare industry and strive to work towards its adoption in other sectors.

2.2 Develop Sustainable Pediatric Chairs:

Produce pediatric chairs in a design and with use of material that is friendly to the environment and ensures resources are saved through recycling.

2.3 Enhance Environmental Awareness:

Raise awareness of sustainability in healthcare and demonstrate how feasible it can be to introduce more eco-friendly materials into key medical furniture.

3.0 METHODOLOGY

Table 1: Description of innovation product “Wonder seat”

NO.	FEATURES	FUNCTIONALITY	USEFULNESS	PRACTICALITY
1	Drip tubes as chair backrest.	Ensure comfortability.	Reducing hospital waste into something practical.	Easy to maintain and sustain for long period.
2	Water bottles as base support.	Made for strength, durability and proper support.	Prevent collapse of seat when used by child.	Ensure seat would sustain longer.
3	Cotton for comfortable seat.	Promote comfortable feeling.	Prevent child with unpleasant experience with usual hospital waiting seat.	Suitable for child to use during waiting time.
4	Cardboard as the frame of the product.	Lightweight and easy to shape.	Cost-effective solution for pediatric seating.	Supports sustainable practices.
5	Industrial plastic basket	Rigid shape for structure.	Suitable frame for product.	
6	Used clothes used on arm pad and seat.	Enhances aesthetic appeal with a vibrant, recycled look	Reduces waste by repurposing discarded textiles	Helps in creating a comforting and familiar atmosphere for children

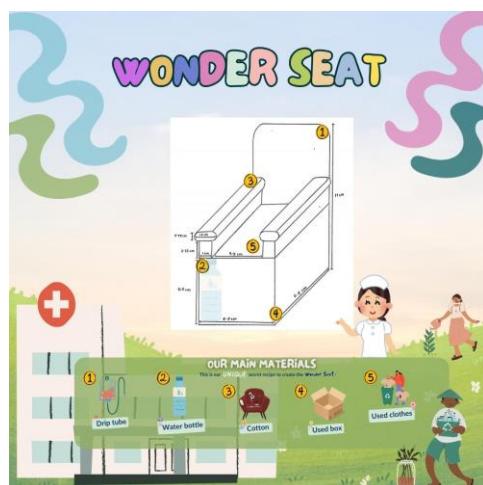


Figure 1: Innovation product “Wonder Seat”

4.0 RESULTS

The innovation of the pediatric chair made from recycled materials provides several key benefits and impacts. First and foremost, using recycled materials significantly decreases waste and conserves non-renewable resources—two of the most critical environmental issues facing modern industries (Chien & Wang, 2022). This approach aligns with the principles of a circular economy, which emphasizes the importance of reusing materials that would otherwise contribute to landfill waste (Jones & Stewart, 2023). By reducing the ecological footprint of healthcare facilities, the project supports broader sustainability goals and demonstrates how environmentally responsible practices can be integrated into stringent healthcare requirements (Sweeney & Han, 2021).

The unique methodology of the "Wonder Seat" project, such as using repurposed drip tubes for backrests, illustrates the potential for incorporating sustainable practices without compromising the quality or safety of medical furniture (Williams & Davis, 2019). This approach shows that it is possible to produce high-quality, safe, and durable pediatric chairs in an eco-friendly manner, challenging the misconception that sustainability and functionality are mutually exclusive (Smith & Patel, 2020). Additionally, the cost-effectiveness of using recycled materials makes this project economically viable for healthcare settings, further supporting its widespread adoption with a positive environmental impact (Jones & Stewart, 2023).

5.0 CONCLUSION

The "Wonder Seat: Eco-friendly Pediatric Chair" project exemplifies how sustainability can be integrated into healthcare furniture design effectively. By using recycled materials, the project not only reduces waste and conserves non-renewable resources but also meets high standards of quality, safety, and durability. This approach challenges the notion that sustainability compromises performance and demonstrates that eco-friendly solutions can be both practical and economically viable.

The success of this initiative highlights the potential for broader adoption of sustainable practices in healthcare settings, setting a benchmark for future innovations. As environmental concerns continue to impact global health, integrating such sustainable practices into healthcare design is crucial for advancing both ecological stewardship and patient care. The "Wonder Seat" project not only paves the way for a greener future in medical furniture but also reinforces the importance of sustainability in all aspects of healthcare.

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(A-SS047) IMPLEMENTING BLOCKCHAIN TECHNOLOGY FOR FINANCIAL SUSTAINABILITY IN URBAN RAILWAYS: A HOLISTIC MULTIDIMENSIONAL FRAMEWORK FOR MALAYSIA'S FUTURE TRANSPORTATION

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ABSTRACT

The urban railway system plays a critical role in modern transportation, demanding constant operational efficiency and cost-effectiveness improvement. Blockchain technology holds promise for revolutionizing financial transactions and maintenance strategies in urban railway systems. Existing payment systems and maintenance operations often suffer from inefficiencies and lack transparency. Blockchain offers a decentralized and secure platform to address these challenges. This study proposes a model framework leveraging blockchain technology to enhance sustainability practices in Malaysian urban railways. Urban railways face issues with international payment systems, transparency, and operational efficiency. Conventional financial systems lead to high transaction costs and delays for tourists, while maintenance operations suffer from manual processes and lack of collaboration among stakeholders. This study adopts a multidimensional approach to develop a model framework for sustainable urban railways in Malaysia and also to approach to assess different types of blockchain networks. The framework incorporates key dimensions such as environmental impact, social equity, economic viability, and governance effectiveness. Indicators within each dimension are identified to measure performance and guide decision-making. Public permissionless blockchains enable global accessibility and instant settlements for tourists, while public permissioned, private permissioned, and private permissionless blockchains offer transparency, streamlined workflow management, predictive maintenance analytics, and supply chain optimization for maintenance operations in urban railways. Blockchain technology presents opportunities for innovation in urban railways by enhancing financial transactions, governance, and maintenance operations. Implementing the proposed model framework, Malaysian urban railways can achieve greater sustainability by leveraging blockchain technology. The framework provides a comprehensive roadmap for assessing, monitoring, and improving sustainability practices across key dimensions. Through strategic adoption and continuous refinement, stakeholders can work together to build resilient, environmentally friendly, and socially inclusive urban railway systems in Malaysia.

Keywords: *operation and maintenance costs, rolling stock, urban railway development and blockchain technology*

1.0 INTRODUCTION

The fast process of urbanization and the increase in population in Malaysia have created significant strain on its urban transportation systems, requiring inventive measures to guarantee sustainability, effectiveness, and dependability. The urban railway industry in Malaysia, which is an essential part of the public transportation network, has several difficulties such as operational inefficiencies, safety issues, and an increasing need for openness and accountability. These problems highlight the need of adopting a revolutionary strategy that utilizes new technology to improve the sector's capacity to withstand and maintain its sustainability. Malaysia may use blockchain technology to investigate potential uses in managing goods, optimizing scheduling, enhancing communication networks, and implementing automated ticketing systems for its urban train infrastructure.

Blockchain technology, which is distinguished by its decentralized, transparent, and unalterable attributes, offers promising solutions to these challenges. Blockchain technology was initially created to guarantee secure financial transactions; however, its potential extends far beyond the confines of cryptocurrencies. By guaranteeing the accuracy and reliability of data, enhancing security measures, optimizing supply chain management, and facilitating real-time monitoring and maintenance, the integration of blockchain technology into urban railway systems has the potential to completely transform operations. This technology integration is consistent with the global trend of digitization and supports Malaysia's goal of establishing a transportation system that is sustainable, efficient, and future-proof.

Ultimately, this study presents a comprehensive and multifaceted plan for incorporating blockchain technology into Malaysia's urban railroads. The primary objectives are to improve sustainability, operational efficiency, and trust by stakeholders. The framework encompasses several aspects, such as governance, technology infrastructure, regulatory compliance, and social implications offering a thorough strategy to implementing blockchain in this industry. Integrating blockchain technology into Malaysia's urban train system may enhance transparency, streamline operational operations, and cultivate public confidence. This, in turn, will contribute to the nation's overall sustainable development goals.

2.0 OBJECTIVE

The purpose of this project is to provide a detailed and diverse framework for integrating blockchain technology into Malaysia's urban railway networks. The framework will focus on essential elements such as governance, deep learning, financial technology, and regulatory compliance to support long-lasting and effective railway operations. The research aims to improve operating and maintenance efficiency, increase data accuracy, simplify supply chain management, enable real-time monitoring and maintenance, and facilitate smart contract implementation by concentrating on these specific areas.

Furthermore, the project will investigate the potential of blockchain technology to enhance transparency and accountability in urban trains, hence promoting increased trust and confidence among stakeholders and the general public. The assessment will evaluate the technology's influence on sustainability, including its

capacity to diminish operating expenses, enhance resource administration, and decrease carbon emissions. The purpose also seeks to tackle the legislative and societal obstacles linked to the implementation of blockchain technology, offering valuable insights and suggestions to steer future progress in Malaysia's transportation infrastructure.

Lastly, the study examines how blockchain technology might be used to significantly change Malaysia's urban train systems, making them a prime example of sustainability and creativity. The suggested framework serves as both a strategic plan for upgrading urban railroads and a crucial step towards achieving Malaysia's future transportation goals. This research seeks to provide a meaningful contribution to the current discussion on sustainable urban transportation by adopting a multidisciplinary approach. The insights gained from this study might be beneficial for policymakers, industry stakeholders, and academics.

3.0 METHODOLOGY

In order to successfully incorporate blockchain technology into Malaysia's urban trains, as illustrated in Figure 1. The research will use the SCRUM framework, with specific emphasis on the responsibilities of the Product Owner. This stage is accountable for establishing the project's overall direction and ensuring that the system is in line with the requirements of all parties involved, such as government agencies, stakeholder's, and the wider community. The responsibilities of the Product Owner include the creation and management of the Product Backlog, which is a prioritized inventory of crucial features and requirements necessary for the implementation of blockchain solutions in railway operations and maintenance. This position necessitates a profound comprehension of stakeholder expectations and strategic decision-making in order to guarantee that the blockchain system provides significant value and tackles crucial requirements such as operational efficiency, transparency, and security.

However, the SCRUM process entails a method of iterative development known as Sprints, whereby each cycle concludes with a Sprint Review, as shown in Figure 1, during which the team showcases the finished work to stakeholders. This evaluation is essential for assessing the advancement of the blockchain system and collecting practical input. The Product Owner utilizes the knowledge acquired from these reviews to modify and refine the Product Backlog, guaranteeing that the project adapts to stakeholder input and technical improvements. This iterative method promotes ongoing improvement, enabling the project to adjust to emerging difficulties and possibilities. The SCRUM framework's focus on frequent communication, transparency, and adaptability is especially advantageous for overseeing innovative projects such as blockchain integration. This approach guarantees that the system stays in line with the requirements of stakeholders and the objectives of the project throughout its development.



Figure 1: Scrum Method (Agile Framework)

4.0 RESULTS

This study employs a comparative analysis to evaluate traditional and blockchain-based financial systems, focusing on payment processes, transparency, and operational efficiency, as illustrated in Figure 2. The methodology is structured around four main areas. First, payment systems are examined by comparing transaction flows in traditional financial systems with blockchain-based systems. Traditional systems are analyzed for currency exchange procedures, including international and domestic payments, and the use of counter and machine tickets. In contrast, blockchain systems are investigated for their ability to facilitate direct cryptocurrency payments, which bypass conventional exchange rates and potentially streamline transactions.

Next, the second focus area is public transparency. Figure 2 highlights the difference in transparency between traditional financial systems and blockchain-based systems. Traditional systems provide a certain level of transparency, but blockchain technology inherently offers a higher degree of openness. Transactions and actions are recorded on a distributed ledger, creating an immutable and transparent transaction log. This feature enhances accountability and fosters greater community engagement by making financial information more accessible and verifiable to all stakeholders.

Finally, the flow chart addresses operation and maintenance transparency, including the analysis of maintenance activity records. This encompasses comprehensive records of inspections, repairs, and enhancements to the system. Within a system that operates on blockchain technology, these data are included into an unchangeable ledger, guaranteeing the integrity and capacity to track the history of maintenance. The last segment delves into the capacity of blockchain technology in enhancing asset management and optimizing supply chains. The system presents the ideas of department-specific data-driven storage and a node-based system architecture. The flow chart proposes the incorporation of smart contracts with parameters to compute expenses, provide data exchange methods, and immutable records, as depicted in Figure 2.

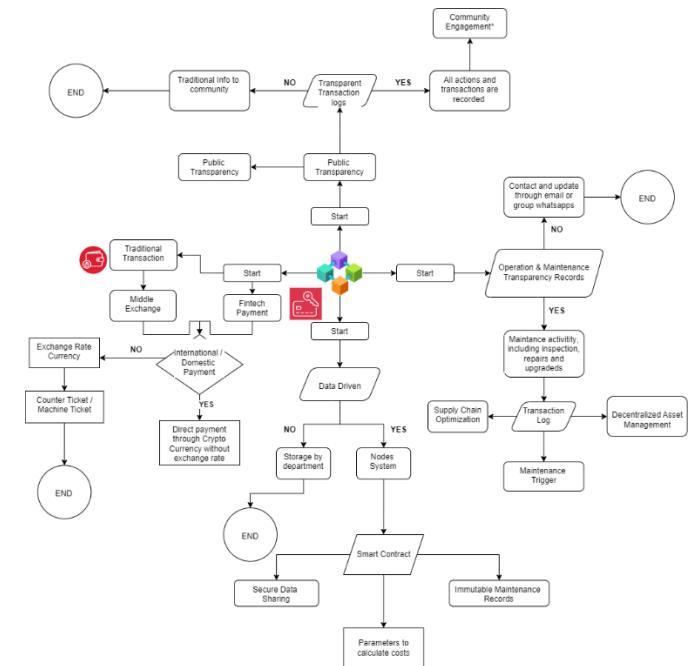


Figure 2: 4'P Tech Research Flow

5.0 CONCLUSION

Integrating blockchain technology into Malaysia's urban train networks signifies a revolutionary transition towards enhanced safety, efficiency, and sustainability. The fundamental characteristics of blockchain technology, including decentralization, transparency, and immutability, play a crucial role in resolving the existing operational inefficiencies and safety issues in the urban transportation industry. Malaysia may improve operational efficiency and promote transparency and stakeholder confidence by implementing a complete framework that utilizes blockchain technology for materials management, scheduling, communication, and ticketing. This strategy is in line with current worldwide trends in smart city development, guaranteeing a transportation network that is more resistant and prepared for the future.

Last but not least, under the specific circumstances of emerging nations such as Malaysia, blockchain technology has significant potential to completely transform intelligent transportation networks. The main aspects of this technology are strong data security and privacy, achieved via decentralization and resilience to attacks. These properties are essential for the modernization of transportation infrastructure. Blockchain technologies enhance the potential to scale and integrate different urban infrastructure components, effectively tackling issues in smart city services. Malaysia may achieve a sustainable urban train system by customizing blockchain frameworks to meet unique requirements. This would enable efficient operations, promote cooperation among stakeholders, and align with the nation's objectives of sustainable urban living and innovation.

(A-SS049) MYLPSOLVER

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ABSTRAK

Pengaturcaraan Linear merupakan salah satu topik yang ditawarkan dalam kursus Matematik Kejuruteraan 3 (DBM30033) kepada pelajar kejuruteraan di Politeknik Malaysia. Dalam topik ini, pelajar perlu mahir menyelesaikan masalah pengaturcaraan linear menggunakan Kaedah Grafik dan Kaedah Simpleks. Bagi mendapatkan penyelesaian masalah dalam topik Pengaturcaraan Linear, pengiraan dilakukan secara manual. Oleh itu, kesilapan pengiraan mudah dilakukan oleh pelajar kerana jalan pengiraan yang panjang. Secara tidak langsung, pelajar cenderung untuk hilang minat, fokus dan motivasi untuk belajar matematik. Berdasarkan keputusan peperiksaan akhir semester Politeknik Nilai bagi sesi I dan II 2022/2023 didapati purata skor markah pelajar hanya 6 daripada 25 markah bagi soalan Pengaturcaraan Linear. Oleh itu, MyLPsolver direkabentuk untuk meningkatkan kefahaman dan kemahiran pengiraan yang lebih baik mengenai topik ini. Inovasi ini dibangunkan menggunakan perisian Microsoft Excel dan boleh diakses dengan mudah tanpa bantuan capaian internet. MyLPsolver adalah mesra pengguna di mana pelajar hanya perlu melengkapkan dua langkah sahaja iaitu memilih bilangan pembolehubah atau jenis masalah Pengaturcaraan Linear dan seterusnya memasukkan data mengikut arahan yang disediakan bagi mendapatkan jawapan akhir. Secara keseluruhannya, penggunaan inovasi ini telah berjaya meningkatkan kefahaman dan kemahiran pengiraan yang seterusnya meningkatkan purata skor markah pelajar dalam peperiksaan akhir bagi sesi I dan II 2023/2024 kepada 13 daripada 25 markah bagi topik Pengaturcaraan Linear.

Kata Kunci : Pengaturcaraan Linear, MyLPsolver

1.0 PENGENALAN

Matematik Kejuruteraan 3 adalah kursus yang ditawarkan oleh Jabatan Matematik, Sains dan Komputer kepada pelajar semester 3 bagi program Diploma Kejuruteraan di Politeknik Nilai. Kursus ini mengandungi empat topik iaitu Statistik dan Kebarangkalian, Kaedah Berangka, Persamaan Pembezaan dan Pengaturcaraan Linear yang memerlukan kemahiran penyelesaian masalah.

Topik Pengaturcaraan Linear mengandungi dua sub topik iaitu Kaedah Grafik dan Kaedah Simpleks. Kedua-dua kaedah ini digunakan untuk mendapatkan penyelesaian optimum. Kaedah penyelesaian grafik ini sesuai digunakan untuk menyelesaikan masalah yang mempunyai dua pembolehubah. Dalam kaedah grafik, langkah pertama adalah dengan menentukan pembolehubah dan seterusnya menghasilkan graf serta

mendapatkan penyelesaian optimum. Kaedah simpleks sesuai digunakan untuk menyelesaikan masalah yang mempunyai dua atau tiga pembolehubah. Secara ringkasnya, persamaan perlu ditukarkan kepada bentuk am dan dimasukkan dalam jadual simpleks untuk diselesaikan.

Proses menyelesaikan masalah menggunakan kaedah grafik dan simpleks secara manual memerlukan jalan pengiraan yang kompleks serta panjang. Melalui pemerhatian, pelajar sering melakukan kesilapan dalam pengiraan bagi mendapat jawapan. Semasa proses pengiraan, sekiranya pelajar mendapat nilai jawapan yang salah pada langkah pertama ia akan memberi kesan kepada langkah pengiraan seterusnya. Ini dibuktikan oleh analisis markah peperiksaan akhir yang menunjukkan pelajar mendapat skor markah yang rendah bagi soalan Pengaturcaraan Linear. Oleh yang demikian, MyLPSolver dibangunkan bagi mengatasi masalah ini.

MyLPSolver adalah aplikasi yang direkabentuk bagi topik Pengaturcaraan Linear dengan menggunakan perisian Microsoft Excel yang dibangunkan mengikut keperluan silibus terkini serta boleh digunakan di Politeknik yang menawarkan kursus yang sama. Inovasi ini adalah sebagai pemudahcara bagi pelajar dan pensyarah dalam proses pengajaran dan pembelajaran (PdP). Pelajar boleh menggunakan inovasi ini untuk pembelajaran kendiri dimana MyLPSolver memaparkan jalan kerja secara langkah demi langkah yang seterusnya membantu meningkatkan kefahaman dan kemahiran pengiraan pelajar. Inovasi ini boleh digunakan oleh pensyarah untuk mengubal soalan dan menyediakan skema jawapan bagi topik Pengaturcaraan Linear.

2.0 OBJEKTIF

Objektif inovasi ini adalah :

1. Membangunkan aplikasi pembelajaran kendiri bagi topik Pengaturcaraan Linear.
2. Meningkatkan kefahaman dan kemahiran pelajar untuk menyelesaikan masalah topik Pengaturcaraan Linear.
3. Meningkatkan skor markah peperiksaan akhir pelajar bagi topik Pengaturcaraan Linear.

3.0 METODOLOGI



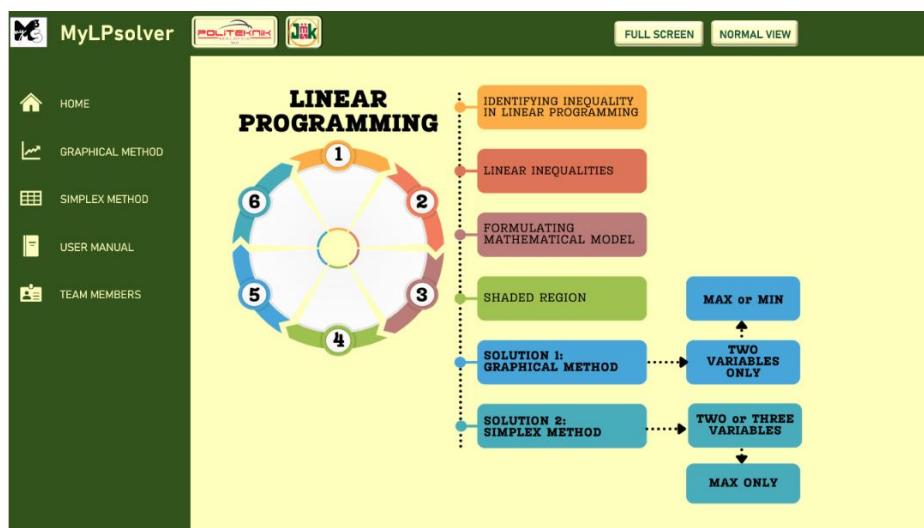
Rajah 1: Proses pembangunan MyLPSolver

Pengumpulan maklumat dilaksanakan hasil daripada pemerhatian pensyarah kursus semasa dalam bilik kuliah dan melalui markah penilaian akhir pelajar. Analisis markah peperiksaan akhir menunjukkan skor markah pelajar bagi topik Pengaturcaraan Linear adalah rendah bagi sesi I dan sesi II 2022/2023 seperti dalam Jadual 1. Pemerhatian semasa kuliah mendapati pelajar sering melakukan kesilapan dalam pengiraan. Carian secara atas talian dilaksanakan untuk mendapatkan maklumat berkaitan aplikasi sedia ada bagi menanggani isu ini. Hasil carian mendapati aplikasi sedia ada tidak bersesuaian dengan keperluan silibus kursus.

Jadual 1 : Purata Skor Markah Soalan Penilaian Akhir Pelajar Bagi Topik Pengaturcaraan Linear Sesи 2022/2023

Sesi pengajian	Sesi I 2022/2023	Sesi II 2022/2023
Purata markah pelajar	7 /25	6 /25

MyLPSolver dibangunkan dengan menggunakan Microsoft Excel dan kandungannya selari dengan silibus kursus Matematik Kejuruteraan 3 bagi topik Pengaturcaraan Linear. MyLPSolver menawarkan dua kaedah penyelesaian Pengaturcaraan Linear iaitu Kaedah Grafik dan Kaedah Simpleks. Bagi memudahkan pelajar menggunakan MyLPSolver juga dilengkapi dengan manual pengguna.



Rajah 2 : Rekabentuk Antaramuka MyLPSolver

The screenshot shows the MyLPSolver interface for the Graphical Method. It includes:

- Left Sidebar:** HOME, GRAPHICAL METHOD (selected), SIMPLEX METHOD, USER MANUAL, TEAM MEMBERS.
- Top Bar:** MyLPSolver, POLITEKNIK JIK, SOLUTION 1: GRAPHICAL METHOD.
- Table 1:** Objective function and constraints in standard form.
- Table 2:** Points X and Y for each constraint.
- Figure:** A graph plotting the constraint lines and identifying vertices A, B, C, D, and the shaded feasible region.
- Table 3:** Vertices identified from the graph.
- Table 4:** Relevant intersection points for each vertex.

Rajah 3: Rekabentuk Kandungan MyLPSolver Kaedah Grafik

The screenshot shows the MyLPSolver interface for the Simplex Method. It includes:

- Left Sidebar:** HOME, GRAPHICAL METHOD, SIMPLEX METHOD (selected), USER MANUAL, TEAM MEMBERS.
- Top Bar:** MyLPSolver, POLITEKNIK JIK, SOLUTION 2: SIMPLEX METHOD, TWO VARIABLES.
- Table 1:** Objective function and constraints in standard form.
- Table 2:** Initial simplex tableau.
- Table 3:** Determining Pivot Column (PC) and Pivot Row (PR).
- Table 4:** Correct values transferred from row A, B, C, and D.
- Table 5:** Repeating step 3 until no negative values remain.
- Table 6:** Final simplex tableau.
- Table 7:** Repeating step 3 until no negative values remain.

Rajah 4: Rekabentuk Kandungan MyLPSolver Kaedah Simpleks

4.0 DAPATAN

Inovasi MyLPSolver adalah merupakan inovasi pertama yang dibangunkan di Jabatan Matematik, Sains dan Komputer Politeknik Malaysia dan bertepatan dengan keperluan kursus Matematik Kejuruteraan 3. Pembangunan MyLPSolver tidak melibatkan sebarang implikasi kewangan kerana menggunakan perisian Microsoft Excel sahaja. Pelajar tidak perlu melanggan atau muat turun aplikasi kerana ianya boleh diakses tanpa capaian internet.

MyLPSolver yang dibangunkan ini bersifat mesra pengguna dan mudah untuk digunakan dimana pelajar boleh menggunakan inovasi ini dengan berpandukan kepada manual yang disediakan. Secara tidak langsung, MyLPSolver turut menyokong

polisi teknologi hijau. MyLPSolver membantu pelajar untuk belajar dan mengulangkaji topik Pengaturcaraan Linear dengan menawarkan jalan penyelesaian sebagai panduan dan semakan pelajar. Proses pembelajaran menggunakan MyLPSolver secara tidak langsung membantu meningkatkan kefahaman dan kemahiran pelajar. Hasil penggunaan MyLPSolver bagi sesi I dan II 2023/2024 telah berjaya meningkatkan skor markah pelajar dalam peperiksaan akhir bagi topik Pengaturcaraan Linear seperti dalam Jadual 2.

Jadual 2 : Purata Skor Markah Soalan Penilaian Akhir Pelajar Bagi Topik Pengaturcaraan Linear Sesi 2023/2024

Sesi pengajian	Sesi I 2023/2024	Sesi II 2023/2024
Purata markah pelajar	9 /25	13 /25

5.0 KESIMPULAN

Menariknya, MyLPSolver mempunyai potensi untuk disebar luas kepada 13 Politeknik Malaysia yang menawarkan kursus yang sama. Pembangunan MyLPSolver dengan menggunakan Microsoft Excel membolehkan inovasi ini mudah untuk diselengara mengikut kesesuaian dan keperluan serta kos efektif. Di samping membantu pelajar dalam proses pembelajaran, MyLPSolver juga turut membantu pensyarah dalam proses pengajaran serta memudahkan pensyarah untuk menggubal soalan dan menyediakan skema jawapan bagi topik Pengaturcaraan Linear.

(A-SS053) EDUCALC: STREAMLINED GRADE CALCULATION USING VBA

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ABSTRACT

EduCalc is developed to address the inefficiencies and inaccuracies in manual student grade calculation, offering a streamlined solution using Visual Basic for Applications (VBA). The innovation highlights traditional grade management methods' time-consuming and error-prone nature, identifying the primary problem as needing an automated, reliable system to handle grade calculations efficiently. EduCalc utilizes VBA to automate grade entry, customize grading criteria, and minimize errors during the data entry process. The commercial value of EduCalc lies in its seamless integration with Microsoft Excel, making it a scalable and adaptable tool for educational institutions of various sizes. The significance of this innovation is its ability to drastically reduce administrative burdens, enhance data accuracy, and improve overall educational outcomes. In conclusion, EduCalc exemplifies the potential of VBA in educational technology, offering a practical, user-friendly, and impactful solution for modern educators, thereby fostering a more efficient academic environment.

Keywords: VBA, streamlined, automated grade entry

1.0 INTRODUCTION

Efficient and accurate grade calculation is crucial for educators. However, traditional methods often involve time-consuming manual processes prone to errors. EDUCALC, a grade calculation tool developed using Visual Basic for Applications (VBA), offers a streamlined solution. VBA, integrated within Microsoft Office applications, enables the automation of repetitive tasks and the creation of custom functions, improving the grading process into a more efficient, reliable system and interactive (Wang & Shen, 2014).

This innovation examines the development and implementation of EDUCALC, emphasizing its design, features, and advantages. Through case studies and user feedback, the innovation evaluates how EDUCALC reduces administrative workload, minimizes errors, and improves the grading experience (Tsai & Wardell, 2006a). By leveraging VBA, EDUCALC enhances operational efficiency and contributes to a fairer assessment system, demonstrating the potential of automation in educational technology.

2.0 OBJECTIVE

This innovation aims to present EduCalc as a streamlined tool developed using Visual Basic for Applications (VBA) to address inefficiencies and inaccuracies in manual grade calculations by automating grade entry, customizing grading criteria, and minimizing data entry errors. It can also predict the marks needed to achieve the desired grade.

3.0 METHODOLOGY

EduCalc is a tool for automating grade entry, customizing grading criteria, and minimizing errors during data entry (Tsai & Wardell, 2006b). It was developed using Visual Basic for Applications (VBA). A comprehensive methodology was followed to develop and implement EduCalc, a streamlined grade calculation tool using VBA. Initially, a survey and interviews were conducted with educators to identify the assessments needed for the development of EduCalc. The main objective was to discover and understand the most significant inefficiencies in current grading methods. The tool was designed with user input to include features such as automated grade entry and customizable grading criteria. The development phase involved programming the tool in VBA and integrating it with Microsoft Excel while implementing error-checking mechanisms to minimize data entry mistakes. Extensive testing was conducted in various educational settings to ensure functionality, accuracy, and user-friendliness. The feedback from these tests led to making iterative improvements. As a result, a final version was achieved that was both scalable and adaptable. The tool was used in selected institutions, and its impact on reducing administrative workload and enhancing grading accuracy was analysed through quantitative and qualitative feedback. The flowchart in Figure 1 illustrates the development process of EduCalc. Based on feedback from educators, EduCalc was developed using VBA. The interface is shown in Figure 2.

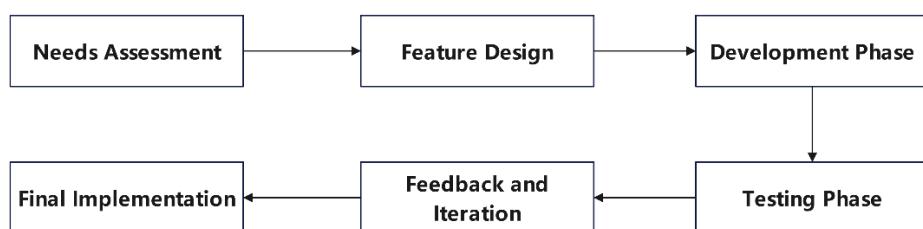


Figure 1: EduCalc Development Process

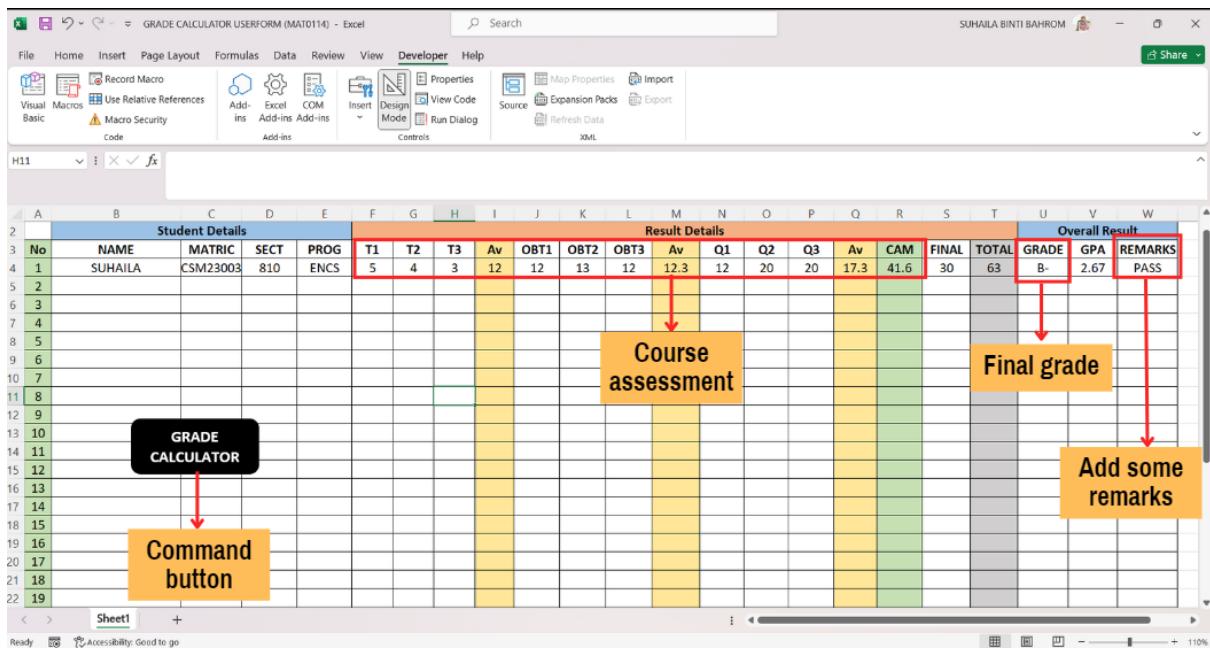


Figure 2: EduCalc Interface

The items needed in the interface were recorded. Then, the user form was created to streamline data entry, validate real-time inputs, and present a professional interface for users to interact with the application seamlessly. The user form will pop up once the button on the interface is clicked, as shown in Figure 3. This interaction allows users to input data directly into the form, which is processed and validated before submission. The results are displayed or saved based on the form's functionality, ensuring a smooth and efficient data management experience. The coding was created to handle the User Form interactions, including initializing form controls, validating user input, and processing the data upon submission. It ensures that the form behaves as expected, responding to user actions and updating the relevant data or interface elements accordingly. The code example is depicted in Figure 4.

Student Details				Result Details												Overall Result						
No	NAME	MATRIC	SECT	PROG	TUTORIAL 1:	0	TUTORIAL 2:	0	TUTORIAL 3:	0	OBT 1:	0	OBT 2:	0	OBT 3:	0	CAM	FINAL	TOTAL	GRADE	GPA	REMARKS
1	SUHAILA	CSM23003	810	ENCS	0	0	0	0	0	0	0	0	0	0	0	0	41.6	30	63	B-	2.67	PASS
2																						
3																						
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Figure 3: EduCalc User form

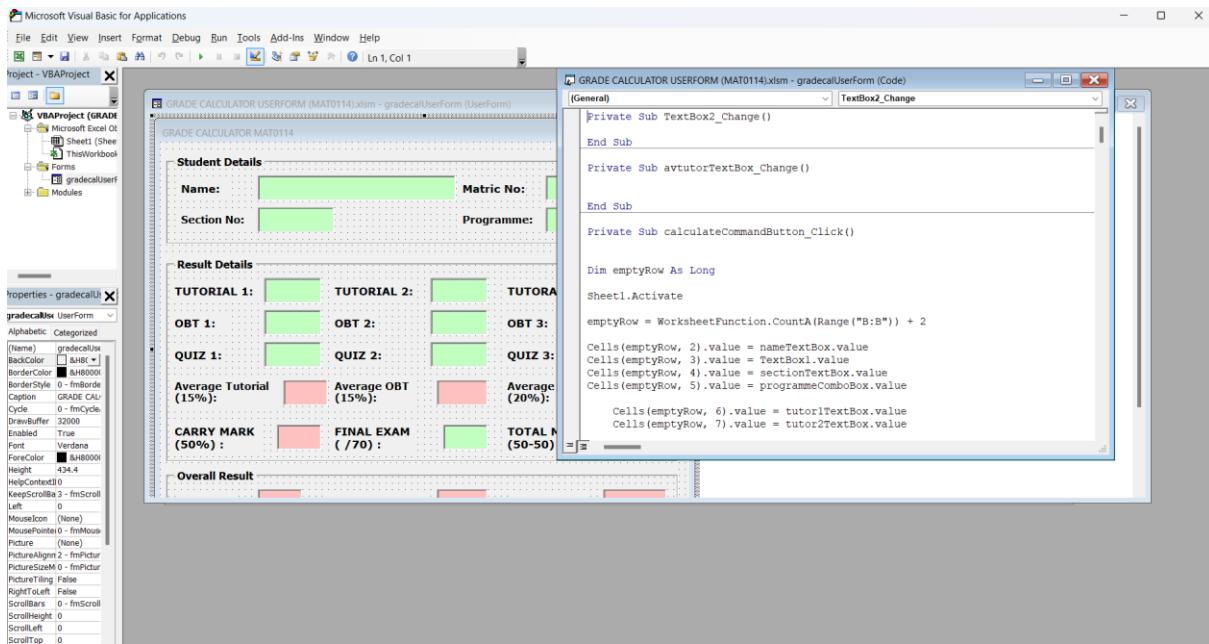


Figure 4: EduCalc Coding

4.0 RESULTS AND DISCUSSION

Implementing EduCalc has shown significant advantages and positive impacts, including drastically reducing the time and effort required for grade calculation by automating repetitive tasks and minimizing data entry errors (Sipos & Sweeney, 2003). This automation leads to enhanced accuracy and consistency in grading, which fosters greater transparency and fairness in student assessments. The novelty of EduCalc lies in its seamless integration with Microsoft Excel, making it uniquely adaptable and scalable for diverse educational environments. Its customizable grading criteria feature allows educators to tailor the tool to their needs, ensuring flexibility and user-friendliness (Rohaeti et al., 2019). Feedback from initial deployments has indicated improved efficiency in administrative tasks and higher satisfaction among educators, illustrating the transformative potential of leveraging VBA for educational innovations.

5.0 CONCLUSION

In conclusion, EduCalc, developed using Visual Basic for Applications (VBA), represents a significant advancement in educational technology by automating and streamlining the grade calculation process. Through its features of automated grade entry, customizable grading criteria, and error minimization, EduCalc addresses the inefficiencies and inaccuracies inherent in traditional grading methods. Its seamless integration with Microsoft Excel ensures scalability and adaptability across various educational institutions. By reducing administrative burdens and enhancing data accuracy, EduCalc not only improves overall educational outcomes but also demonstrates the potential of VBA in creating practical, user-friendly solutions for modern educators, fostering a more efficient and effective academic environment.

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(A-SS054) SMART SHOPPING CART USING RADIO FREQUENCY IDENTIFICATION (RFID)

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ABSTRACT

Habits of buying goods without checking the price first and purchasing unnecessary items often lead to overspending the monthly budget. Therefore, verifying the price at the price checker counter is essential to ensure the displayed price matches the scanned price. Additionally, checking prices before purchasing items allows customers to choose supermarkets offering lower prices. However, this can be troublesome if customers have many items to purchase. A Smart Shopping Cart can resolve this issue by allowing customers to check prices instantly as they add items to the cart. The Smart Shopping Cart can also keep a running total of the prices of selected items and subtract prices for items removed from the cart. This enables customers to reconsider unnecessary purchases and stay within their budget, enhancing their shopping experience. The use of Radio Frequency Identification (RFID) technology in these Smart Shopping Cart improves purchasing efficiency. In summary, this smart shopping cart benefits both customers and supermarket owners by streamlining the selling and buying process.

Keywords: RFID, RFID card, smart shopping cart, Arduino

1.0 INTRODUCTION

In today's fast-paced world, efficient and budget-conscious shopping is a growing priority for many customers. Traditional shopping methods often result in overspending due to a lack of real-time price awareness and the inconvenience of manually checking prices. Additionally, long queues at payment counters due to inefficient barcode scanning further exacerbate the shopping experience.

To address these challenges, the development of a Smart Shopping Cart equipped with RFID technology offers a promising solution. This innovative shopping cart not only assists customers in managing their budgets by providing real-time price tracking but also enhances the overall shopping efficiency by leveraging the capabilities of RFID technology.

RFID provides a significant advantage over traditional barcode systems by enabling the automatic detection of items within a certain range. This eliminates the need for manual scanning, thereby reducing waiting times at checkout and streamlining the entire shopping process.

2.0 OBJECTIVE

The primary objectives of this project are twofold: first, to help customers maintain their monthly budgets by offering instant price visibility and total cost calculations as they shop; and second, to improve the efficiency of the purchase process, making shopping a more seamless and enjoyable experience. By integrating RFID technology into Smart Shopping Carts, the aim is to revolutionize the retail experience for both customers and supermarket owners, creating a more efficient, convenient, and budget-friendly shopping environment.

3.0 METHODOLOGY

This project encompasses both software and hardware development. The simulation was conducted using Proteus software. Upon completing the simulation, the process of creating the Printed Circuit Board (PCB) begins. The project utilizes an Arduino microcontroller, RFID card, MFRC522 reader, LCD screen, push button, LEDs, and a buzzer. The prototype of Smart Shopping Cart is illustrated in Figure 1, with dimensions of 20x15x8 cm.



Figure 1: Prototype of Smart Shopping Cart

Figure 2 explains the flow of this project. Firstly, the switch must be turned on to activate the entire system. When the card is tagged on the MFRC522 reader, it reads the information stored in the card's memory. If the card is registered, the price, name of item and quantity of the item will be displayed on the LCD screen. If an unregistered card is scanned, the system will trigger a specific error function and allow for another card to be read.

Once the customer has finished shopping, they need to press a designated button to display the total number of items scanned and the overall cost of the products in the cart. Pressing a second button will reset the calculated items and prices, preparing the system for the next user.

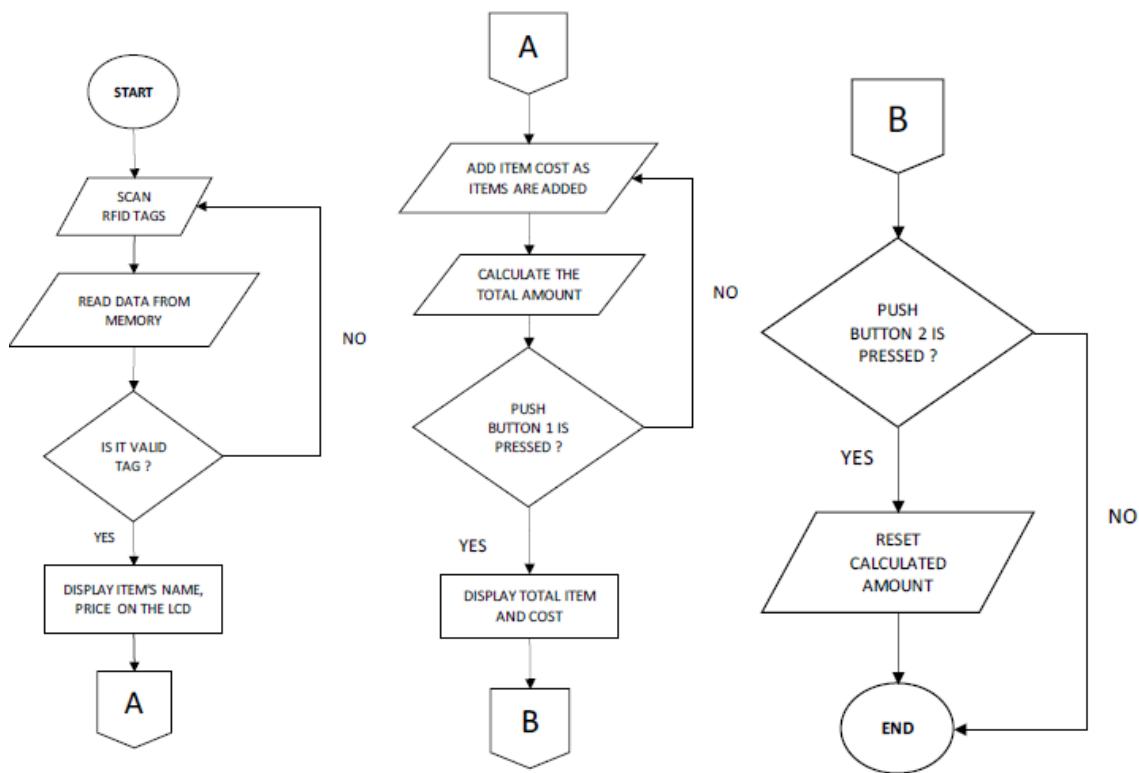


Figure 2: Flowchart of the project

4.0 RESULTS

When the item, represented by the RFID card, is scanned at the MFRC522 reader, its name and price are displayed on the LCD screen, as shown in Figure 3. Once items have been selected for purchase, the LCD screen will then display the total price that customers need to pay and total item purchase, as depicted in Figure 4.

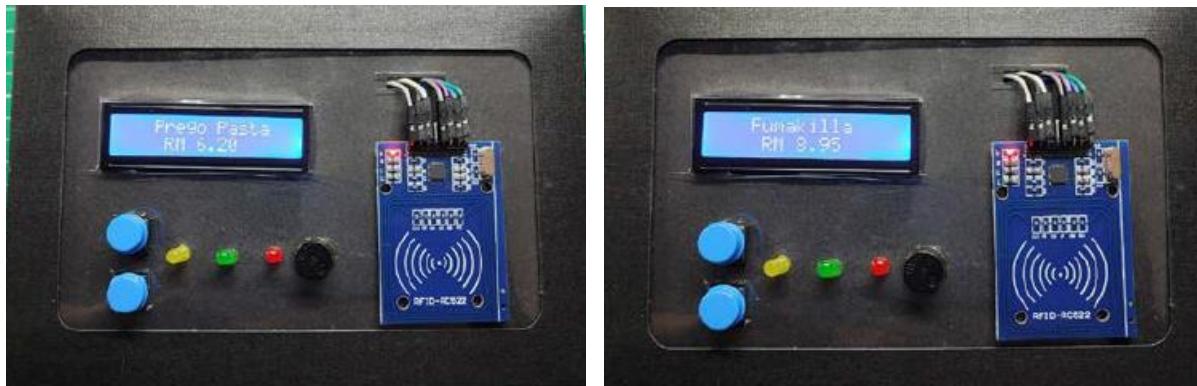


Figure 3: Example of item price after scan



Figure 4: Total item purchase and total price

This smart shopping system is incredibly user-friendly. Customers simply touch the desired item at the scanner. A green LED confirms that the RFID card has been successfully registered, whereas a red LED signals an error or indicates that the card is not registered.

Regarding the buzzer, different frequencies are used for specific alerts. An unregistered card triggers the buzzer at 1kHz while a registered card activates the buzzer at 2kHz. Higher frequencies produce higher-pitched sounds, while lower frequencies produce lower-pitched sounds. This setup ensures that customers are promptly alerted to the status of the scanning process, enhancing their awareness and interaction with the system.

This project is cost-effective due to its use of affordable components, and its compact size makes it practical for attachment to a shopping basket and trolley. Every supermarket can benefit from deploying these Smart Shopping Cart to assist customers in managing their budgets effectively and avoiding long queue.

5.0 CONCLUSION

In conclusion, the Smart Shopping Cart with RFID Technology represents a transformative innovation in retail. By integrating RFID technology, this system enables real-time tracking of items and prices, empowering customers to make informed purchasing decisions and manage their budgets more effectively. The use of affordable components and its practical, compact design make it a feasible solution for supermarkets to adopt widely. This technology not only enhances the efficiency of shopping processes by reducing checkout times but also improves overall customer satisfaction. As retail continues to evolve, embracing Smart Shopping Carts with RFID Technology promises to elevate the shopping experience and optimize operational efficiency in supermarkets.

(A-SS060) PERMAINAN MADLIBS: SEBUAH PERMAINAN INTERAKTIF DALAM PEMBELAJARAN KOSA KATA BAHASA ARAB

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ABSTRAK

'Madlibs' merupakan sebuah permainan kosa kata yang digunakan untuk meningkatkan kemampuan kosa kata bahasa Arab seseorang. Masih ramai pelajar bahasa Arab tidak mempunyai penguasaan kosa kata Arab yang tinggi berpunca daripada kekurangan inisiatif untuk belajar kosa kata bahasa Arab secara kendiri di luar bilik darjah. Oleh itu, kajian ini dijalankan untuk meninjau permainan 'Madlibs' sebagai salah satu alternatif yang digunakan oleh pelajar untuk meningkatkan pengetahuan kosa kata Arab mereka melalui permainan interaktif. Lazimnya pembelajaran kosa kata Arab dilaksanakan secara tradisional di dalam bilik darjah melalui kaedah pengulangan hafalan bagi sejumlah perkataan sehingga menimbulkan persepsi pelajar yang negatif terhadap pembelajaran bahasa Arab. Namun begitu, isu ini dapat diatasi dengan menjadikan gamifikasi seperti 'Madlibs' sebagai salah satu inisiatif untuk menarik minat pelajar mengulang kaji dan menggunakan kosa kata Arab di luar bilik darjah. Pengaplikasian 'Madlibs' ini akan meningkatkan motivasi, pengetahuan dan kebolehan pelajar untuk membaca dan memahami teks bahasa Arab dengan baik. Kajian ini dijangka memberi sumbangan dan implikasi dalam pendidikan secara teori dan praktikal serta cadangan untuk melaksanakan penyelidikan pada masa hadapan.

Kata kunci: 'Madlibs', permainan interaktif, pembelajaran kosa kata, bahasa Arab

1.0 PENGENALAN

Pembelajaran kosa kata bahasa Arab kini semakin berkembang dengan kepelbagaiannya kaedah dan pendekatan yang diterapkan di dalam dan luar bilik darjah untuk menjadikan sesbuah pembelajaran lebih efektif. Sejajar dengan kepesatan teknologi maklumat pada masa kini, gamifikasi merupakan salah satu kaedah yang diketengahkan dalam pembelajaran kosa kata bahasa Arab kerana gamifikasi dapat meningkatkan motivasi, penglibatan dan pencapaian dalam penguasaan kosa kata Arab dalam kalangan bukan penutur asli (Sultan, 2024). Kebanyakan guru bahasa Arab berpandangan bahawa gamifikasi merupakan antara kaedah yang berkesan dalam pemerolehan kosa kata bahasa Arab dan penguasaan bahasa Arab dan kemahiran pelajar dapat dipertingkatkan dengan baik (Mohammad Najib et al., 2024).

Namun begitu, kemahiran membaca pelajar masih berada pada tahap membimbangkan dimana pelajar sering terkeliru dan tidak mampu untuk memahami teks yang dibaca (Mohmad Rouyan et al., 2020) kerana kekurangan kosa kata dan pengetahuan sintaksis dan morfologi yang sederhana (Al-haqbani & Riazi, 2012). Selain itu, pelajar bahasa Arab sebagai bahasa asing di Malaysia kurang memperuntukkan waktunya terhadap pembelajaran bahasa Arab dan kurang inisiatif dalam melaksanakan aktiviti, permainan atau latihan bahasa secara kendiri (Mat Nafi

& Mat Teh, 2023). Oleh itu, kajian ini mengetengahkan satu permainan yang boleh dilaksanakan oleh pelajar bagi pemerolehan kosa kata Arab dan latihan kemahiran membaca teks dalam pembelajaran kosa kata bahasa Arab secara santai dan kendiri melalui permainan '*Madlibs*'.

2.0 OBJEKTIF

Kajian ini dilaksanakan bagi memenuhi objektif seperti berikut:

1. Meninjau keberkesanan permainan *Madlibs* sebagai sebuah permainan interaktif dalam pembelajaran kosa kata bahasa Arab.
2. Menghuraikan ciri-ciri permainan *Madlibs* yang memudahkan pembelajaran kosa kata bahasa Arab.

3.0 METODOLOGI

Kajian ini menggunakan pendekatan kuantitatif melalui soal selidik. Data soal selidik diperoleh daripada enam orang pelajar sukarela yang mengambil kursus bahasa Arab sebagai bahasa asing bagi subjek *Arabic for Business Communication II* (TAC 452) di UiTM Cawangan Perlis, Kampus Arau. Sebuah pautan permainan *Madlibs* daripada laman sesawang 'wordwall' telah diberikan kepada pelajar. Mereka diminta untuk menyempurnakan permainan *Madlibs*. Kemudian, sebuah soal selidik secara atas talian melalui *Google Form* perlu dilengkapkan bagi mendapatkan maklumat terperinci mengenai permainan *Madlibs* dalam proses pembelajaran kosa kata bahasa Arab.

Permainan '*Madlibs*'

Permainan Mad Libs ialah permainan mengisi tempat kosong (Price and Stern, 1974) untuk melengkapkan sebuah cerita yang lengkap. Pelajar atau pemain diminta untuk meneka perkataan mengikut kesesuaian konteks ayat. Permainan '*Madlibs*' boleh dilaksanakan secara fizikal di dalam bilik darjah atau secara atas talian melalui laman sesawang. Bagi kajian ini, permainan '*Madlibs*' dicipta secara atas talian melalui laman sesawang 'wordwall' (wordwall.net/resource/74919083) seperti Rajah 1 dan Rajah 2 dengan konteks teks yang berbeza



Rajah 1: Permainan '*Madlibs*' melalui laman sesawang wordwall
(Konteks teks: Kehidupan Yusuf)



Rajah 2: Permainan 'Madlibs' melalui laman sesawang wordwall
(Konteks teks: Rutin harian Muhammad)

4.0 DAPATAN

Keberkesanan permainan 'Madlibs' beserta ciri-cirinya dalam pembelajaran kosa kata Arab dikenalpasti melalui soal selidik secara atas talian yang mengandungi soalan tertutup dan soalan terbuka. Dapatkan soal selidik boleh didapati dalam Jadual 1.

Jadual 1: Soal selidik keberkesanan dan ciri-ciri permainan 'Madlibs'

Soal selidik	Ya	Tidak
Pengalaman belajar kosa kata bahasa Arab melalui permainan atas talian atau 'Madlibs'	17%	83%
Permainan 'Madlibs' ini mempunyai antara muka (<i>interface</i>) yang menarik	100%	-
Saya berasa gembira dan tidak bosan sepanjang melaksanakan pembelajaran menggunakan kaedah permainan 'Madlibs' ini.	100%	-
Saya berasa mudah untuk memahami kosa kata Arab melalui permainan ini	100%	-
Permainan 'Madlibs' merupakan suatu bentuk permainan interaktif yang menarik	100%	-
Permainan 'Madlibs' dapat memberi manfaat kepada anda semasa proses pembelajaran kosa kata	83%	17%

Dapatkan kajian mendapati permainan *Madlibs* merupakan sebuah permainan interaktif yang berkesan dalam pembelajaran kosa kata bahasa Arab. Walaupun, hanya sebilangan kecil pelajar iaitu sebanyak 17% sahaja yang pernah menggunakan permainan atas talian dalam pembelajaran kosa kata Arab, namun dapatan kajian menunjukkan bahawa seramai 83% pelajar bersetuju bahawa permainan 'Madlibs' memberi manfaat kepada mereka semasa proses pembelajaran kosa kata bahasa Arab. Berdasarkan soal selidik terbuka, pelajar berpandangan bahawa permainan yang berkonsepkan mengisi tempat kosong ini dapat memberi manfaat kepada mereka iaitu mudah untuk memahami kosa kata bahasa Arab, menggalakkan mereka untuk berfikir secara aktif terhadap penggunaan kata nama (اسم), kata kerja (فعل) dan kata hubung atau kata sendi (حرف الجار) yang bersesuaian dalam teks sekali gus dapat melatih kemahiran membaca (مهارة القراءة) secara tidak langsung melalui permainan ini. Keberkesanan permainan ini difokuskan kepada usaha dan keupayaan pelajar dalam

memilih, menyusun serta menggunakan sesuatu perkataan bagi membentuk satu ayat lengkap dalam konteks yang sebenar.

Kesemua pelajar dengan peratusan 100% menyetujui bahawa ‘*Madlibs*’ mempunyai antara muka (*interface*) yang menarik dan bewarna-warni, menyeronokkan dan tidak membosankan serta mudah untuk memahami kosa kata. Soal selidik terbuka kajian ini merakamkan pandangan pelajar yang menyatakan bahawa penggunaan warna yang pelbagai dalam permainan ‘*Madlibs*’ mampu menarik minat mereka untuk membaca dan memahami teks Arab. Oleh itu, permainan ‘*Madlibs*’ dalam aplikasi ‘*wordwall*’ merupakan sebuah permainan interaktif dalam pembelajaran kosa kata Arab yang berkesan dan mempunyai ciri-ciri permainan yang menarik, santai dan menyeronokkan.

5.0 KESIMPULAN

Kesimpulannya, permainan ‘*Madlibs*’ boleh dijadikan sebagai salah satu bahan tambahan pembelajaran di peringkat sekolah dan pengajian tinggi khususnya bagi pembelajaran kosa kata bahasa Arab. Pembelajaran yang berkesan bukan sahaja bergantung kepada pengajaran guru yang baik di dalam bilik darjah sahaja, malah sumber tambahan yang menyokong pembelajaran kosa kata pelajar di luar bilik darjah seperti permainan atas talian seperti ‘*Madlibs*’ turut menyumbang ke arah pembelajaran yang lebih bermakna. Pelajar dapat berinteraksi dengan kosa kata baharu secara tidak langsung ketika bermain permainan kosa kata atas talian, sekali gus meningkatkan peruntukan waktu mereka terhadap pembelajaran kosa kata bahasa Arab di luar bilik darjah.

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(A-SS063) FROM INTENTION TO CONFIDENCE: THE EXPERIENCE OF DEVELOPING ENGAGING ESL TIKTOK VIDEOS

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ABSTRACT

The intention behind teaching is vital because it influences how educators approach their tasks, which in turn directly impacts student engagement, learning outcomes, and the overall success of the educational process. Having a clear intention directs teachers' instructional practices and shapes the educational experiences of their students. This study examines the process of the formation of confidence among teachers who create engaging ESL TikTok videos beginning from their initial intention. In-depth, semi-structured interviews were conducted with four English teachers; a secondary school teacher who is a national, Best of Education TikTok award winner; a primary school teacher who is a Ministry of Education (KPM) 'Edufluencer'; a Sixth-Form college teacher who is also a KPM 'Edufluencer'; and a tuition centre teacher with an online learning app. Data were analysed using the thematic analysis method. The study found that such teachers who created TikTok videos have noble intentions that differ from traditional teaching methods. They acquire a higher sense of courage to counter negative perceptions among traditionalists. This courage is built upon the belief that there is no need to worry about what others will say about the video produced due to the confidence that the video fulfils the noble intention. Confidence begins to build from the initial success of creating and posting a TikTok video. This study addresses a significant research gap by examining language teachers' use of TikTok, with a special focus on the educational philosophy of language pedagogy in creating multimodal content. The study's implication suggests improved student engagement, among others.

Keywords: teaching intention; teaching philosophy; instructional practice; social media content curation; TikTok.

1.0 INTRODUCTION

TikTok is a widely utilised social media platform across different societal segments and professional fields (Rejeeb, 2024). In the educational domain, educators have also adopted TikTok as a tool for instructional purposes (Tan et al. 2022). Although numerous studies have explored the use of TikTok, prior research has primarily emphasised its significance as a technological resource (Rueda-Arranz et al. 2023), with limited focus on the video creation process (Hartung et al. 2023). This study addresses this gap by investigating the experiences of educators who have successfully produced popular engaging ESL TikTok videos, analysing the processes through which they attained such success.

2.0 OBJECTIVE

This study aims to examine the process of the formation of confidence among Malaysian ESL teachers who create engaging ESL TikTok videos beginning from their initial intention.

3.0 METHODOLOGY

This study employs a qualitative research methodology, involving semi-structured interviews with four educators experienced in creating engaging ESL TikTok videos that have achieved widespread popularity, garnering thousands of views (Carpenter et al., 2023). The participants represent various educational levels; a high school teacher, who is the recipient of national TikTok award; a primary school teacher, recognised as an ‘Edufluencer’ by the Ministry of Education (Kementerian Pendidikan Malaysia) (KPM); a Sixth Form College teacher, who is also a KPM ‘Edufluencer’; and a tuition teacher at an online-based tuition centre. The interviews were conducted both in-person and online, lasting between 1 and 1.5 hours. All interviews were recorded and fully transcribed. The data were analysed using thematic analysis to interpret the experiences of the educators in creating their ESL TikTok content. The findings presented here represent only a portion of the overall results.

4.0 RESULTS

A summary of the teachers who participated in the study is presented in Table 1 below. The selected teachers were identified based on their achievement of a significant number of likes on their videos and/or a substantial following on their TikTok accounts. One teacher, in particular, stood out for receiving extensive media coverage and news reports highlighting his proactive approach to teaching on TikTok.

Table 1. Background of participants

Participant	Background of participants	Total no. of followers (f) and likes (l)
Azlan	Secondary school teacher, Kelantan; 23-year teaching experience; first TikTok video posted on 29/11/2020; KPM Edufluencer 3.0 (2023); Winner of the 1st TikTok Awards Best of Education (2023); Top 5 Malaysia Teacher Prize; Best National Educational Influencer, KNKV Award 2024; Best National Educational Content, KNKV Award 2024	1,200,000 (f) 32,300,000 (l)
Husna	Primary school teacher, Kelantan; first TikTok video posted on 26/07/2021; KPM Edufluencer 3.0 (2023)	119,100 (f) 546,800 (l)
Faiz	MUET instructor, Penang; Form 6 English teacher; first TikTok video posted on 13/03/2023;	6,652 (f) 66,500 (l)

KPM Edufluencers 3.0 (2023); Appointed Rakan Strategik MOHE; Duta TWINKL

Zahra	Online tutor, Kedah; English teacher at Pandai Official, Malaysia's No. 1 Smart Revision App; first TikTok video posted on 31/12/2022	7,225 (f) 62,800 (l)
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Pseudonyms are used in place of the participants' real names.

The findings of this study reveal a commendable motivation among teachers who create engaging ESL TikTok content; a genuine intention to voluntarily produce TikTok videos to support students with limited English proficiency. This altruistic intent is accompanied by a sense of courage, which plays a crucial role in transforming the intention into reality. This courage propels the teachers to take bold steps, overcoming fear and uncertainty about the feasibility of creating TikTok content that deviates from conventional norms. This bravery is rooted in the belief that external opinions about the TikTok videos are inconsequential, as the teachers are confident that their content serves a noble purpose. Confidence begins to emerge from the initial successful experience of creating a TikTok video, leading to the continuous production of content until creating ESL TikTok videos becomes a routine activity. The entire process is depicted in Figure 1.

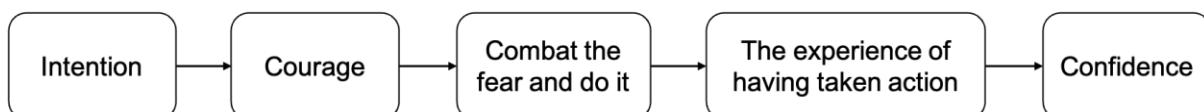


Figure 1. The formation of confidence beginning from initial intention.

4.1 INTENTION

i. Identify strategies to enhance students' comprehension of English and provide them with support

Azlan embraced the challenge of teaching at a school where the majority of students lacked proficiency in English as a problem that required a solution, prompting him to seek creative methods to support his students (Greenier et al., 2023). As Azlan explains:

Their English level is not that good...their lack of English exposure. So, that's why it's a bit challenging, for me...but...it's a way of – to push me; to become more creative, to find ways; how to make my students understand English more, to find ways to make it fun...I've faced a lot of challenges, I've seen a lot of different students and their abilities, and their proficiencies in English, their attitudes towards English...but that's – that's how you push yourself to be a good teacher. You see the problem, and you try to be better, for them, and for yourself. So, that's how it begins with TikTok!

4.2 COURAGE

4.2.1 COMBAT THE FEAR AND DO IT

i. Unafraid to make mistakes

In an effort to differentiate himself from the other teachers who do not create ESL TikTok videos as supplementary material to utilise in their teaching and learning, Faiz proclaimed himself as a “dare-taker” to characterise his personality in creating content. He exhibited courage in teaching his students (Turk et al., 2023) despite the ethical issues that revolved around the professionalism of educators acquiring a TikTok account and creating content openly. He further informed that he had also, once, committed an accidental error whilst teaching in one of his videos; yet, in spite of the flaw, he was unafraid due to his honesty and sincerity in teaching.

I'm not saying that I'm better than them (the other teachers) ...no. They just want to (teach) on the basic level (without having to create videos or any extra teaching materials). So, (that's) up to them. Maybe they don't want to be 'dikecam' or something; they are scared that they would do something; a mistake. I'm a dare taker, you know, I may make a mistake – ada, I pernah buat...so, some people are scared to make mistakes. So, they (teach) on the basic level; tak apa, silakan, no problem. So, I memang dare-taker, I buat je (i.e., create TikTok videos).

ii. Spontaneity in creating videos without worrying about what others may say later

Azlan emphasised that creating a TikTok video requires a strong passion for the process, without concern for potential external criticism or opinions (MacIntyre et al., 2020).

So, that's why – a few of my early videos were like, more – me and my students, doing crazy stuff, you know – don't care about, about the world, right? We just do, like, naturally – yeah – naturally. And it is just, just for me and my students.

iii. Create educational TikTok videos that deviate from traditional cultural norms

In traditional educational settings, teaching and learning are typically conducted with decorum and respect, and actions deemed unconventional are often viewed as contrary to the cultural norm. However, to engage his students in learning English, Azlan is willing to challenge these norms. According to Azlan, he creates TikTok videos that he believes are appropriate for both himself and his students, without concern for external judgements (Johnston et al., 2023). Consequently, many of his early TikTok videos feature unconventional or “crazy” elements.

With this – with this, kind of, uh...you know, behaviour, attitude, right? So... (regardless of) what people think (about our TikTok videos), I don't care. [Laugh] Because I'm comfortable with it – that's me, ha...

When he started producing numerous videos featuring unconventional content with his students, deviating from cultural norms, some individuals responded with negative comments. Despite the criticism, some teachers endorsed his approach (Carpenter et al., 2024), viewing it as an innovative addition to language learning that could be beneficial for students.

...I don't know why, [laughs] but the teachers – the whole teachers in Malaysia were behind my back, uh...so, I was like, surprised. They said that this is something new to the teachers, and something that's fun. They can use it with their students.

4.3 THE EXPERIENCE OF HAVING TAKEN ACTION

i. The joy of creating TikTok videos

According to Husna, she initially started creating TikTok videos at the suggestion of her husband, who encouraged her to pursue this endeavour. Her husband also supported her by taking care of their children, allowing her to concentrate on producing the videos. Initially, Husna experienced difficulty due to her shyness in front of the camera. However, as she gained experience in video creation, she began to find the process enjoyable (Vizcaíno-Verdú & Abidin, 2023). As Husna describes:

My husband made me do it, actually [laughs]...during PKP (Perintah Kawalan Pergerakan) (Movement Control Order) (MCO), and TikTok was in (trend) during that time, and he said, "Hey, look at these videos...why don't you (create TikTok videos) like Azlan...I think you can do it." I was hesitant because I'm, like, a camera-shy person... (My husband said), "Go on, I'll take care of the kids; go and record the video." And then I (realised), "It's quite fun, actually," because I can reach more people, and it's easier for me to share the videos with my students, and they like it.

4.4 CONFIDENCE

i. Perseverance in creating videos until it becomes a routine practice

In the process of producing creative and engaging videos, Azlan and his students consistently create a variety of content (Willis, 2023). Through repeated video production, the activity has become a routine practice, during which confidence has been developed. According to Azlan:

But, as – as we keep on trying, and trying (to make the Tiktok videos) we get used to ourselves, kan? Dah biasa dah – dah biasa dah with this voice, this face – [laughs]

5.0 CONCLUSION

This study illustrates the process of cultivating confidence from a particular intention. It finds that a positive intention is unlikely to materialise if it is overshadowed by fear (Roseman, 1984; Roseman et al., 1995; Roseman et al. 1996). Overcoming fear requires courage, supported by the belief that the action, grounded in a commendable

intention, is inherently valuable. Although this study focuses on teachers creating engaging TikTok videos, the steps outlined in this process are applicable to anyone who struggles with confidence despite having positive intentions.

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(A-SS082) BA:THUB: INTENDED DESIGN OF UNINTENDED BEHAVIOUR

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ABSTRACT

The acronym Ba: Thub refers to Baby Basin: The Unintended Behaviour Design Concept. The innovation project is inspired by the study of unintended human behavior (UHB). For instance, some individuals use the washbasin as a "baby bathtub" device to bathe their babies. According to previous studies, designers and researchers tend to pay less attention to UHBs compared to intended behaviors. This situation arises because humans find it challenging to predict and control UHBs in specific contexts. According to our research, factors such as psychological, environmental, economic, and product characteristics trigger the use of washbasins for baby bathing. Additionally, the problems often encountered by users, such as at R&R areas, hotels, malls, and hospitals, do not provide baby-friendly facilities and do not support the function of bathing babies when the user is outside of their home. According to our research findings, unintended use of a product begins when the user is in a complex situation, needs an immediate solution, and then interacts with the surrounding object to complete their tasks. However, psychologists agree that UHB has great value and potential in the field of product design. The project aims to (i) introduce the concept of 'Unintended Behavioural Design' (UBD) to designers who produce user products, and (ii) visualize the usability of the concept to develop new product designs. The method applied in this project involves four phases: ideation, concept development, digital draughting, and the modeling process. The UBD concept enhances designers' design thinking parameters by leveraging consumers, the sanitaryware industry, the tourism sector, and human well-being. The findings of this innovative product prototype unequivocally provide comfort to users and reduce the risk to their babies when using Ba: Thub.

Keywords: Unintended behaviour, Unintended Behaviour Design, Wash basin, Design thinking, Product design

1.0 INTRODUCTION

Every day, people interact and communicate with various kinds of products for different purposes. For example, people creatively use reversible chairs to hang plastic waste or, manipulated a bottle to separate egg yolks. The unintended uses of product were not designed by designers; rather, they were involuntary inventions that gave human life meaning and freedom from problems (Norman, 1988). Through investigation in systematic literature, UHB occurs due to several major factors, such as psychological, environmental, economic, and product characteristics (Hassan, Z. et al., 2022). Suri (Suri, 2005) has created a term "thoughtless act" of everyday activities that refers to unintended use of product. Understanding human interpretation, observing human

behaviour, and exploring experience can lead to better ideas and valuable solutions to people needs. Previous study was conducted, which user's attention was drawn to certain unintentional behaviours through survey (see Figure 1). During the survey, respondent selected five representations of UHB, one of it is "bathe babies using a wash basin". Wash basin originally is designed to be used for washing hands and faces. However, it is used not only as an intended function but also outside of its original context (Hassan, Z. et al., 2023). This is considered an everyday phenomenon in which non-designers are accidentally involved in the process of creating new functions through new ways of using existing products (Kim, S. et al., 2021). According to our findings, factors contributing to the behaviour include impractical portable baby bathtub for a vacation activity, unfriendly wash basin in baby's public area, consideration of back pain for mothers during their confinement period, cost saving, time concern, easier way to complete the task, social influences, personal experiences, and product affordances. The investigation was continued empirically involved thirty designers in product design through several stages: Verbal protocol, Design protocol, and Design syntactic analysis. Research locations are being carried out around Kuala Lumpur, Selangor, Negeri Sembilan, Kedah, Perak, and Penang, which ethically conducted. Based on the research findings, a design development model called Unintended Behavioural Design (UBD) concept was developed (Hassan, Z. et al., 2024). Thus, this project is designed to expose and test the concept of UBD based on the results of the research carried out. Therefore, to visualise the concept of UBD, we transform the idea of UHB into a prototype form.



Figure 1. Example of unintended use of product in everyday contexts

2.0 OBJECTIVE

The first goal of the innovation project was to introduce the concept of UBD, which was developed from early research discoveries. It will expose the industrial product designers, particularly those involved in user product design. The second objective is to convey the idea of innovation to the public by visualising the UBD concept in the development of new product designs. Both objectives are achieved through prototype development strategies, as mentioned in the methodology section.

3.0 METHODOLOGY

The project employs four-phase activities: ideation, concept development, digital draft, and modelling process. The first phase entails selecting ideas based on the protocol design activities carried out during the initial research. For this project, several UBDs proposed by the designers have been evaluated and selected as design representatives. The second phase involves the development of product concepts that involve defining the final form, material determination, technical components, and presentation. For phase three, digital design involves using the AutoCAD application to create two dimensions and three dimensions views. The final step is to translate the

2D design into 3D form using the 3D printer application (Flash forge Adventurer 4). The project was also collaborated with several companies to develop the prototypes.

4.0 RESULTS

The innovation aims to test the UBD concept's applicability in design development. The project's impact will (i) increase the potential for designing products through the UHB concept, (ii) reduce the risk of misuse of existing products, and (iii) provide comfort and opportunities for users to use products based on their daily needs. The innovation's uniqueness lies in its ability to enhance a new function without compromising the product's original purpose, while also incorporating improved safety features, ergonomics, and baby-friendly materials. Designers and product design experts inspired the novel features of this product during the protocol design session that was conducted at the beginning of the research. Therefore, we consider this finding to be highly reliable after careful consideration by those involved throughout the research and development of the design.

5.0 CONCLUSION

The design research has become familiar with the phenomenon of everyday design, which has gained acceptance in the design arena through various definitions of design concepts. Adjustments, exposures, and guidelines for UBD need to be introduced and expanded to product design practitioners so that this effort benefits all parties. Through the Ba:Thub prototype, designers benefit from UBD's design concept. It also opens opportunities for the sanitaryware industry to expand product production variations. Finally, through the introduction of this innovation, it benefits users in meeting their needs without risk.

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**(A-SS083) AN OVERVIEW OF THE SOCIAL SUPPORT OF PARENTS TO
TEENAGERS WHO DO EARLY MARRIAGE IN CIPINANG**

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ABSTRACT

According to UU on Child Protection No.23/2012. Early marriage is a marriage performed by those who are under 18 years old. So, anyone who gets married below the age limit can be said to be the perpetrator of early marriage. According to UU No. 16/2019. The minimum age of marriage for women is the same as men, which is 19 years. Based on the background of social support for parents of teenagers who carry out early marriages in Cipinang. So the purpose of this research is to describe the social support of parents for their son and daughter. The object of the research was adolescents who had early marriage under 19. This research uses a qualitative approach with descriptive research type. The direction of this research is about social support for adolescents who married early, either male or female. This research will be conducted in Cipinang, Jatinegara, East Jakarta. Sources of data were collected by means of interviews, and documentation (collecting evidence, selecting, processing, and storing information). Data validity test in qualitative research includes member checks and triangulation. Based on the results of interviews with 6 informants, it was found that not all adolescents who married early get social support from their parents.

Keywords: Early Marriage, Parents Social Support, Cipinang

1.0 INTRODUCTION

According to Law no. 1 of 1974 Article 1, The definition of marriage is the occurrence of marriage and spirituality between a man and a woman with the aim of forming an eternal family and based on the Supreme Godhead. According to the BKKBN, early marriage is underage marriage caused by social, educational, economic, and social factors. culture, parents, self and place of residence. According to the child protection law No. 23 of 2012, early marriage is a marriage performed by those who are not yet 18 years old. So, anyone who gets married under the age limit can be considered as a perpetrator of early marriage. According to law number 16 of 2019, the minimum age for marriage for women is the same as the marriage limit for men, which is 19 years.

The survey of world marriage patterns conducted by the United Nations (2011) on countries with a marriage age of 18 years or older, shows the second highest rate in ASEAN after Cambodia and is ranked 37th in the world in terms of early marriage. According to the head of the BKKBN, 2019, in Indonesia, many teenagers experience problems. Starting from early marriage to premarital sex. Based on the Central Statistics Agency (BPS) in 2020 the percentage of early marriage in the country has increased by 1.48%, in 2018 as many as 14.18% of Indonesian teenagers had early

marriages and in 2019 as many as 15.66% of teenagers had early marriages. If this trend continues, by 2020 as many as 14.2 million young women are married every year or 39,000 every day.

In developing countries women in the 15-19 years experience complications from childbirth and the main cause of death. It is estimated that 90% are married and 50 thousand have died of the 16 million women born each year. The risk of death does not only occur in a mother. Compared with women who are pregnant at the age of 20 years and over, the mortality of newborns is 50% higher than those born to mothers under the age of 20 years (WHO, 2012).

Women under 20 years old are not ready to get married biologically. So the risk is very high for both mother and baby. Based on health studies. The age of marriage that should be for teenagers is 20-35 years. At that stage, women fall into the category of young adults. Age under 20 years of early marriage is not ready physically, psychologically, endocrinologically and emotionally unstable (Julianto Witjaksono, 2014).

Early marriage can also cause psychological problems, such as trauma, crisis of self-confidence, and emotional stress. Psychologically, the perpetrators of early marriage are not ready to build their families. In addition, early marriage can also cause cognitive disorders, such as difficulty making decisions, not daring to solve problems, and impaired memory. Other problems with early marriage are injustice, domestic violence and divorce.. This can lead to decreased productivity and fewer opportunities for further education. Adolescent girls in early marriage, pregnancy and childbirth are prone to mental disorders, such as depression after childbirth (baby blue syndrome) due to hormonal changes, fatigue, mental stress and lack of assistance during childbirth.

The impact of early marriage includes social aspects that have the potential to take away freedom of expression. Actors of early marriage will lose the right to express and think according to their age because of the demands of their obligations as a wife or head of the household. The perpetrators of early marriage also limit the association because they are not given the space to hang out with many people which should have a positive effect on personality maturity. On the other hand, socializing in society or facing demands for public opinion can frustrate children and tend to distance themselves from social activities.

The Cipinang area in the center of the capital city is located in the Jatinegara sub-district, East Jakarta, the Special Capital Region of Jakarta. The village which has an area of 1.15 km² consists of 14 community units. Based on the results of the interview, Mrs. Sundari as the Village Head of Cipinang Besar Utara said that the data found by the sub-district ensured that there was no confirmed data because most cases of Early Marriage were found in unregistered marriages on the grounds that they were pregnant out of wedlock.

With the discovery of cases of early marriage in Cipinang, our group conducted a study entitled "An overview of the social support of parents of teenagers who marry early in Cipinang."

2.0 OBJECTIVE

The research objectives to be achieved in this P3KPM proposal are as follows :

1. To find out more about the influence of early marriage on factors psychology
2. To provide information to the public about the dangers of early marriage on psychological factors

3.0 METHODOLOGY

➤ Description Of The Research Location

Cipinang Village is located in Jatinegara sub-district, East Jakarta, Special Capital Region of Jakarta. The village which has an area of 1.15 km² consists of 14 community units.

The reason the researcher chose Cipinang Besar Utara Village was that there was a circular letter to prevent child marriage issued by Sri Sundari, Cipinang Besar Utara Village Head, dated October 05, 2018. but already have to take care of the children. This attracted the attention of researchers to conduct a study on the Impact of Early Marriage for Teenagers of Early Marriage in Cipinang Besar Utara Village, East Jakarta.

➤ Data Collection Technique

Data collection techniques are the most important step in research, because the main purpose of research is to obtain data according to Sugiyono (2007) when viewed in terms of data collection methods or techniques, data collection techniques can be carried out by observation, interviews, questionnaires and documentation. However, in this study, the data collection techniques carried out by researchers were through three methods, namely:

1. Interview

Esterberg in Sugiyono (2007) defines an interview as a meeting of two or more people to exchange information and ideas through question and answer, so that meaning can be constructed in a topic. With interviews, researchers will find out more in-depth things about informants in interpreting situations and phenomena that occur, where this cannot be found through observation. In conducting interviews, researchers prepared research instruments in the form of written questions to be asked, and recorded what was stated by the informants, therefore the types of interviews used by researchers included in the type of structured interviews.

2. Documentation

Documentation is a record of events that have passed. Documents can be in the form of writing, pictures, or someone's monumental works (Sugiyono, 2007). Research results from observations or interviews will be more credible if they are supported by the relevant documents.

➤ Data Analysis Technique

Data analysis is presented in descriptive form. At the data analysis stage, the process of simplifying the collected data is carried out in a form that is easier to read and understand. The stages of data analysis carried out by researchers are:

1. Data Collection

Data was collected through observation and interviews. At this stage the data that has been collected is then made into a transcript, namely by simplifying the information collected in written form that is easy to understand. Furthermore, the data collected was selected according to the focus of this research and coded to make it easier for researchers to categorize the data that has been obtained.

2. Data reduction

Reducing data is summarizing, choosing the main things, looking for themes and patterns. As well as discarding things that are not needed in research. At

this stage, the data that has been coded and grouped are summarized to provide a clearer picture.

3. Data presentation

Presentation of data that has been interpreted and explained in the form of text descriptions or is narrative in nature accompanied by tables and graphs for easy understanding

4. Drawing Conclusion

At this stage the researcher draws conclusions from the results of the data analysis that has been done.

➤ **Data Calibration Techniques**

Qualitative validity is an effort to check the accuracy of research results. In this study the researcher will use the following validity (Cresswell, 2014)

1. Member check

Re-examine the information or data information obtained during observations or interviews from the informant whether the information or information remains or changes so that the truth of the data can be ascertained.

2. Triangulation

According to Alwasilah (2012) triangulation is the collection of information or data using various methods to reduce bias. Check the truth of the hypothesis, construct or analysis by comparing the results of research partners. In triangulation, researchers collect data through various sources so that the results of interviews, observations and documentation can be analyzed completely. (Creswell, 2014)

4.0 RESULTS

➤ **Description of Findings**

1. Cipinang Village

Cipinang Village is located in Jatinegara sub-district, East Jakarta, DKI Jakarta. The village which has an area of 1.15 Km consists of 14 community units. East Jakarta is an area close to the border between North Jakarta and Central Jakarta.

2. Spread of Early Marriage in Cipinang

The number of early marriages in East Jakarta is still concerning. There are about 93,332 teenagers aged 15-19 years in East Jakarta. The number is spread over 10 districts.

3. Early Marriage in Cipinang

The Cipinang community is the primary data source in this study. Researchers get information by conducting interviews with 6 informants with the characteristics that have been determined by the researchers and get the results as shown in table 1.

Table 1. Data Characteristics of Research Informants

Inisial	Status	Usia saat ini	Usia saat menikah
TA	Ibu Rumah Tangga	20 Tahun	16 Tahun
IN	Ibu Rumah Tangga	18 Tahun	18 Tahun
MW	Buruh	17 Tahun	15 Tahun
WU	Ibu Rumah Tangga	22 Tahun	18 Tahun
AP	Ibu Rumah Tangga	17 Tahun	16 Tahun
RA	Pengajar	19 Tahun	18 Tahun

The results of data analysis which includes data reduction and data presentation are as follows:

4. Emotional support

The first participant with the initials TA had problems not understanding the nature of each and was still carried away by ego and economic problems which often became a problem. TA often relents for fear of domestic violence. TA never talked about family problems because her parents didn't want to interfere.

The second participant with the initials IN is experiencing economic problems and does not understand the nature of one another. IN learning does not magnify the problem. IN is often assisted by parents in overcoming problems by giving advice.

The third participant with the initials MW experienced a problem of nature which was still unstable and did not understand each other. MW often relents if there is a problem. MW explained that his parents never knew about the problems his family was facing.

The fourth participant with the initials WU feels happy in his marriage. WU has not experienced any problems in her marriage. WU explained that her parents helped give direction regarding her husband's character

The fifth participant with the initials AP often experiences misunderstandings with his partner. AP is often misunderstood because her husband works with many female colleagues. AP is now able to better understand her husband's work. AP solved the problem by communicating well with her husband. AP has never been so indifferent to her husband. AP parents help solve their problems if AP subjects tell stories. AP's parents immediately gave an action response to AP's husband. AP parents are the type of parents who solve their children's problems. AP's parents advise subject AP regarding his problems

The sixth participant with the initials RA has problems in the form of emotional instability, disappointment if his plans with his husband do not match his expectations, do not talk to each other when their emotions are not good. RA resolved the problem with her husband by discussing after their emotions had stabilized. RA also received emotional support in the form of advice from his parents, especially his mother. She told the problem with her husband to her mother and her mother immediately followed up on the problem by directly asking the child's husband.

4 out of 6 teenage informants who married early marriages under 19 years of age felt emotional support, especially when they talked about problems in their marriage. Meanwhile, the other 2 informants felt that they did not receive emotional support because their parents did not want to interfere with their household problems.

5. Award Support

TA is not allowed to work by her husband. TA often relents when there is a problem for fear of commotion and domestic violence. TA said that his parents did not want to interfere in his household matters. TA said her parents didn't care about her husband's work, the most important thing was that he could eat.

IN works. IN follows the advice of parents in dealing with problems. IN explained that his parents were very firm in their opinion on family problems. IN explains that his parents don't care about the results of his work

MW works. MW relents if there is a problem. MW explained that his parents did not want to interfere with his income. MW explained that his parents were happy with his work

WU doesn't work. WU explained in dealing with problems with mutual understanding and not selfish. WU explained that his parents advised him if there was a problem. WU explained that it was her husband who gave a little of his work to his parents.

AP is not working. AP solved the problem by communicating well with her husband. AP still uses his own way in solving his son's problems. AP's parents were satisfied with the work of AP subjects. AP parents applaud AP's work. AP's husband always compliments AP

RA gets work support from his parents and the freedom to keep working or not. RA overcomes disagreements in overcoming marital problems by discussing with her husband. RA often complains to his parents, but his mother continues to encourage him to be patient. RA often helps her parents before marriage, so she is used to doing homework which makes her not get comments on the results of homework

4 out of 6 teenage informants who do early marriage are supported by their parents to work. Meanwhile, the other 2 informants did not work because their husbands prohibited them. Then the results of the work of some of the informants were appreciated by their parents and some did not want to interfere

6. Instrumental support

TA said that her husband is responsible for the finances in her household. TA said no one helped his family financially. TA was never helped by her parents because her parents were also unable.

IN who is responsible for family finances. IN is often assisted by parents in financial needs. IN feels the role of parents is very important in helping his family material

MW is responsible for the finances in his family. MW is not assisted by anyone in financial needs. MW is not assisted by parents in material needs.

WU explained that her husband was responsible for the family finances. WU explained that there was no one to help her family's financial needs. WU explained that since the pandemic his parents helped with material needs for his child.

AP's husband is in charge of financial matters. AP has experienced financial problems. AP is trying to save money. AP's parents often give AP money. AP's parents often give goods to AP

RA and her husband have both been financially independent since they were not married. After marriage, their household finances are covered by RA's husband and they are able to meet their household material needs independently. Thus, neither other people nor their parents provide them with instrumental support.

3 out of 6 teenage informants who do early marriage are supported by their parents to work. Meanwhile, the other 3 do not work because their husbands prohibit them. Then the results of the work of some of the informants were appreciated by their parents and some did not want to interfere

7. Information support

TA never talked about family problems because her parents didn't want to get involved. TA really trusts her parents in sharing her problems but doesn't want to be a bother. TA was never given information on how to take care of the household by her parents because she lived far away. TA is advised not to fight constantly.

IN often tells parents when there is a problem. IN feels that parents want the best and are more experienced in taking care of the family. IN explained the importance of the role of parents in taking care of the household. IN advised parents to live in harmony.

MW never told his family problems to his parents. MW never told his parents about the problem. MW explained that the role of parents is important in providing information on how to take care of the household. MW is given advice to be more mature

WU has never talked about her marriage problems with her parents. WU feels safe when she shares her problems with her parents. WU explained that the roles of parents are many, starting from serving their husbands to children. WU explained that her parents gave her advice on how to maintain the relationship and not bring up the problem

AP rarely talks about his marriage problems. AP has often shared problems with his parents from before marriage. AP's parents provide information regarding household matters

RA often shares stories with his parents because he has confidence in his parents because according to him he has more experience in household matters and knows himself better.

Teenagers who married early marriage under 19 years. Receive information support both how to take care of the household as well as dealing with conflicts in their marriage.

8. Social network support

TA rarely sees family. TA meets family while husband is on vacation. TA often interacts by telephone with his family. TA is happy to meet family because it adds to the experience.

IN has a good relationship with parents. IN often meets parents. IN often interacts with parents. IN enjoys meeting parents and feels the need for parental direction.

MW is on good terms with his parents after marriage. MW often interacts with his parents. MW often interacts with his parents. MW feels happy to meet his parents but doesn't feel helped

WU is on good terms with her parents. WU often interacts with her parents. WU often interacts with her parents. WU likes to meet parents because it helps if there are household problems and to share stories

AP feels the difference from before and after marriage. AP often interacts with his parents. AP meets his parents every day. AP feels safe and helped by the presence of his parents

RA's relationship with his parents after marriage got closer and they often interacted, either directly or indirectly.

The results of the research above are the facts that show the description of the social support of parents of early marriage perpetrators in Cipinang. The following will discuss the meanings contained in these facts.

Based on the results of the reduction and presentation of data, it can be concluded that young people who do early marriage in Cipinang feel that they get social support from their parents. Such as emotional support, reward support, instrumental support, information support, and social network support.

5.0 CONCLUSION

Marriage ideally is quite a complicated thing, it takes various preparations in it such as psychological, biological, and financial readiness. It is unfortunate that teenagers who should be able to explore the world and find their identity instead have to be preoccupied with various marital conflicts. Indonesia as a state of law has made many policies related to the implementation of marriages that are recognized by the state, one of which is the minimum marriage limit of 19 years for both men and women. However, it turns out that there are still many cases of early marriage which means it is not legally valid. that at least one out of four girls in Indonesia has been married before the age of 18. Immature emotions in teenagers who marry early often cause them difficulty in overcoming problems. Therefore, we need a support that can make these teenagers stronger in facing various problems. This support is nothing but social support, especially from parents as the first environment for children. Someone who gets social support will generally feel more secure and valued because there are still people who care about him.

(A-PP002) MALAYSIAN HOUSEHOLD INCOME SURVEY FOR NECESSITIES

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ABSTRACT

The term of household income in buying essential needs refers to the combined gross income of all members of a household above a specified age. Household income aims to guarantee the affordability of housing for every category of salary earner, including the low income, middle income and high income individuals. This study aims to fill a knowledge gap about the spending habits of essential households versus income household among Malaysian. By conducting a survey, we hope to gain a more nuanced understanding of these households' financial dynamics, shedding light on how they allocate their limited resources to meet their basic needs. From this survey, it is conclude that the cost of living against the cost of expenses can be shown in the purchasing behaviours. The majority of Malaysians concur that their household income is adequate to pay for their necessities.

Keywords: Income, Household, Essential

1.0 INTRODUCTION

"Household income" refers to the total gross income of all household members who are older than a given age. Household income includes every family member that lives under the same roof, including partners and their children who are at an age of maturity. The income of everyone is counted even if they do not support the household expenses. This also includes anyone living under the same roof even if they are not related. Household income is important to measure for a useful economic indicator of an area's standard of living. Furthermore, household income aims to guarantee the affordability of housing for every category of salary earner, including the low income, middle income and high income individuals.

The problem that usually Malaysian people have been facing is the cost of living. Whether the government should subsidize the goods or the wages should be increased. On how the economy should be developed in the future.

Furthermore, one of the advantages of conducting this survey is to measure how well people in a given area are doing financially. All of the factors will be a stepping stone for respondents to make decisions to buy and purchase behavior respectively. It is also to measure the effect of purchasing behaviors on families that may change according to various factors as a result of the characteristics of families. Such as the size of a family, the place of living and the number of individuals in the household are considered as factors that affect buying essential needs of a household. We aim to provide surveys automatically to run statistically accurate surveys across the nation.

By conducting a survey, we hope to gain a more nuanced understanding of these households' financial dynamics, shedding light on how they allocate their limited resources to meet their basic needs. The emphasis is on essential expenditures such as food, housing, healthcare, education, and other basic necessities that comprise the daily fabric of life. Therefore, this survey is conducted to study on the household income for the buying essentials need among Malaysian people.

2.0 OBJECTIVE

The following are the overall objectives of this study:

- To estimate how much Malaysian people spend monthly to buy essential item
- To approximate monthly household income of Malaysian people
- To determine if the household income is sufficient to cover Malaysian people essential expenses (e.g., housing, utilities, food, healthcare)

3.0 DESCRIPTION OF DATA

3.1 Population and Sample

The term population is used to represent all possible measurements or outcomes that are of interest to us in a particular study or piece of analysis. In this report, Malaysian people are selected as a population.

The term sample is used to designate a subset of items that are chosen from the population. A sample of 80 respondents are selected Malaysian people.

3.2 Sampling Techniques

Given the objective of understanding household income in buying essential needs among Malaysians, a convenience sampling technique would be appropriate. Convenience sampling is the procedure where the selection of respondents is at the convenience of a researcher. The respondents are selected because they happened to be in the right place, at the right time where we are conducting the survey. By employing a convenience sampling technique, you can capture the diversity of the Malaysian population and ensure that the survey results are reflective of various socio-economic conditions.

3.3 Data Collection Method

We used an online survey for this. With this method, we build a questionnaire using a Google Form and distribute it to everyone. We will have to wait for the respondents' submissions of the Google Form questionnaire. Not to forget that the 80 participants were selected at random for the study since there was an equal chance of selection for each person. All in all, this online survey proved to be an effective method of collecting data for this study.

4.0 RESULTS

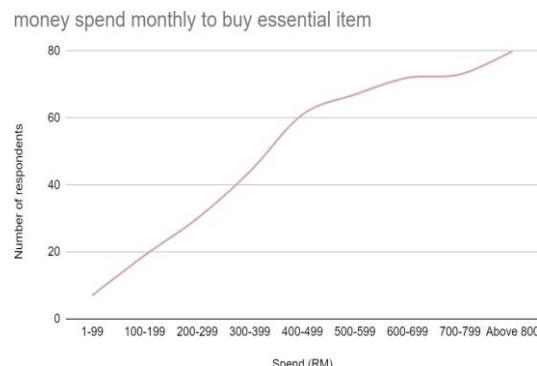


Figure 1 : Ogive chart of respondents' evaluation based on the amount of money spend monthly to buy essential item

Based on the ogive above, it shows that most of the respondents spend RM400 to buy their essential item monthly.

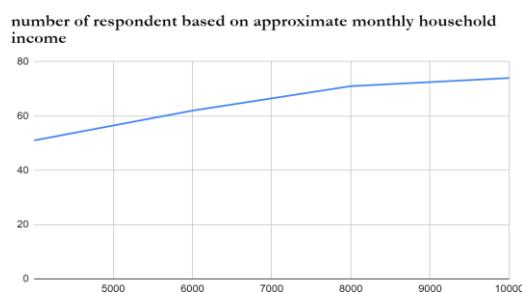


Figure 2 : Ogive chart of Number of respondent based on approximate monthly household income

Based on the ogive above, it shows the highest approximate monthly household income of respondents are below RM2000 which is 28 respondent and the lowest is in “RM 8001-10000” income range.

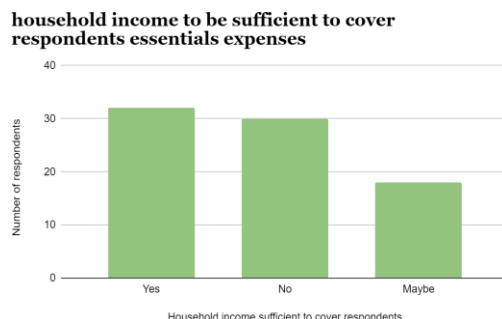


Figure 3 : Bar chart of household income to be sufficient to cover respondents essential expenses

The bar chart illustrates that respondents' household income sufficiently covers their essential needs more with 32 respondents than who said no with 30

respondents and who are uncertain about how sufficient the household income to cover their essential needs with 18 respondents.

5.0 CONCLUSION

In conclusion, an overall of 80 Malaysians responded to the survey that has been conducted to determine the number of respondents based on the amount of money spend monthly to buy essential item. With 17 respondents, the majority of respondents spend between RM 400 and 499. Spending decreases as the price ranges increase from RM 1-99 to RM 700-799. The "RM above 800" category has increased once more, indicating a group of respondents with higher spending habits. The RM 400-499 range could represent a middle-income bracket, and a sizable portion of the surveyed population could fall into this income bracket. Middle-income people frequently strike a balance between income and expenditure.

Next, from the observation number of respondent based on approximate monthly household income, the majority of respondents 28 are in the "RM below 2000" income range, indicating that a sizable portion of the surveyed population has a lower monthly household income. The number of respondents generally decreases as the income ranges increase, indicating a smaller proportion of individuals with higher income. The surveyed population may predominantly consist of individuals or households with lower economic means. This could be influenced by the geographic location, type of industry, or the overall economic conditions of the surveyed area.

Moreover, from the questions regarding household income to be sufficient to cover respondents essential expenses. As we can observe, individuals in this category believe that their household income is sufficient to cover their essential expenses. These respondents are confident in their ability to meet basic needs. Respondents in the "Yes" category may have financial stability, as their income meets or exceeds their essential expenses on a consistent basis. This could be because of well-paying jobs, multiple sources of income, or good budgeting.

From the survey it can be concluded that almost all of Malaysian people, spend their money wisely based on their monthly income. Most of them agree that their household income are sufficient to cover their essential expenses.

(A-PP003) A COMPARATIVE ANALYSIS OF UITM PASIR GUDANG STUDENTS' ONLINE AND IN-STORE PURCHASE HABITS

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ABSTRACT

Online and physical shopping are two different things. Some items are less expensive when purchased online thanks to coupons, which may influence individuals to shop online instead of in person. Physical stores, however, offer consumers instant satisfaction. In spite of that, both methods have their own benefits. Online shopping is more convenient for university students because it eliminates the need for them to leave campus to go shopping. The purpose of this survey is to compare online and in-person purchases made by UiTM Pasir Gudang students. It has been discovered that the majority of UiTM Pasir Gudang students prefer to shop online rather than physical shopping. Additionally, it is shown that the majority of UiTM Pasir Gudang students prefer to shop online for clothes and food.

Keywords: Online, Physical, Shopping

1.0 INTRODUCTION

Online purchase referring to a form of electronic commerce to directly buy goods over the internet while physical purchase is a shopping activity where consumers need to visit physical stores in person. Online shopping is often cheaper than in stores because online retailers may have fewer overhead costs. Online shopping also may come with the chance to apply more discount codes so you can save even more money. You may even be able to find cheaper gently or never used items on second-hand shopping sites.

In other cases, some people, especially older people, prefer physical shopping because they do not know how to use online banking or even gadgets. Also, some students prefer physical shopping because they will feel satisfied when they buy the item at the store, because they can touch the item, they can read the ingredients if they are buying skincare or foods, this can make them feel satisfied with the money that they spent.

Nevertheless, online and physical shopping have their own benefits. For instance, when we shop at a physical store, we can earn members points, like Watsons do. They provide a member card for their regular customers, so when we buy items at their store, we can earn points, which can give benefits to us. Other than that, online shopping also has its pros and cons. For example, we get a free shipping voucher and other discounts from the store. Above all, using online purchased it is difficult for consumer to differentiate whether the item is original or fakes.

Online shopping is a trend nowadays, it has become popular day by day for students. Social media also has become a platform for owners of the business to sell their products widely. This is due to the benefits it gives since youngsters use social media a lot these days. Online shopping is the use of technology for better marketing promotion. However, there are still students that are using physically shopping in the mall. Therefore, the purpose of this study is to analyse a comparison between online and physical shopping among UiTM Pasir Gudang students

2.0 OBJECTIVE

The objective of study are :

- To determine whether UiTM Pasir Gudang students prefer to shop online or physically.
- To examine students' level of satisfaction between online and offline shopping.
- To identify the most preferred products students bought online.

3.0 METHODOLOGY

3.1 Population and Sample

All of the objects being studied are referred to as the "population," whereas a particular subset of those things is referred to as the "sample". Population for this survey is all UITM Pasir Gudang Students.

Out of all UITM Pasir Gudang Students only 104 students are selected as respondents

3.2 Sampling Technique

Convenience Sampling are used in the study. This approach is less expensive and more effective than others. The sample is selected from the public using a convenience sampling technique, which ensures that every potential responder has an equal chance of being selected.

3.3 Data Collection Method

Online Questionnaire are used as data collection method for this survey. In this method, a questionnaire were generated using a Google Form and distribute it to all students via the internet, including social media. Participants' will submit the Google Form of questionnaire after they have completed the survey.

4.0 RESULTS

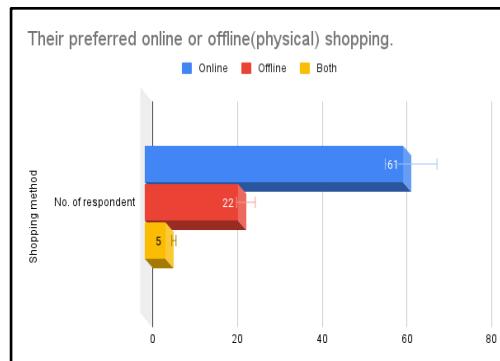


Figure 1 : Bar chart of respondents based on their preferred online or offline(physical) shopping.

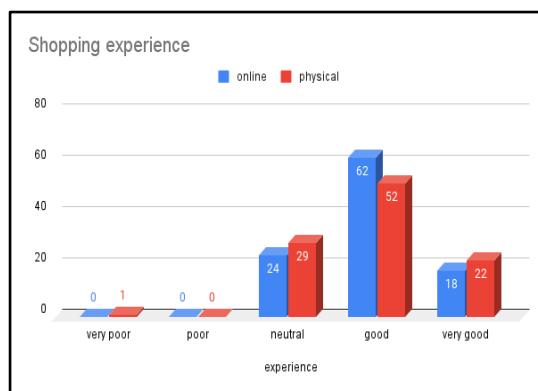


Figure 2 : Multiple bar charts of respondents on their satisfaction of shopping experience online versus physical

The multiple bar chart shows the respondents' experience of online and physical shopping. Online and physical only have 10 different votes with 62 votes for online and 52 for physical on the good term.



Figure 3 : Pie chart of respondents based on the product that they prefer to shop online.

The Pie chart shows Respondents based on the product that they prefer to shop online. We can see the top three respondents prefer to shop online for clothes, food and makeup. This is because these products provide cheaper prices when we buy

online, because the shop gives many vouchers, for example free delivery vouchers and 20% off when they shop for more than RM50.

5.0 CONCLUSION

As a conclusion, a total 104 respondents are selected from a survey. Based on responses, it is found that students are more likely to shop online. Most of the respondents for this survey are female rather than the male. From the survey 90.4 percent of the 104 respondents are 18 -19 years old students.

Firstly, almost all of the students prefer to shop online. From the questionnaire it is found that 66 students prefer to buy online because they are too lazy to go out. Other than that, buying online is cheaper than a walk-in store as it always has a sale and can save time by doing online shopping. On the other hand, there are 22 votes from students that they prefer to do physical shopping. This is because offline buying offers the chance to personally contact with products and ask questions to the sales workers. Also, there are students who prefer both methods of shopping. In the end, each method aims to provide people with a quick and easy way to make purchases.

Moreover, there are differences in the students' level of satisfaction between online and offline shopping. We found that 62 students had a good experience on online shopping and 52 students on physical shopping. This demonstrates that while physical stores provide rapid access to things and enable customers to see, touch, and test items before purchasing, online shopping allows people to purchase anywhere at any time without having to drive to the store. Ultimately different people will enjoy different things when they shop, depending on their preferences, the kind of item they are buying, and their needs.

In addition, from the observation, most of the products that students prefer to shop online are clothes. There are 67 students that prefer to buy clothes online. Students highly buyed clothes on online platforms as they always have sales and students can get it at a cheaper price. While there are only 15 students that prefer to buy food online, this could be because there are a variety of types of food that they can buy from variety of platform available such as foodpanda, grab food and others. Consumers can chose from fast food to traditional cuisine, this give them a wide range of options.

(A-PP007) PARCEL TUBE

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ABSTRACT

This abstract introduces "SecureConvey: ParcelTube," an innovative product design poised to revolutionize last-mile delivery processes. SecureConvey: ParcelTube is a cutting-edge solution comprising a large, interconnected box equipped with an integrated conveyor belt system. This system facilitates the seamless transportation of parcels from external mailboxes directly into recipients' homes. Adding to its ingenuity, SecureConvey: ParcelTube incorporates a robust security feature requiring couriers to scan a QR code for access, ensuring secure parcel deposition (Focardi, 2019). In the wake of escalating demand for efficient and secure parcel delivery solutions amidst e-commerce expansion, SecureConvey: ParcelTube addresses prevalent challenges such as missed deliveries and package theft (Morrel, 2023). By enabling direct deliveries to recipients' homes, irrespective of their presence, SecureConvey: ParcelTube offers unmatched convenience and reassurance to consumers. The design journey of SecureConvey: ParcelTube was steered by exhaustive research into user preferences and behaviours, prioritizing usability, security, and compatibility with existing delivery infrastructures. Iterative prototyping and rigorous testing phases enabled refinement of functionality, ergonomics, and reliability, ensuring optimal real-world performance. Key features of SecureConvey: ParcelTube encompass seamless integration with courier operations, remote monitoring, and control capabilities accessible via mobile app or web interface, alongside robust security measures safeguarding parcels throughout the delivery process. In essence, SecureConvey: ParcelTube signifies a monumental leap in parcel delivery technology, furnishing a scalable and adaptable solution that caters to the evolving needs of the modern delivery landscape (Americas, 2020). With its unwavering focus on convenience, security, and efficiency, SecureConvey: ParcelTube pledges to elevate the overall delivery experience for both consumers and delivery providers (Lai, 2020).

Keywords: Last-mile delivery, Parcel delivery, Connected box, QR code access, Secure delivery solution.

1.0 INTRODUCTION

In this 21st century, the landscape of e-commerce and online shopping has rapidly evolved. The final stage of the delivery journey of the packages is basically the process of receiving parcels at the doorstep, which this stage encounters numerous challenges. The frequent challenges that both recipients, senders, and delivery

providers have been facing include missed deliveries, package theft, and the need for the recipients to be physically present to accept deliveries. Therefore, the development of this product design is necessary to enhance the efficiency and security of the final stretch delivery process. This innovative solution is designed to smoothly transport parcels from an external mailbox directly into the recipients' homes. The incorporation of advanced technology, that includes a QR code access mechanism, would ensure secure parcel delivery and retrieval. Couriers are required to scan a designated QR code to unlock the box's door and drop the parcels inside, guaranteeing the safety of deliveries until they are retrieved by the recipient.

2.0 OBJECTIVE

Therefore, the innovation of Parcel Tube aims:

- To build a last-mile delivery system that is flexible and expandable to meet the changing needs of the e-commerce sector.
- To develop a smart, connected mailbox with an integrated conveyor belt and safe access control, which will improve security and convenience for recipients of e-commerce parcels.
- To design and assess a last-mile delivery system that is safe, user-friendly, and seamlessly interacts with the current delivery infrastructure.

3.0 METHODOLOGY

A systematic approach to developing innovative parcel tube delivery boxes that prioritizes user needs.

Based on market research and consultations with the lecturer, product design was conducted through analysis to identify critical problem points faced by both consumers and delivery staff (Gayst, 2021). This initial step, which included online surveys and observational studies, provided a clear understanding of the problems and areas for improvement, such as missed deliveries, package theft, and inconvenient delivery space.

Prototyping and iterative testing developed afterward following the creation of ideas.

Utilizing design software where applicable, product designs were constructed prototypes from different materials. Throughout this process, features like the conveyor belt system and secure access mechanism were carefully tested at each stage. User testing further improved the box's ergonomics and the mobile web interface's usability.

Security evaluations ensured the durability of the QR code access and remote monitoring features.



Finally, to guarantee a smooth connection with the current delivery system, analysed compatibility with standard parcel sizes and explored potential partnerships with courier companies have been made. This emphasizes how careful the parcel tube delivery boxes are to ensure that the product successfully meets the changing needs of delivery providers as well as customers.

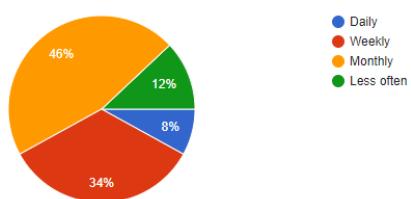


4.0 RESULTS

Based on a survey that has been conducted among students, lecturers, and the public, it shows that as many as 46% of respondents receive parcels at their homes every month. Therefore, online purchases certainly have their own risks. A total of 54% of respondents experienced missing parcel delivery because respondents were not at home. Therefore, this can not only harm online buyers but also become a concern for buyers to continue online purchases in the future.

How often do you receive parcels (packages) at home?

50 responses



Have you ever missed a parcel delivery because you weren't home?

50 responses

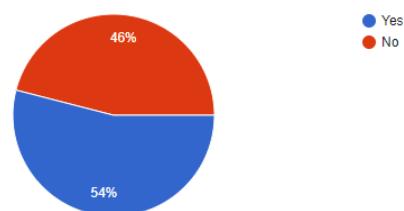


Figure 1&2: Survey on how often respondents receive parcels at home and how many times respondents have lost delivery parcels when respondents are not at home.

Next, there are 70% of respondents who are interested in using the parcel tube system if there is such a system at home to ensure that parcels are delivered safely through a tube installed directly to their home. Furthermore, a significant majority of 98% showed interest that the notification system is very important when the parcel arrives.



Figure 3&4: Survey on how many respondents is interested in using the parcel tube system and do respondents feel that the notification system is very important when the parcel arrives.

In addition, as many as 28% of respondents showed an interest in using a parcel tube delivery system at their home and there were as many as 56% of respondents comfortable with the idea of a tube system that delivers parcels directly to their home.

5.0 CONCLUSION

Parcel tubes offer a potential solution to increase efficiency and reduce the problem of lost parcels. Its use can provide convenience to users about the security of their packages. In addition, through the survey that has been conducted, it can be concluded that the community is interested in using the parcel tube system service in their homes. This is because people are aware of the risk they will face if they are not at home when their parcel is safely delivered.

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(A-PP008) ISSUES AND CHALLENGES OF IMPLEMENTING GREEN BUILDING PRACTICES IN MALAYSIA CONSTRUCTION INDUSTRY

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ABSTRACT

The significance of green building standards in addressing environmental challenges and promoting sustainable development worldwide has been widely acknowledged. The construction industry is an essential sector that requires dialogue regarding sustainable development. The growing recognition of green buildings has compelled several industries to improve their quality standards. This research, through the implementation of green building practices in Malaysia, aims to pinpoint the most pressing issues that demand attention and devise solutions achievable through the application of these practices. The research examines (1) the implementation of green building in Malaysia, (2) the current challenges that are anticipated to be encountered, and (3) the implementation strategies for green building that aim to address the challenges identified. The current investigation utilises a quantitative approach, specifically employing an online questionnaire survey built on Google Forms. As of the November 2023 update on the website of the Board of Quantity Surveyor Malaysia (BQSM), a total of 181 surveys had been distributed to Selangor-based consulting firms. 56 out of 181 respondents completed the surveys, achieving a response rate of 31%. The results of the analysis performed using IBM SPSS Statistics Version 25.0 indicate that a vast majority of directors and senior quantity surveyors possess a comprehensive understanding of GB implementation. This research offers significant contributions to the understanding of the current state of green building practices, identifies areas that require improvement, and proposes approaches to foster sustainability within the construction sector.

Keywords: Green Building (GB), Current Issues, Strategies

1.0 INTRODUCTION

Green building (GB) is crucial to sustainable construction development, promoting effectiveness and a harmonious society. Sustainable construction development relies on incorporating green building characteristics across several aspects. Malaysia is poised to embrace green building because of the economic and environmental advantages it offers as it revolutionizes construction practices. Urban locations present both opportunities and challenges for incorporating green construction practices. Furthermore, metropolitan areas are a popular target for green building projects because they also have high energy consumption and a substantial carbon effect. Although GBs have increased since the last century, the Malaysian construction industry is slow to implement sustainable GBs. Because of this obstacle, one can learn about GB through structured courses in many fields, such as engineering, architecture, urban planning, construction, and real estate, which focus on the built environment.

2.0 OBJECTIVES

The primary aim of this research is to investigate the application of GB practices in Malaysia. The implementation of GB techniques has garnered significant attention and momentum in Malaysia in recent times. The second objective of this research is to examine the present difficulties and obstacles associated with ecological construction in Malaysia. There are challenges and prospects associated with the implementation of green construction practices in urban settings. The third and final aim of this research is to ascertain the GB strategies implemented in Malaysia. Cooperation between the construction industry, financial incentives, government regulations, and community engagement are a few of the measures required to implement GB practices in urban areas.

3.0 METHODOLOGY

This research aims to identify the challenges and obstacles to implementing GBs as perceived by the director and senior quantity surveyor. In 2023, the research identified 181 consultant firms in Selangor, Malaysia, according to the Board of Quantity Surveyors (BQSM) website. We obtained a sample size with a response rate of 30.94% to shed light on the challenges encountered. The research necessitates a questionnaire survey as a means of gathering quantitative data. Afterwards, we analysed the data using a 5-point Likert scale to assess the level of agreement for each statement concerning the issues and challenges of implementing GBs. Charts and tables then display the data.

Table 1: Current Issues and Challenges of GB in Malaysia

Current Issues and Challenges of GB in Malaysia	Ranking	Mean	Standard Deviation (SD)
Initial financial commitments discourage developers	1	4.75	0.44
Contractors import materials increase costs	2	4.75	0.44
Government offer GB incentives	3	4.59	0.50

Table 1 analyses Malaysia's GB issues and challenges. The highest mean value is 4.75 (SD: 0.44) for the initial financial commitments that discourage developers. The structural equation modelling demonstrated that monetary green tax incentives and green skills had considerable incidental effects on supply. Furthermore, the statement that contractors import materials increase costs has the second highest mean value of 4.75 (SD: 0.44). The net green outcome of a construction project is the total of the efforts done at the various supply chain phases. Lastly, the third highest mean value is 4.59 (SD: 0.50) for government GB incentives. To enhance the development of GBs in Malaysia, the government has sponsored and offered numerous initiatives to the key construction actors in adopting GBs.

Table 2: Strategies of the Implementation of GB in Malaysia

Strategies of the Implementation of GB in Malaysia	Ranking	Mean	Standard Deviation (SD)
Research and development resulting in GB materials and technology cheaper	1	4.79	0.41
Implement LEED or BREEAM Certification Programs	2	4.79	0.41
Integrated Planning and Design	3	4.59	0.50

Table 2 shows the analysis of the strategies to overcome the current issues and challenges of GB in Malaysia. The highest mean value is 4.79 (SD: 0.41) for the statement of research and development resulting in GB materials and technology being cheaper. The use of purely quantitative statistical methods to determine end users' happiness with GBs is misleading because qualitative interactions show end users' tolerance levels better than quantitative metrics. Furthermore, the second highest, with a mean value of 4.79 (SD: 0.41), is the implementation of LEED or BREEAM certification programs. British BREEAM green certification systems possess a dominant competitive position. Lastly, the third highest with a 4.59 (SD: 0.50) mean value is Integrated Planning and Design. Thus, good site planning is an important component of the community.

4.0 RESULTS

Most participants comprehended the challenges faced by the Malaysian construction sector in relation to GB issues. In addition, the survey participants also mentioned that developers are deterred by significant upfront financial obligations for specialized gear, equipment, and important players. The survey participants also concurred that contractors are needed to import materials because of the absence of local options, resulting in increased costs. In addition, the respondents expressed that the government should provide incentives, like as investment tax credits, to facilitate the implementation of GB projects. According to the findings, it is recommended that the Malaysian government provide financing for GB research and development. Encouraging the use of these cutting-edge technologies created through research and development efforts may greatly speed up innovation, enhance the quality of building projects, and boost the overall efficiency of GB implementation.

5.0 CONCLUSION

This research study examines the implementation of green building principles in Malaysia's construction industry and makes major contributions to both theoretical knowledge and actual execution. Furthermore, this study highlights the essential elements that influence the outcome of GB implementation in the Malaysian construction industry by comprehensive data collection and analysis. Hence, possessing this knowledge empowers experts and decision-makers to focus their efforts and resources on critical areas, ultimately enhancing the overall efficiency and effectiveness of green construction activities. The research's findings can be utilized

by researchers, practitioners, and policymakers seeking to enhance the implementation of GB practices in Malaysia.

(A-PP009) DEVELOPMENT OF CARBON NITRIDE-MODIFIED AIR FILTERS FOR REMOVAL OF AIRBORNE BACTERIA AND VIRUSES

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ABSTRACT

A few years ago, millions of people died worldwide as a result of the fast-spreading coronavirus known as SARS-CoV-2 and the condition it caused, known as COVID-19. Additionally, another similar virus, influenza A, has also been reported to cause respiratory problems in healthy people. Because these diseases travel through the air, they are difficult to control. Since it is impossible to completely avoid these airborne diseases, the development of highly efficient antimicrobial air filters is required, as people cannot rely solely on protections such as social distancing and wearing masks. In the past few decades, nanotechnology has emerged as a promising field in the fight against infectious diseases. For example, various nanomaterials with outstanding physical and chemical properties have been extensively explored in biomedical applications such as the development of vaccines, drug delivery, and antibacterial treatments. Previous studies have shown that the application of metal-based and metal oxide nanoparticles, including copper oxide (CuO) and silver oxide (Ag₂O), as excellent antiviral and antibacterial filters, when coated on air filters. However, one of the limitations is that they cannot be simply disposed of, as they can be harmful to the environment. Therefore, in these studies, the use of sustainable nanomaterials that are environmentally friendly will be prioritized. Recently, graphitic carbon nitride (CN) has emerged as a prominent and sustainable photocatalyst, providing an innovative solution to address the environmental and energy challenges. However, since most of the reported CN absorbs light only up to 450 nm, it might not work well under solar light irradiation. Therefore, modification of CN with a dopant that can extend its light absorption to 700–800 nm is highly recommended. In this part, a red dopant (2,4,6-triaminopyrimidine) will be incorporated into the framework of CN, and the home air filters will be coated with the respective modified CN using nanospray drying. This product is expected to prevent the spread of a wide number of respiratory infections. Moreover, this study would also specifically investigate the effectiveness of the modified air filters to prevent the growth of two specific respiratory pathogens such as *Streptococcus pneumoniae* and *Pseudomonas aeruginosa*.

Keywords : Carbon Nitrides, Nanospray, Antimicrobial, Air-filter.

1.0 INTRODUCTION

The recent COVID-19 pandemic might have alerted people and made them more conscious about the air they breathe (Shah, 2021). The transmission of disease can occur in many ways; however, the most unpredictable way is airborne transmission. Airborne transmission can happen over long distances and time, leading to the spread of various diseases to a large number of people (Klompas et al., 2020). In general, airborne diseases contain bacteria or viruses that are usually spread via small respiratory droplets. These droplets are released when a person with the airborne disease sneezes, coughs, laughs, or exhales in any way (Gonzalez-Martin, 2019). It is said that the airborne transmission has different capabilities. For instance, airborne diseases can travel more than 6 feet and remain infectious in the air for minutes to hours. This largely depends on the building's ventilation and the preventative measures in such place. Moreover, the longer people spend time indoors, the more it significantly raises concerns about indoor air quality (Klompas et al., 2020). Therefore, addressing air quality concerns is crucial for safeguarding public health and ensuring a sustainable future for everyone.

Nanotechnology has played a key role in introducing innovative solutions to address airborne diseases through the development of air purifiers (Mahmoudi et al., 2023). A key application is the development of photocatalytic nanomaterials, which, when activated by UV or visible light, can destroy microorganisms by producing reactive oxygen species (ROS). Its mechanisms of action can be explained by oxidative damage resulting from the formation of ROS or heat stress caused by an increase in temperature. These processes are known as photodynamic therapy and photothermal therapy (Bhole et al., 2021). These nanomaterials can significantly enhance purification levels, decrease energy consumption, and extend filter lifespans, leading to technological advances in air purification techniques. Photocatalysts and materials such as zinc oxide (ZnO), silver oxide (Ag_2O), and copper oxide (CuO) have been reported to have an antiviral activity of up to 99%. Additionally, filters made from Ag_2O -based material showed the full inhibition of bacterial growth within a 24-hour studies(Alavi and Morali, 2022). Although the aforementioned metal oxides exhibit excellent antimicrobial properties, they are not easily disposed of and require expensive methods to avoid harming the environment. Recently, there has been an increasing trend in exploring carbon-based materials, especially carbon nitride (CN), for environmental remediation. Studies have shown that CN-based materials possess excellent antimicrobial properties. For example, CN-based materials have been reported to inhibit the growth of *Escherichia coli* (*E. coli*) and *Staphylococcus aureus* (*S. aureus*) by up to 99% and 90%, respectively (Syrgiannis and Christoforidis, 2021).

However, there are some limitations associated with CN, such as low solubility, biocompatibility issues, aggregation, and limited utilization efficiency of visible light (Zhou et al., 2018). Therefore, in these studies, a CN with high crystalline properties is proposed to overcome these limitations. Crystalline CN has demonstrated great potential as an antimicrobial agent due to its outstanding features, such as high stability, low toxicity, reduced band gap structure, and facile synthesis. The reduced band gap energy allows for better electron charge transfer and extended light absorption in longer wavelengths (Cao et al., 2015). Hence, this modified CN is an attractive material for antimicrobial applications.

2.0 OBJECTIVE

The study aims to develop a carbon-nitride-modified air filter for the removal of airborne bacteria and viruses, particularly two respiratory pathogens: *Streptococcus pneumoniae* and *Pseudomonas aeruginosa*. These pathogens have been progressively linked to several diseases such as meningitis, pneumonia, and chronic obstructive pulmonary disease (COPD), as well as infections and other respiratory conditions including bronchitis.

3.0 METHODOLOGY

3.1 Material Preparation

The CN will be prepared via the ionothermal condensation method. Approximately 5 g of melamine, as a precursor of CN, will be mixed with a salt melt composed of 2.26 g of lithium chloride (LiCl) and 2.74 g of potassium chloride (KCl) and 0.2 g of 2,4,6-triaminopyrimidine. The purpose of the salt melt is to induce the crystallinity of CN. The precursor will be stirred in 30 ml of ethanol solution for 1-2 hours until all the ethanol evaporates before being calcined at a temperature of 550 °C for 4 hours. The product will then be washed with ethanol and dried in an oven at 80°C overnight. Figure 1 illustrates the experimental procedure in preparing the material.

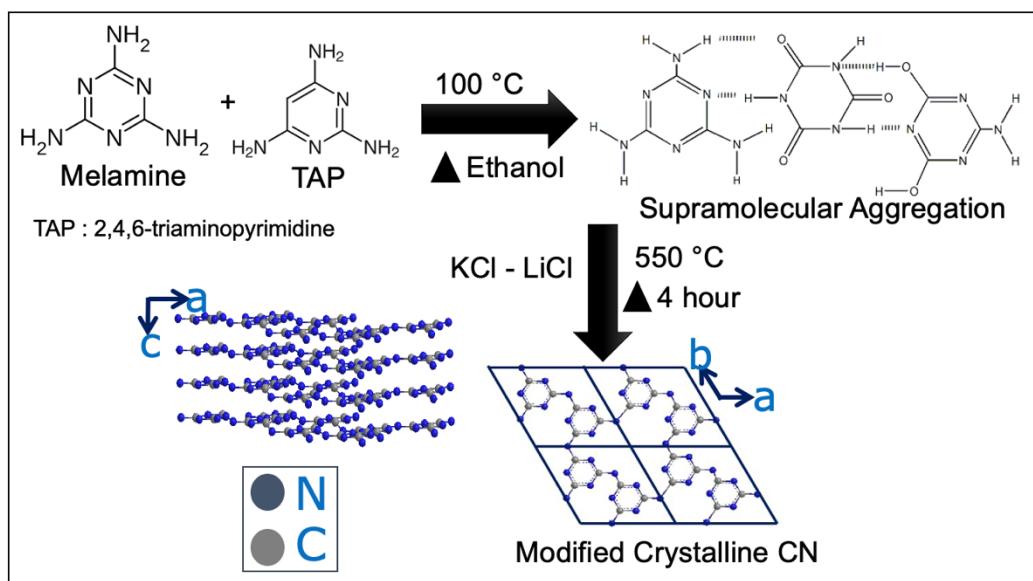


Figure 1 : Preparation of modified crystalline CN

3.2 Air Cleaner Preparation

Figure 2 illustrates the diagram of the air cleaner. The air purifier will be equipped with a high-efficiency particulate air (HEPA) filter, a pre-filter, and an activated carbon filter as the primary filtration components. The HEPA filter can theoretically remove up to 99% of dust, pollen, and airborne particles as small as 0.3 microns (μm). Illumination

will be provided by solar light irradiation (150 W , $\lambda > 230\text{ nm}$, $I = 100,000\text{ Lux}$). A centrifugal fan will be used to draw air in at the front of the air cleaner and exhaust it at the top, as shown in Figure 2. The flowrate will be set to $5\text{ m}^3/\text{min}$. The modified CN filter will be mounted on the top of solar lamp.

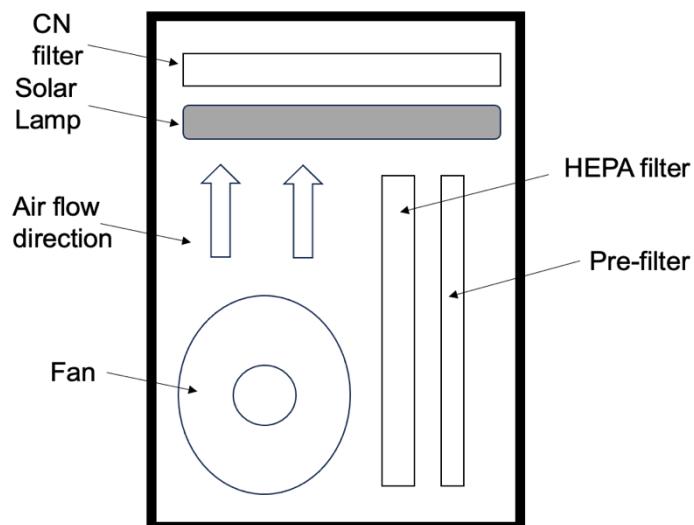


Figure 2 : Schematic diagram of the proposed CN-modified air filter

4.0 Expected Result

The main mechanisms for inactivation of the airborne viruses and bacteria in this process are the chemical oxidation by ROS, such as hydroxyl radicals, superoxide, single oxygen, and hydroperoxide. These ROS are pervasive since they are produced from oxygen, which is abundant. The produced ROS may cause damage to DNA, RNA, and proteins, leading to cell death. The mechanism of action is illustrated in Figure 3. Figure 4 illustrates that when these charges react with water molecules, which are present in the air, they lead to the formation of ROS. The photon (light) is absorbed by the material and generate an excited electron–hole pair which can then migrate to the surface of the particle. The electron can then reduce atmospheric oxygen to the more labile superoxide radical. The formation of ROS within the respective cells is known as oxidative stress. This process destroy the proteins, DNA and RNA, as well as leading to the death of cell.

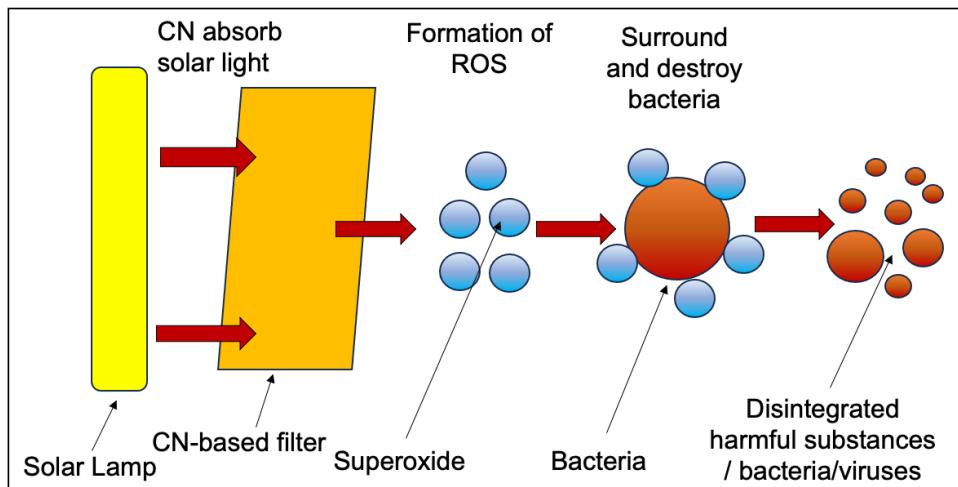


Figure 3 : The main mechanisms for inactivation of the airborne viruses and bacteria.

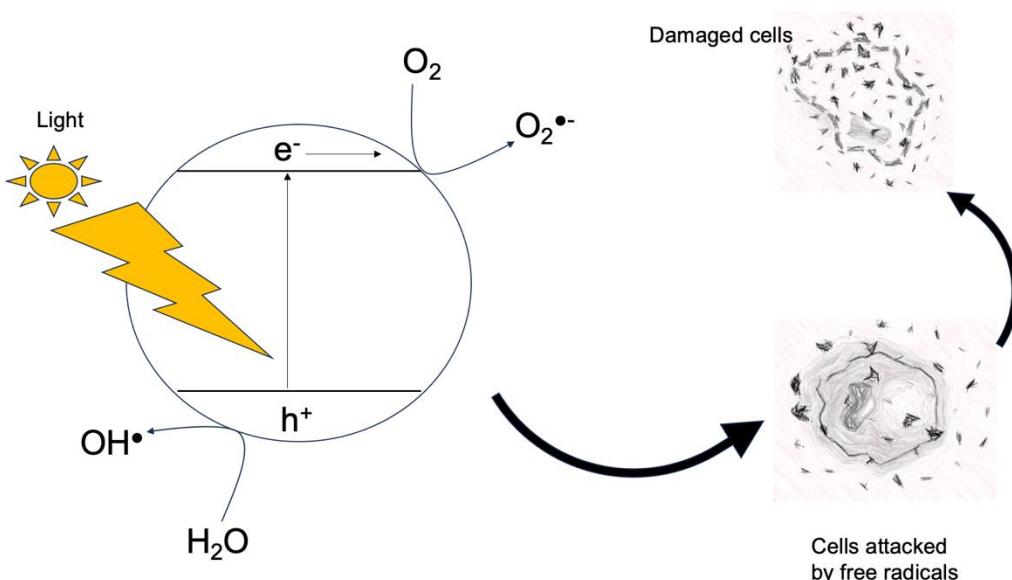


Figure 4 : Generation of ROS via photocatalytic oxidation process and cells damaged caused by oxidative stress.

5.0 CONCLUSION

The photocatalytic technique can be a promising technology for purifying indoor air containing viruses. However, different materials can affect the performance of the photocatalytic process in inactivating airborne viruses. Therefore, a single viral model may not be generalizable to other airborne viruses.

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(A-PP010) DEVELOPMENT OF VISIBLE LIGHT ACTIVE CRYSTALLINE CARBON NITRIDES FOR PHOTOCATALYTIC DEGRADATION OF MICROPLASTICS

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ABSTRACT

Plastic-based products are widely used in almost all aspects of our daily lives owing to their durability, low cost, and portability. However, these tiny pieces of plastic, known as microplastics, that enter our waterways have been acknowledged as a major contributor to water pollution, especially in seawater. In addition, these products are significantly impacting both human health and the environment on a global scale. Therefore, the full removal and degradation of microplastics from seawater is an important challenge in the 21st century. In removing organic-based compounds, the photocatalytic oxidation process using titanium dioxide (TiO_2) has been acknowledged as one of the promising methods. However, since sunlight comprises 45% of the visible light spectrum and TiO_2 only works excellently under ultraviolet (UV) light, a new visible light active material is required. Recently, crystalline carbon nitride (CN) has attracted worldwide attention, particularly in the field of photocatalysis, due to its low cost, environmental friendliness, and tunable structures. Unfortunately, some limitations associated with CN materials are their relatively low surface area and high band gap energy, which subsequently affect their photocatalytic performance. Therefore, constructing crystalline CN with a larger surface area that is highly active under visible light can be a challenging task. In this study, a mesoporous crystalline CN will be prepared to improve its surface area, while a dopant with a chemical structure similar to CN will be incorporated within the CN triazine structure to improve its visible light response. Their large surface area would facilitate the accumulation of more microplastics into the CN structure for the photocatalytic process to occur, while the addition of a dopant would enhance CN's light absorption in longer wavelengths.

Keywords: Carbon Nitride, Mesoporous, Microplastics, Photocatalysis.

1.0 INTRODUCTION

Microplastics are classified as tiny plastic particles formed from various commercial products and the breakdown of larger plastics. They are present in the oceans and on remote islands and have been identified as emerging pollutants that significantly threaten the environment and animal health. Generally, microplastics are composed of synthetic polymer compounds that form when plastic materials break down into particles smaller than 5 mm (Laskar and Kumar, 2019). Both humans and animals can easily be exposed to microplastics as these particles move through the food chain and persist in the environment due to their resistance to biodegradation (Lehel and Murphy, 2021). Because of their small size, down to micro or nano levels, microplastics are challenging to remove once they are released into the environment. These characteristics have the potential to cause hazards to humans and the environment. For example, long-term exposure can cause physical and mechanical harm, such as abnormalities in internal organs, cancer, cardiovascular diseases, inflammation, reduced fertility, and mortality (Yu et al., 2022). Consequently, there are concerns about the negative effects of microplastic accumulation in the human body.

Research from Nottingham University Malaysia indicates that Malaysia ranks third among the countries contributing the most to marine plastic pollution (Nottingham Malaysia). Therefore, microplastics removal from the environment is highly necessary to prevent major health issues. To address this issue, significant efforts have been made. However, microplastics are difficult to be fully removed due to their properties as synthetic polymers that are made to be highly resistant to any physiochemical processes, including biological processes (Kasmuri et al., 2022). Various methods and techniques have been reported for the degradation of microplastics, such as chemical oxidation method, biological processes, photocatalytic oxidation techniques, and thermal processes. Among these, the photocatalytic oxidation technique is considered a promising method due to its low cost, high thermal stability, efficiency, and wide acceptance in reducing environmental problems (Konstas and Konstantinou, 2021). Since its discovery in 1972, titanium dioxide (TiO_2) has become a promising semiconductor photocatalyst due to its outstanding physical and chemical properties, such as low-cost, non-toxicity, high thermal and chemical stability and most importantly, superior photocatalytic performance. However, its wide band gap (3.2 eV) only allows it to harvest light within the ultraviolet (UV) region (Nakata and Fujishima, 2012). Since our sunlight consists of 45% visible light and only 5% UV light, the use of photocatalysts that can harvest light in extended visible wavelength is recommended.

Graphitic carbon nitride (CN) has been considered as a promising photocatalyst due to its outstanding physical and chemical properties, such as low-cost and easily prepared, low band gap energy, and better thermal stability (Mishra et al., 2019). However, the CN that prepared via traditional method is typically in amorphous phase and associated with structural defects, hence, leading to low photocatalytic performance. Therefore, constructing CN with high crystalline phase can be considered as a promising strategy in improving its photocatalytic performance. Improved crystallinity of CN has been reported to reduce the high rate of electron-hole recombination, improve charge conductivity, and enhance light harvesting performance in the visible light region (Li et al., 2019). These outstanding characteristic make crystalline CN as a promising material in various photocatalytic applications, especially microplastics removal.

2.0 OBJECTIVE

The objective of this study is to develop a photocatalytic reactor to degrade microplastics obtained from environments such as seawater using a crystalline CN photocatalyst. The proposed reactor will be designed to be low-cost and convenient to operate. Meanwhile, crystalline CN will also be prepared via a simple and low-cost technique known as the ionothermal polycondensation method.

3.0 DESCRIPTION OF INNOVATION/METHODOLOGY

3.1 Material Preparation

The crystalline CN will be prepared using the ionothermal polycondensation method, with 5 g of melamine used as the precursor to CN. To enhance the crystallinity of CN, a mixture of 2.74 g of KCl and 2.26 g of LiCl will be added to the precursor to induce crystallinity. The resulting product will be washed with ethanol to remove excess salt residues.

3.2 Preparation of Photocatalytic Reactor

The experimental will be prepared as illustrated in Figure 1. The experimental set up will comprise of water cooling system, magnetic stirrer and a closed box. The photocatalyst that will be used in this studies is crystalline CN. The polystyrene microplastic will be selected as typical microplastic particles due to their widespread distribution in the environment. The photocatalytic degradation of microplastics will be systematically investigated under sunlight irradiation in the presence of microplastics.

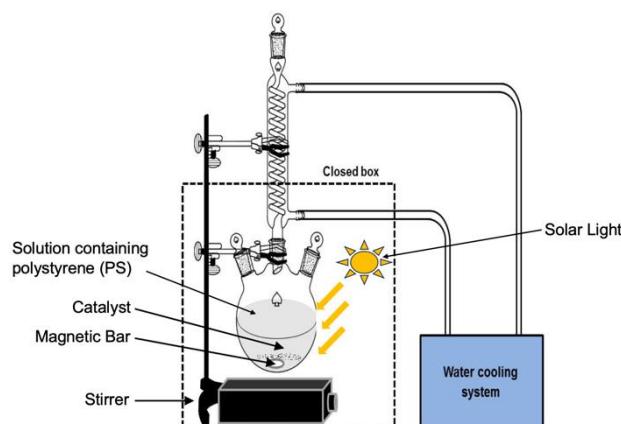


Figure 1 : Illustration of the photocatalytic reactor in degradation of microplastics

4.0 ADVANTAGE/IMPACT/RESULTS/NOVELTY

Photocatalysis has proven to be the most promising method for the degradation of microplastics. Besides microplastics, the presence of organic pollutants in water systems can also be addressed by the photocatalytic method. In this studies, the photocatalytic degradation of microplastics can be explained via four steps, which are initiation, propagation, branching, and termination. The first step (initiation) occurs when hydrogen (H) is abstracted or the C–C bond is cleaved at the impurity sites,

leading to the formation of alkyl radicals in the microplastics. The presence of crystalline CN increases the formation of alkyl radicals through the generation of active species. Meanwhile, radicals such as hyperoxides and peroxy radicals are produced during chain propagation. Additionally, oxidation induces chain branching and scission, leading to the formation of peroxide, hydroxyl, and carbonyl groups. These groups attack the surface of the polymer, causing micro-cracks. The highly reactive species then oxidize the organic compounds, converting them into non-harmful substances such as carbon dioxide and water. Figure 2 illustrates the proposed mechanisms in photocatalytic degradation of microplastics.

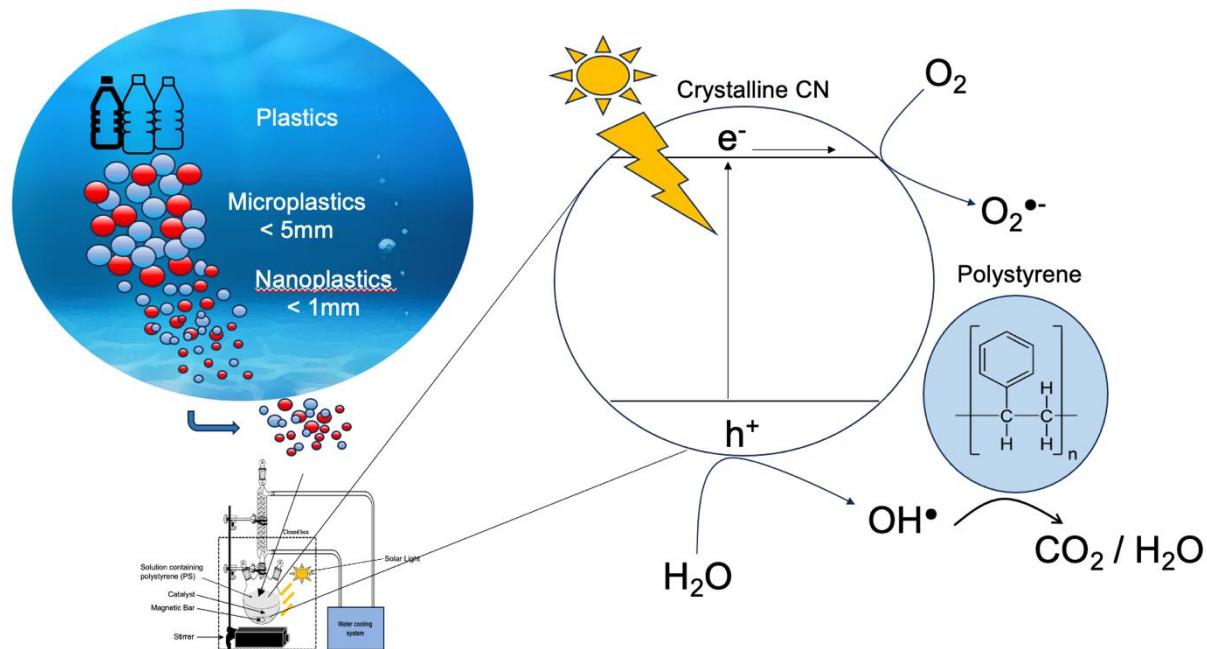


Figure 2 : The mechanisms of microplastics degradation via photocatalytic oxidation process.

5.0 CONCLUSION

Photocatalytic oxidation method is one of the promising technology to address the problems associated with microplastics. The efficiency of this method is due to the formation of reactive oxygen species such as hydroxyl radicals and superoxide, in inducing the degradation of microplastics. Moreover, the design of photocatalytic reactor for degradation of microplastic is simple and low-cost, thus, best fitted for pilot-scale up and beyond.

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(A-PP011) FROM ALGEBRA TO INDUSTRY: ENHANCING SUPPLY CHAIN RESILIENCE WITH ZERO DIVISOR GRAPH

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ABSTRACT

In the field of algebra, specifically in graph theory and ring theory, the zero divisor graph is defined as a graph where its vertices are the zero divisors of a ring and two vertices are adjacent if and only if the product of the vertices is zero. This project paper explores the innovative application of the zero divisor graphs, a concept rooted in abstract algebra, to business mathematics, with a particular focus on enhancing supply chain resilience. In this paper, the fundamental principles of the zero divisor graphs and their construction are introduced, followed by showcasing the practical applications in supply chain management. The zero divisor graphs can be used to represent suppliers, manufacturers, and distributors as their vertices, with edges indicating dependencies between them. By analyzing this graph, a business can identify which supplier failures (zero divisors) could cause significant disruptions (zero product) in the supply chain. This insight allows the company to develop contingency plans, diversify suppliers, and improve overall supply chain resilience.

Keywords: zero divisor graph, supply chain resilience, business networks

1.0 INTRODUCTION

A graph is mathematically defined as a structure with vertices and edges (Bondy & Murty, 1976). To date, graphs are extensively used to visualize various real-life situations and assist in solving many real-world problems. For example, in airplane networks, graph theory is used to effectively optimize routes, leading to cost savings and improved efficiency. Airports are represented as nodes, and direct flights between them are represented as edges. Each edge can be weighted based on factors like distance, cost, or travel time. Another real-life example is in biology, where graphs are used to analyze protein-protein interactions. Proteins are treated as the nodes of the graph, and interactions between the proteins are the edges. This helps in providing a better understanding of the cellular processes and disease mechanisms.

Meanwhile, one of the graphs that are well-known in the field of algebra is the zero divisor graph. A zero divisor graph is defined as a graph where its vertices are the zero divisors of a finite ring, and two vertices are adjacent if and only if their product is the zero element of the ring (Anderson & Livingston, 1999). In this paper, the concept of the zero divisor graph is used to study the supply chain in business networks.

Supply chain refers to a network of facilities that produce raw materials, transform them into intermediate goods and then final products, and deliver the products to customers through a distribution system (Shukla et al., 2011). It can also be described as the entire spectrum of activities involved, from the supply of raw materials and resources for production to the production of products and the distribution of products to the end-users. Generally, the goal of supply chain management is to ensure efficient and timely delivery of products or services to the end consumers, which at the same time benefits all involved parties.

The supply chain encompasses the costs associated with conveying information, producing components, storing them, transporting them, and transferring funds, among other expenses. The overall cost of the supply chain tends to rise due to factors such as the significant capital required for operating global businesses, increasing real estate costs, and rising freight charges (Koh, 2006).

In this project paper, we suggest a method of enhancing supply chain resilience by using an algebraic approach, which is constructing the zero divisor graph.

2.0 OBJECTIVE

This study aims to describe the fundamental principles and mathematical foundations of zero divisor graphs in algebra and to explore and demonstrate how zero divisor graphs can be used to enhance supply chain resilience.

3.0 METHODOLOGY

This section outlines the methodology employed to explore the application of zero divisor graphs in enhancing supply chain resilience. A comprehensive literature review on zero divisor graphs and their mathematical foundations was conducted. Additionally, studies on supply chain resilience and network analysis techniques in supply chain management were surveyed to provide context and background for the research.

Next, the zero divisor is constructed for a supply chain network. The graph would visualize how the resilience of the supply chain can be enhanced by identifying and reinforcing critical components (zero divisors) through strategies like redundancy, diversification, and alternative paths.

4.0 RESULTS

In this section, a model of the zero divisor graph of a supply chain network is presented.

Supposed there exist a supply chain network where different parts work together to deliver products to customers. In this network, we have the ‘suppliers’, which are the companies that provide raw materials; ‘manufacturing plants’ which are the factories that turn raw materials into products; ‘distribution centres’ which act as the warehouses where products are stored before being sent to stores; and the ‘retailers’ or the stores where customers buy the products.

To construct the zero divisor graph showcasing the interconnection between the parts, each circle (vertex) on the graph represents one part of the supply chain (like a supplier or a retailer). Then, arrows (edges) are drawn between the vertices to show the connections between these parts. The diagram below shows an example of the zero divisor graph of a supply chain network.

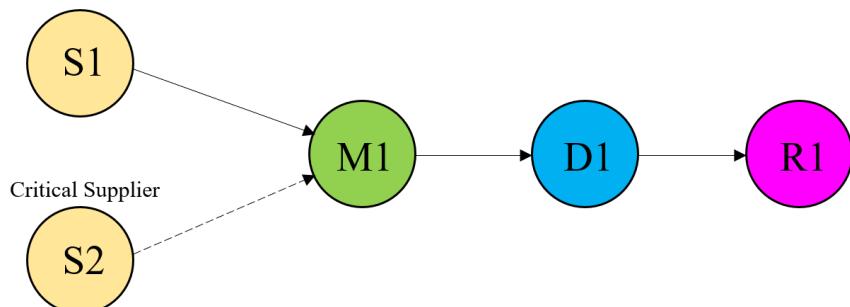


Figure 1: The zero divisor graph of a supply chain network

From Figure 1, it is shown that both Supplier 1 (S1) and Supplier 2 (S2) send raw materials to Manufacturing Plant 1 (M1). M1 needs materials from both suppliers to make products. After M1 makes the products, it sends them to Distribution Center 1 (D1) for storage and distribution. Finally, D1 sends the products to Retailer 1 (R1), where they are available for customers to purchase.

A critical point that needs to be highlighted from the graph is the vertex S2. The Supplier 2 (S2) is a critical part of this supply chain because if S2 fails or has a problem (like running out of materials or facing delays), Manufacturing Plant 1 (M1) won't get all the materials it needs, which means it can't produce the products as demanded. This would cause a ripple effect affecting the whole supply chain, including Distribution Centre 1 (D1) won't have products to store or send out and Retailer 1 (R1) won't have products to sell to customers.

Hence, the construction of the zero divisor graph of the supply chain network plays a significant role in understanding the vulnerability of the network. By identifying and focusing on critical points like S2, businesses can take steps to ensure these parts of the supply chain are well-supported. For instance, businesses might find backup suppliers or increase inventory to avoid disruptions in their supply chain. This way, if something goes wrong, the whole system will not collapse, and they can keep supplying their products to customers.

This graph is a simple way to see how everything is connected and which parts are the most crucial to keep the supply chain running smoothly. Besides identifying disruptions from suppliers that can interrupt a supply chain network, by plotting the zero divisor graph, critical components (zero divisors) can also be reinforced through strategies like redundancy, diversification, and alternative paths.

5.0 CONCLUSION

This research demonstrates the potential of zero divisor graphs as a valuable tool for analyzing and enhancing supply chain resilience. By identifying critical components and dependencies within the supply chain, such as key suppliers or distribution centers, businesses can better understand where vulnerabilities lie. This understanding enables more effective strategies to mitigate risks, such as diversifying suppliers, adding redundancies, and developing alternative routes. The application of zero divisor graphs thus offers a powerful approach to strengthening supply chains, ensuring that they can withstand disruptions and continue to deliver products efficiently to customers.

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(A-PP013) LIPBLUSH LIP BALM: AN INNOVATIVE INTEGRATION OF PHYTOCHEMISTRY AND APICULTURE FOR ADVANCED LIP CARE

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ABSTRACT

This innovative lip balm introduces a revolutionary lip care product in response to the growing demand for natural and eco-friendly cosmetics. This lip balm is produced from an organic plant source, *Antigonon leptopus* flower and beeswax from the honeycomb. Each main ingredient provides antioxidant, antibacterial and anti-inflammatory properties that are good for lip care products. The honeycomb is mostly made of beeswax and various organic components. They provide breeding sites and storage of honey. But after they are no longer needed, these honeycombs frequently will be thrown away or burned. Such acts unleash hazardous substances and worsen global waste worries. Extraction of beeswax from these abandoned honeycombs can reduce the waste produced by honey production industries. In addition, less than 20% of the more than 12,000 synthetic and industrial-based chemicals used in cosmetics have been approved as safe. To develop lip balm for cosmetic and lip care from fruit beeswax and flower extract of *Antigonon leptopus* plant. The main ingredient of this LipBlush lip balm is extracted from natural sources which have been neglected for their beneficial properties. *Antigonon leptopus* is one of the neglected plants in Malaysia that poses antioxidant and anti-inflammatory properties. Beeswax has been proven to have antibacterial and anti-inflammatory properties. This product can be a potential and safe cosmetic product that is being produced from neglected sources available in Malaysia. LipBlush lip balm is a promising cosmetic product developed in Malaysia, that is produced from abandoned beeswax from honeycombs and neglected plant, *Antigonon leptopus* flowers.

Keywords: Natural product, Lip balm, Lip care, Sustainability

1.0 INTRODUCTION

Since 2011, as reported by Barbalova, 2011, the average annual growth rate for the global beauty products market has been around 5%. It is an intriguing truth that the market for makeup and personal hygiene goods has expanded steadily. This is primarily because people are more aware of ways to improve their physical appearance (Arshad et al., 2020). The beauty products like skincare products, hair products, oral hygiene, fragrances, and nail products are used daily by the consumer. Because of this, the consumer may be exposed to any harmful chemicals that may be

present in the beauty products. Moreover, the continuous exposure of humans to a wide range of beauty products may cause a “cocktail effect” because of synergistic contact of different substances or the “additive effect” because of the presence of the same ingredient in many products. Particularly, mineral pigments are frequently employed in the production of coloured cosmetics, which causes heavy metals (HMs) like Cu, Ni, Co, Pb, Cr, and Cd, among other elements, to contaminate cosmetic products. In addition, there are other harmful chemicals like paraben, PEGs (polyethylene glycols), acrylate copolymer and fragrance (Panico et al., 2019). The harmful effects of the chemicals may cause contact dermatitis, reproductive toxicity, neurotoxicity, and cancer (Palacios et al., 2016; Arshad et al., 2020). Therefore, in search for cosmetic products that are based on natural sources is in high demand. Natural-based products are safer and more convenient for the consumer.

In our attempt to contribute to the development of a new natural-based lip balm from a potential plant, *Antigonon leptopus*, belonging to the buckwheat family, Polygonaceae. It is known as air mata pengantin or bunga pengantin by the Malaysian (Ramadan, 2018). Pharmacologically, *A. leptopus* plant extract has been reported to exert antidiabetic, hepatoprotective, anti-microbial, anti-helminthic, analgesic, anti-inflammatory, antioxidant, and cytotoxic activity (Bhalerao, Kalode, & Doifode, 2023).

2.0 OBJECTIVE

The objective of this study is to develop a natural-based lip balm, Blush which uses the natural pigment of the *Antigonon leptopus* flower. Interestingly, the flower was reported to have anti-inflammatory and antioxidant properties. Thus, in addition to cosmetic use, this lip balm also can be applied for lip care.

3.0 METHODOLOGY

Blush is made from the natural ingredients available in Malaysia which reduces the production cost. The main ingredient includes pigment synthesized from *A. leptopus* flower and beeswax which usually been abandoned after the processing of honey. Beeswax has been proven to have antibacterial and anti-inflammatory properties. Blush lip balm will be produced by the moulding method.

Flower petals will be washed and dried in an oven at 40°C until a constant weight is obtained, and then the dried petals will be ground in a blender. Later, the petal powder will be stored in a freezer until pigment extraction. Extraction of the pigment will be done by conventional solid-liquid extraction method (Gomez et al., 2022). Beeswax collected from the honey processing industry, will be added to the preheated mixture of oils and pigment from *A. leptopus*, and heated to 60–67° C until melting. The mixture was homogenized together and coconut butter was added and melted. All the ingredients will be homogenized and poured into clean and lubricated moulds.

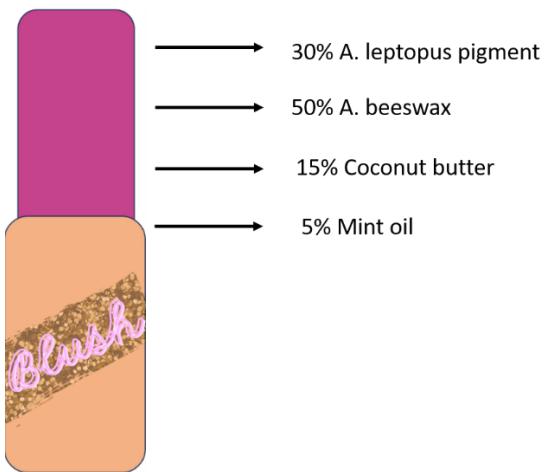


Figure 1: Blush Lip balm composition

4.0 RESULTS

Lip balm produced will replace the chemical-made lip balm products. Additionally, for cosmetic use, this lip balm is also good for lip care products as both main ingredients possess anti-inflammatory and antioxidant properties. The pigment from the natural source will not be harmful to the consumer to use daily. The shelf life of this natural product maybe differs compare to the chemical-made products as it is not added with any preservatives.

5.0 CONCLUSION

It is proposed that this invention could contribute to a safe product for the cosmetic user. The advantage is the pigment of the lip balm made from one of the neglected plants in Malaysia that has a lot of useful phytoconstituents. In addition, beeswax which is waste from honey production can be used for the development of beneficial products for consumers. Upcycling of waste is a good alternative for supporting the nation's mission in supporting the Sustainable Development Goals.

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(A-PP014) BIZZCOM EVENT MANAGEMENT SYSTEM

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ABSTRACT

An Event Management System (EMS) assists organizers in planning, executing, and reporting on events. BIZZCOM, a faculty club at UiTM Terengganu's Kuala Terengganu Campus, currently faces challenges in event management, including disorganized record-keeping, difficulty accessing past event data, and redundant tasks. This paper introduces the BIZZCOM Event Management System (BEMS), a web-based platform designed to improve event administration within the club. BEMS is tailored for use by club advisors, committees, and members, offering streamlined management processes and integrated document storage to address organizational issues. Developed using User-Centered Design (UCD) principles, BEMS emphasizes usability and employs heuristic evaluation to assess its user interface. Testing yielded highly positive feedback, with average ratings of 4.70 for Interface, 4.76 for Effectiveness, 4.79 for Efficiency, 4.85 for Satisfaction, and 4.85 for User-Centered Design.

Keywords: Event Management, Event Management System, Web-based, Events

1.0 INTRODUCTION

University clubs are essential for student growth, skill development, and social engagement. They organize events that engage members, raise awareness, and foster community, providing platforms for students to showcase their talents.

Event management involves planning and executing various events, such as festivals and social gatherings, following a series of progressive stages regardless of complexity (Getz, 2004). Technology significantly enhances this process by improving time management, cost-effectiveness, and work quality (Klerk, 2013). Event management systems are software tools that assist in planning, executing, and reporting on events, connecting different components to help managers understand interdependencies and external impacts (Getz, 2004).

User-Centered Design (UCD), introduced by Donald Norman in the 1980s, is a theory in human-computer interaction (HCI) focused on designing systems that are intuitive

and user-friendly. Norman's (1988) principles guide system design to help users understand functionality and interface status. Nielsen's heuristic evaluation is one method developed to support UCD principles (Abras et al., 2004).

BIZZCOM, a faculty club at UiTM Terengganu, manages events manually, leading to issues with disorganized record-keeping and repetitive processes. Event reports are scattered between physical files and Google Drive, making it difficult to locate past records. The club also faces inefficiency in event registration and attendance tracking, requiring new Google Forms for each event and forcing members to repeatedly enter the same personal details.

2.0 OBJECTIVE

Currently, the BIZZCOM club faces a few challenges in handling event-related paperwork, record-keeping, and registration process. Therefore, the primary objectives of this project are:

- i. To identify and gain comprehensive understand of the existing event management process in BIZZCOM club
- ii. To design and develop an event management system for BIZZCOM that allows club committee to create, update and store data related to its club events
- iii. To test and evaluate the usability of the system to accurately display details of the events held by BIZZCOM

3.0 METHODOLOGY

The project development methodology for BIZZCOM Event Management System adapts the Waterfall Model, as depicted in the figure 1 below.

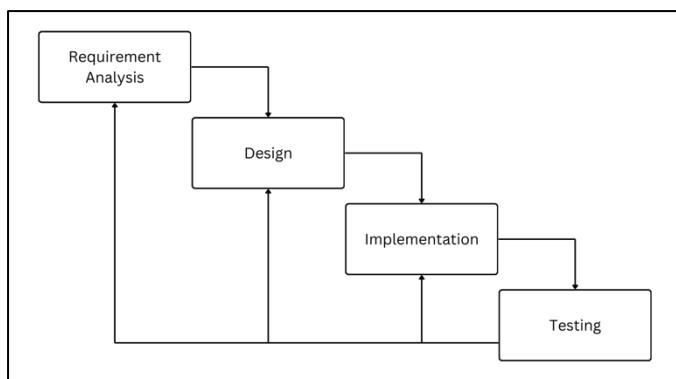


Figure 1: Waterfall Model

A. Requirement Analysis

The requirements of the event management system are thoroughly examined to ensure its successful implementation. This project prioritizes the stakeholder's needs, aiming to simplify their operations within event management. The main users for this system are club advisors, club committees and club members. There are two types of system requirements gatherings which are functional requirements and non-functional requirements.

B. Design

In this phase, the main focus is on visualizing the system's architecture and functionalities. To achieve this, quick design techniques are employed to effectively help in transforming the system processed and specifications into a complete system. The major entities involved are club advisor, committees and members. Figure 2 below illustrates the context diagram for the BEMS, providing an overview of the systems flow and interactions.

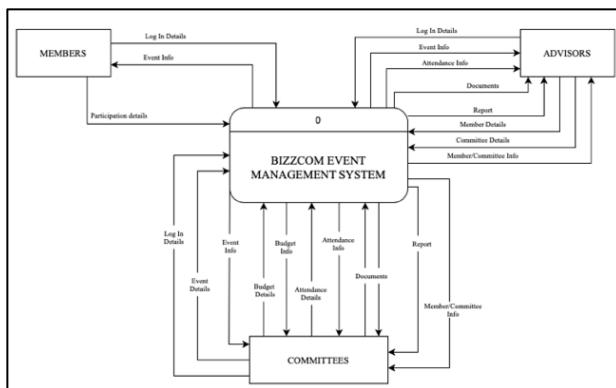


Figure 2: Context Diagram

C. Implementation

This phase involves carrying out the coding and development of the system. The system is crafted using several programming languages such as HTML, CSS, JavaScript and PHP. The database management tool that was used is PHPMyAdmin. MAMP was also utilized to set up a local server environment on a local machine which allows the web server and database server to run locally. Example of the screenshots of the event management system shown as below in Figure 3, 4, 5 and 6.

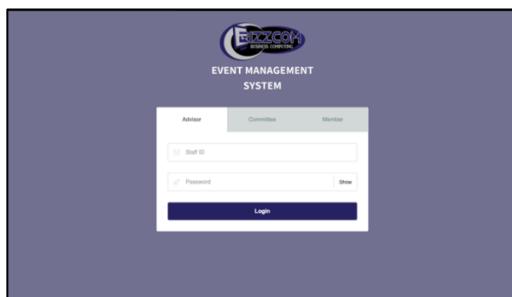


Figure 3: Log In Page

Event Lists						
Upcoming Events						
Search						
Event Name	Start Date	Start Time	End Date	End Time	No. of Registrants	No. of Attendees
Finance Room	2024-03-10	09:00:00	2024-03-10	11:00:00	10	8
PHP Workshop	2024-03-24	08:30:00	2024-03-24	09:00:00	24	17
Summer Guy Tournament	2024-03-16	17:00:00	2024-03-16	18:00:00	4	3

Past Events						
Rejected Events						
Search						
Event Name	Start Date	Start Time	End Date	End Time	No. of Registrants	No. of Attendees
Carrie Talk with Alvin	2023-12-26	08:00:00	2023-12-26	10:00:00	0	0
Community and Creative (CH2) Meet	2023-11-19	08:00:00	2023-11-19	10:00:00	21	8
Movie Night	2024-03-09	20:00:00	2024-03-09	23:00:00	6	1

Figure 4: Event List Page

Figure 5: Create New Event Page (Event Details Section)

Figure 6: Create New Event Page (Document Section)

The theory of User-Centred Design (UCD) was applied to create a system that is easy to use and it's also an approach that raises the likelihood of user satisfaction and adoption. Some of the features implemented in the system based on the UCD principles are visibility of system status, match between system and the real world, user control and freedom, error prevention, help users recognize, diagnose and recover from errors, recognition rather than recall, and lastly, aesthetic and minimalist design.

D. Testing

As the system aims to provide a user-friendly platform for the BIZZCOM stakeholders, two types of testing were done to provide insights into the overall stability of the system. The two testing techniques include expert evaluation and user evaluation. With that being said, it helps to identify the contrasts between its actual behaviour and the desired behaviour as specified by the requirements.

4.0 RESULTS

The project's key components include the creation of user-friendly and simplifies the event management tasks within BIZZCOM stakeholders. Table 1 below provides an overview of the improvement in BIZZCOM's event management process flow.

Table 1: Business Process Flow Improvement

Process	Before the System	After the System
Registration & Attendance Management Process	Google Forms are used to separately create registration and attendance form, involving repetitive data entry.	Club members can register with a click, as the system stores their details. Club committees can view registrants and efficiently manage registrants' attendance with a click as well.
Documentation Management Process	Documents are stored physically or in Google Drive which lacks structure and consistency.	Club committees are required to upload relevant documents during event creation, ensuring strategic storage.

The system had undergone an expert evaluation with input from two professionals with IT and Computing background, as well as user evaluation with a total of 33 respondents. The results are shown in Table 2 below.

Table 2: Testing Result

Category	Expert Evaluation		User Evaluation	
	Mean	Standard Deviation	Mean	Standard Deviation
A: Interface	4.50	0.547	4.70	0.47
B: Effectiveness	4.50	0.55	4.76	0.50
C: Efficiency	4.333	0.516	4.79	0.42
D: Satisfaction	4	1.095	4.85	0.36
E: User-Centred Design	4.429	0.514	4.85	0.36

The system's interface, effectiveness, efficiency, satisfaction and application of UCD in the system were among the many topics assessed in both expert and user evaluations. As a result, feedbacks gathered are fairly positive, driven by high ratings and low standard deviation.

5.0 CONCLUSION

BIZZCOM Event Management System (BEMS) is a web-based platform designed to simplify and automate various aspects of event management within the BIZZCOM club. It transitions the manual, paper-based and third -party dependent event management to an automated and efficient system. BEMS offers significant advantages, one of it being automating event creation, participant registration, and attendance management, which simplifies the process for the club committees and members by eliminating the need for repetitive tasks. It also makes accessing past events, attendance records and storing documents easy through its centralized record-keeping. All in all, the project manages to achieve its objectives and resulted with an overwhelming positive attitude.

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(A-PP015) ELECTROSPUN ANTI-INFLAMMATORY PATCH LOADED WITH CITRUS LIMON (L.) EXTRACTS INCORPORATED WITH DIMETHYL SULFOXIDE (DMSO) FOR ACCELERATING WOUND HEALING

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ABSTRACT

The four consecutive phases of haemostasis, inflammation, proliferation, and remodelling comprise the normal natural wound healing process. The proper sequence and duration of these phases are essential for effective healing. On the contrary, endotoxins and bacterial infections can prolong the inflammatory phase by elevating pro-inflammatory cytokines, including TNF- α and interleukin-1 (IL-1). Should this extension continue, there is a chance the wound will become chronic and never heal. Numerous studies are being carried out to expedite the wound healing process for endotoxins and bacterial infections. However, factors like bacterial resistance to antibiotics and their narrow spectrum have made it more difficult to treat patients accurately. Therefore, it is advised to choose an approach that combines antibacterial and anti-inflammatory qualities for wound healing. This study aims to provide susceptibility to the bacteria and broaden the spectrum of antibiotics for various bacteria to address these issues. To address these challenges, this study proposes an electrospun anti-inflammatory patch loaded with Citrus limon (L.) extract incorporated with Dimethyl Sulfoxide (DMSO) for accelerating the wound healing process. Two different solvents (i.e., 70% ethanol and 10% DMSO) will be loaded onto the extracted citrus limon to generate the electrospun anti-inflammatory patch. DMSO is added as a carrier when ethanol is used as the solvent to improve Citrus limon's ability to permeate into the bacterial cell membrane. This patch has strong anti-inflammatory qualities and shows promise as a successful way to treat bacterial infections. This patch also has antioxidants, which can help shield body cells from harm. The effective development of the patch on eliminating germs and speed up wound healing, it will solve many chronic diseases linked to bacterial infections and improve wound healing, enabling us to treat wounds as soon as possible at our convenience.

Keywords: Wound Healing, Bacterial infection, Citrus limon, Electrospun anti-inflammatory patch, DMSO.

1.0 INTRODUCTION

The 20th century shows significant medical discoveries, including antibiotics, which reduced morbidity and death in bacteria-related infections. The "Golden Era of Antibiotics" occurred in the mid-19th century, with the emergence of antibiotic-resistant strains. However, antibiotic resistance has spread uncontrollably due to excessive use and improper utilization, exacerbated by clinicians prescribing antibiotics excessively and the industry's widespread use, including livestock breeding and cultivation industries (Baran et al., 2023). Dr Tedros Adhanom Ghebreyesus warns of the global rise of antibiotic-resistant bacteria, posing a threat to healthcare advancements and equitable development (Sarkar et al., 2021). Projections suggest most bacteria will become resistant within 25 years, with antimicrobial resistance-related mortality potentially causing a million annual fatalities (Kaur Sodhi and Singh, 2022; Murray et al., 2022; Halawa et al., 2023).

It is believed that in heavily colonised and infected wounds, bacterial toxins contribute to the delayed healing process. Endotoxins, which are discharged from Gram-negative bacteria either through the lysis of the bacteria by human phagocytes during a defence response or by antimicrobial drugs, can impact every facet of the wound's recovery, resulting in postponed healing and exacerbating the chronicity of the wound (Rippon et al., 2022). Clinical investigation has revealed that endotoxins in the wound area can trigger the synthesis of inflammatory agents including TNF-alpha and interleukins, which in turn can trigger the synthesis of endogenous matrix metalloproteases (MMPs). Many forms of nonhealing wounds are known to have elevated MMP levels, which are thought to play a role in the local degradation of growth factors, receptors, and tissue constituents (Landén et al., 2016).

The idea in combining antimicrobials and anti-inflammatory medications has attracted a lot of attention lately as a way to accelerate wound healing (García-Salinas et al., 2020). Lemons (*Citrus limon*) are significant flavonoid and phenolic acid-rich plants that are also environmentally sustainable (Farhat et al., 2024). Because of its wide-spectrum antibiotic properties and multitarget bactericidal effects, limonene, another compound found in citrus limon, is a viable antimicrobial against multidrug-resistant pathogens (Chen et al., 2024). In a recent study, researchers discovered that limonene significantly improved pulmonary function and anti-inflammatory effects in mice with acute lung damage caused by lipopolysaccharide. This was due to its ability to inhibit signal pathways like ERK, MAK, NF-κB, and C-Jun N-terminal kinase (Chen et al., 2024).

The solubility and pharmacological formulations of lemon's natural components have revealed several limitations, nevertheless (García-Salinas et al., 2020). Different delivery methods have been created to get over these obstacles and produce improved solubility and efficacy while keeping effective oversight and discharge (Justo et al., 2015). Therefore, in these studies, there has been investigation into the potential of electrospun patches containing antibacterial and anti-inflammatory medications as a means of creating medical dressings that improve wound healing. In order to lower inflammation during wound healing, a polycaprolactone (PCL) electrospun nanofibrous patch loaded with *Citrus limon* (L.) extract incorporated with Dimethyl Sulfoxide (DMSO) is proposed to overcome this situation. According to Lima de Souza et al. (2019), PCL is a nontoxic and bioreversible polymer that has received FDA approval

for utilisation in several healthcare equipment and medication delivery devices. Hence, utilizing this patch associated with an antibacterial component is a significant approach to the medical field.

2.0 OBJECTIVE

In order to speed up the healing of wounds and any bacterial infections, primarily from *Staphylococcus aureus*, *Escherichia coli*, and *Pseudomonas aeruginosa*, this study aims to develop a polycaprolactone (PCL) electrospun nanofibrous patch loaded with *Citrus limon* (L.) extract incorporated with Dimethyl Sulfoxide (DMSO). These pathogens are frequently the ones that colonise the surface of long-term wounds and slow down the healing process.

3.0 METHODOLOGY

3.1 Lemon Extract Preparation

Following the washing process, the lemon peels were separated and dried in an oven at 55°C. The lemon juice was then extracted using a lemon squeezer. With the aid of a blender, the lemon peel will be finely crushed into a coarse powder once it has fully dried. Juice and peel powder samples will be extracted using two distinct solvents. 70% ethanol and 10% DMSO are used as the solvents (50gm powder combined with 500ml ethanol/DMSO for peel extract and 50ml juice in 450ml ethanol/DMSO for juice extract, respectively). The mixture will be continuously stirred in the incubator for 72 hours at 30°C. followed by filtration with Whatman No. 1 filter sheets. After that, the filtrate was centrifuged for 15 minutes at 4000 rpm. After that, the mixture was evaporated at 50 degrees Celsius until a sticky mass was formed. This mass was weighed and then dissolved in an aliquot of 10.0 millilitres of 10% v/v dimethyl sulfoxide (DMSO). Before being used again, the substance will be kept at 4°C.

3.2 PCL Patch Preparation

A PCL solution will be prepared using a dichloromethane (DCM): dimethylformamide (DMF) mixture and lemon extracts. A Yflow 2.2 D500 electrospinner will be used to create patches with a single lemon extract. The process will be carried out at room temperature with a relative humidity of 30-50%, with a flow rate of 1.0 mL/h and a distance of 18 cm between needle tips. Figure 1 illustrate the experimental procedure in preparing the PCL Patch material.

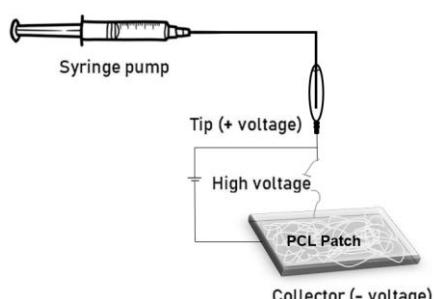


Figure 1 Preparation of the PCL Patch material

4.0 Expected Result

The patch will reduce inflammation, especially for wounds and inflammatory conditions. Its organic antibacterial component reduces bacterial infections and provide protection to the wound. This makes the patch adaptable, promotes faster healing, and minimizes pain or discomfort. Its antibacterial properties also improve cleanliness. Electrospinning polymer fibers allow for extended release of anti-inflammatory and antibacterial materials, providing long-lasting effects compared to single dosage treatments. These patches are biocompatible, making them suitable for direct contact with tissues. When used with therapeutic agents, they blend into the body, reducing side effects from oral or intramuscular administration.

5.0 CONCLUSION

Using an electrospun anti-inflammatory patch can help hasten the healing process of wounds and stop the spread of germs. Nonetheless, a PCL electrospun nanofibrous patch made of different materials may have distinct effects on gram positive and negative bacteria. Development of this patch is targeting to have a broad-spectrum protection against different types of bacteria.

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**(A-PP016) TRAFFIC LIGHT AUTO-DETECTION (TLAD) TOWARDS
SUSTAINABLE SMART TRANSPORTATION**

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MAISARAH NABILAH BINTI AHMAD AMIRUDDIN

ZIRAWANI BAHARUM

SALLAUDIN HASSAN

ABSTRACT

Introduction:

In this rapidly advancing era, buses faced a challenge of low demand from road users, despite being designed to reduce the number of private vehicles on the road.

Problem Background:

The core issue originated from a lack of prioritization for public transport on the road, resulting in lengthy travel times between stations and infrequent bus trips. This modelled a challenge as the number of private vehicles increased, and demand for buses decreased. To tackle this issue, our project prioritized the buses that seamlessly integrated with traffic lights.

Objective:

Therefore, the objective of this study is to develop a simulation model for traffic light auto-detection (TLAD) recognition in order to support the ministry agenda into towards sustainable smart transportation. The TLAD recognition prioritised the public transport (e.g. buses) by decreased the waiting time at the junction.

Research Methodology:

The research begins by identification of 6 components of TLAD through the comprehensive content analysis. Before proceed with the design simulation model, the details observation to map the flow of the process in simulation model. Lastly, the TLAD simulation model is developed, and the data is analysed using PTV Vissim software, and also validated by the industry expert. The efficiency of the existing transport system was evaluated and analysed using statistical data obtained from a site survey.

Result:

As a result, this project proves the decrease of the waiting time of buses using TLAD recognition, focuses at traffic lights.

Significant/Contribution:

The project had the significant potential to impact communities by decreasing the amount of time buses spent waiting at traffic lights. By implementing this approach, it was believed that road users would convert from using private vehicles to utilizing buses, resulting in reduced congestion and lower carbon emissions. Furthermore, this

project had the possibility to expand into a device that could bring numerous benefits for future togetherness.

Keywords:

Transportation, Automatic, Traffic Light, Smart City, Sustainability

PRODUCT DESCRIPTION

The Traffic Light Auto Detection (TLAD) system is an innovative solution designed to optimize urban traffic flow by prioritizing public buses at intersections. Utilizing advanced RFID technology, TLAD detects approaching buses and adjusts traffic signals in real-time to minimize bus waiting times. This system integrates seamlessly with existing traffic control infrastructure, ensuring efficient and smooth transit for public transportation.

Key Features:

1. **RFID Detection:** Equipped with RFID readers to identify and prioritize buses at a distance.
2. **Real-Time Signal Adjustment:** Dynamically alters traffic light phases to reduce bus delays.
3. **Data Analytics:** Collects and analyses traffic data to continuously improve signal timings.
4. **Compatibility:** Integrates with existing traffic management systems for easy implementation.
5. **Environmental Impact:** Reduces fuel consumption and emissions by decreasing idle times for buses.

Benefits:

- **Reduced Travel Time:** Significantly cuts down on bus travel times, enhancing public transit efficiency.
- **Improved Punctuality:** Ensures buses adhere to schedules, boosting passenger satisfaction.
- **Lower Congestion:** Frees up road space by encouraging public transport use, thus reducing overall traffic congestion.
- **Sustainability:** Promotes greener urban environments through reduced carbon emissions.

The TLAD system represents a forward-thinking approach to urban mobility, offering a scalable and effective solution to modern traffic challenges.

(A-PP017) MODELLING AND ANALYSIS OF A MIXTURE PROBLEM USING FIRST-ORDER DIFFERENTIAL EQUATIONS

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ABSTRACT

Mixture problems are general in various scientific and engineering disciplines, providing critical insights into how substances interact within dynamic systems. This study focuses on a classical scenario where salt concentration in a tank is influenced by the continuous inflow of brine and simultaneous outflow of the mixture. The system is modelled using first-order differential equations, which allow for the analysis of how the salt concentration evolves over time. Through analytical solutions and simulations, this study reveals the transient and steady-state behaviors of the system, highlighting the practical utility of differential equations in solving complex real-world problems. It will contribute to a deeper understanding of the dynamics involved in mixture processes, with implications for fields such as environmental engineering and chemical process control.

Keywords: first-order differential equations, mixture problem, rate of change

1.0 INTRODUCTION

In numerous applications, understanding the dynamics of substances as they mix and react within a system is crucial. A typical problem involves a tank where a solution containing dissolved substances is mixed with an incoming solution at a constant rate, while an equivalent amount is simultaneously removed. Such processes can be accurately described by first-order differential equations. This study aims to explore the mathematical modelling of a mixture problem, focusing on the behavior of salt concentration in a tank. By the differential equation in this system, can produce detailed insights into how the concentration varies, thereby offering practical solutions for real-world engineering and scientific challenges.

1.1 PROBLEM STATEMENT

A major problem is determining the salt content in a tank over time when a well-mixed solution is removed at the same rate as a brine solution is introduced at a steady pace. Conventional approaches to this problem's solution may be complicated and may not offer intuitive understandings of the behaviour of the system. To better understand how the salt concentration changes over time, a methodical approach to modelling and solving the differential equation driving this process is therefore required.

2.0 OBJECTIVE

The primary objectives of this study are:

- a) To develop a mathematical model using first-order linear differential equations to describe the behavior of solute or reactant concentration in a mixture.
- b) To solve the differential equation analytically and predict the concentration of the solute or reactant over time.
- c) To analyze the resulting solution to understand the transient and steady-state behavior of the salt concentration in the tank.

3.0 METHODOLOGY

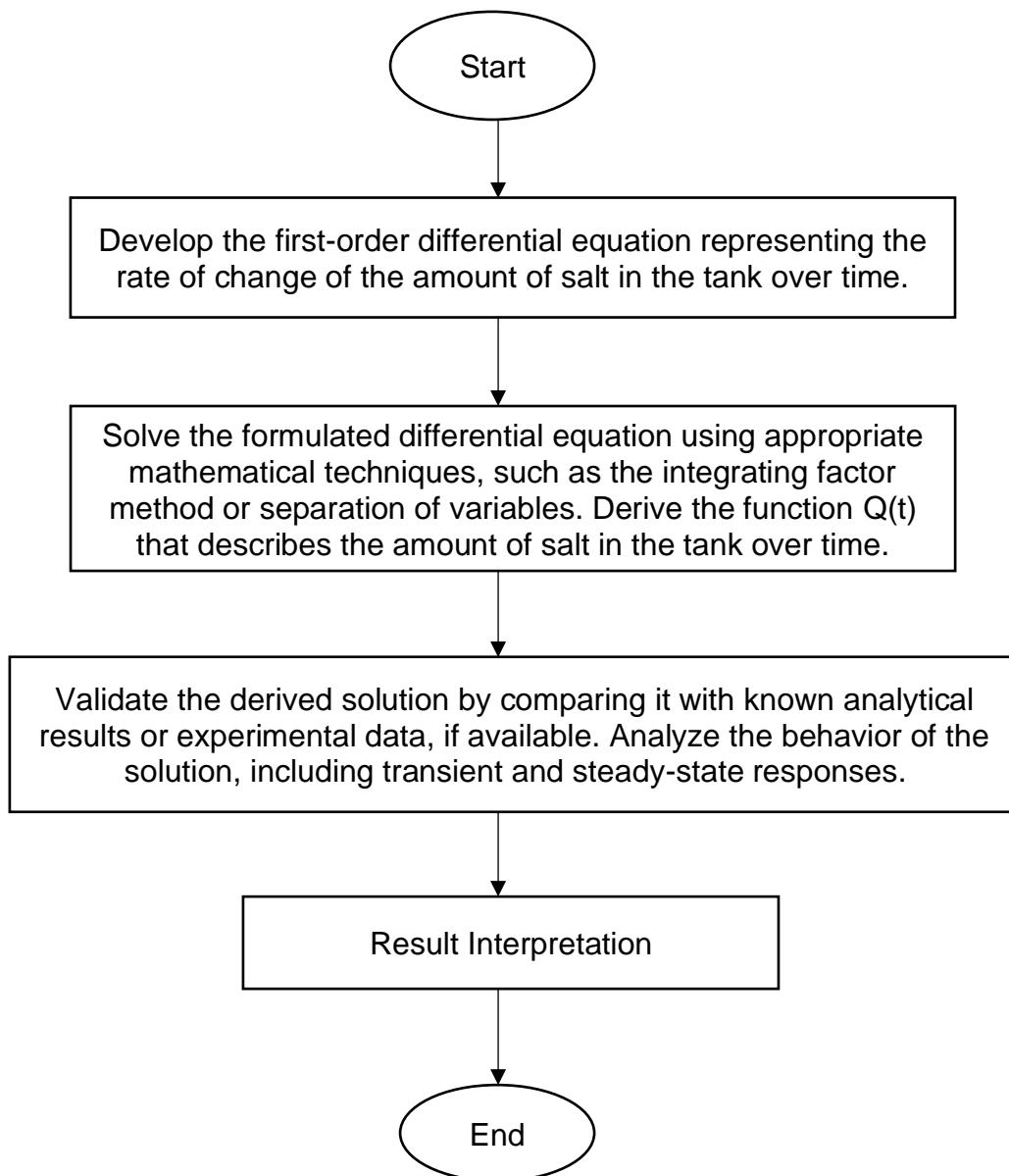
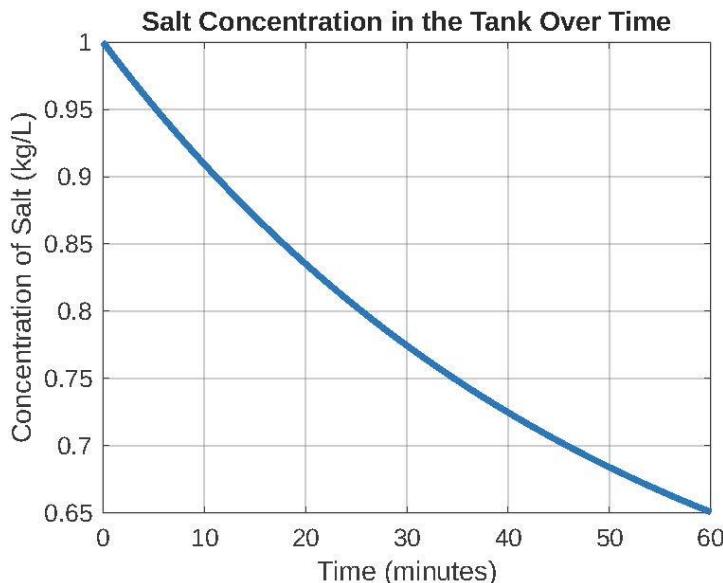


Figure 1: The methodology framework of study.

Figure 1 shows the study involves defining the initial conditions and system parameters for the mixture problem, formulating a first-order linear differential equation to model the rate of change of salt in the tank, and solving the equation using MATLAB. The

solution is then simulated and analyzed over time, and the results are plotted to visualize the behavior of the salt concentration, providing insights into the dynamic system's steady-state or decay behavior.

4.0 RESULTS



The results demonstrate the salt concentration $C(t)$ in the tank over time, described by the differential equation $\frac{dC(t)}{dt} = \frac{r_{in} \cdot c_{in} - r_{out} \cdot C(t)}{V_0}$, where r_{in} and r_{out} are the inflow and outflow rates, c_{in} is the concentration of the inflow brine, and V_0 is the tank volume. The analytical solution $C(t) = C_{in} + (C_0 - c_{in})e^{-\frac{r_{out}}{V_0}t}$ reveals that the concentration, initially at 1 kg/L, decreases and asymptotically approaches the inflow concentration of 0.5 kg/L. This trend confirms the system's gradual equilibrium and validates the differential equation model, effectively illustrating how the concentration evolves to a steady state over time.

5.0 CONCLUSION

This study provides a comprehensive analysis of a classic mixture problem using first-order differential equations. By modeling the dynamics of the system and solving the differential equation, we gain insights into the transient and steady-state behavior of the salt concentration in the tank. The simulation results confirm the theoretical predictions and demonstrate the practical applications of differential equations in real-world scenarios, such as in environmental engineering and process control.

6.0 BENEFIT OF STUDY

- a) This study provides a practical application of first-order differential equations, deepen their understanding of how these mathematical tools can model and solve real-world dynamic systems.
- b) By modeling the mixture problem, this study offers valuable insights into the behavior of solutions in systems where substances are mixed.

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**(A-PP018) ASSESSING AND ENHANCING TIME MANAGEMENT SKILLS
AMONG STUDENTS AT UITM PASIR GUDANG**

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ABSTRACT

This study investigates time management issues among students at UiTM Pasir Gudang, exploring their habits, challenges, and potential solutions. Conducted via a Google questionnaire, the survey included responses from 80 students. Findings reveal significant difficulties in balancing academic and leisure activities, with over half of the respondents struggling to manage their time effectively. A primary issue identified is excessive time spent on video games, leading to insufficient sleep and poor academic performance. The study emphasizes the need for daily routine schedules and better prioritization of tasks. Additionally, it highlights the importance of motivational programs to enhance students' awareness of time management and reduce procrastination. Recommendations include creating structured daily routines, reducing time spent on non-productive activities, and participating in motivational and educational programs organized by UiTM. These measures aim to improve students' academic performance and overall well-being by fostering effective time management skills.

Keywords: Time management, poor academic performance, awareness

1.0 INTRODUCTION

Students need to learn how to manage their time well, especially at university, where academic standards are high. Planning and consciously controlling how much time is spent on various tasks can boost productivity and efficiency. This is known as effective time management.

Students deal with many kinds of time management issues, such as managing personal responsibilities and balancing extracurricular activities and academics. Having good time management skills may have a big influence on stress levels, well-being, and academic achievement. Gaining insight into the time management habits and challenges shared by these kids will help us better understand their everyday lives and academic achievements.

It is critical to realize the possible negative effects of ineffective time management, such as raised stress levels, missed deadlines, and worse academic performance. To handle these obstacles, a thorough comprehension of students' time management practices is necessary, as is the creation of focused assistance solutions. This report focuses on how students manage their time. Surveys were used to gather information about how students divide their time between academic and extracurricular activities,

how they handle their schedules, and how these practices affect their stress levels and academic performance.

In conclusion, time management is a vital element of student success. By exploring the practices, challenges, and strategies related to time management, this report aims to offer recommendations for improving students' academic experiences and overall well-being. Effective time management not only enhances academic performance but also fosters a healthier, more balanced lifestyle for students.

2.0 OBJECTIVE

The following are the overall objectives of this study:

- to identify how student manage their time in weekend
- to identify how student deal with distractions
- to identify satisfaction level on lack of time management in lecture week
- to identify how many hours students spend per week studying or do completing assignment
- to identify the main factors that contribute to student procrastination

3.0 METHODOLOGY

3.1 Description of Data

Population : The term of population on this research isrefer to all students of UiTM Pasir Gudang students

Sample : The sample of this survey consists of 80students UiTM Pasir Gudang

Sampling Techniques : Non-probability - Convenient Sampling Technique

3.2 Method of Analysis

Table 1: Summary of Methodology

Objectives	Variables	Methodology
1. To identify how studentspend their time in weekend	Student activity on weekend	Bar chart
2. To identify satisfaction level on lack of time management in lecturer week	Satisfaction level on lack of time management in lecturer week	Pie Chart
3. To identify how many hours students spend per week studying or do completing assignment	Hours students spend per week	Ogive
4. To identify the main factors that contribute to student procrastination	Main factors that contribute to student procrastination	Bar Chart

4.0 RESULTS

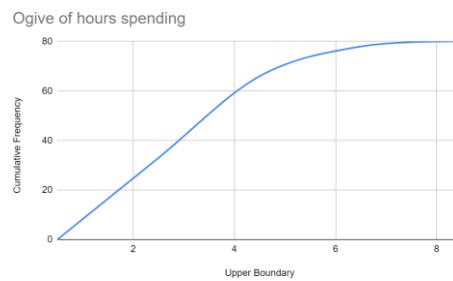


Figure 1 : Ogive chart of hours spend by the students per week studying or completing assignment

Based on the figure above, it is shows that a significant portion of respondents, 85%, dedicate between 1-3 hours per week to studying or completing assignments outside of class during lecture weeks. This suggests a range of study habits and academic commitments among the participants, with most falling into the categories of minimal (1-2 hour) or moderate (3-4 hours) additional study time. However, a smaller proportion, 15%, invests a slightly higher amount of time (3-4 hours) into academic pursuits outside of class.

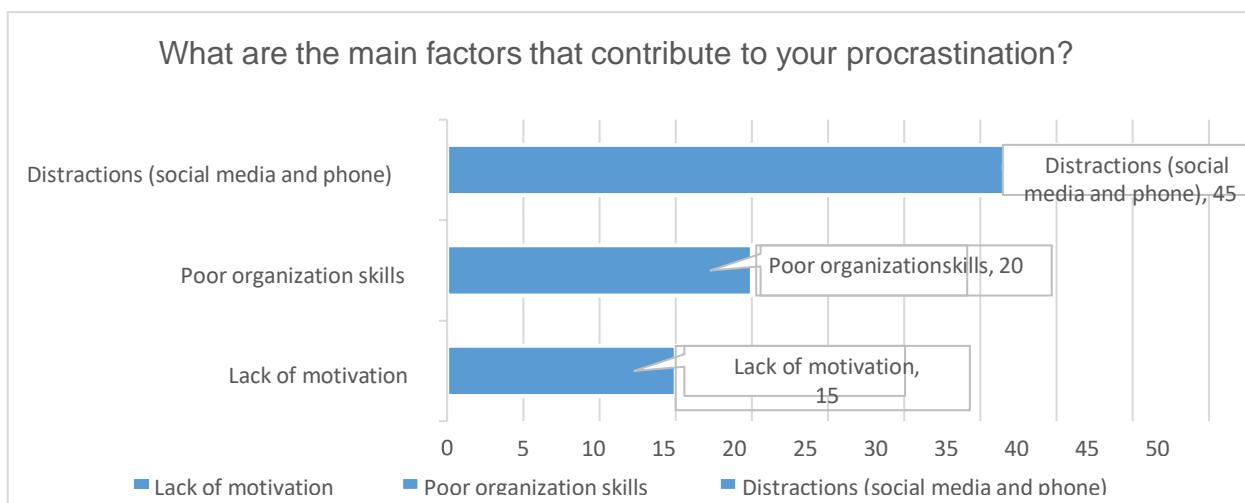


Figure 2 : Bar chart of main factor that contribute to students procrastination

Based on the figure above, it is reveals that distractions, especially from social media and mobile phones, are the leading cause of procrastination for most respondents (56.3%). Poor organization skills also play a significant role for 25% of individuals, indicating issues with time management and task prioritization. Lack of motivation affects 18.8% of respondents, highlighting the impact of personal interest and engagement on productivity.



Figure 3 : Bar chart of time spend on weekend

Figure 2, shows that a majority prefer social activities with friends on weekends, while a substantial number enjoy gaming. A smaller group uses their time for study and personal development, highlighting diverse approaches to weekend activities among the respondents.

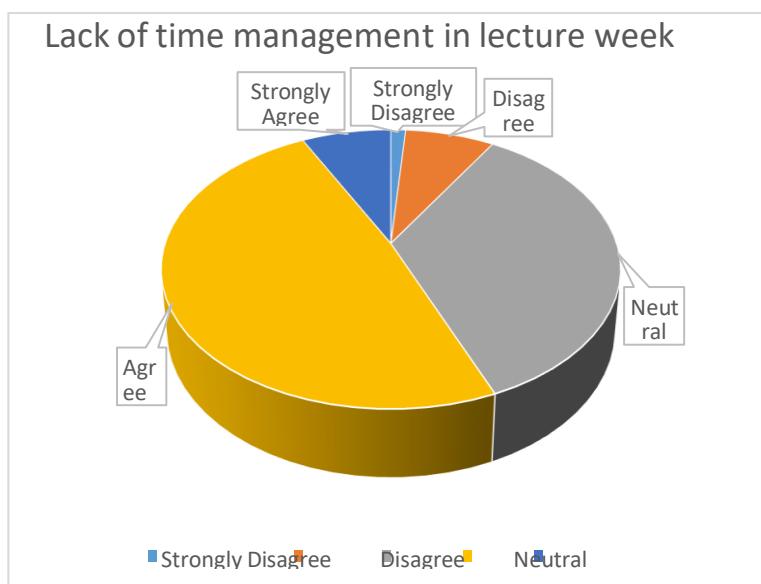


Figure 4 : Pie chart of satisfaction level of lack of time management in lecturer week

Figure 4, highlights a prevalent perception among respondents that there is a lack of time management during lecture weeks, with a majority (56.3% combined agree and strongly agree) expressing concerns about this issue. A minority (8.8% combined disagree and stronglydisagree) do not see it as a significant problem, while a notable portion (35%) remain neutral or uncertain.

5.0 CONCLUSION

The survey conducted among students at UiTM Pasir Gudang aimed to investigate time management skill. The findings revealed that the majority of students allocate only 1-3 hours per week to studying. This limited study time is often attributed to their packed class schedules, leaving little room for additional academic work outside of class hours. The issue of limited study time is compounded by the prevalent use of social media, which was identified as a major factor contributing to procrastination. Many students spend significant amounts of time on their phones, engaging with social media platforms, which detracts from their ability to focus on academic tasks and complete assignments on time.

Furthermore, the survey highlighted that students often prioritize social activities over studying, particularly during weekends. These activities are perceived as essential for stress relief, allowing students to unwind from the pressures of academic life. While social engagement is important for overall well-being, it appears that many students struggle to balance these activities with their academic responsibilities. This imbalance further exacerbates the issue of insufficient study time and contributes to procrastination.

The survey's findings underscore a broader issue of time management among students. Poor time management skills can have far-reaching consequences, not only impacting academic performance but also affecting students' mental health. The stress of uncompleted assignments, looming deadlines, and the guilt associated with procrastination can contribute to anxiety and other mental health challenges. Moreover, this issue is not confined to students alone; it reflects a societal challenge where the allure of digital distractions and the demands of a busy lifestyle often hinder effective time management.

In conclusion, the survey reveals a critical need for better time management strategies among UiTM Pasir Gudang students. There is a need for interventions that can help students balance their academic and social lives more effectively. Educational institutions can play a pivotal role by providing resources and workshops focused on time management and effective study habits. Additionally, fostering a culture that values academic diligence and self-discipline can help mitigate the negative impacts of procrastination. Addressing these challenges is essential not only for improving academic outcomes but also for supporting the overall well-being and mental health of students. As students navigate their academic journeys, developing strong time management skills will be crucial in helping them achieve their academic and personal goals.

(A-PP019) PROMOTING WELL-BEING: ADDRESSING MENTAL HEALTH AMONG UITM PASIR GUDANG STUDENTS

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ABSTRACT

This report, titled "Balancing Mental Health Among Students at UiTM Pasir Gudang," explores the mental health challenges faced by students and evaluates the effectiveness of various coping strategies and institutional support systems. The study's primary objectives are to identify prevalent mental health issues, understand how students manage these issues, and assess the impact of a supportive campus environment on student well-being. Utilizing a structured survey, data were collected from students across different faculties and semesters. The analysis highlights key factors influencing mental health, such as academic pressure, feelings of anxiety, and the role of campus counseling services. Findings indicate that while a significant proportion of students experience stress and anxiety, there is a neutral perception of academic pressure's impact on mental health. The report concludes that enhancing mental health awareness and integrating supportive measures into the curriculum are essential. Additionally, fostering an open environment and providing accessible counseling services are recommended to help students navigate their academic and personal lives effectively.

Keywords: mental health, impact, academic pressure

1.0 INTRODUCTION

In the era of learning, mental health problems are often found among students. The topic of Balancing Mental Health among students has emerged as a focal point of learning. This assignment aims to delve into various aspects of students' mental health and the strategies needed to foster a harmonious balance between academic pursuits and personal well-being. Further, this discussion rests on a deep recognition that mental health is not just an abstract concept but a fundamental determinant of a student's ability to thrive academically and personally. The pressure of rigorous coursework, looming deadlines, and the relentless pursuit of success can take a toll on students' mental well-being, which often manifests in stress, anxiety, depression, and a host of other mental health challenges. Additionally, transitioning to college or university, away from home and family support, can exacerbate these issues, leaving students feeling isolated.

However, amid these challenges there are signs of hopeful recognition that by prioritising mental health, educational institutions can introduce students to navigate the complexities of academic life with self-awareness and purpose. Instead of fostering

an open campaign culture and more awareness about mental health can implement a proactive support system and resources. There are also various approaches that can contribute to an environment that fosters student well-being.

Students should also consult with counselling as it serves as an important resource to address the various personal, emotional, psychological and relational challenges that individuals face throughout their lives. Counselling provides a safe and confidential space for individuals to discuss their mental health issues, such as anxiety, depression, trauma and stress. Trained counsellors offer support and guidance to help individuals cope with their emotions and work towards better mental well-being. Therefore, from this study, it can be concluded that it is important to identify and pay attention to students who face mental health problems among the student population of UiTM Pasir Gudang. Steps need to be taken to provide support and assistance to them to manage and overcome mental health challenges more effectively.

2.0 OBJECTIVE

The following are the overall objectives of this study:

- To gain empathy and understanding among students.
- To identify mental health issues among students.
- To identify how students manage their mental health.
- To educate students about the importance of mental health and its impact on overall well-being.
- To gain awareness on mental health issues.

3.0 METHODOLOGY

3.1 Description of data

Population	The term population in this research refers to all UiTM Pasir Gudang students.
Sample	The sample of this survey consists of 101 students from UiTM Pasir Gudang.
Sampling Technique	We choose Convenient Sampling Technique for our research because it is more efficient and flexible since it has a smaller sample size.

3.2 Method of data analysis

Table 1 : Summary of methodology Objectives

Objectives	Variables	Methodology
1. To gain empathy and understanding among students.	Ways of students support their peers struggling with mental health issues.	Table of respondents. Pie Chart.
2. To identify how students manage their mental health.	Types of coping strategies with negative emotions	Table of respondents. Pie Chart.
3. To identify satisfaction level on academic and curriculum give negative impact on mental health	Satisfaction level on academic and curriculum give negative impact on mental health	Table of respondents. Bar Chart .
4. To identify how students maintain between their responsibilities and mental well-being	Factor contribute in maintaining between their responsibilities and mental well-being	Table of respondents. Bar Chart.

4.0 RESULTS

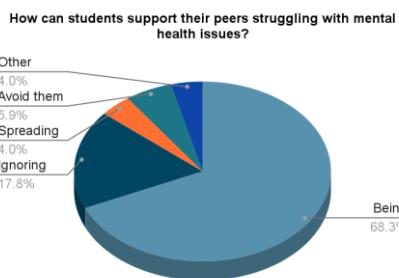


Figure 1 : Pie chart how students support their peers struggling with mental health issues.

The pie chart above shows how students support their peers who are coping with mental health difficulties. 69 students prefer to be compassionate listeners in order to assist their friends. 18 students choose to ignore them and pretend that everything is normal. 4 students decide to spread rumours about their peers' situation. 6 students want to avoid them. For the other answer, some students respond by being a good listener and distracting their attention from doing something damaging to oneself, as well as listening and understanding without judgement.

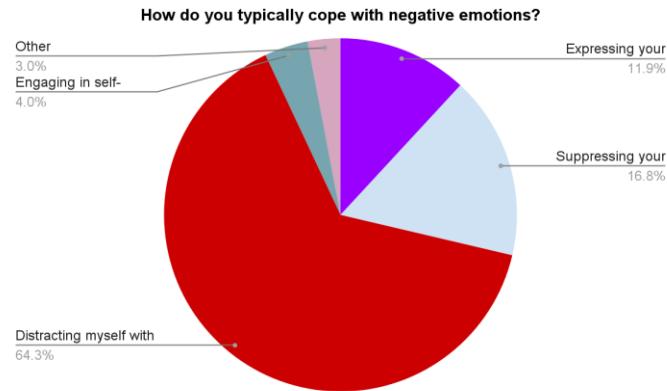


Figure 2 : Pie Chart of how students typically cope with negative emotions

The next chart shows how students commonly deal with negative emotions. 12 students decide to express their emotions through journaling. 17 students conceal their feelings to avoid dealing with them. 65 students choose to divert themselves with entertainment or social media. 4 students choose to participate in self-harming behaviours. For the alternative option, they respond neutrally; I play games and listen to music. I would disconnect as well. I would also be quiet and avoid communicating if possible, and last but not least, vent.

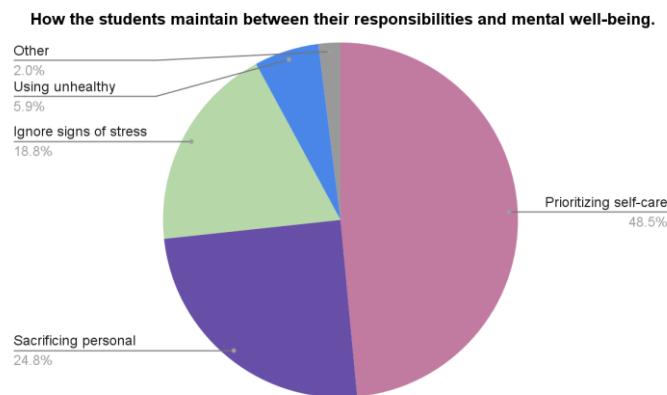


Figure 3.9 Pie Chart of how the students maintain between their responsibilities and mental well-being

The following graphic depicts how the students manage their obligations and mental health. 49 students said they prioritised self-care. 25 students responded by sacrificing personal time. 19 pupils say they disregard indicators of stress or mental health difficulties. 6 students respond with unhealthy coping mechanisms.

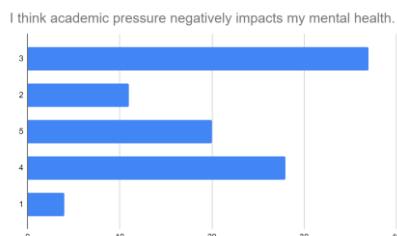


Figure 4 : Bar chart of academic pressure negatively impacts a student's mental health.

Mental health education should be integrated into the curriculum.

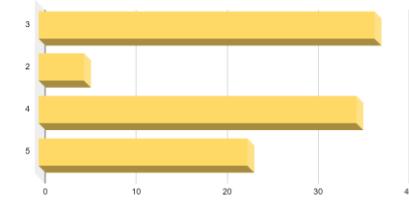


Figure 4 : Bar chart of curriculum pressure negatively impacts a student's mental health.

Both of Bar chart above shows that the majority of the respondents feel neutral. This means that most of the students in UiTM Pasir Gudang think that academics and curriculum does not have a negative impact on their mental health.

5.0 CONCLUSION

A survey on balancing challenges was conducted among students at UiTM Pasir Gudang by promoting well-being focusing on addressing mental health issue. The findings indicate that most students choose to be compassionate listeners to their peers, a common approach for relieving stress among teenagers.

In terms of coping strategies, many students reported diverting themselves with entertainment or social media. They find these activities relaxing and a helpful way to unwind. However, when balancing responsibilities with maintaining mental well-being, many students acknowledged sacrificing personal time to focus on their academic and extracurricular commitments, believing this to be in their best interest for future success.

In conclusion, the survey reveals that while students generally do not perceive academic and extracurricular activities as having a significant impact on their mental health, they still face challenges in decision-making and managing their mental well-being. These results underscore the need to address mental health issues among students and suggest the integration of mental health education into the curriculum. Promoting awareness and providing adequate support can help students better navigate their emotions and overall well-being. Creating a supportive environment that fosters empathy and understanding among students is crucial for enhancing their mental health and resilience.

(A-PP020) EXPLORING FINANCIAL CHALLENGES AMONG UITM PASIR GUDANG STUDENT

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ABSTRACT

This report investigates the financial challenges faced by students at UiTM Pasir Gudang and the impact on their well-being and academic performance. Utilizing a survey distributed to 81 students, the study aims to analyze the students' monthly income, expenditure, financial habits, and the resulting stress. Key findings indicate that the majority of respondents are male (76.5%) and earn an average monthly income of RM376.66, with significant variability in spending patterns. Approximately 63 students save for emergencies, though many struggle to afford study fees and basic necessities, leading to sacrifices in physical health and increased anxiety. The study concludes that financial insecurity among students is prevalent, adversely affecting their mental and emotional well-being. Recommendations include enhancing financial aid, increasing food initiatives, and promoting budgeting skills to mitigate financial stress and support academic success.

Keywords: Financial challenges, monthly income, academic performance

1.0 INTRODUCTION

Financial costs are one of the major problems that students will face at university. Students may also experience increased stress and anxiety due to financial problems, which can further impact their overall well-being and ability to focus on their studies. Therefore, students should manage their finances well so that the problem will not disturb them in the future.

Several important issues have contributed to the growing severity of the financial load facing students. Due to the increase in college and university tuition over the last few decades, which has outpaced both inflation and salary growth, many families now find higher education to be less accessible and affordable. In addition to tuition, living expenses for students are considerable and include food, rent, and transportation all of which are especially expensive in cities. Furthermore, the cost of necessary educational materials like software and textbooks can reach the hundreds of dollars per semester. Because of this, a lot of students need loans to pay for their education. Although these loans provide short-term financial respite, they frequently result in long-term debt, requiring graduates to repay them over years or even decades, which has a substantial negative influence on their career and financial security.

Students' academic performance, emotional health, and overall educational results are significantly impacted by financial stress. Many students struggle to keep up with their studies because they must work long hours to support themselves, which lowers their

academic performance. Their quality of life and academic achievement are further jeopardized by this financial strain, which also worsens mental health conditions including stress, anxiety, and depression. Moreover, since students who are unable to pay for their education frequently abandon their studies, financial issues play a big role in the high dropout rates. This perpetuates a cycle of limited options and unstable finances by interfering with their schooling and having long-term detrimental effects on their earning potential and prospects.

The cost of education is rising and that will cause financial problems among students, many students work part-time to afford their education. This will be causing their grades due to lack of time and tiredness. Other than that, financial problems can lead to mental health problems like anxiety and depression. Thus, there are some scholarships and financial aid help but not all students can access these resources and some students may have had financial problems through to how they manage their allowance. In This study, we want to investigate how many students are facing financial problems among UITM Pasir Gudang students.

2.0 OBJECTIVE

The following are the overall objectives of this study:

- To identify how much allowance student get in a month
- To identify how much allowance student spent in a month
- To observe how and where there spent their allowance
- To study if they save their money for emergencies
- To study if they think financial problem can lead to anxiety

3.0 METHODOLOGY

3.1 Description of data

Population	The term population in this research refers to all UiTM Pasir Gudang students.
Sample	The sample for this survey is 81 students at UITM Pasir Gudang
Sampling Frame	List of student respondents who answered the question.
Sampling Technique	We choose Convenient Sampling Technique for our research because it is more efficient and flexible since it has a smaller sample size.

3.2 Method of data analysis

Table 1 : Summary of methodology Objectives

Summary of methodology Objectives	Variables	Methodology
1. To identify how much allowance student get in a month	Amount of money students earn per month	Ogive
2. To identify how much allowance student spent in a month	Amount of money students spend per month	Ogive
3. To observe where there spent their allowance	Where does student spend their money?	Barchart
4. To study if they save their money for emergencies	Student saving for future emergencies	Bar chart
5. To study satisfaction level of financial problem can lead to anxiety	Satisfaction level Financial problems can lead to mental health issues among students, such as depressions or anxiety.	Pie Chart

4.0 RESULTS

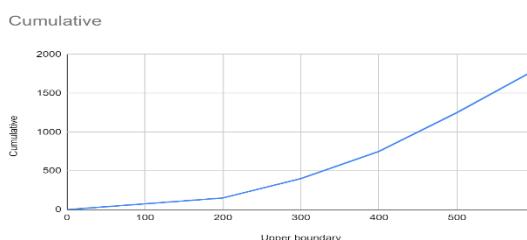


Figure 1 : Ogive of how much respondent get allowance per months

Based on Figure 1, there are 18 respondents who allowances are 300-399 while 17 respondents on 200-299. The highest allowances are 500-599 consist of 23 respondents which are the highest in the ogive while 10 respondents allowances 100-199 and 13 respondents respectively received 400-499 allowances per month.

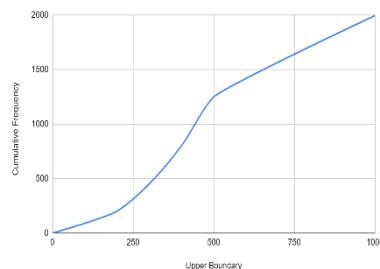


Figure 2 : Ogive of how much respondent expenses per months

Based on figure 2, most of the students spending their budget per month is RM199-RM299. Only 8 students spend their budget on RM500 and above. 10 students are spending their budget on RM399-RM499. meanwhile 19 students and 17 students are spending their budget per month is RM100-RM199 and RM299-RM399.

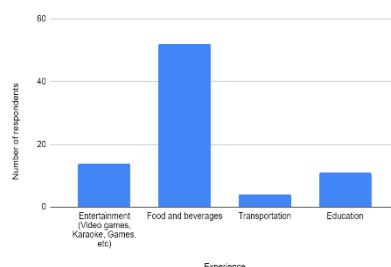


Figure 3 : of respondents most spent budget goes to

Based on figure 3.11, 52 students are spending their budget most on food and beverages, 14 students on entertainment, 11 students on education and 4 students on transportation.

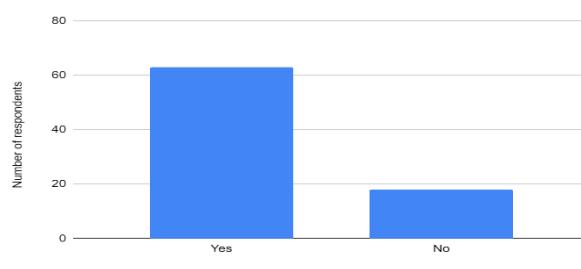
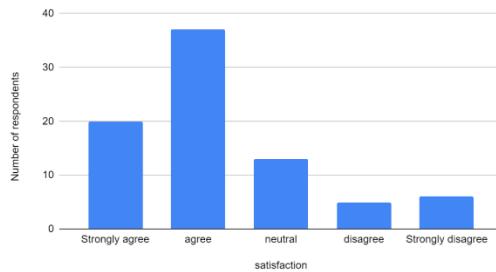


Figure 4 : consist of respondents saving on future emergency

Based on figure 4, there are 63 students answering yes while 18 students saying no for future emergencies saving.



Bar chart 3.16, shows that the respondent feel about financials problem can lead to mental health issue among students

Based on the figure 3.16, most of the respondents agreed with this statement above, which is 45.7 percent of the total 81 person. Only 5 person or 6.2 percent disagreed that financial problem could lead to mental health issue among students.

5.0 CONCLUSION

The study conducted at UiTM Pasir Gudang explored various aspects of students' financial challenges, including their monthly income, spending habits, expenditure categories, savings practices, and perceptions of financial stress.

Objective 1 revealed that the average monthly income among students is RM376.66, with a median of RM374.5. This indicates that half of the students earn more than RM300 per month, while the other half earn less, with the majority earning around RM374.5 per month. For Objective 2, the findings show that the majority of students spend between RM199 and RM299 per month, a range influenced by the monthly allowances they receive.

Objective 3 indicates that most students allocate a significant portion of their budget to food and beverages, a fundamental necessity for daily life. Regular meals are essential for maintaining energy levels, focus, and overall well-being, particularly when students are balancing academic, social, and work commitments. Objective 4 reveals that most students do save for future emergencies. This practice provides a financial safety net, offering peace of mind that funds are available if something unexpected occurs, thereby reducing anxiety about potential financial difficulties.

Lastly, Objective 5 addressed students' perceptions of financial problems and their potential impact on mental health. The majority of respondents agreed that financial issues can lead to anxiety, indicating widespread recognition of the connection between financial stress and mental well-being.

In conclusion, the study underscores the varied financial experiences of students at UiTM Pasir Gudang. It highlights the importance of financial literacy and planning, given the substantial portion of students concerned about financial stress and the need for emergency savings. These insights suggest a need for targeted financial education and support services to help students better manage their finances and reduce associated stress.

(A-PP021) ANALYZING VEHICLE USAGE AMONG UITM STUDENT COMMUNITY

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ABSTRACT

This report examines the transportation needs and preferences of university students at UiTM Pasir Gudang. It provides an in-depth analysis of various factors influencing students' choices regarding vehicle services, including the types of services used, frequency of use, and associated expenses. The study utilizes data from a questionnaire survey targeting students to gather insights into their transportation habits. Key findings reveal that Grab Car is the most preferred vehicle service, primarily used for shopping and travel purposes. Most students spend between RM0 to RM50 monthly on vehicle services, with online banking being the favored payment method. The report highlights the importance of understanding student transportation needs to enhance their overall campus experience and suggests potential improvements in transportation options and related services. By addressing these needs, the university can support students' mobility and contribute to their academic and personal well-being.

Keywords: transportation, vehicle, services

1.0 INTRODUCTION

Vehicles that can transport us from one place to another can be divided into categories based on their function. The use of a vehicle these days can be vital for both students and someone with a career to meet their daily needs regardless of how the vehicle is used. University students are also known for their hectic daily schedules as students can benefit a lot from a vehicle. This is because sometimes students need a vehicle whether it is a rental or car service from a well-known application for them to be mobile to wherever they need to be.

In UiTM Pasir Gudang, even though there is a curfew for students to enter the campus from 8.00 a.m. to 11.00 p.m. It does not stop them from doing those activities which are renting a car and getting car service from applications that are the choice of many students if they need to be in a certain place. These activities can be seen daily inside the campus when the car service is required.

Next about the operating hours for rental car services and car services from the application. Car rental service usually starts operating from 9 am to 9 pm according to the operating hours of a company. The car service from the application operates for 24 hours according to the number of drivers working at that time. From the questionnaire given to all UiTM students, we wanted to know which services are the before the students. Car rental and car services from the application provide various

payment methods for UiTM students such as cash and online transfer to make it easier for students to make transactions. Therefore, this survey aims to find a comparison of rental car services and car services from the applications.

2.0 OBJECTIVE

Those are the overall objectives of the study:

- To observe the vehicle needs among students.
- To study the frequency of vehicle use among students.
- To identify where students often get vehicle service.
- To discover where the vehicle is used among students.
- To compare which services are the best between car rental and vehicle service by apps.

3.0 METHODOLOGY

3.1 Description of data

Population	A set of all populations or complete groups consists of individuals, objects, or measurements under study. This research population is students in UiTM.
Sample	The sample of this survey consists of 100 students from all UiTM branches.
Sampling Technique	This research uses a quota-sampling technique. This method is much easier and more effective. The sample is selected from UiTM students who mostly use the vehicle service to go outside.

3.2 Method of data analysis

Table 1 : Summary of methodology Objectives

Objectives	Variables	Methodology
1. To observe the vehicle needs among students.	Importance of vehicle among UiTM students	Graph - Pie chart
2. To study the frequency of vehicle use among students.	Frequency of vehicle use among students.	Graph - Bar chart
3. To identify where students often get vehicle service.	The most application used to get vehicle services	Graph - Pie chart
4. To discover where the vehicle is used among students.	Purpose of the car is used for.	Graph - Bar chart
5. To compare which services are the most popular between car rental and vehicle service by apps.	Which vehicle services are most popular choices among student	Graph - Bar chart

4.0 RESULTS

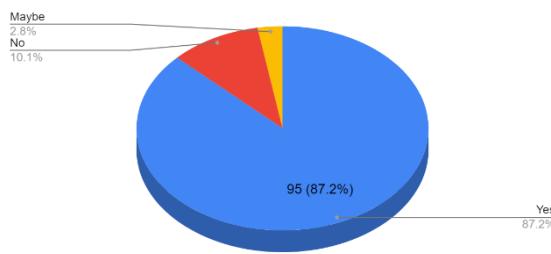


Figure 1: Pie Chart of respondents based on the importance of vehicles used for them.

Based on Figure 1, most respondents think the use of vehicles is important for students. This is most likely because they need it to go to class or move somewhere

easily. A total of 11 respondents think vehicles are not important and 3 people are not sure. This may be because they live in or around the university area.

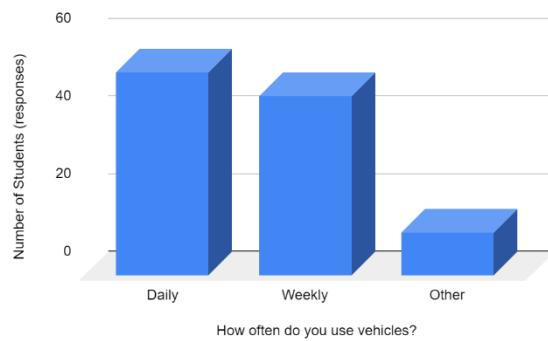


Figure 2: Bar Chart of respondents based on the frequency of vehicles used by students.

Based on the information above, 52 out of 109 respondents use the vehicles every day and 46 of them use the vehicle every week. While 11 respondents only use the vehicle a few times a month.

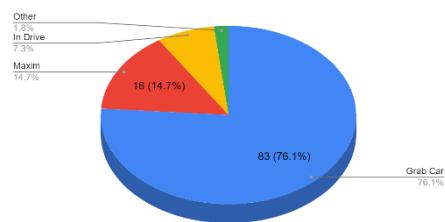


Figure 3: Pie Chart of respondents based on the types of applications used by students to get vehicle service.

Based on the table and pie chart above, the most popular application used by students to get vehicle service is Grab Car. Following Maxim, In Drive and the lowest choice by students is using the other vehicle service apps.

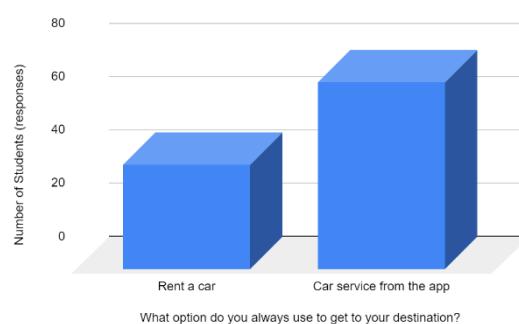


Figure 4 : Bar Chart of respondents based on the choice of vehicle used for students to go to their destination.

Based on the Bar Chart above, 64.2 percent of the respondents choose to get car services from the apps to go to their destination. Other than that, 35.8 percent of the respondents prefer the services of renting a car.

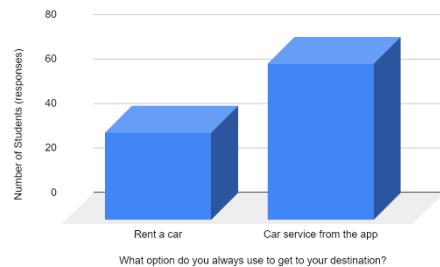


Figure 5 : Bar Chart of respondents based on the choice of vehicle used for students to go to their destination.

Based on the Bar Chart above, 64.2 percent of the respondents choose to get car services from the apps to go to their destination. Other than that, 35.8 percent of the respondents prefer the services of renting a car.

5.0 CONCLUSION

A study on vehicle use among UiTM students reveals that they primarily use car services for shopping and traveling. The survey highlights that these activities are the main reasons students rely on vehicles.

Most respondents view vehicle use as essential for students, likely due to the need for convenient transportation to classes and other destinations. The most popular app among students for car services is Grab Car, chosen for its affordability, widespread availability, and ease of finding a driver. Students prefer using such apps over renting cars, as it is more convenient to have a driver rather than drive themselves.

In conclusion, the preferences of 109 UiTM students indicate a clear favor towards app-based car services over traditional car rentals. The data underscores that app-based services are more popular due to their convenience, accessibility, and user-friendly nature. These services offer notable advantages, such as ease of use and cost-effectiveness, making them the preferred choice among students compared to conventional car rental options.

(A-PP022) EXPLORING SLEEP ROUTINES OF UNIVERSITY STUDENTS

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ABSTRACT

This research investigates the critical importance of sleep for students' overall health, cognitive function, and emotional well-being. It identifies various environmental, behavioural, and psychological factors that affect sleep, such as noise, late-night eating, caffeine consumption, and stress. It highlights the severe consequences of poor sleep, including physical health issues, mental health problems, and decreased academic and work performance. In order to improve sleep quality, establishing a consistent sleep routine, optimizing the sleep environment, and making lifestyle adjustments such as regular exercise, a healthy diet, and limiting screen time before bed are suggested. Additionally, it recommends monitoring sleep patterns through diaries and apps, and seeking professional help for persistent sleep issues. The comprehensive analysis emphasizes that personalized approaches are necessary to address individual sleep needs effectively.

Keywords: health, sleep, routines, monitoring

1.0 INTRODUCTION

Sleeping habits among students play a crucial role in their academic performance and overall well-being. Factors like age, social activities, and technology use before bedtime contribute to disrupted sleep routines and sleep-friendly environment, limiting screen time before bed, managing time wisely, and seeking professional help when needed to address sleep challenges and improve sleep quality. Lack of sleep not only affects academic success but also leads to various health issues like obesity, heart diseases, depression, and anxiety. Therefore, establishing healthy sleep habits is essential for students to enhance their learning, memory, and overall academic performance while safeguarding their physical and mental health.

Next, sleeping habits among students are multifaceted, reflecting a blend of individual preferences, academic pressures, social dynamics, and lifestyle choices. One of the most noticeable aspects of these habits is the variability in bedtime and wake up times. While some students adhere to a consistent schedule, others experience fluctuations influenced by factors such as coursework deadlines, social events, or part-time employment. Consequently, this irregularity often leads to inconsistent sleep durations, with many students failing short of the recommended 7 to 9 hours per night. The quality of sleep also influenced by stress levels and environmental factors.

Furthermore, the college environment itself can contribute to poor sleep hygiene, with dormitory living, noisy surroundings, and uncomfortable sleeping arrangements hindering restful sleep for some. Additionally, the prevalence of caffeine consumption

to combat daytime sleepiness or meet academic demands further complicates students' sleep patterns, potentially leading to a vicious cycle of caffeine dependence and disrupted sleep. Efforts to establish consistent sleep schedules, create conducive sleep environments, and practice good sleep hygiene are increasingly emphasized as essential components of self-care and stress management strategies. Therefore, this research are conducted to investigate sleeping habits among university students.

2.0 OBJECTIVE

The following are the overall objectives of this study:

1. To determine how they typically handle their sleep time
2. To observe their sleep quality
3. To identify hours sleep for each respondent
4. To identify the satisfaction level of challenges that may impact on the students sleeping schedule

3.0 METHODOLOGY

3.1 Description of data

Population	The term population in this research refers to all university students.
Sample	The sample of this survey consists 80 students selected randomly from every state in Malaysia
Sampling Technique	We choose Convenient Sampling Technique for our research because it is more efficient and flexible since it has a smaller sample size.

3.2 Method of data analysis

Table 1 : Summary of methodology Objectives

Objectives	Variables	Methodology
1. To determine how they typically handle their sleep time	How students typically handle their sleep time	Graph -Bar Chart
2. To observe their sleep quality	Students sleep quality	Graph-Pie Chart
3. To identify hours sleep for each other	Hours sleep of students	Graph-Pie Chart
4. To identify the satisfaction level of challenges that may impact on the students sleeping schedule	Satisfaction level of impact sleeping schedule on students	Graph-Bar Chart

4.0 RESULTS

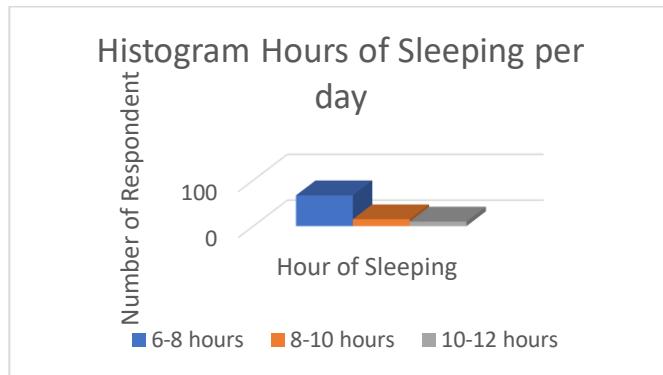


Figure 1 : Histogram chart of respondents takes many hours usually for sleeps each night.

Based on the data, this histogram chart shows the distribution of sleep duration among the 92 students. The majority, 67 students sleep for 6-8 hours every night. This shows that most respondents get a moderate amount of sleep with the majority getting less.



Figure 2 : Bar chart of how respondents handle their sleep schedules.

The information displayed shows how pupils respond to unexpected challenges or disruptions that could interfere with their sleep habits. 43 students said they would rather remain composed and evaluate the circumstances. These percentages are shown graphically in a column chart, which emphasises the preference for maintaining composure and making timetable adjustments.

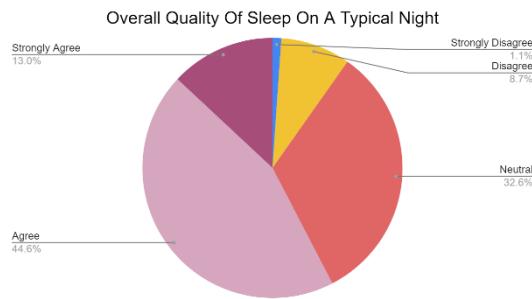


Figure 3 : Pie chart of overall quality of sleep on a typical night.

The survey's findings show that students sleep quality differs widely. 41 students agreed that they get high quality sleep, and 12 students chose strongly to agree as their experiences. This implies that most of the students who are typically satisfied with their sleep. Although most students had an excellent quality of sleep, the existence of neutral and unsatisfactory sleep responses shows that, the need for education and action to promote sleep health among all students.

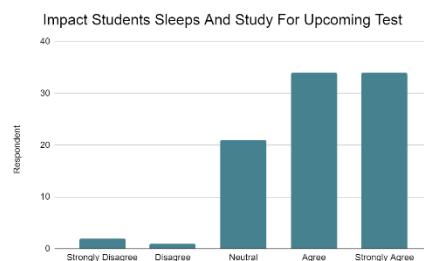


Figure 4: Bar chart of impact students sleeps and study for upcoming test.

According to the finding data, from the strongly agree and agree, the majority of students that are agreeing is 68 in total and they both have the same respondents which is 34 students.

5.0 CONCLUSION

In conclusion, the study on students' sleeping habits underscores the critical role sleep plays in academic performance and overall well-being. In this study, students' sleep patterns are shaped by a complex interplay between individual preferences, academic pressures, social dynamics, and lifestyle choices. A consistent sleep schedule is essential because of the variability of bedtimes and wake-up times, in combination with irregular sleep durations. The effects of disrupted sleep routines and poor sleep quality on concentration, assignment completion, and academic success have been shown to be detrimental. Even though students perceived they had sufficient time for assignments, a significant portion of them reported feeling distracted by sleep related issues, which points to a potential gap in time management strategies.

Moreover, to understand how students usually manage their sleep time by identifying their habits and factors that affect their sleep quality. This can find out how student's irregular sleep schedules are caused by academic stress, social activities, and technology use, as well as identify common challenges such as stress and a poor

sleep environment. The aim is to gather the various strategies used by students to manage sleep, whether positive or negative. Also, this is to evaluate the overall impact of these practices on their health and academic performance. Out of 92 students, 43 students choose to stay calm and assess the situation when their sleep is disrupted. While 36 students adjust their schedules, only 10 students discuss solutions openly, and 3 students ask for help from lecturers or friends. As a student, it is important to balance academics, and social life which leads to poor sleep. Understanding our sleep habits can help students develop better ways to improve their sleep quality which is good for health and academic success.

Afterwards, to understand and acknowledge everything that sleep offers for maintaining student's physical and emotional health. This entails investigating how students getting enough sleep supports body functioning, bolsters the immune system, and promotes physical performance and recuperation in addition to improving mental clarity, emotional stability, and general brain health. Based on the data analysis, they agreed that sleep is considered to increase mood, reduce stress, improve cognitive function, boost immunological function, and help with academic and athletic performance. A few disagreed, presumably because of variations in sleep requirements among students, the significance of other variables like food and exercise, scepticism, or own experiences. Most people agree that getting enough sleep has a favourable effect on students' health. Understanding the benefits of sleep for mental and physical health might make all the difference for people who lack it. It's the difference between being continuously tired and emotionally drained and having enhanced cognitive function, mood control, and overall well-being with each night of restorative sleep.

Therefore, to find out how students manage their time to complete assignments by knowing their time management strategies, habits, and challenges they face. This involves looking at how students perform on assignments, performing assigned work such as individual or group work, and submitting on set dates by the lecturer. By understanding these factors, we can identify effective techniques in time management, which can provide better support to help students improve their productivity and academic performance. Among 92 students, 39 students prioritize urgent assignments, the most common strategy. 22 students use planners, 16 students adjust plans for flexibility, and 14 students set goals for each task. Only one student finishes assignments last minute. For students, it is major to understand how they manage their time for assignments. Balancing coursework, activities, and personal life requires effective planning and prioritization. Students have to learn more about their time management strategies can help improve productivity and reduce stress for students and can support academic success and well-being.

**(A-PP023) ADDRESSING FACILITY CHALLENGES AMONG STUDENTS AT
UITM PASIR GUDANG**

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ABSTRACT

This research addresses the growing concern of facility issues at UiTM Pasir Gudang, which significantly impact the overall educational experience. Despite the campuses well-intentioned design, it faces infrastructural and maintenance challenges, such as insufficient classroom space, crowded lecture halls, and limited access to libraries and study areas. Frequent breakdowns of essential utilities like air conditioning and Wi-Fi disrupt the learning environment, affecting students' focus and academic performance. Additionally, the lack of adequate and well-maintained common areas for group studies and extracurricular activities leads to overcrowding and limited opportunities for collaborative learning. The research emphasizes that improving these facility issues through better maintenance, infrastructure upgrades, and increased resources is crucial for enhancing the student experience. By prioritizing these improvements and gathering regular student feedback, UiTM Pasir Gudang can create a more supportive and conducive learning environment that fosters academic excellence and personal growth.

Keywords: facilities, educational experience, maintenance issue, infrastructure

1.0 INTRODUCTION

Facility issues among students at UiTM Pasir Gudang have become a growing concern, impacting the overall educational experience. The campus, though well-intentioned in its design and facilities, faces several infrastructural and maintenance challenges. These issues include not enough classroom space, crowded lecture halls, and limited access to libraries and study areas. One of the primary concerns is the frequent breakdown of essential utilities, such as air conditioning and Wi-Fi, which are crucial for a good learning environment. Students often report that these disruptions affect their ability to focus and participate in lectures, leading to a decline in academic performance. Furthermore, the lack of sufficient and well-maintained common areas for group studies and extracurricular activities has led to overcrowding and reduced opportunities for collaborative learning.

Fixing these facility issues is crucial for improving the student experience at UiTM Pasir Gudang. Better maintenance, investing in infrastructure upgrades, and providing more resources can greatly help solve these problems. By focusing on these improvements, the university can create a better learning environment that supports students' academic and personal growth. Universiti Teknologi MARA (UiTM) Pasir Gudang faces several facilities-related issues that affect students' experiences and academic

performance. These problems include poorly maintained hostels and classrooms, not enough library resources, outdated laboratory equipment, and poor facilities. Additionally, students often deal with unreliable internet connectivity and safety concerns from poorly maintained infrastructure. These issues can distract students, reduce academic performance, and increase stress levels. Previous research indicates that the quality of campus facilities is directly linked to student satisfaction and success. Addressing these problems is essential for improving the overall student experience at UiTM Pasir Gudang.

2.0 OBJECTIVE

The following are the overall objectives of this study:

- To study the frequency of facility use among students
- To ensure a conductive learning environment that supports academic excellence, student well-being, and overall campus satisfaction
- To solve the problem about facility issues among students
- Identify any barriers or challenges that may affect the frequency of facility use among students

3.0 METHODOLOGY

3.1 Description of data

Population	The term population in this research refers to all UiTM Pasir Gudang students.
Sample	The sample of this survey consists of 85 students from UiTM Pasir Gudang.
Sampling Technique	We choose Convenient Sampling Technique for our research because it is more efficient and flexible since it has a smaller sample size.

3.2 Method of data analysis

Table 1 : Summary of methodology Objectives

Objectives	Variables	Methodology
1. To study the frequency of students having issue facilities	Frequency of students having issue facilities	Graph: Pie Chart
2. To identify facility that need improvement	Factor to improve facility at UiTM pasir Gudang	Graph: Pie Chart

3. To observe highest frequency of facility breakdowns location	Location of highest frequency of facility breakdowns	Graph: Bar Chart
4. To identify satisfaction level of overall cleanliness of the campus facilities	Satisfaction level of overall cleanliness of the campus facilities	Graph: Bar Chart

4.0 RESULTS

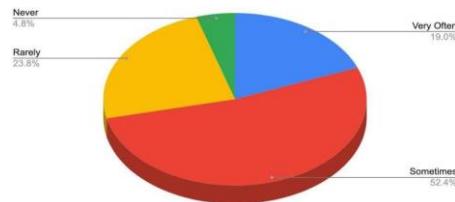


Figure 1 : Pie Chart of having issues with the facility

Figure above show the distribution data for students that having issues with the availability of equipment. Most students, which are 44 students believe that they sometimes having issues with the facility. Only 4 student that respond they never having any problem with facility provided.

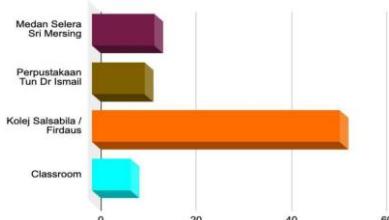


Figure 2 : Bar chart pf frequency of facility breakdowns

Figure above show the distribution data for students who receive that experiences the highest frequency of facility breakdowns and issues. Majority of students (61.9%) of respondents experienced the highest frequency of facility breakdowns and issues. The lowest frequency of facility breakdowns and issues is at classroom which is (9.5%).

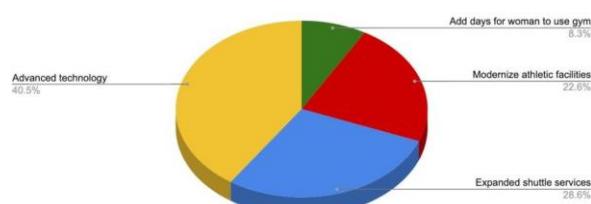


Figure 3 :Pie chart of facility improvement that would be benefit for student

Figure above show the distribution data for students think facility improvement that would be benefit for student. Most students, believe that the advanced technology is

the best facility improvement that would benefit them. Whereas other 24 students think that expanded shuttle services will be the best facility improvement.

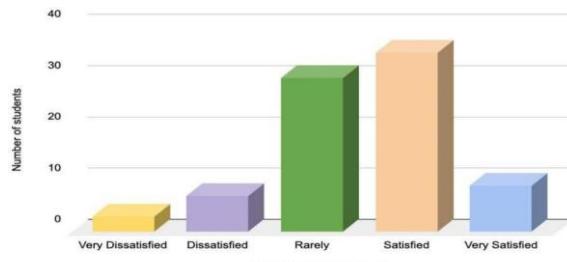


Figure 4 : Vertical Bar Chart of satisfied level of overall cleanliness

Figure above display the distribution data for students who are satisfied with the overall cleanliness of the campus facilities. This data distribution mode is satisfied, the number of students is the highest ranking which is 35 out of 84 respondents. The lowest ranking of respondents is 3 students who answer for very dissatisfied with the overall cleanliness of the campus facilities.

5.0 CONCLUSION

Based on our first objective, to study the students that having issues with the availability of equipment. Most students believe that they sometimes having issues with the facility. One indication of a strong need for better weather protection and accessibility on campus is the respondents' preference for covered pathways. This suggests that infrastructure is important for improving students' comfort and facility satisfaction. The whole campus experience may be considerably enhanced by taking these preferences into consideration.

Next, the second objective is students who experiences the highest frequency of facility breakdowns and issues. Majority of students (61.9%) of respondents experienced the highest frequency of facility breakdowns and issues. Lack of proper equipment or resources in labs and other specialised facilities causes many students to struggle, which lowers the standard of instruction and learning outcomes. To increase student satisfaction and guarantee fair access to educational resources, these problems must be resolved.

The third objective, is about student opinion on improvement of facility that would be benefit for student. Most students, believe that the advanced technology is the best facility improvement that would benefit them. Adaptive learning technologies can tailor educational content to individual students' needs, allowing them to learn at their own pace and style. This helps in addressing diverse learning abilities and improving overall comprehension. The last objective is focus on satisfaction level of cleanliness around campus. It is found out although students did not satisfied with facility provided at campus, they satisfied with the cleanliness around campus where 42% agree that campus are in good condition in term of their cleanliness.

In conclusion, dealing with facilities-related issues in UiTM Pasir Gudang is a complex process that includes a number of elements that are essential to the general prosperity and welfare of the academic community. UiTM Pasir Gudang needs to protect the physical integrity of their campuses and foster study, research, and community involvement by giving infrastructure maintenance, renovations, and expansions a priority. Modernized buildings with cutting-edge amenities and resources improve students' educational experiences by giving them the resources and surroundings they need to succeed both personally and academically.

(A-PP024) INVESTIGATING SOCIAL CHALLENGES AT UITM PASIR GUDANG

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ABSTRACT

The article discusses the serious concern of university student social issues, highlighting how these challenges impact academic progress and overall well-being. As students navigate higher education's complexities, they face numerous obstacles, including demanding academic standards, complex social dynamics, and increased freedom, which can lead to significant stress and anxiety. Additionally, peer pressure, social exclusion, discrimination, and bullying can create a hostile environment, undermining students' sense of community and belonging. Addressing these issues requires a collaborative effort from support services, instructors, students, and university administrations to cultivate a culture of empathy, inclusivity, and support. The article emphasizes that fostering a campus environment that prioritizes students' social and emotional wellness is crucial for their academic and personal success. The study's objectives are to identify the existence of social conditions, understand social life decisions, explore the relationship between physiological and safety aspects with others, assess the developmental social impact on students, and find solutions to social problems among students. By prioritizing these aspects, universities can help students overcome the challenges of college life and develop into resilient, capable, and successful individuals.

Keywords: social impact, academic progress, obstacles

1.0 INTRODUCTION

An issue that affects a large number of individuals in a society and frequently calls for collective action to remedy is referred to as a social problem. Social problems depend on various types directly or indirectly. According to the latest issue, social problems are increasing especially among students due to various factors. Because of this, students need to be smart in dealing with social problems that happen to each other.

Here are some social problems that happen to students that cause them to feel disturbed to continue learning. The social problem that occurs is that students find it difficult to interact with other students. This is due to the fact that some students do less outdoor activities. Furthermore, social problems can cause instability in an organization. This is because students with social problems cannot convey their opinions through communication. Next, social problems occur resulting in students missing out on information if they don't dare to come face to face with people from the environment or lecturers. In addition, social problems make students easily depressed

and make their learning life gloomy. This is because the students do not interact with the outside world and only rely on social media entertainment.

The performance of students who experience social problems while in class is usually difficult to get concentration due to the internal problems faced. Most of them force themselves to study very hard, causing some of them to quickly become stressed. This is also closely related to the pressure of people in the environment such as families who expect good results to be obtained by students if they study hard and that forces themselves to continue chasing their dreams thus causing extreme pressure due to not having enough rest. Next, the worst effect that will hit students is that after experiencing the peak of stress while at university, they try to do things that can damage themselves and the future. For example, such as the culture of smoking cigarettes and even worse is suicide attempts. This is probably because in their view, in such a way they can get rid of the feeling of the hair in their head. Therefore, this research focusing on social challenges among student at UiTM Pasir Gudang.

2.0 OBJECTIVE

The following are the overall objectives of this study:

- To identify the existence of a social condition
- To investigate satisfaction level on outdoor activities can help to overcome social problem
- To identify satisfaction level on environment sustainability are one of factor contribute to social problem
- To find the impact on individual quality of live

3.0 METHODOLOGY

3.1 Description of data

Population	The term population in this research refers to all UiTM Pasir Gudang students.
Sample	The sample of this survey consists 100 students selected randomly from every state in Malaysia
Sampling Technique	We choose Convenient Sampling Technique for our research because it is more efficient and flexible since it has a smaller sample size.

3.2 Method of data analysis

Table 1 : Summary of methodology Objectives

OBJECTIVE	VARIABLES	METHODOLOGY
To identify the existence of a social condition	Contributing factors to the perpetuation of social condition	Bar Chart
To investigate satisfaction level on outdoor activities can help to overcome social problem	Satisfaction level on outdoor activities can help to overcome social problem	Bar Chart
To identify satisfaction level on environmental sustainability Are one of factor contribute to social problem	Satisfaction level on environmental sustainability Are one of factor contribute to social problem	Bar Chart
To find the impact on individual quality of live	Impact on individual quality of live	Bar Chart

4.0 RESULTS

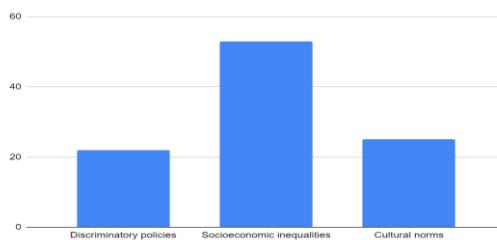


Figure 1 : Bar chart of contributing factors social condition

Based on the bar chart above, 53% of respondents chose socioeconomic inequalities as the highest contributing factor. The number of cultural norms is 25% followed by discriminatory policies with 22%.

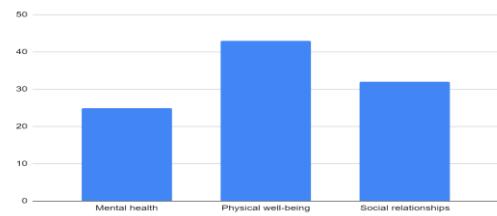


Figure 2 : Bar chart of social condition impact

Based on the bar chart above, as many as 43% of respondents chose physical well-being as the highest social condition impact. It followed by the number of social relationships with 32%.

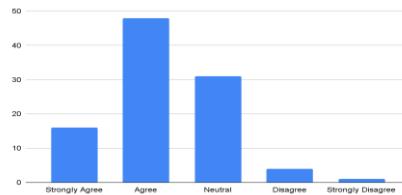


Figure 3 : Barchart of opinion about environment sustainability are factor social problem can be solve.

Based on Figure 3, most of people agree with this statement. The majority of respondent agree with this statement, making up 48% from 100% respondents. In the meantime, the number neutral responses is 31%. Followed by strongly agree 16%. And the last is strongly disagree, which is 1%.

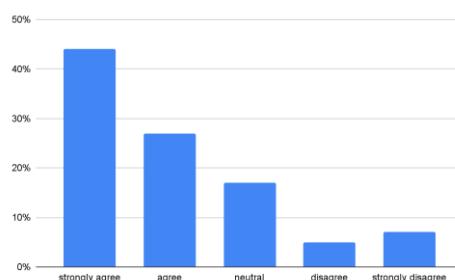


Figure 4 : Barchart of opinion outdoor activities can help to overcome social problem.

Based on the figure 4, majority of respondents are strongly agree outdoor activities can help to overcome social problem. With the largest number of respondents which is 44% followed by agree with 27% and neutral 17%. The last is disagree with 5%.

5.0 CONCLUSION

Based on first objective, 53% of respondents identified socioeconomic inequalities as the primary factor contributing to social issues. Cultural norms were cited by 25% of respondents, followed by discriminatory policies at 22%. Socioeconomic status significantly influences a student's health and well-being, which in turn affects academic performance. Students from low-income families often face poor nutrition, inadequate healthcare, and elevated stress and instability, all of which can hinder their ability to concentrate, learn, and perform well academically.

Next, the data reveals that 43% of respondents view physical well-being as the most impactful social condition. This is followed by social relationships at 32%. Health issues can adversely affect educational outcomes; students with chronic health problems may frequently miss school, struggle with concentration, and perform poorly academically, limiting their future opportunities and reinforcing cycles of poverty and social inequality.

In addition, 48% of respondents agree with the statement about the benefits of implementing sustainable practices in schools. Meanwhile, 31% were neutral, 16% strongly agreed, and 1% strongly disagreed. Incorporating sustainable practices, such as energy-efficient buildings, green spaces, and clean energy sources, can create a healthier learning environment. Improved air quality, natural lighting, and access to

nature can enhance students' physical and mental well-being, leading to better academic performance.

Lastly, majority of respondents strongly agree that outdoor activities can help address social problems, with 44% supporting this view. This is followed by 27% who agree and 17% who are neutral. Only 5% disagreed. Research indicates that students who engage in outdoor activities often achieve better academic results. The physical and mental health benefits, combined with improved cognitive skills, contribute to better focus, memory, and overall academic success.

In conclusion, addressing social challenges, along with implementing sustainable and outdoor initiatives, can significantly improve student outcomes and contribute to solving broader social problems.

(A-PP025) DYNAMICS AND APPLICATIONS OF SECOND-ORDER RL CIRCUITS IN MODERN ELECTRONICS

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ABSTRACT

A second-order RL (Resistor-Inductor) circuit involves a configuration with resistors and inductors that produce a second-order differential equation, dictating the circuit's dynamics. These circuits are essential in electrical engineering and are employed in applications like filtering, signal processing, and power management. The second-order RL circuit showcases complex impedance properties, influencing its response to different frequencies in terms of amplitude and phase. Analysis of these circuits involves determining key parameters such as the natural frequency, damping factor, and transient response. The solutions to the differential equations provide valuable insights into both transient and steady-state behaviors, critical for designing robust and efficient electronic systems. Understanding these behaviors is pivotal for the development of effective filters and oscillators, highlighting the importance of second-order RL circuits in modern electronic design and analysis.

Keywords: differential equation, inductance, resistor, current, rate of change

1.0 INTRODUCTION

Second-order RL circuits consist of resistors and inductors, are crucial components in the realm of electrical engineering. This study particularly in the design of systems for filtering, signal modulation, and energy regulation. These circuits are characterized by their ability to produce second-order differential equations, which describe the time-dependent behavior of current and voltage within the circuit. Understanding these equations is key to predicting how the circuit will respond to various inputs, especially in terms of oscillations and damping phenomena.

1.1 PROBLEM STATEMENT

Analyzing second-order RL circuits is challenging due to the complexity of the second-order differential equations involved. Traditional methods can be difficult, making it hard to understand the circuits' transient and steady-state behaviors. There is a need for an accessible approach to apply these equations in analyzing RL circuit dynamics, specifically to determine and compute the time-dependent charge $q(t)$ on the capacitor.

2.0 OBJECTIVE

The main objectives of this studies are:

- a) To employ the second-order differential equation in application the dynamics circuit.
- b) To determine the charge $q(t)$ on the capacitor as a function of time.
- c) To compute the time-dependent expression for the charge on the capacitor.

3.0 METHODOLOGY

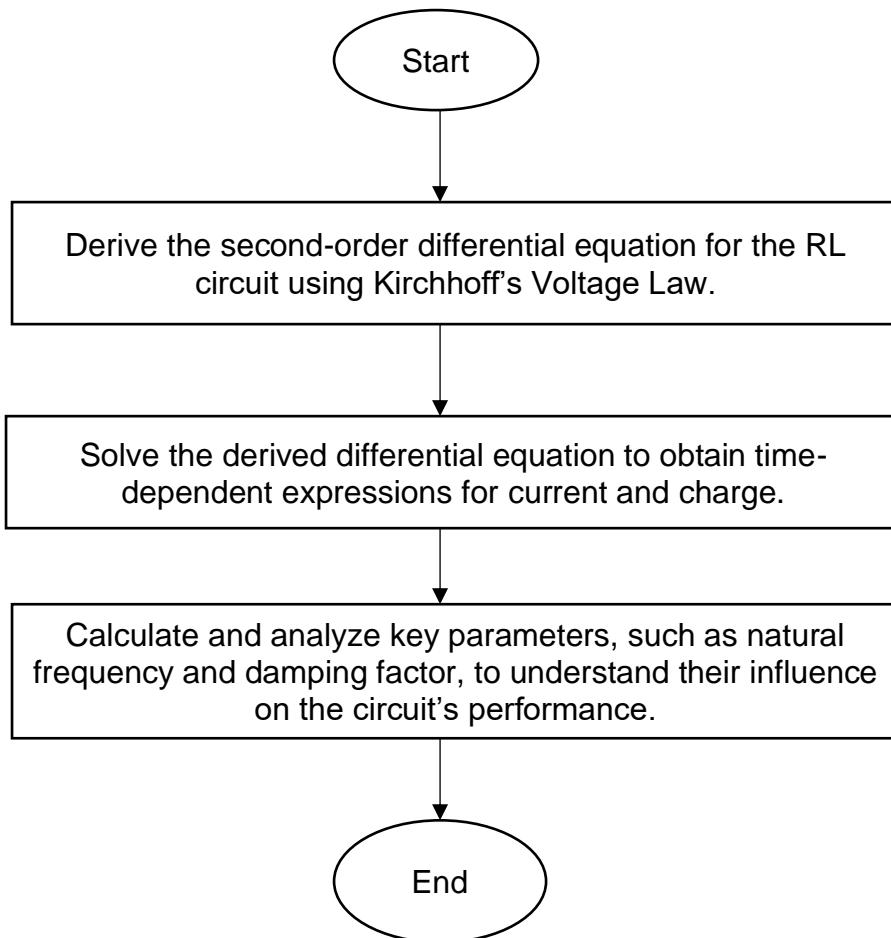


Figure 1: The methodology framework of study

Figure 1 shows the study begins with a literature review to establish the theoretical background on second-order RL circuits and differential equations. The next step involves formulating the second-order differential equation using Kirchhoff's Voltage Law. Analytical solutions are then derived to obtain time-dependent expressions for current and charge. These solutions are implemented in MATLAB to simulate circuit behavior and generate time-dependent plots. Key parameters, such as natural frequency and damping factor, are analyzed to understand their impact on the circuit's performance.

4.0 RESULTS

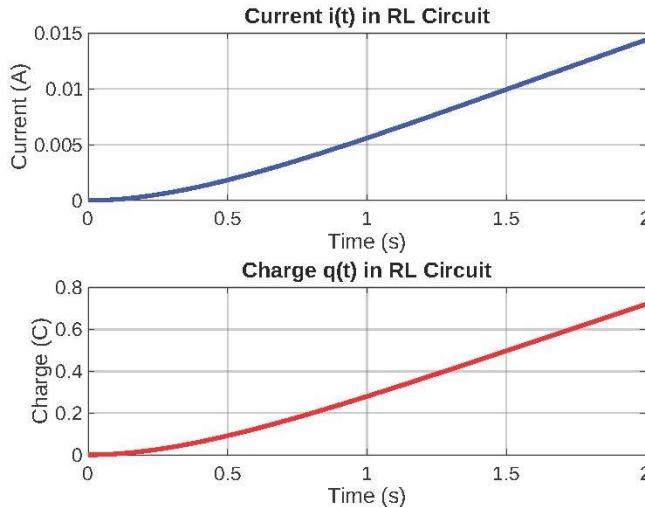


Figure 2: Current $i(t)$ and Charge $q(t)$ in RL Circuit base on Time

Figure 2 shows the results of the second-order RL circuit analysis reveal that the current $i(t)$ and the charge $q(t)$ on the inductor exhibit damped oscillatory behavior over time illustrated in Figure 2. Governed by the differential equation $L \frac{d^2 q(t)}{dt^2} + R \frac{dq(t)}{dt} + \frac{1}{C} q(t) = V(t)$, where L is inductance, R is resistance, and C is capacitance, the current is expressed as $i(t) = I_0 e^{-\alpha t} \cos(\omega_d t + \phi)$, showing an initial rise followed by oscillations that decay due to the damping factor $\alpha = \frac{R}{2L}$. The charge $q(t)$ mirrors this behavior, reflecting energy exchanges between the inductor and the resistor. These oscillations diminish over time, leading the system to a steady state. The findings highlight how inductance and resistance influence the circuit's transient and steady-state responses, crucial for optimizing electronic system performance.

5.0 CONCLUSION

The study of second-order RL circuits reveals the intricate dynamics governing the behavior of electrical circuits. By solving the second-order differential equation, valuable insights into the transient and steady-state responses essential for various applications in modern electronics. The methodology used here provides a systematic approach to analyze and understand these circuits, contributing to the development of more effective electronic components and systems. This analysis underscores the importance of mastering the underlying principles of RL circuits for advancing technology in signal processing, filtering, and power management.

6.0 BENEFIT OF STUDY

- a) This study enhances comprehension of transient and steady-state behaviors in second-order RL circuits, aiding in more accurate and efficient electronic designs.
- b) By integrating theory with practical MATLAB simulations, the study makes complex concepts more accessible, enhancing learning and preparation for advanced studies in electrical engineering.
- c) from this study support the development of robust and efficient electronic systems, improving filters, oscillators, and signal processing tools crucial for various technological applications.

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(A-PP026) APPLICATION NEWTON'S LAW OF COOLING USING FIRST-ORDER DIFFERENTIAL EQUATIONS

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ABSTRACT

Newton's Law of Cooling describes how the temperature of an object changes over time when it is exposed to a surrounding medium with a different temperature. The rate at which the temperature of the object decreases is proportional to the difference between its temperature and the constant temperature of its surroundings. By applying first-order differential equations, we can calculate how much an object's temperature decreases over time relative to the surrounding environment. This study aims to analyze the principles governing the rate of temperature change, solve the differential equation using mathematical methods, and validate the theoretical model to predict future temperature changes. The findings provide a quantitative foundation for understanding temperature variations in objects exposed to different thermal conditions, offering accurate predictions and practical solutions to real-world cooling problems.

Keywords: Newton's Law of Cooling, differential equations, temperature

1.0 INTRODUCTION

Understanding the thermal behavior of objects in various environments is crucial for applications ranging from industrial processes to everyday situations like food preservation. Newton's Law of Cooling offers a framework for analyzing how the temperature of an object evolves when it is not in thermal equilibrium with its surroundings. This law states that the rate of change in temperature is directly proportional to the difference between the object's temperature and the ambient temperature. The mathematical formulation of this law, a first-order differential equation, allows for the precise prediction of temperature over time, making it a valuable tool for scientists and engineers.

1.1 PROBLEM STATEMENT

Accurately predicting the rate of temperature change in an object exposed to different thermal environments is essential for various scientific and industrial applications. Despite the simplicity of Newton's Law of Cooling, real-world conditions often present challenges that can complicate the application of the law, such as varying surrounding temperatures and heat exchange rates. This study seeks to address these challenges

by applying the method of separation of variables to solve the first-order differential equation associated with Newton's Law of Cooling.

2.0 OBJECTIVE

The main objectives of this studies are:

- d) To employ the method of separation of variables to solve the first-order differential equation derived from Newton's Law of Cooling.
- e) To validate the theoretical model and predict future temperature changes.

3.0 METHODOLOGY

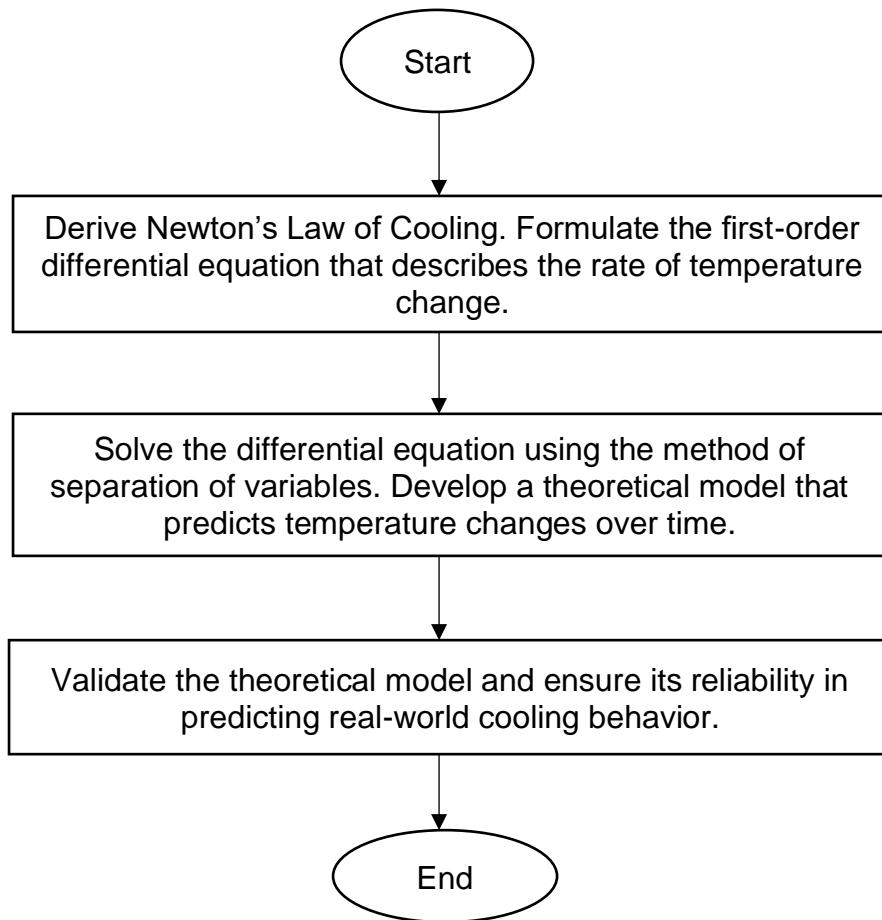


Figure 1: The methodology framework of study.

Figure 1 shows this study involves a combination of theoretical analysis, experimental design, data collection, and model validation. Initially, Newton's Law of Cooling is reviewed and the corresponding first-order differential equation is derived to establish the mathematical framework. An experiment is then set up in a controlled environment where the temperature of selected objects is measured at regular intervals using precise instruments, ensuring that the ambient temperature remains constant. The collected data is used to solve the differential equation using the method of separation of variables, allowing for the development of a theoretical model that predicts temperature changes over time. This model is validated by comparing its predictions with the experimental data, and statistical methods are employed to assess its accuracy. The analysis includes an evaluation of any discrepancies between the

theoretical and experimental results, followed by a discussion of the model's limitations and implications for real-world applications.

4.0 RESULTS

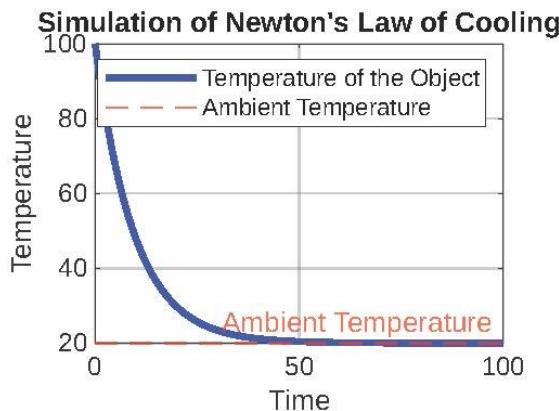


Figure 2: Graph of Simulation Newton's Law of Cooling Temperature vs Time

Figure 2 shows, demonstrate the cooling behavior of an object over time in accordance with Newton's Law of Cooling as shown in Figure 2. The temperature $T(t)$ of the object at any time t is governed by the differential equation $\frac{dT}{dt} = -k(T - T_{ambient})$, where $T_{ambient}$ is the constant ambient temperature, and k is the cooling constant. The solution to this equation, obtained through the method of separation of variables, is $T(t) = T_{ambient} + (T_0 - T_{ambient})e^{-kt}$, where T_0 is the initial temperature of the object. The plot illustrates how the temperature $T(t)$ decreases exponentially over time, approaching the ambient temperature asymptotically. The ambient temperature is marked as a horizontal dashed line on the graph, highlighting the convergence of the object's temperature to this value. The rate of cooling, dictated by the constant k , determines how quickly the object loses heat and reaches thermal equilibrium with its surroundings.

5.0 CONCLUSION

Newton's Law of Cooling, when solved as a first-order separable differential equation, shows that an object's temperature decreases exponentially towards the ambient temperature over time. The rate of cooling is influenced by the initial temperature difference and the material-specific constant k . This study illustrates the practical application of Newton's Law of Cooling in predicting temperature changes, providing valuable insights for various scientific and engineering fields.

6.0 BENEFIT OF STUDY

- a) Improved Prediction: Provides accurate predictions of temperature changes over time, aiding in precise thermal management.
- b) Practical Applications: Useful for industries requiring temperature control, such as electronics and food preservation.
- c) Model Validation: Confirms the reliability of theoretical cooling models in real-world scenarios.

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(A-PP027) MODELING ELECTRIC CIRCUIT DYNAMICS: AN APPROACH VIA FIRST-ORDER ORDINARY DIFFERENTIAL EQUATIONS

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ABSTRACT

This study explores the dynamics of electric circuits using first-order ordinary differential equations (ODEs) as a foundational framework. It begins with an introduction to the fundamental principles of electric current, progressing to the formulation and solution of first-order ODEs that characterize circuit behaviour, particularly in RL circuits. The analytical solutions reveal both transient and steady-state responses, enhanced by practical examples and graphical illustrations. These representations offer tangible insights into the real-world applications of theoretical concepts. By seamlessly integrating theoretical frameworks with practical scenarios, this research provides a holistic understanding of how first-order ODEs serve as predictive tools in analyzing electrical circuits. This study not only bridges the gap between theory and practice but also lays a crucial foundation for complex circuit analysis, underpinned by Kirchhoff's Second Law, thereby enhancing the predictive analysis of dynamic electrical behaviour.

Keywords: Ordinary differential equations (ODEs), RL circuits, Kirchhoff's Second Law.

1.0 INTRODUCTION

Electric circuits are essential in electrical engineering, underpinning various electronic devices and systems. First-order ordinary differential equations (ODEs) provide a robust framework for analyzing the dynamic behaviour of circuits, particularly those with capacitors and inductors. These components introduce time-dependent characteristics, making ODEs crucial for predicting circuit responses to different inputs over time.

1.1 PROBLEM STATEMENT

Consider an RL (resistor-inductor) circuit with a resistor R and a capacitor L in series with a voltage source $V(t)$. The task is to determine the current $i(t)$ through the circuit and the voltage across the inductor $V_L(t)$ when the circuit experiences a step input voltage. This problem can be modelled as a first-order ODE, representing the relationship between voltage, current, and the resistor-inductor properties. Solving this ODE reveals the circuit's transient and steady-state behaviour.

2.0 OBJECTIVE

The primary objective of this study is:

- a) To employ first-order ordinary differential equations to solve comprehensive model of RL circuits.
- b) To analyse the current $i(t)$ through an RL circuit in voltage across the inductor.

3.0 METHODOLOGY

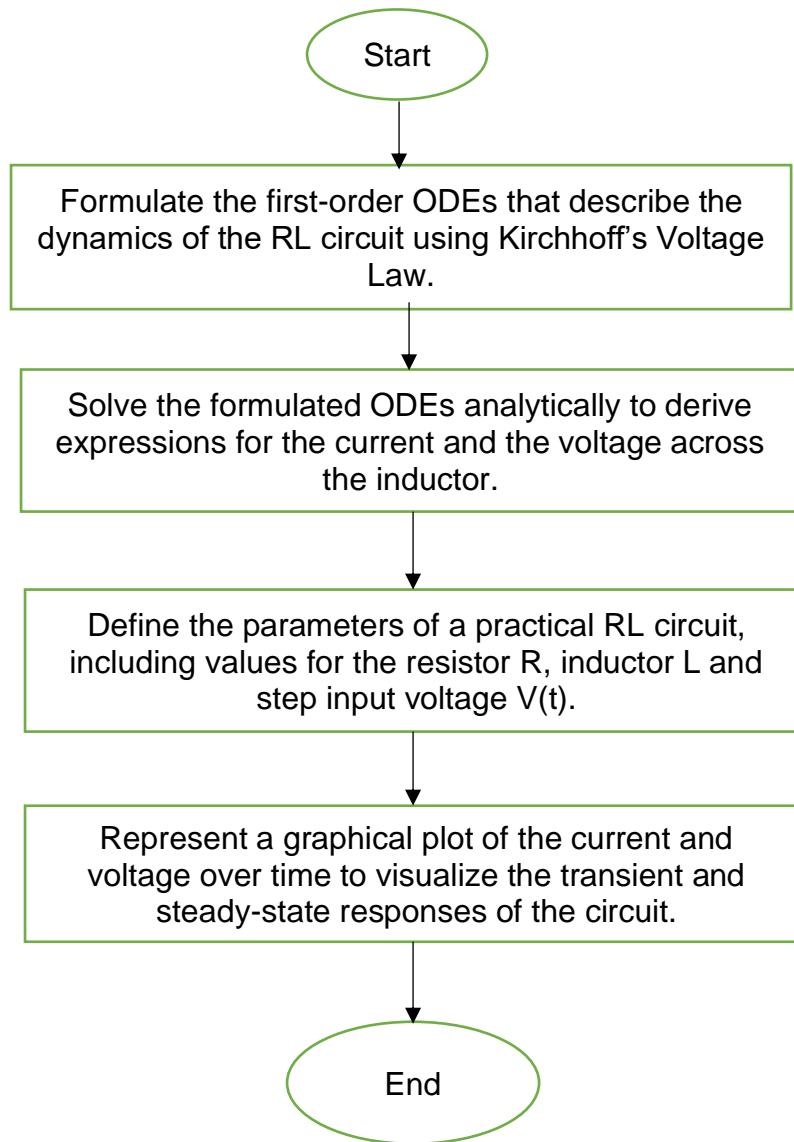


Figure 1: Methodology framework of study

Figure 1 shows the methodology framework of this study involves a comprehensive approach to understanding the dynamics of electric circuits using first-order ordinary differential equations (ODEs).

Initially, fundamental principles of electric circuits are reviewed to establish a foundational understanding. The next step involves formulating the first-order ODEs representing the RL circuit's behaviour, followed by deriving analytical solutions for the current and voltage across the inductor. Practical parameters for the RL circuit are

defined, and simulations are conducted using MATLAB to generate data and visualize the circuit's transient and steady-state responses. These theoretical and simulation results are then compared with real-world scenarios to validate the models. Finally, the study's findings are summarized, highlighting the implications for circuit analysis and suggesting directions for future research.

4.0 RESULTS

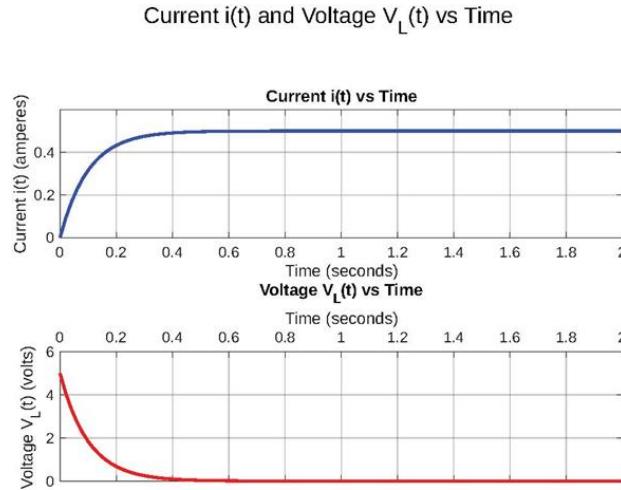


Figure 2: Transient and steady-state behavior of RL circuits

The results demonstrate the transient and steady-state behavior of RL circuits. The transient response, influenced by the circuit's time constant $\tau = \frac{L}{R}$, is characterized by the exponential change in current, described by $i(t) = \frac{V_0}{R} (1 - e^{-\frac{t}{\tau}})$. As time approaches infinity, the current stabilizes at $\frac{V_0}{R}$, while the voltage across the inductor, given by $V_L(t) = V_0 e^{-\frac{t}{\tau}}$, decays to zero. Graphical illustrations and practical examples highlight how these ODE solutions accurately predict circuit behavior under various conditions, underscoring the importance of first-order ODEs in circuit analysis.

5.0 CONCLUSION

The study concludes that first-order ordinary differential equations are effective tools for modelling and predicting the behaviour of RL circuits. By integrating theoretical analysis with practical examples, the research provides a holistic understanding of circuit dynamics. The findings highlight the significance of mathematical modelling in electrical engineering, offering a foundation for more complex circuit analysis and design.

6.0 BENEFIT OF STUDY

- a) By seamlessly integrating theoretical frameworks with practical scenarios, this research facilitates a holistic understanding of how first-order ODEs serve as predictive tools in analyzing electrical circuits.
- b) By integrating theoretical insights with practical applications, this study facilitates a deeper understanding of how first-order ODEs are applied to predict and analyze the dynamic behavior of electrical circuits, laying a crucial foundation for complex circuit analysis, underpinning Kirchhoff's Second Law.
- c) Increase knowledge and understanding using ODE in real life in example for circuit's application among students.

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**(A-PP028) ANALYSIS OF HARMONIC MOTION IN MASS-SPRING SYSTEMS:
INSIGHTS FROM SECOND-ORDER DIFFERENTIAL EQUATIONS**

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ABSTRACT

This study focuses on analyzing the dynamics of a mass-spring system, a fundamental concept in physics and engineering. The system's behavior is modeled using a second-order differential equation derived from Newton's Second Law of Motion. Specifically, the study examines the oscillatory motion of a mass attached to a spring with a spring constant k , exploring key parameters such as natural frequency, amplitude, and phase angle. The solution of the differential equation provides insights into harmonic motion and its implications for mechanical vibrations and resonance phenomena. It also considers the effects of damping on the system's behavior, enhancing the understanding of real-world applications. The findings from this study are expected to contribute to a deeper comprehension of mass-spring systems, offering valuable knowledge for applications in fields such as mechanical engineering, materials science, and structural analysis.

Keywords: Harmonic motion, Mass-spring, Newton's Second Law

1.0 INTRODUCTION

Harmonic motion is a fundamental concept in the study of oscillatory systems, particularly those involving mass-spring configurations. These systems are characterized by their periodic motion, where the mass oscillates around an equilibrium position due to the restoring force of the spring. The behavior of such systems can be accurately described using second-order differential equations derived from Newton's Second Law of Motion. This mathematical modeling is crucial for understanding the natural frequency, amplitude, and phase of oscillations, which are essential parameters in various applications, from mechanical systems to electronic circuits. Moreover, the study of damping effects provides insights into how real-world factors influence system stability and performance.

1.1 PROBLEM STATEMENT

Mass-spring systems are fundamental in various engineering and physics applications, yet there is a need for a deeper understanding of how system parameters such as mass, spring constant, and damping affect their dynamic behavior. While the basic principles of harmonic motion are well-known, the impact of these parameters

on the natural frequency, amplitude, and overall stability of the system under different conditions is not fully explored. Additionally, understanding the effects of damping on mechanical vibrations and resonance is crucial for optimizing the design and performance of systems that rely on these principles.

2.0 OBJECTIVE

The main objectives of this studies are:

- a) To develop a comprehensive understanding of harmonic motion in mass-spring systems.
- b) To determine the system's natural frequency, amplitude, and phase angle, and explore their dependence on key parameters

3.0 METHODOLOGY

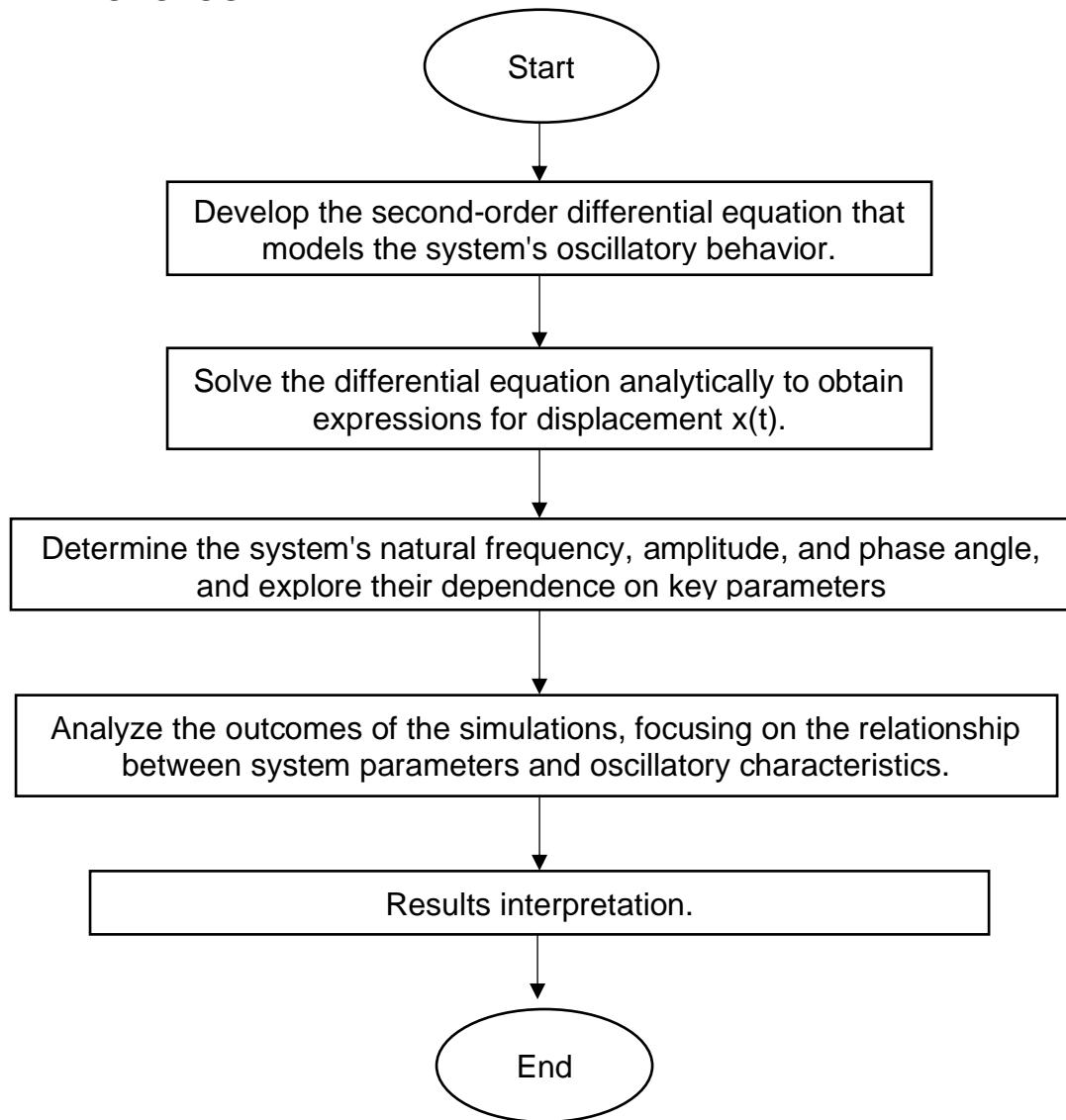


Figure 1: The methodology framework of study.

Figure 1 shows this study begins with the formulation of the mass-spring system, using Newton's Second Law to derive the governing second-order differential equation that models the system's oscillatory behavior. Analytical solutions are then

obtained to determine key parameters like displacement, natural frequency, amplitude, and phase angle. Numerical simulations are conducted to validate the analytical results and to explore how variations in system parameters such as mass, spring constant, and damping coefficient affect the system's dynamics. The results are analyzed to understand the relationship between these parameters and the system's oscillatory characteristics, with particular attention to the impact of damping on stability. Finally, the findings are interpreted in the context of practical applications, demonstrating how the insights can be applied to optimize the design and performance of systems relying on mass-spring dynamics.

4.0 RESULTS

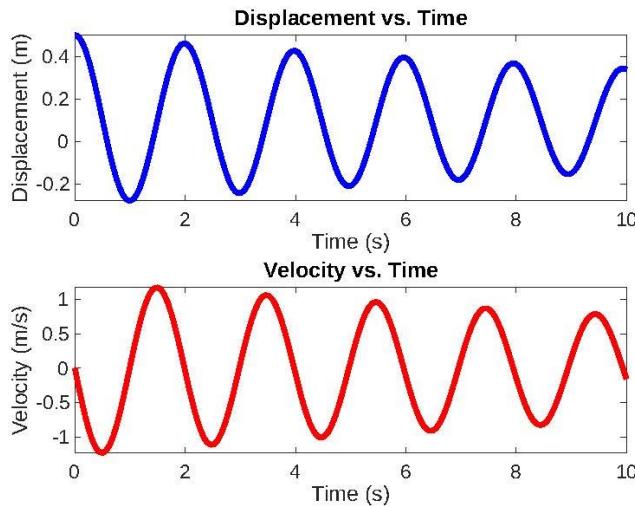


Figure 2: Simulation Displacement vs Time

Figure 2 shows the simulation results for the mass-spring system reveal the effects of oscillatory behavior over time, modeled by the differential equation $m \frac{d^2x}{dt^2} + c \frac{dx}{dt} + kx = 0$. In the undamped case (when $c = 0$), the displacement $x(t)$ exhibits harmonic motion with constant amplitude and frequency, determined by the mass and spring constant. The natural frequency of oscillation is given by $\omega = \sqrt{\frac{k}{m}}$, with the period T and frequency f showing regular oscillations. In contrast, when damping is present (with $c > 0$), the amplitude of oscillation decreases exponentially over time, reflecting the energy loss due to damping. The results illustrate how damping alters the system's response by reducing oscillation amplitude and affecting stability, providing practical insights into the system's behavior in real-world applications.

5.0 CONCLUSION

The study successfully models and simulates the dynamics of a mass-spring system using a second-order differential equation, providing a comprehensive understanding of harmonic motion and the effects of damping. The analytical and numerical results demonstrate that, in an undamped system, oscillations occur with constant amplitude and frequency, while damping introduces a gradual reduction in amplitude, highlighting the impact of energy dissipation. This detailed analysis not only confirms theoretical predictions but also illustrates practical implications for engineering and physics applications. The findings underscore the significance of these dynamics in designing and optimizing systems involving oscillatory motion.

6.0 BENEFIT OF STUDY

- a) The study aids in optimizing the design of mechanical systems like shock absorbers and vibration isolators by considering the effects of damping and resonance.
- b) It provides valuable insights for developing effective vibration control strategies to reduce unwanted vibrations in engineering applications.
- c) The findings improve understanding of mechanical vibrations and resonance, benefiting fields like structural engineering and automotive design.

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(A-PP029) AI-MEDIASUITE: ADVANCED TOOLS FOR MULTIMEDIA PROCESSING

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ABSTRACT

The rapid evolution of multimedia content creation necessitates efficient and comprehensive editing tools. Traditional methods often fail to deliver quick, intuitive, and secure solutions, especially given the ethical implications of AI-generated content. This paper introduces an AI-powered multimedia editing platform designed to address these challenges. Utilizing advanced machine learning technologies such as Convolutional Neural Networks (CNNs) which this platform provides tools that enhance efficiency and ensure the integrity of edited content. The primary objective is to develop a toolbox that streamlines multimedia processing, enabling users to edit their content swiftly and effectively. Additionally, the platform incorporates a watermarking system to embed invisible markers in processed content, crucial for maintaining ethical standards and preventing misuse by ensuring traceability and authenticity of AI-generated modifications. This solution not only promotes ethical AI practices but also increases user trust in AI tools. By integrating watermarking and comprehensive edit histories, the platform addresses concern about the authenticity and ethical use of AI in multimedia. The project's impact includes promoting ethical standards in AI, enhancing trust in AI-powered tools, and boosting market competitiveness and industry leadership. In summary, our AI toolbox for multimedia editing offers a pioneering solution to modern content creation challenges. It combines efficiency, security, and ethical consideration, setting new benchmarks in the multimedia industry and ensuring responsible and effective use of AI technologies.

Keywords: Digital watermarking, AI in media production, Ethics in AI, AI toolbox

1.0 INTRODUCTION

The fast improvements in multimedia content material creation have brought about a growing demand for green and available modifying equipment. Traditional multimedia editing software program, while powerful, frequently falls quick in meeting the needs of users who searching for quick, intuitive, and steady solutions. The emergence of synthetic intelligence (AI) gives a promising avenue to revolutionize this area, particularly through the integration of advanced device getting to know techniques which include Generative Adversarial Networks (GANs), Convolutional Neural Networks (CNNs), and Recurrent Neural Networks (RNNs).

The motivation in the back of growing this AI-driven multimedia modifying platform stems from the need to address 3 tremendous challenges inside the current landscape. Firstly, there's a pressing want for efficient multimedia enhancing gear that could lessen the time and complexity concerned in content material advent. Current solutions are much less available to informal users and small companies, creating a gap that AI can fill by means of democratizing multimedia modifying.

Secondly, the dearth of comprehensive edit histories in modern-day system gives a barrier to every getting to know and effective content material cloth control. Users often require an in depth records in their edits to music adjustments, analyze from their approaches, and revert to preceding versions if wished. Incorporating this feature might beautify person enjoy by way of the usage of imparting greater manipulate and transparency.

Finally, as AI-generated content material becomes an increasing number of indistinguishable from human-created content material, ethical issues approximately authenticity and misuse rise up. The implementation of watermarking in AI-edited content is important to ensuring the responsible use of those technologies, supplying traceability and deterring unethical practices.

This progressive platform pursuits to address those demanding situations, imparting a solution that combines efficiency, protection, and moral considerations, putting new requirements inside the multimedia enterprise.

2.0 OBJECTIVE

As a starting point of this project aim, the project will develop an advanced platform which designed to enable users efficiently edit and enhance image elements using AI technology. This platform will prioritize ease of use, allowing users to process their images in a significantly shorter time compared to traditional methods.

Moreover, the platform will include a feature that logs the history of all edits made to multimedia elements. This allows users to easily review or revisit previous versions of their work, ensuring they can track changes and make informed decisions during the editing process.

As the final point, this project will promote the ethical use of AI tools by applying watermarks on the processed image. This feature is particularly important for scenarios where the distinction between original and AI-modified content must be clearly indicated, helping to maintain transparency and integrity in the use of AI-generated media.

3.0 METHODOLOGY

In this toolbox, we are focusing on the image element. The application has provided with the image processing service which include with the image restore, generative fill, object remove, object recolor, background remove and an AI search history. In this system, all the transformed images will be embedded with the watermark (Generated by AI) which consider the image is processed by the AI to ensure the user not abuse the images.

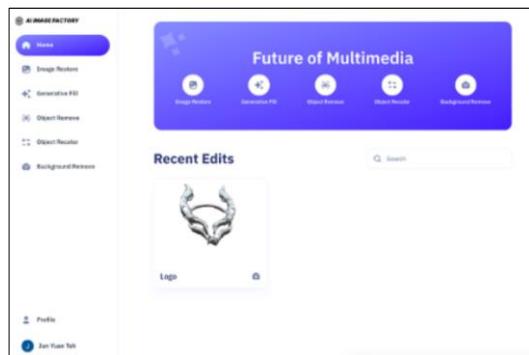


Figure 1 Home page

In this function, it shows the history of edited images and the search function.

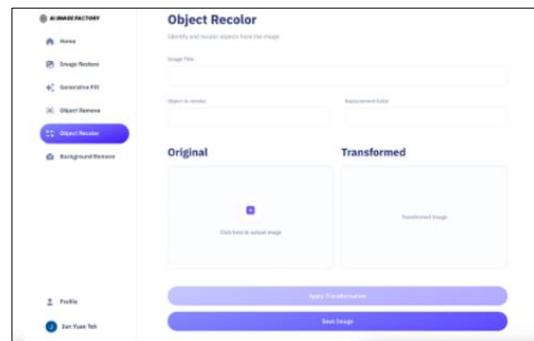


Figure 2 Image recolor module

In this function, using AI, it allow user to recolor the specific objects required.

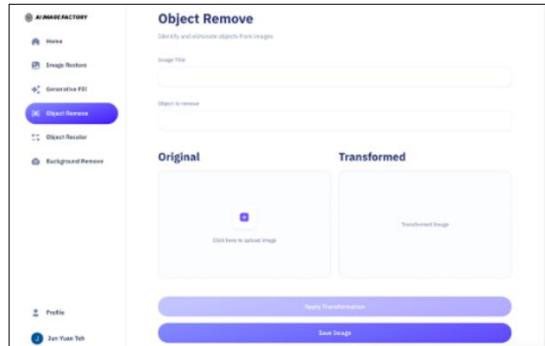


Figure 3 Image remove module

In this function, using AI, it allow user to remove the specific objects required.

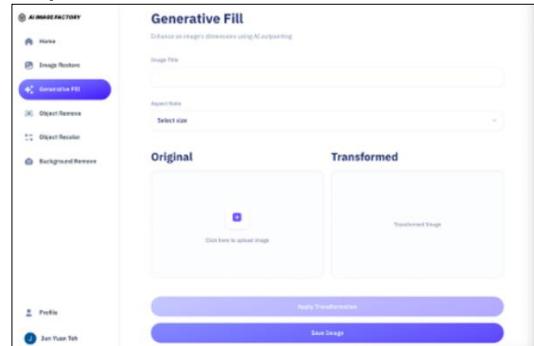


Figure 4 Image resize module

The generative fill is the function to use the AI to resize the image either expand or shrink the image.

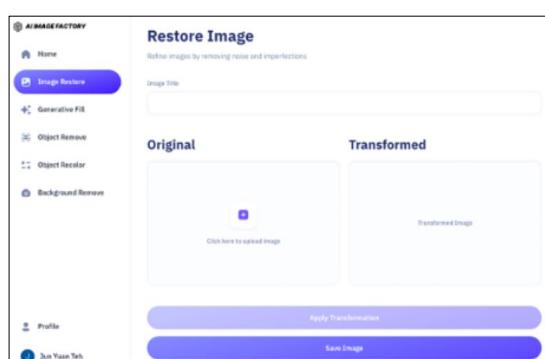


Figure 5 Image restore module

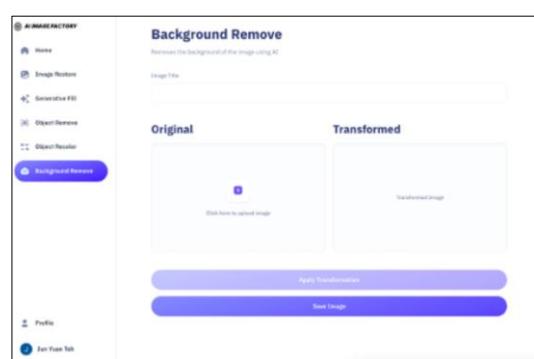


Figure 6 Background remove module

Image restores is used to restore the blur images to more clearly.

The background remover is used to remove the background and keep the main object.



Figure 7 Watermark Example

All the transformed image will embed with the watermark “Generated By AI”.

The Generative Fill is a feature leverages AI to dynamically resize images by either expanding or shrinking them. This function is particularly useful when the users need to adjust an image to fit specific dimensions without losing an important content.

The Object Recolor and Object Remove features use advanced AI to detect specific objects within an image that a user wants to modify or eliminate. In Object Recolor, it allow the users to change color of a particular object within an image. To apply it, once AI detected the object, the user can select a new color to apply which makes it easy to match the object with the desire needs. While in the Object Remove is designed to helps users eliminate unwanted objects from their image. The AI would identifies the objects that need to be removed and then intelligently fills the space with an appropriate content to ensure a natural look.

In this project, we implement Claudiary as AI tool to process an image as object. Cloudinary's AI-based image editing implements a mix of sophisticated algorithms and neural networks to realize better images and manipulation. It initiates with the input of the image, then normalizing and resizing. Convolutional Neural Networks (CNNs) form the core of most image editing operations through feature extraction, for example, objects, edges, and textures from images. Among the mentioned AI capabilities, Cloudinary provides the following: Auto-enhance, doing things like color correction and exposure adjustments; manipulate objects for tasks like removing backgrounds; restore images by removing noise or repairing damage. It often indicates the before and after comparison view that allows users to see how edits have changed the image and be sure that modification is according to quality standards set by them. Inbuilt into Cloudinary, this CNN integration utilizes the real-time processing framework to empower delivery of powerful and versatile image editing solutions.

4.0 RESULTS

The emergence of AI-powered multimedia editing tools marks a new era in content production, offering a wealth of innovative capabilities and transformative

impacts on the industry. One of the primary advantages of AI-powered multimedia editing platforms is their efficiency. By leveraging advanced artificial intelligence techniques, these platforms significantly reduce the time and complexity involved in content creation. Tasks that once required hours of manual work, such as object removal, background replacement, and colour correction, can now be accomplished with a few clicks.

Accessibility is another crucial benefit of these platforms. Unlike traditional tools, AI-driven platforms make multimedia editing accessible to everyone. This system user-friendly design accommodates the beginners as well offering an advance feature for professionals. In addition, control and transparency are enhanced through features like detailed edit histories. Users can track changes, learn from their editing process, and revert to previous versions, giving them unprecedented control over their work.

The impact of these platforms on the industry could be transformative. Traditional editing software companies may need to adapt their business models to compete, and the job market for multimedia editors may shift towards AI-assisted editing skills. Moreover, new categories of content creators may emerge, leveraging the platform's capabilities to produce innovative forms of media.

Ethical considerations are also at the forefront of these platforms' design. By incorporating watermarking to ensure the traceability of AI-edited content, they set new ethical standards within the industry, particularly in addressing concerns about authenticity and misuse of AI-generated content.

Moreover, the learning and skill development opportunities provided by these platforms are significant. The comprehensive edit history feature serves as a learning tool for users, helping them improve their editing skills by studying their past work. Interactive tutorials, AI-powered suggestions, and integration with online learning platforms offer users the chance to enhance their skills continuously.

The results of using such platforms are multifaceted. Users can produce high-quality multimedia content in a shorter time, leading to increased productivity and potentially more frequent content updates or releases. The ability to review and revert to previous edits results in better content management, reducing errors and improving the quality of the final product. With watermarking, the platform ensures that AI-edited content remains identifiable, thus reducing the risk of unethical use, such as passing off AI-generated content as entirely human-made.

The novelty of these platforms lies in their integration of advanced AI techniques like GAN's. This modern approach distinguishes them from traditional software and opens up new possibilities for content creation. Unlike existing tools that cater to a more professional audience, these platforms aim to make advanced editing capabilities available to a broader range of users, a novel approach in the multimedia editing space.

In conclusion, AI-driven multimedia editing platforms represent a significant advancement in content creation technology. By offering enhanced efficiency, accessibility, and control, they are set to transform the industry, democratize advanced

editing tools, and establish new ethical standards. As these platforms continue to evolve, they promise to reshape how we create, manage, and interact with multimedia content, opening up new possibilities for creativity and innovation in the digital age.

5.0 CONCLUSION

The AI-powered multimedia modifying platform presented in this project gives a transformative approach to the challenges confronted through modern-day content creators. By leveraging modern AI technology together CNNs, the platform no longer simplest enhances the performance and accessibility of multimedia modifying however also addresses crucial moral worries. The integration of capabilities like digital watermarking and complete edit histories ensures that the platform promotes accountable and transparent use of AI gear, safeguarding the authenticity of AI-generated content material. The innovative method of democratizing advanced enhancing capabilities makes this platform a pioneering pressure inside the multimedia industry. By placing new moral standards and lowering obstacles to entry, it holds the capability to revolutionize content introduction, making professional-grade equipment available to a wider audience and fostering industry-extensive transformation. Ultimately, this mission now not most effective advances the sphere of multimedia enhancing however also underscores the significance of moral AI practices, ensuring that the future of content material introduction is both efficient and principled.

(A-PP031) SOLVING MIXTURE PROBLEMS IN APPLIED MATHEMATICS: A DIFFERENTIAL EQUATION APPROACH

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ABSTRACT

This study explores the dynamic behavior of solute concentration in a tank system subjected to continuous inflow and outflow of a salt solution. By applying first-order linear differential equations. It reveals how the solute concentration evolves over time, transitioning from an initial state of pure water to a steady-state equilibrium. The findings highlight the critical role of parameters such as inflow rate and concentration in determining the system's long-term behavior. This analysis provides valuable insights into the mechanisms governing mixture processes, offering practical implications for fields like chemical engineering and environmental science, where precise control of concentration dynamics is essential for optimizing operational efficiency and safety.

Keywords: Mixture Problem, Linear Solution, Differential equations

1.0 INTRODUCTION

Mixture problems are central to applied mathematics and have significant implications in fields like chemical engineering, environmental science, and pharmaceutical development. These problems involve understanding how the concentration of substances in a mixture changes over time, which is crucial for optimizing processes, ensuring safety, and making informed decisions. In many cases, the behavior of mixtures can be effectively modeled using first-order linear differential equations, which describe the relationship between the rates of substance inflow and outflow. This study focuses on developing and solving these differential equations to predict solute concentration dynamics in a tank-based system.

1.1 PROBLEM STATEMENT

Accurately predicting solute concentration in a mixture over time is vital for optimizing processes in various fields. This study addresses the challenge of modelling a tank system with constant solute inflow and outflow, developing a first-order linear differential equation to predict concentration dynamics under varying conditions.

2.0 OBJECTIVE

The primary objectives of this study are:

- a) To develop a mathematical model using first-order linear differential equations to describe the behavior of solute concentration in a mixture.
- b) To solve the differential equation analytically and predict the concentration of the solute over time.
- c) To validate the model with practical data and explore the impact of varying initial conditions and rates on the solution.

3.0 METHODOLOGY

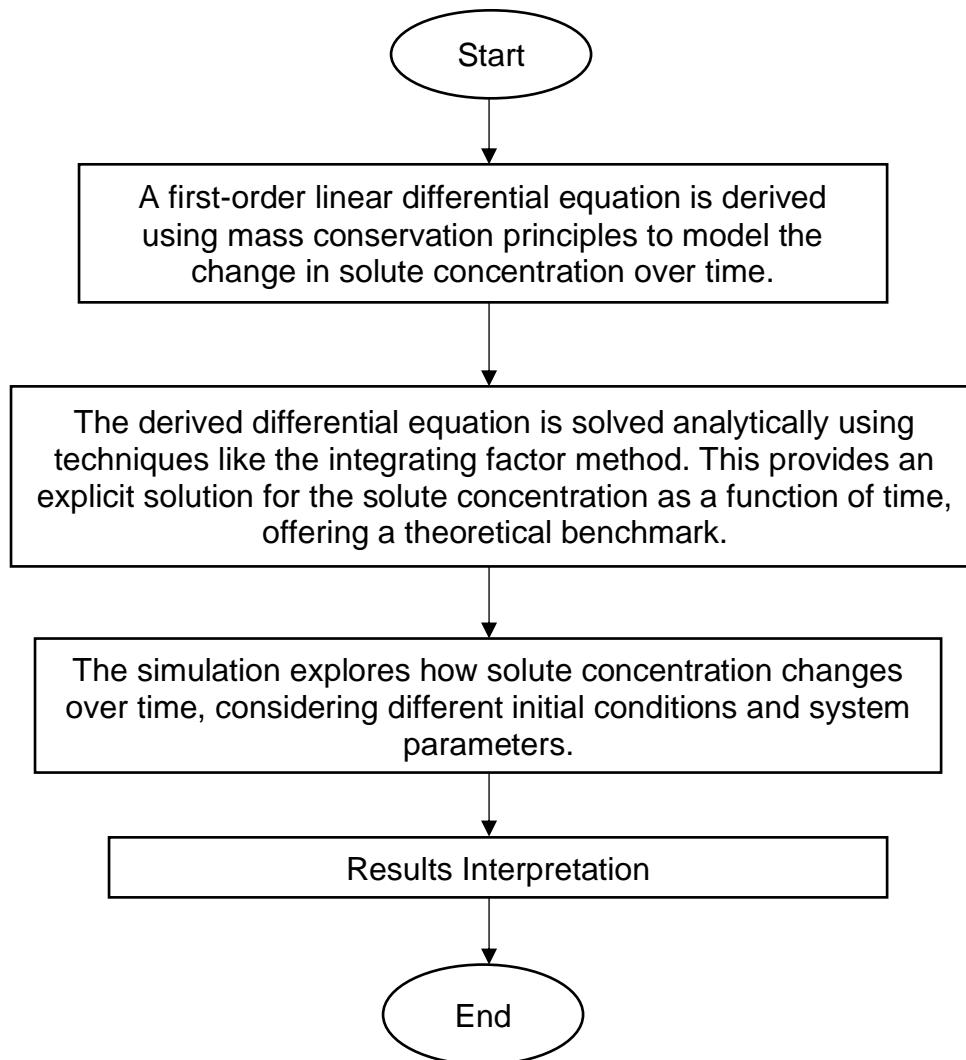


Figure 1: The methodology framework of study.

Figure 1 shows this study involves defining a problem scenario where a tank system with an inflow of a salt solution and simultaneous outflow is modeled using a first-order linear differential equation based on mass conservation principles. The differential equation is solved analytically to provide an understanding of the system's behavior over time, with particular attention to the solute concentration dynamics. Numerical methods are then employed to simulate the system under various initial conditions and parameter settings, allowing for a detailed analysis of how these factors influence the concentration. Validation of the numerical results against the analytical solution

ensures accuracy, and the insights gained are used to interpret the system's behavior, emphasizing the practical applications of this approach in real-world scenarios.

4.0 RESULTS

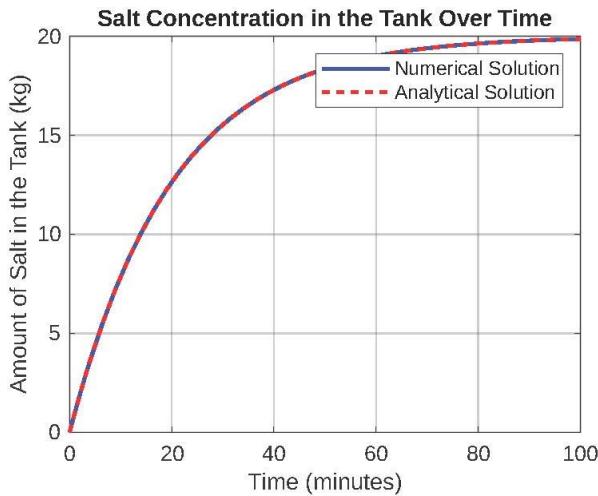


Figure 2: Graph of salt concentration in the tank over time.

The results in figure 2 demonstrate that the salt concentration in the tank, modeled by the differential equation $\frac{dQ(t)}{dt} = r_{in} \cdot c_{in} - \frac{r_{out}}{V_0} \cdot Q(t)$, increases over time, starting from zero and eventually reaching a steady state where the inflow and outflow rates of salt are balanced. The analytical solution, $Q(t) = \frac{r_{in} \cdot c_{in} \cdot V_0}{r_{out}} (1 - e^{-\frac{r_{out}}{V_0}t})$, closely matches the numerical results obtained from MATLAB, confirming the model's accuracy. The simulation reveals that the concentration rises rapidly at first but slows as it approaches the steady state, influenced by parameters like inflow rate, inflow concentration, and outflow rate. These findings highlight the effectiveness of the differential equation in predicting the dynamic behavior of the mixture system.

5.0 CONCLUSION

This study successfully demonstrates the application of first-order linear differential equations in modeling and solving mixture problems. The developed model accurately predicts the solute concentration in a tank over time, with results validated through both analytical and numerical methods. The study reveals how the system approaches a steady state, where the inflow and outflow of the solute are balanced, and how varying initial conditions and rates affect the concentration dynamics. This approach is particularly useful in fields like chemical engineering and environmental science, where precise modeling of mixture behavior is critical for process optimization and decision-making.

6.0 BENEFIT OF STUDY

- a) It provides a reliable model for predicting solute concentration in mixture problems, crucial for optimizing industrial processes.
- b) Helps in optimize mixing processes, reducing waste and ensuring efficient resource use in industries.

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(A-PP032) CRACKING ELECTRIC CIRCUIT COMPLEXITY WITH DIFFERENTIAL EQUATIONS

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ABSTRACT

Understanding the dynamics of electrical circuits, particularly resistor-inductor (RL) and resistor-capacitor (RC) circuits, is crucial for the creation and management of electrical systems. These circuits exhibit time-dependent behavior that can be effectively analyzed using differential equations—a key focus of Calculus II. However, traditional methods of teaching and analyzing these circuits can be unintuitive and challenging for students. This study aims to simplify the analysis of RL and RC circuits through calculus by deriving time-dependent solutions for current and voltage using differential equations. By integrating computation with circuit analysis, this approach offers an intuitive understanding of the linear decay of current in RL circuits and the charge-discharge behavior in RC circuits. The results provide students with a clearer grasp of the temporal dynamics of these circuits, enhancing their learning experience and preparing them for more advanced studies in engineering. This method bridges the gap between theoretical mathematics and practical electrical applications, making complex concepts more accessible to Calculus II students.

Keywords: Differential equation, Electrical circuits, Resistor-inductor (RL)

1.0 INTRODUCTION

Electric circuits are essential to modern technology, powering devices from home lighting to smartphones. They consist of interconnected components that transfer electric current to perform various tasks. Understanding circuits is crucial for engineers and scientists, impacting fields such as electronics, communication, and renewable energy. This study aims to simplify the analysis of resistor-inductor (RL) and resistor-capacitor (RC) circuits by using differential equations, which are key to understanding their time-dependent behavior.

1.1 PROBLEM STATEMENT

Traditional methods for analyzing resistor-inductor (RL) and resistor-capacitor (RC) circuits can be complex and challenging for Calculus II students. The differential equations used are essential for understanding time-dependent circuit behavior but often seem disconnected from practical applications. This gap can hinder students' grasp of circuit dynamics. Therefore, a more accessible approach is needed to simplify

the analysis, making the connection between mathematical theory and practical understanding clearer, thus enhancing the learning experience and preparing students for advanced studies.

2.0 OBJECTIVE

The main objectives of this studies are:

- f) To analyze RL and RC circuits by determining the time-dependent solutions for current and voltage using differential equations.
- g) To study the theoretical mathematics with practical electrical applications

3.0 METHODOLOGY

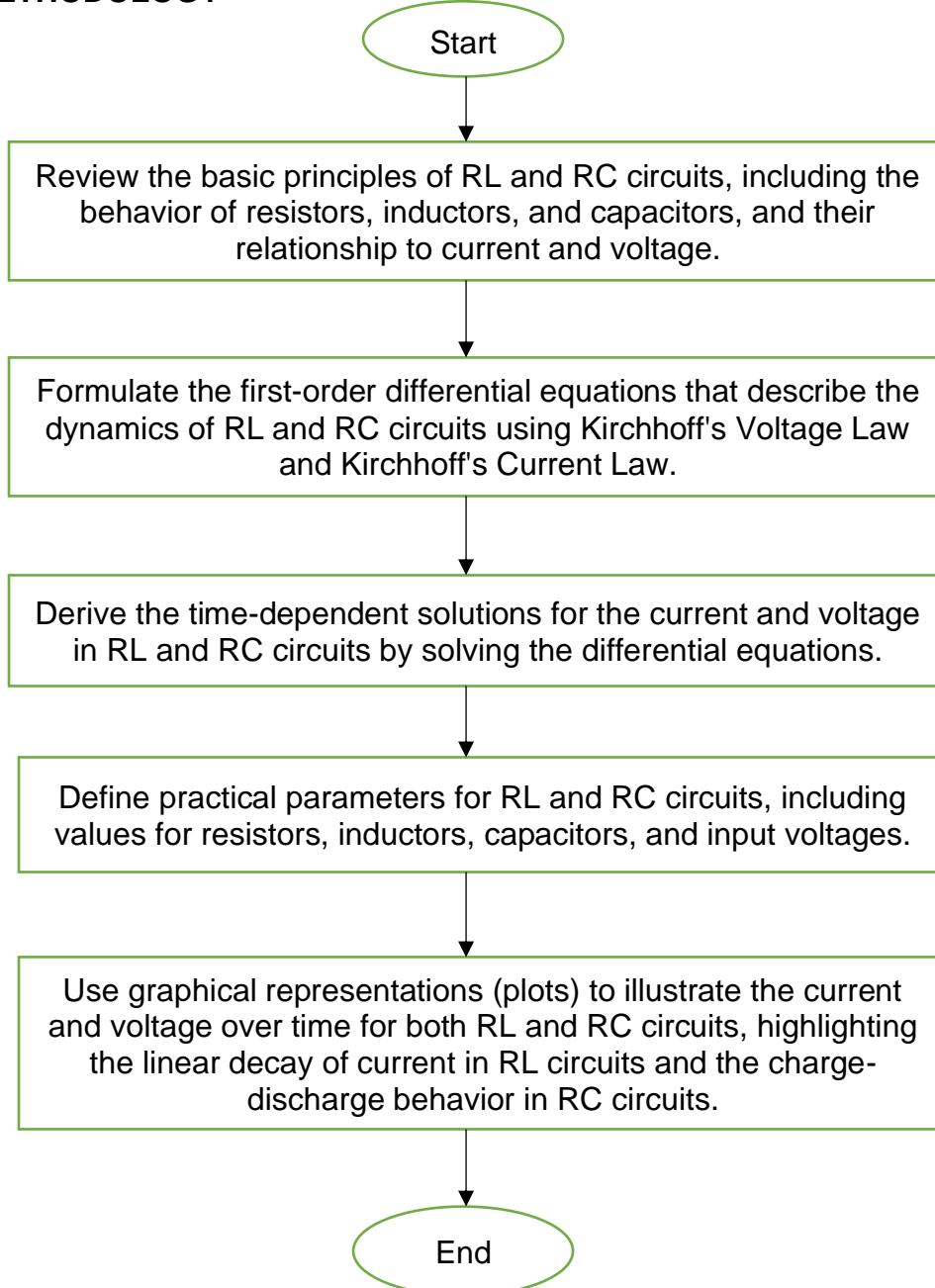


Figure 1: The methodology framework of study.

Figure 1 shows this study involves a systematic approach to simplifying the analysis of RL and RC circuits using differential equations. Initially, fundamental principles of these circuits are reviewed, followed by the formulation of first-order differential equations representing their behavior. Analytical solutions are derived for current and voltage, and practical parameters are defined for simulation purposes. MATLAB is employed to implement these solutions, generating data and visualizing the circuits' transient and steady-state responses through graphical representations. These theoretical and simulation results are validated against real-world scenarios, bridging the gap between mathematical theory and practical applications.

4.0 RESULTS

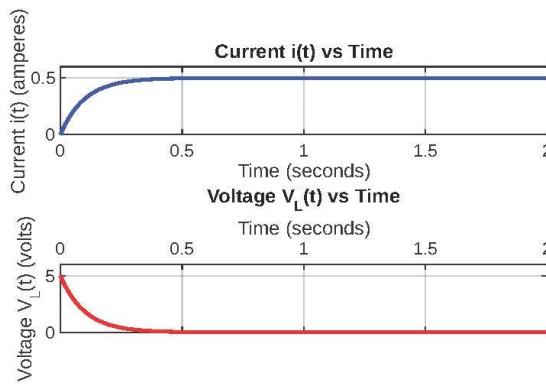
Current $i(t)$ and Voltage $V_L(t)$ vs TimeFigure 2: The graphs of $i(t)$ vs Time and $V_L(t)$ vs time

Figure 2 of simulation results illustrate the transient and steady-state behavior of the circuit with a step input voltage. The current $i(t)$ increases exponentially, approaching a steady-state value of $\frac{V_0}{R}$, dictated by the time constant $\tau = \frac{L}{R}$. The voltage across the inductor $V_L(t)$ initially equals the input voltage V_0 and decays exponentially to zero. The graphs clearly show the exponential rise of the current and the exponential decay of the inductor voltage, confirming theoretical predictions and demonstrating the circuit's energy dynamics.

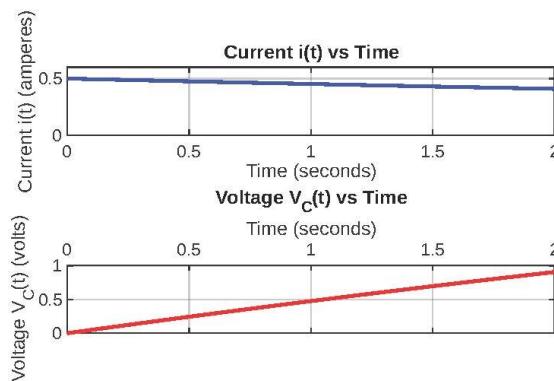
Current $i(t)$ and Voltage $V_C(t)$ vs TimeFigure 3: The graphs of $i(t)$ vs Time and $V_C(t)$ vs time

Figure 3 of simulation results display the charging behavior of the capacitor in response to a step input voltage. The capacitor voltage $V_C(t)$ increases exponentially, approaching V_0 with a time constant $\tau = RC$. The current $i(t)$ through the resistor starts at $\frac{V_0}{R}$ and decays exponentially to zero. The plots effectively show the exponential rise of the capacitor voltage and the exponential decay of the current, validating theoretical expectations and illustrating the energy storage and release process in the RC circuit.

5.0 CONCLUSION

This study successfully simplifies the analysis of RL and RC circuits through the use of first-order differential equations. The methodology provides students with a clearer and more intuitive understanding of the time-dependent behavior of current and voltage in these circuits. By bridging the gap between theoretical mathematics and practical applications, this approach not only enhances the learning experience but also equips students with essential skills for advanced studies in engineering and related fields. Understanding the dynamics of RL and RC circuits using differential equations is vital for the continued development and innovation of modern electrical technologies. Future study could expand on this approach to cover more complex circuit configurations, further enriching educational resources in this domain.

6.0 BENEFIT OF STUDY

- i. Enhanced Understanding: Simplifies the analysis of RL and RC circuits, making complex concepts more accessible and improving students' grasp of time-dependent circuit behavior.
- ii. Bridging Theory and Practice: Connects theoretical mathematics with practical applications, helping students see the real-world relevance of differential equations in electrical engineering.
- iii. Foundation for Advanced Studies: Prepares students for more advanced engineering courses by providing a solid understanding of essential circuit principles, supporting their academic and professional growth.

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(A-PP033) EXPONENTIAL DECAY MODELLING OF RADIOACTIVE SUBSTANCES: THEORY AND APPLICATION

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ABSTRACT

This study models the process of radioactive decay, where unstable atomic nuclei spontaneously transform into more stable forms, releasing radiation. The study focuses on applying first-order differential equations to describe this decay process and uses the separation of variables method to solve the equation. The aim is to enhance the understanding of radioactive decay, validate the mathematical model with practical data, and explore its applications across various scientific fields. Additionally, the study highlights the educational benefits of using this approach to teach exponential decay and differential equations, emphasizing its relevance in physics, chemistry, geology, and medicine.

Keywords: Radioactive decay, Separation of Variable, Exponential Decay

1.0 INTRODUCTION

Radioactive decay is a critical process in many scientific fields, including physics, chemistry, geology, and medicine. It involves the transformation of unstable atomic nuclei into more stable forms, accompanied by the emission of radiation in the form of alpha, beta, or gamma particles. Understanding and accurately modelling radioactive decay is essential for applications such as dating archaeological and geological samples, designing radiation therapies, and managing nuclear waste. The process is mathematically described by first-order differential equations, which capture the rate at which radioactive substances decay over time. This study explores the application of the separation of variables method to solve these equations, providing insights into the decay process and its practical applications.

1.1 PROBLEM STATEMENT

Modelling the rate of radioactive decay accurately is essential for predicting the behavior of radioactive materials over time, which is critical in fields such as nuclear physics, geology, and medical treatment. While the concept of exponential decay is widely recognized, there is a need to deepen the understanding of how different parameters influence this process and to apply mathematical methods, like the separation of variables, effectively. Additionally, there is a gap in validating these

theoretical models with practical data, which is necessary to ensure their reliability and applicability in real-world scenarios.

2.0 OBJECTIVE

The primary objectives of this study are:

- a) To develop a mathematical model for radioactive decay using first-order differential equations.
- b) To solve the differential equation using the separation of variables method.
- c) To enhance educational understanding of exponential decay and differential equations by demonstrating the application of the separation of variables method.

3.0 METHODOLOGY

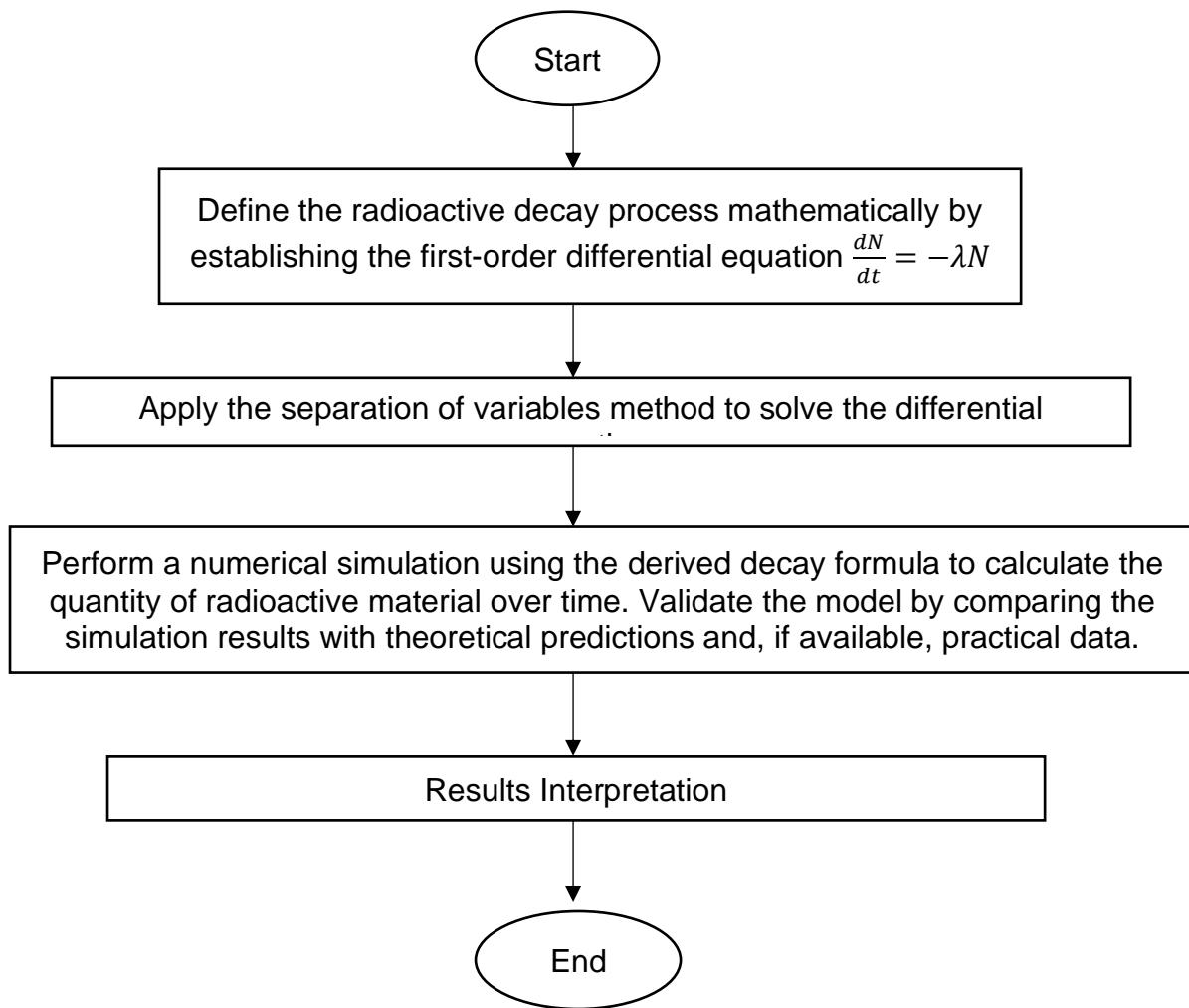


Figure 1: The methodology framework of study.

Figure 1 of this study involves developing a mathematical model of radioactive decay using first-order differential equations and solving it through the separation of variables technique. This approach allows for an analytical solution that describes how the quantity of radioactive material decreases over time. A numerical simulation is then performed to illustrate the decay process, using specific initial conditions and decay constants. The simulation results are analyzed to understand the decay dynamics, with

an emphasis on validating the model against theoretical expectations and practical data. It also highlights the educational benefits of using this method to teach concepts related to exponential decay and differential equations, demonstrating its practical relevance in scientific and engineering applications.

4.0 RESULTS

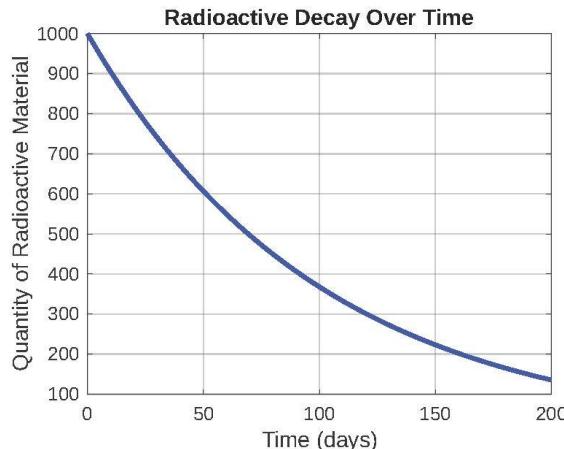


Figure 2: Simulation results of radioactive decay over time.

The results from Figure 2 shows the simulation demonstrate the exponential decay behavior of radioactive materials, as predicted by the equation $N(t) = N_0 e^{-\lambda t}$. The graph of $N(t)$ over time shows a rapid decline in the quantity of radioactive material, especially in the early stages, followed by a more gradual decrease as the material continues to decay. The rate of decay is directly influenced by the decay constant λ ; a larger λ would result in a faster decay, while a smaller λ leads to a slower process. The analysis highlights the importance of the decay constant in predicting the long-term behavior of radioactive substances, making this model valuable for various practical applications.

5.0 CONCLUSION

This study successfully models the process of radioactive decay using first-order differential equations and the separation of variables method. The resulting exponential decay formula accurately describes the decay behavior of radioactive materials over time. By validating the model with practical data and exploring its educational applications, the research enhances the understanding of both the decay process and the mathematical techniques used to model it. The study's findings have significant implications for fields that rely on precise decay predictions, such as nuclear physics, geology, and medical applications.

6.0 BENEFIT OF STUDY

- a) The study provides a reliable mathematical model for predicting radioactive decay, which is crucial for applications like dating geological samples and designing radiation therapies.
- b) The use of the separation of variables method as a teaching tool helps students better understand exponential decay and differential equations, reinforcing their grasp of key mathematical concepts.

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(A-PP034) ANALYZING NEWTON'S LAW OF COOLING THROUGH FIRST-ORDER SEPARABLE DIFFERENTIAL EQUATIONS

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ABSTRACT

Newton's Law of Cooling describes the rate at which an exposed body changes temperature through radiation, which is proportional to the difference between its temperature and the ambient temperature. This study presents an in-depth exploration of Newton's Law of Cooling using first-order separable differential equations. By formulating the cooling process as a differential equation and employing the method of separation of variables, a general solution derived that describes the temperature evolution over time. This solution demonstrates how an object's temperature asymptotically approaches the ambient temperature, offering insights into practical applications in forensic science, engineering, and beyond. The analytical approach not only reinforces the theoretical understanding of heat transfer but also provides a robust tool for predicting temperature variations in various real-world scenarios.

Keywords: Newton Law of Cooling, body temperature, First order, Separable variable

1.0 INTRODUCTION

Newton's Law of Cooling in this study for understanding how the temperature of an object changes relative to its surrounding environment. It states that the rate of change in temperature is proportional to the difference between the object's temperature and the ambient temperature, making it a fundamental principle in thermodynamics. This study investigates this cooling process through the lens of first-order separable differential equations. This exploration not only deepens our theoretical comprehension of heat transfer but also highlights the practical implications of these findings in areas such as forensic science, where accurately estimating the time of death is crucial, and in engineering, where precise temperature control is often required.

1.1 PROBLEM STATEMENT

The challenge in understanding and applying Newton's Law of Cooling lies in accurately predicting the temperature change of an object over time, especially in varying ambient conditions. Traditional methods may not fully capture the complexity of the cooling process, leading to inaccuracies in practical applications such as forensic investigations or thermal engineering.

2.0 OBJECTIVE

The main objectives of this studies are:

- h) To derive the differential equation governing the cooling process.
- i) To determine the time of death in a forensic scenario by analyzing the cooling rate of a body using first-order separable differential equations.

3.0 METHODOLOGY

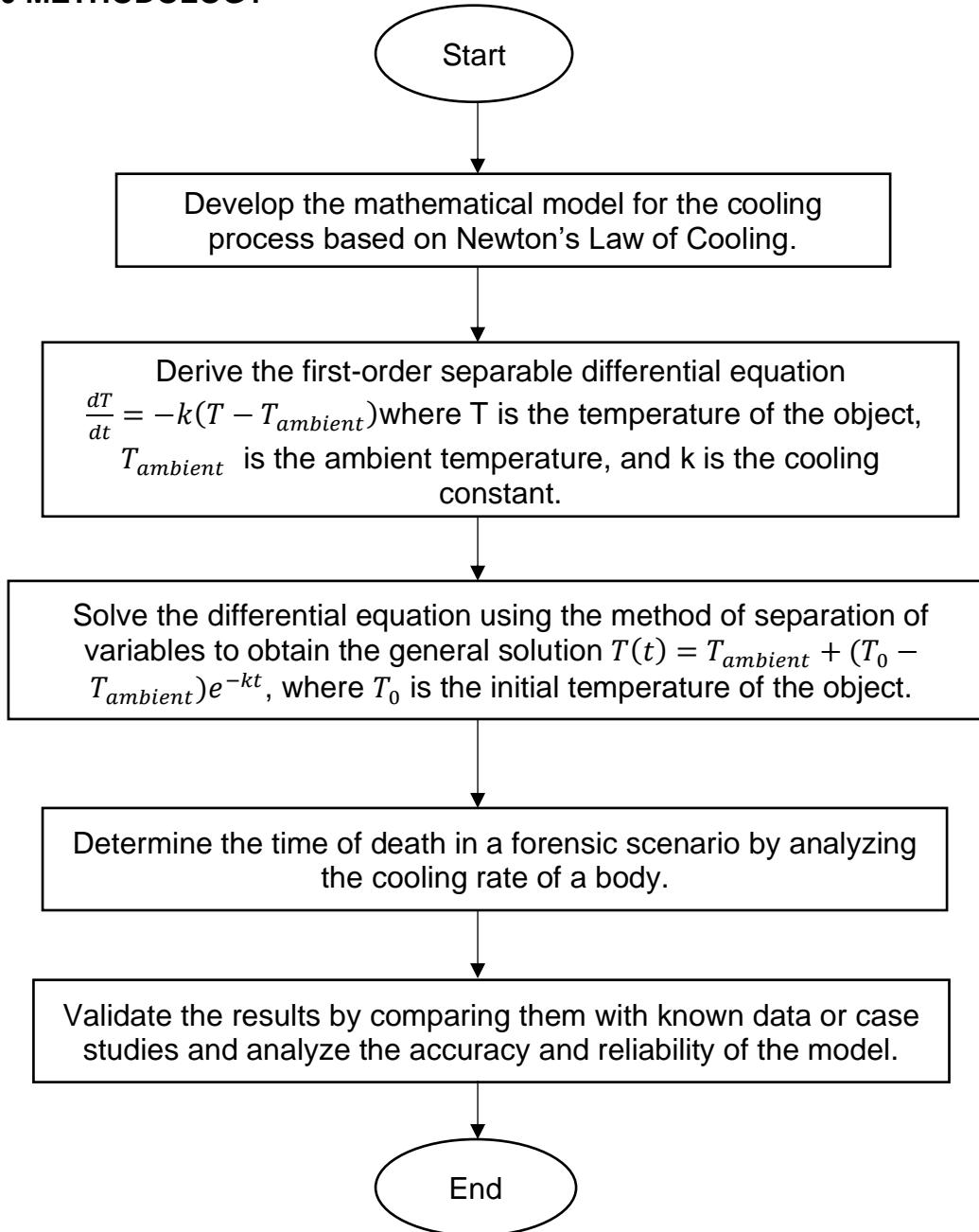


Figure 1: The methodology framework of study.

The temperature $T(t)$ of the body at any time t is given:

$$T(t) = T_{ambient} + (T_0 - T_{ambient})e^{-kt} \quad (1)$$

Figure 1 shows that the methodology begins by formulating Newton's Law of Cooling as a first-order separable differential equation to describe the rate of temperature change of a body. Parameters such as initial body temperature, ambient temperature, and cooling constant are defined. The differential equation is solved using separation of variables to obtain the general solution for temperature as a function of time. A MATLAB simulation is set up to model the cooling process, specifying initial conditions and a suitable time range. The simulation is executed to generate temperature data over time, and the results are visualized using a temperature versus time graph. The final step involves analyzing the data to understand the transient and steady-state behavior of the cooling process, providing practical insights and validating the theoretical model.

4.0 RESULTS

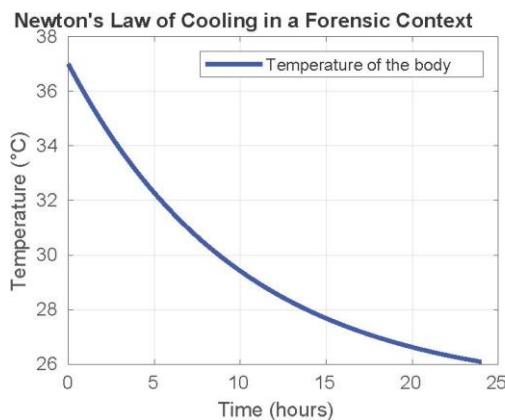


Figure 2: Simulation results of Newton's Law of Cooling in a Forensic context.

The simulation results in figure 2 demonstrate the exponential decay of the body's temperature, initially decreasing rapidly and then gradually approaching the ambient temperature. This modelling allows forensic investigators to estimate the time of death with higher precision, highlighting the practical application of first-order separable differential equations in forensic science. The results underscore the importance of mathematical models in providing reliable tools for forensic analysis.

5.0 CONCLUSION

This study delves into the application of Newton's Law of Cooling, formulated through first-order separable differential equations, to provide a detailed analysis of temperature changes over time. The study specifically explores the forensic application, demonstrating how the cooling constant and temperature evolution can help accurately estimate the time of death. MATLAB simulations corroborate the theoretical model, showing an exponential decay in body temperature consistent with the principles of Newton's Law of Cooling. It underscores the importance of mathematical models in forensic science, offering robust tools for precise and reliable analysis in real-world applications.

6.0 BENEFIT OF STUDY

- a) This study improves the accuracy of estimating the time of death, which is crucial for criminal investigations.
- b) It deepens knowledge of heat transfer processes, valuable in both forensic science and various engineering fields.
- c) The study makes complex mathematical concepts easier to understand, bridging the gap between theory and practical applications, benefiting students in their studies and future careers.

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(A-PP035) POTENTIAL OF CLOVE, STAR ANISE AND CURRY LEAVES TO REPEL DIPTERA

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ABSTRACT

The use of commercialized fly repellent containing DEET (N, N-diethyl-meta-toluamide) which is present in many repellent formulations can affect humans' health and the air quality. The significance of this research is to provide natural repellent, which is affordable, easy-access and less toxic to human health. Furthermore, curry leaves, cloves, and star anise are edible herbs that are nontoxic, safe for kids, and they do not contain any chemicals that could be damaging to skin. The objective of this project is to examine the effectiveness of these three natural spices and herbs (*Illicium verum*, *Murraya koenigii* and *Syzygium aromaticum*), and thus to provide the repellents that are environment friendly. The extractions of curry leaves, cloves, and star anise were used in this study. The extraction of clove is the most effective in repelling the Diptera rather than curry leaves and star anise because of special components called eugenol and carbazole alkaloids that have antioxidant, and insecticidal properties that used against flies. The suitability also considers aspects like safety, convenience of preparation, and any negative reactions or side effects. It can be concluded that the natural plant resources can be used in reducing the number of flies and repel Diptera in a way that are affordable, less toxicity, environment friendly, and providing a safer and greener alternative to chemical repellents. The findings will be useful in determining the best natural repellent technique for everyday use.

Keywords: clove, curry leaves, Diptera, repellent, star anise

1.0 INTRODUCTION

A common insect of the Muscidae family (order Diptera) is the housefly (*Musca domestica*). Houseflies make up around 90% of all flies found in human habitations. Houseflies are still an issue anywhere rubbish and decomposing organic waste are allowed to gather. Therefore, it is known that house flies, or Diptera, are carriers of diseases that are easily spread to humans.

Numerous diseases, like germs and viruses, are known to be carried by these *Musca domestica* and are easily dispersed across surfaces and food. Usually, commercialized fly repellent is toxic and costly. Amazingly, nature has its own ways of dealing with flies. Since many natural materials contain chemicals that flies find repulsive or even poisonous, they are effective fly repellents. For example, the strong fragrances of

several natural plants, such as curry leaves, cloves, and star anise, might repel flies or affect their nervous system systems (Jason, 2024).

The safe and efficient method of keeping these bothersome insects away from your home is to use natural fly repellents. In addition to being useful for cooking, natural herbs also work well as organic fly inhibitions (Flykiller, 2023). Indirectly, this innovation is changing the use of chemicals into natural products that can guarantee a better environment, health and safety. Moreover, curry leaves, cloves, and star anise are edible herbs that are nontoxic and safe for kids to accidentally ingest, they do not contain any chemicals that could be damaging to skin.

2.0 OBJECTIVE

The objectives of the study are to test the potential of using star anise, curry leaves and cloves as natural repellent, to compare the effectiveness of star anise, curry leaves and cloves to repel flies and to provide the extraction of natural herbs as natural repellent.

3.0 METHODOLOGY

Star anise, curry leaves and cloves are examples of natural products that can repel flies. Natural products are efficient in repelling flies without the use of harsh chemicals. Plant-based repellents are effective against many species of flies, including house flies, stable flies, and Anopheles mosquitoes.

The research is worth doing because it can show that natural plant sources can be used in reducing the number and repel Diptera in a way that are affordable, less toxic to human health. This research is also to avoid food poisoning problems and be environment friendly as it will help to reduce toxicity in the air and not be harmful to the children if they are accidentally taken or exposed. Thus, herbs are the best solution that can help people to get rid of flies naturally.

Procedures to provide the extractions started when the star anise, curry leaves and cloves were weighed about 30 grams. Star anise, curry leaves and cloves have been dried in the oven about 40°C for 3 hours until the color of the three herbs become brown. The star anise, curry leaves and cloves were then grinded until it becomes powdered. The star anise has been put in a beaker labelled 'A' and filled in the 500mL beaker with distilled water until 300mL. The beaker has been heated by using a Bunsen burner until it goes down $\frac{1}{3}$ of total water. The sample has been cooled for a few minutes at room temperature. Then, the star anise has been filtered using a funnel and filter paper to get the liquid extraction from the mixture of star anise with distilled water. After that, beaker 'A' has been poured until all sediments are retained in a conical flask into the bottle. The bottle was labelled as 'A'. Those steps were repeated for curry leaves and cloves. Curry leaves were labelled as 'B' and cloves as 'C'. According to Aguele et.al (2023), it shows that this methodology is safe and environment friendly because it didn't use any chemical product to repel flies. Other than that, it is easy, not costly and affordable alternative to repel flies.

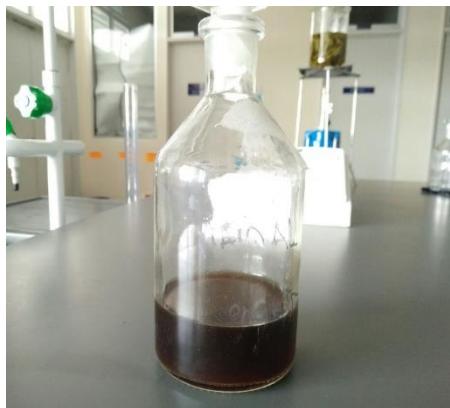


Figure 1: Product of Clove Extraction

4.0 RESULTS

The research had been conducted to reduce the fly disturbance in Beta Cafe, University Teknologi MARA (UiTM) Perak branch, Tapah campus. The research is worth doing because it can show that natural plant sources can be used in reducing the number and repel Diptera in a way that are affordable, less toxic to human health. This research is also may avoid food poisoning problems among students and be environment friendly as it will help to reduce toxicity in the air and not be harmful to the children if they are accidentally taken or exposed. Thus, herbs are the best solution that can help people to get rid of flies naturally.

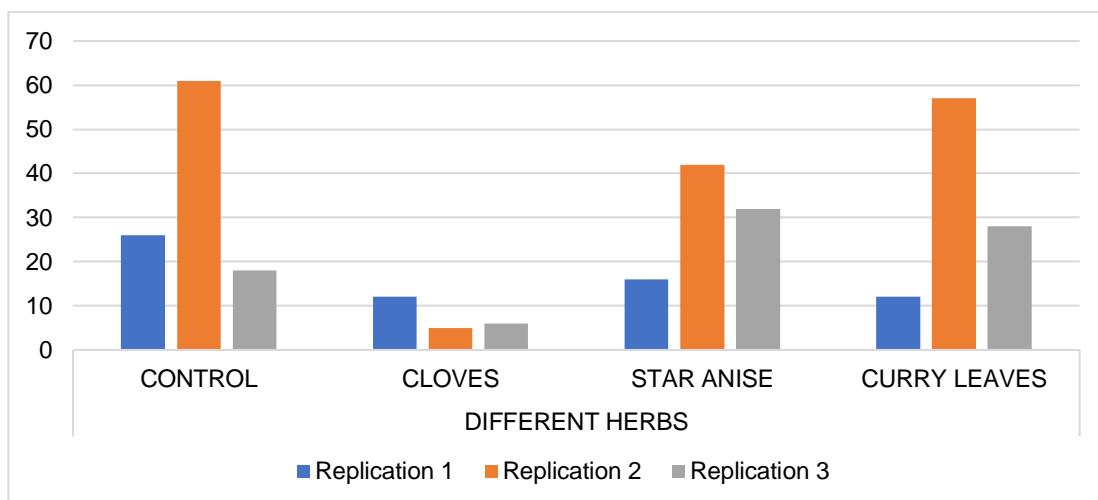


Figure 2: Number of Flies Trapped by Using Different Herbs Extractions

The result indicates that cloves have the highest repellence against flies, as they are there were the fewest number of insects captured on the fly trap. The extraction of clove is the most effective in repelling the Diptera rather than curry leaves and star anise because of special components called eugenol, and carbazole alkaloids that have antioxidant, and insecticidal properties that used against flies. Cloves contain an essential oil called eugenol, which has antiseptic, antibacterial, and antioxidants (Tavvabi-Kashani et. al, 2024). The outcome demonstrates that fewer flies were caught on fly traps containing cloves than on fly traps with curry leaves and star anise. This demonstrates that cloves, as opposed to curry leaves and star anise, have potent

repelling qualities. Cloves are the most effective plant to use as a fly repellent because their aroma can cover the largest possible area and keep flies away. Essential oils found in natural herbs serve as nature's insect deterrent.

There are some factors that lead to these results. One of the factors is the chemical compound present in the herbs used that gave the repellence towards flies. But, among the three all of them the least inefficient was curry leaves. For curry leaves, the main chemical component is the leaves of *M. koenigii*, which have been identified as having distinct flavour and aroma. It is believed that the folks in the rural areas of Malaysia use curry leaves as traditional home remedies for flies' prevention possibly due to presence of chemical component in the chemical component in the curry leaf that have the similar characteristic to the repellent's active compound.

Natural herbs can also be used to repel flies instead of DEET or other commercial insect repellent. And it is for a very good reason, as they may contain harmful chemicals that can trigger allergies, skin reactions or severe respiratory conditions that can guarantee a better environment, health and safety. Thus this can provide natural insect repellent which is more cheaper than commercialize ones.

5.0 CONCLUSION

Cloves, star anise and curry leaves have potential to repel flies. The cloves are the most effective one as fly repellent followed by star anise and curry leaves. It can be concluded that the natural plant resources can be used in reducing the number of flies and repel Diptera in a way that are affordable, less toxicity, environment friendly, and providing a safer and greener alternative to chemical repellents. The findings will be useful in determining the best natural repellent technique for everyday use.

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(A-PP037) ACOUSTIC EMISSION MONITORING FOR MEANINGFUL FATIGUE LIFE PREDICTION IN ALUMINIUM ALLOY 6061

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ABSTRACT

This study introduces a novel method for predicting the fatigue life of aluminium alloy 6061 under block spectrum loading using acoustic emission (AE) data signals. Specimens were subjected to cyclic loading patterns, specifically constant amplitude loading and block spectrum loading, under Low-High and High-Low conditions. AE signals were continuously monitored and recorded, capturing events related to crack initiation and propagation. Key features of the AE data, such as amplitude, frequency, duration, counts, and energy, were extracted and analysed. The cumulative AE activity was correlated with the material's fatigue life, revealing distinct trends at various stages of fatigue damage. Statistical methods were applied to the AE data to develop predictive models for estimating the remaining fatigue life of the specimens. The proposed method demonstrated high accuracy in predicting fatigue life, offering a reliable, non-destructive tool for early detection of fatigue damage. This approach has significant implications for improving the safety and reliability of aluminium alloy 6061 components in critical applications, such as aerospace and automotive industries.

Keywords: acoustic emission, constant amplitude loading, block spectrum loading, data distribution

1.0 INTRODUCTION

Aluminium alloy 6061 is widely used in critical industries like aerospace and automotive due to its excellent strength-to-weight ratio, corrosion resistance, and workability[1]. Despite these benefits, it is prone to fatigue under cyclic loading, which can lead to crack formation and propagation, threatening the structural integrity of components. Therefore, accurately predicting the fatigue life of Aluminium 6061 is essential for ensuring the safety and reliability of these components. Traditional methods for predicting fatigue life often rely on empirical models based on extensive, controlled testing[2]. While these approaches are effective, they usually involve destructive testing and do not provide real-time, in-situ assessments of material health. Acoustic Emission (AE) monitoring has emerged as a valuable technique for detecting and characterizing fatigue-related phenomena [3]. AE monitoring captures transient elastic waves from localized sources within the material, such as crack formation. By analysing AE signals, it is possible to assess the material's damage state and predict its remaining fatigue life [4]. This study introduces a novel method for predicting the fatigue life of Aluminium 6061 under block spectrum loading using AE data. This method offers a reliable, non-destructive tool that could significantly improve the safety and performance of Aluminium 6061 components in demanding applications.

2.0 OBJECTIVE

The primary objective of this research is to develop and validate an innovative methodology for predicting the fatigue life of Aluminium 6061 under block spectrum loading conditions by utilizing acoustic emission (AE) data. The study focuses on the continuous monitoring and analysis of AE signals generated during cyclic loading, including both constant amplitude loading and block spectrum loading with Low-High and High-Low sequences.

3.0 METHODOLOGY

3.1 Material and Specimen Preparation

The material selected for this study is Aluminium alloy 6061, chosen for its prevalent use in critical engineering applications. According to Figure 1, the specimens were machined in accordance with the specifications outlined in ASTM E647, which governs the standard test method for determining the fatigue crack growth rates using compact tension (CT) specimens.

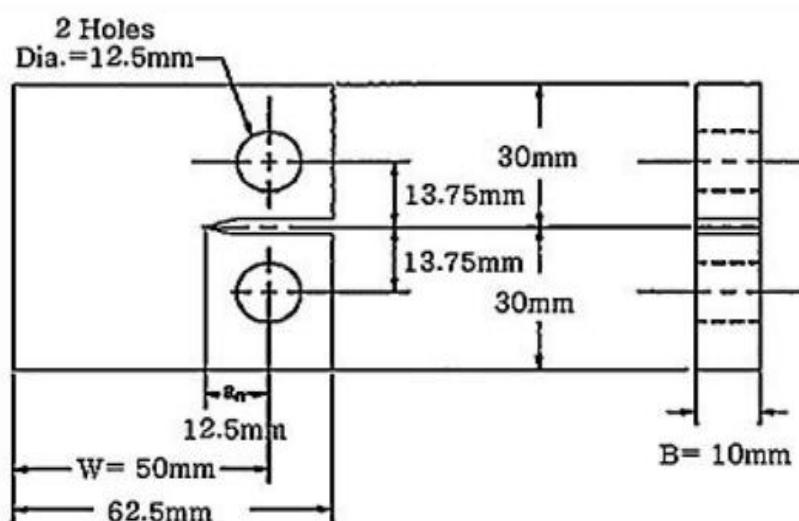


Figure 1: Geometric diagram of specimen based on ASTM E647.

3.2 Experimental Setup

The experimental setup was designed to subject the CT specimens to cyclic loading while simultaneously monitoring the acoustic emission (AE) signals. The specimens were subjected to cyclic loading under controlled conditions using a servo-hydraulic testing machine. The tests were conducted at a frequency of 10 Hz, with a load ratio of 0.1. Two loading scenarios were considered, Load_{low} = 4000N and Load_{High} = 6000N sequences of Low-High and High-Low conditions which are based on values of UTS (Ultimate Tensile Strength) 0.8 and 0.5 of the material. Each loop comprises 10,000 cycles, with each load phase for 5,000 cycles, and the process will continue until the specimen fails.

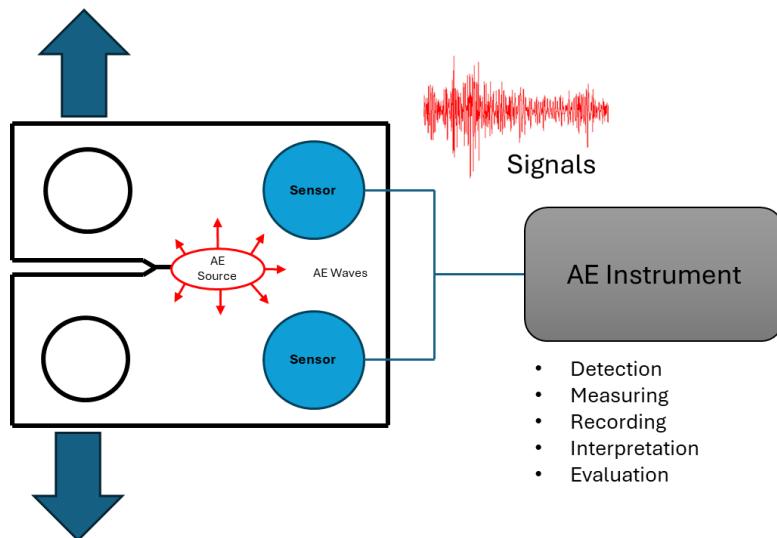


Figure 2: Experimental Setup.

According to Figure 2, two wide-band AE sensors were attached to each specimen using a couplant to ensure optimal acoustic coupling. The sensors were placed at a distance of approximately 20 mm from the notch on either side of the specimen to maximize the detection of AE events originating from the crack tip. The sensors were chosen for their sensitivity to frequencies in the range of 100 kHz to 1 MHz, which is suitable for detecting AE signals generated by crack initiation and propagation in Aluminium 6061. The AE signals were continuously monitored and recorded using a multi-channel AE data acquisition system with a sampling rate of 5 MHz [5]. The system was equipped with preamplifiers to enhance the signal-to-noise ratio. All the sensors were calibrated using pencil lead fracture (PLF) to ensure their connectivity to the specimen's surface [6].

4.0 RESULTS

For each both low-high and high-low loading scenario the specimen failed at $\pm 19,000$ cycles. Subjected to the raw AE signal data captured in both Figure 3 (a) and (b) indicates the progression of fatigue damage in the material over time. Initially, the AE activity is moderate, but as time progresses, the signals become more frequent and intense, indicating increasing damage, likely due to crack growth and coalescence.

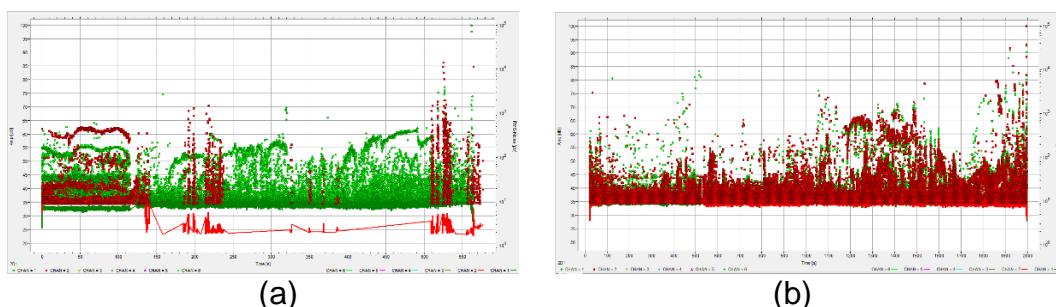


Figure 3: AE signals Amp(dB) Vs Time(s) of specimen (a) Low-High (b) High-Low. Low-high and High-low specimens exhibit initial crack formation at approximately 7,000 cycles and 4,000 cycles, respectively. In these cases, amplitude values exceeding 65 dB indicate an aggressive onset of crack initiation. The use of multiple

channels allows for a comprehensive understanding of the damage mechanisms at play, which is crucial for predicting the remaining fatigue life of the material. The raw AE data was filtered to remove background noise and irrelevant signals using a high-pass filter with a cutoff frequency of 100 kHz [7]. By filtering out noise from the AE data, it becomes possible to obtain accurate data for plotting the cumulative AE signals against the estimated fatigue life of the material.

Figure 4 (a) and (b) illustrates how the number of cycles, stress intensity, and AE signals interact during a fatigue test. Initially, as the material endures low cycles and stress, AE activity is minimal. As stress increases and more cycles are applied, AE amplitude and hits become more frequent, indicating progressive damage. The data presented in the graph can be used to predict the material's remaining fatigue life by analysing the trends in AE hits as a function of stress and cycles.

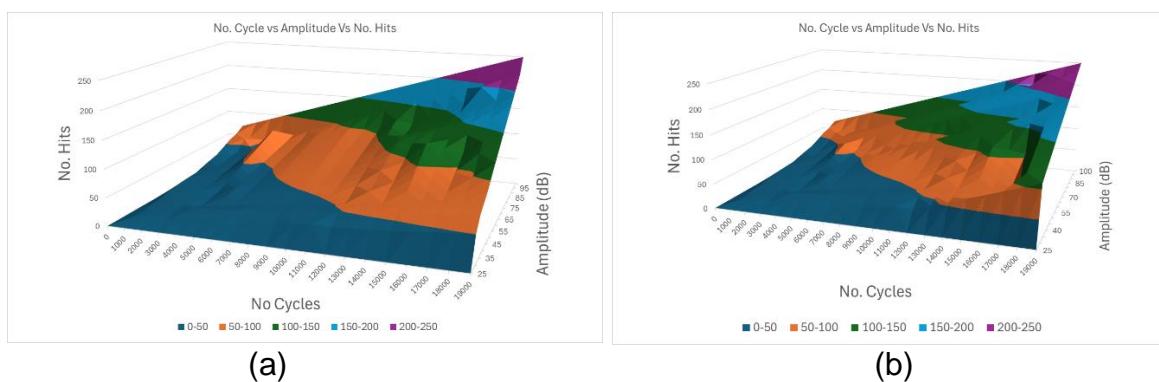


Figure 4: Life estimation vs Stress vs No. Hits (a) Low-High (b) High-Low.

Figure 4 (a) and (b) shows a clear trend where higher stress intensities correspond to higher numbers of AE amplitude and hits, especially as the number of cycles increases. This correlation is consistent with the understanding that as stress intensifies, the material is more likely to undergo microcracks that result in acoustic emissions.

5.0 CONCLUSION

The integration of AE data with traditional fatigue testing enables the early detection of fatigue damage, offering a reliable, non-destructive tool for enhancing the safety and reliability of critical components. Both low-high and high-low loading scenario the specimen failed at $\pm 19,000$ cycles although the initial crack formation at approximately 7,000 cycles and 4,000 cycles, respectively. Through continuous monitoring, key features of AE signals can be extracted and analysed to provide real-time insights into the material's health. The insights gained from AE data, when combined with advanced signal processing techniques, offer a reliable means of enhancing the safety and durability of critical components in engineering applications.

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