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Cawangan Terengganu
Kampus Kuala Terengganu

GDID2023
REVOLUTIONIZING THE FUTURE WITH DIGITAL CREATIVITY

The 3rd Graduate Digital Invention, Innovation & Design

Extended Abstract

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Welcome Address

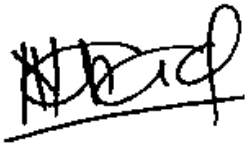
Dear all,

Firstly, we would like to thank Allah SWT from the bottom of our hearts for giving us the opportunity to publish in our third volume of extended abstract for Graduate Digital Invention, Innovation and Design 2023 (GDIID 2023). In order to showcase and publicize their technological ideas, inventions, and designs in a variety of sectors, Universiti Teknologi MARA (UiTM) Cawangan Terengganu Kampus Kuala Terengganu is organizing an international competition for graduate innovators and researchers from local and foreign universities. This biennial event, which was previously held in 2021, has attracted graduate inventors from many institutions.

Presenting GDIID 2023 with the theme "Revolutionizing the Future with Digital Creativity," UiTMCTKKT is proud to be one of the pioneers in the development of virtual IID competitions since 2019. Graduate students and inventors from all over the world gathered at GDIID 2023 to share ideas, exhibit, and publicize their accomplishments, discoveries, and innovations. As all of these groups come together on one platform, an environment of creativity and favorability for future generations will eventually be fostered.

We would like to take this opportunity to thank the juries and reviewers for volunteering their essential time to assess the projects and the extended abstracts. The GDIID 2023 organizing committee is also worthy of praise for a job well done on the event's organization. Your proficiency, attention to detail, and dedication are critical to GDIID 2023's success. In addition to providing intellectual rewards, our goal is for this competition to have given writers and participants the chance to market their studies and products to nearby businesses and the community at large.

Finally, we would like to thank you for your participation and hope to see you at GDIID in the future.



Noor Khairiah Razali
GDIID2023 Chairman

GRADUATE DIGITAL INVENTION, INNOVATION & DESIGN 2023

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The 3rd Graduate

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Kampus Kuala Terengganu

SMART TEACHING AND LEARNING : i-Teach u-Learn (i-TuL)

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Abstract

The Covid-19 pandemic has changed the landscape of the nation's education system. Majority lecturers opted for various digital platforms in order to implement open and distance learning (ODL) systems. This was done to ensure that the teaching and learning process can be continued virtually. There are various types of digital learning platforms that have been developed around the world which have a lot of potential opportunities to be explored. However, there is an inadequate online medium that integrates all digital platforms for the purpose of ODL in the implementation of teaching and learning. Thus, such a situation caused the users (lecturers and students) to log in using different usernames and passwords. Furthermore, the existing digital platforms do not allow a variety of applications, such as video conferencing, lack of platforms for interactions, no option for recording, drawing or sketching. Therefore, the i-TuL (I Teach U Learn) application has been developed to create a platform to integrate various digital platforms to assist the process of teaching and learning through ODL. This application was built based on the Bloom Taxonomy learning domain for the teaching and learning process which is focussed on the domains of Knowledge, Comprehension, Application, Analysis, Synthesis, and Evaluation. As such, i-TUL does not only serve as a one stop centre which accommodates various applications, often used for teaching and learning, it also enables lecturers to categorise the teaching and learning materials according to the mentioned levels of the Bloom Taxonomy. With just a single sign in, it will be convenient to the users to access the digital platform more conveniently and quickly, giving a smooth process for teaching and learning and it helps to avoid the problem of forgetting the use of a variety of passwords.

Keywords: Online Distance Learning, Digital Platforms, Teaching and Learning, Bloom Taxonomy

1. INTRODUCTION

In the wake of Covid-19, the concept of Open and Distance Learning (ODL) has become the standard for the teaching and learning process. ODL provides a virtual, open, and flexible learning environment that can be accessed at any time and location (Arievitch, 2020). It is free from temporal and spatial limitations, and provides flexible learning opportunities for both individual and collective learners. This pandemic has altered the structure of the nation's education system (Das, 2021). To ensure the continuity of the TnL process, educators must integrate various digital platforms into an Open and Distance Learning system (ODL). The i-TuL application has been developed to facilitate the integration of all digital platforms in an ODL system. Bloom proposed a collection of nouns (knowledge, comprehension, application, analysis, synthesis, and evaluation) that climbed from lower-order to higher-order thinking in an effort to discern between various ways of thinking (Barari, 2020; Brindha, 2020). This framework is usually shown as a pyramid.

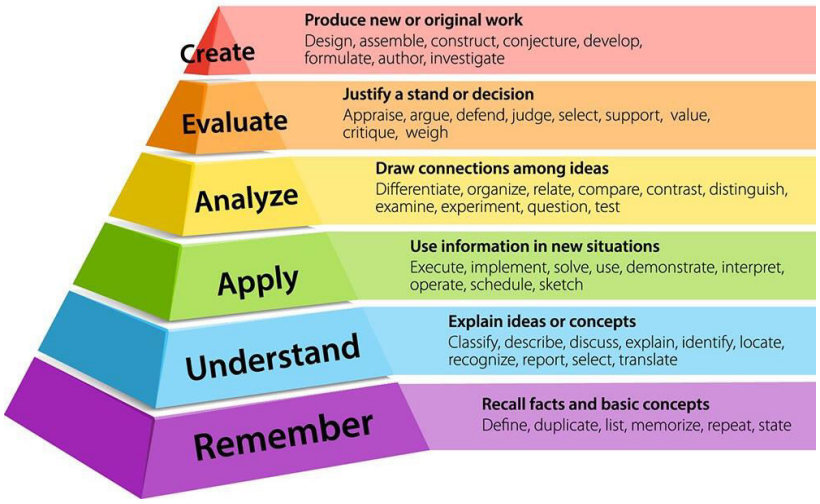

Figure 1.0: Bloom Taxonomy Pyramid

2. MATERIALS AND METHODS

2.1 Selecting a Template

The application, i-TuL, which was created with the implementation of IR 4.0 elements, is compliant with the new standards of Open Distance Learning (ODL) in order to facilitate the integration of all digital platforms (Sosniak, 1994).

2.2 Maintaining the Integrity of the Specifications

i-TuL enables users (both students and lecturers) worldwide to manage their TnL accounts with ease. Users are only required to enter the username and password once. In comparison to traditional methods, users must enter different passwords and passwords for each platform.

2.3 Methodology

An e-submission application system was created (Brindha, 2020). An e-application platform was created. An online application platform was created. This was done by integrating different online network TnL platforms.

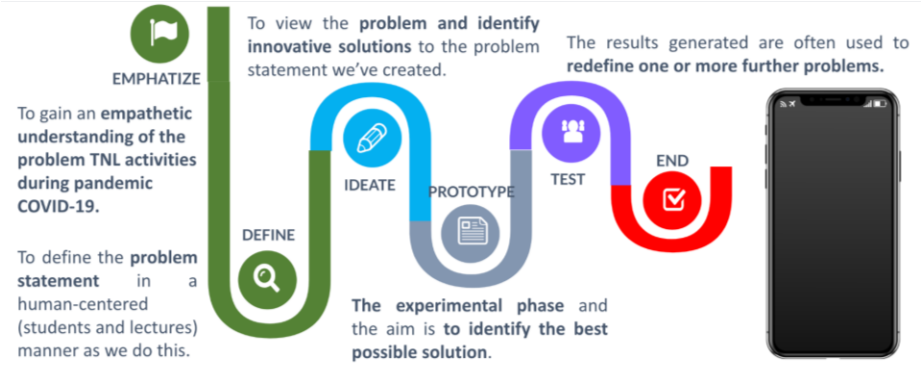

Figure 2.0: Design Thinking Process

3. RESULTS AND DISCUSSION

This project has had a positive effect on academic Quality Assurance, which has enabled TnL to remain operational in the midst of the Covid Pandemic. It has enabled the implementation of more efficient (documentation and storage), time-efficient (cost and space), and technologically up-to-date applications. It has also met customer requirements by streamlining the learning and teaching process, as well as smoothing the organization functions through the provision of a cutting-edge service platform.

Furthermore, it has enabled stakeholders to implement the realization of digital campuses and future-ready curricula through the third element, Transformative Teaching and Learning Delivery. The TnL application is available for free download on Google Play Store and Apple Store, as well as on the Huawei AppGallery, and is expected to generate revenue through the provision of commercial advertisements within the app.

Figure 3.0: Collaboration with International Industry

4. CONCLUSION

i-TuL is a revolutionary application designed to bring together all digital platforms to support the Teaching and Learning process in an Open and Distance Learning (ODL) system. It was developed with the implementation of IR 4.0 elements in accordance with the new standards of ODL-based learning. This has enabled users from all over the world to manage a wide range of digital platforms with only a single entry of a password. This has had a positive effect on Academic Quality and Assurance, helping to ensure the continuity of Teaching and Learning activities in the context of Covid-19. Additionally, i-TuL has developed a digital campus and a future-ready curriculum through the third element, Transformative Teaching and Learning Delivery (TELD).

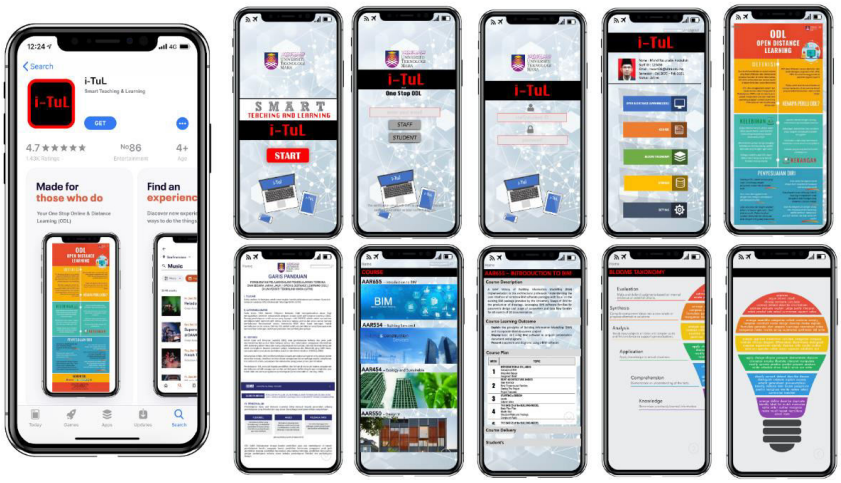

Figure 4.0: Interface i-TuL Application

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ROBOTIC GUIDE FOR THE BLIND WITH BLUETOOTH AND OBSTACLE AVOIDANCE USING ARDUINO

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Abstract

The prevalence of visual impairment among the global population is a growing concern, with rates continuing to rise at an alarming pace[1]. According to statistics from the World Health Organization (WHO), there are an estimated 2.2 billion people globally who live with some form of visual impairment. There are several methods which currently exist to aid the blind in their everyday navigation such as walking sticks and guide dogs[2]. However, these aids do not come without drawbacks. For instance, the use of traditional guide dogs may not be suitable for some individuals due to reasons such as allergies, cultural beliefs, or being unable to take care of a living animal due to the level of responsibility required[3]. On the other hand, walking sticks may give insufficient information about its surroundings. In order to overcome these gaps, the author proposes a joystick-controlled robotic guide which is able to help the blind navigate their environment with ease. The proposed system features an obstacle detection and avoidance feature which detects obstacles around its environment and stops its movement to prevent collisions. Additionally, the robot is able to detect changes in ground level such as holes to prevent the user from falling. In order to cater to users who are also hearing-impaired, a vibration setting is created to allow for haptic feedback. The system features a two-way Bluetooth communication between the robot and a mobile application which is able to provide audio feedback for various stimuli. The user is able to send voice commands through the application to toggle the vibration settings. The proposed system is targeted to benefit visually impaired users by providing more independence to them as well as convenience in terms of mobility.

Keywords: blindness, robotic guide, navigation, Bluetooth, mobility

1. INTRODUCTION

Visual impairment is a significant global disability affecting around 2.2 billion people, according to the World Health Organization. Limited independence of movement is a major challenge faced by visually impaired individuals, impacting their quality of life[4]. While aids such as walking sticks and guide dogs assist with navigation, they have limitations[5]. Walking sticks detect obstacles only within reach, while guide dogs require specialized training and are a long-term responsibility. To address these challenges, a proposed system utilizing IoT technology aims to offer visually impaired individuals greater confidence, ease, and independence in navigating their environment. The Sustainable Development Goals covered by this project are:

3: Good Health and Well-Being; 9: Industry, Innovation, and Infrastructure; 10: Reduced Inequalities
The author has carried out literature review on three existing systems:

System 1: Robotic Guide using Smartphone Camera and Ultrasound Sensors (2019)
System 2: Quadruped Robot Guide with Fuzzy Control Logic (2020)
System 3: Autonomous Path Guiding Robot for Visually Impaired People (2019)

Table 1: Strengths of each existing system in literature review

	Strengths
System 1	• Provide audio feedback when obstacle is detected • Performs route deviation to avoid obstacles
System 2	• Handlebar at the top of the model able to guide users on movement direction
System 3	• User able to control movement of robot using peripheral device • Presence of keypad to allow user to input direction • Made of cost-effective materials

Table 2: Gaps and limitations of each system and author's proposed solution

	Gaps/Limitations	**Proposed System's Solution**
System 1	• Limited coverage area for sensors • Audio feedback is unreliable in noisy environment • Relies on Wi-Fi/4G internet connection	• Place sensors at the front, rear, and sides of the robot. • Audio feedback given directly to the user's ears using earphones • Use Bluetooth connectivity
System 2	• Model is too large and obstructing • Awkward position of handlebar in the middle	• Make a model which is small to medium sized • Place handlebar at the back of the model, nearest to the user
System 3	• No alert to notify the users when obstacle detected • Placement of robot body too near the user's side	• Produce alert sounds when obstacle has been detected • Body of robot placed in front of the user

2. MATERIALS AND METHODS

The development of this project involves a combination of hardware and software components. The hardware components are sourced from Arduino for their quality and reliability. For software, the project utilizes the Arduino IDE software to develop the programming for the microcontroller board, while MIT App Inventor was used to develop the mobile application which will be paired with the robot via Bluetooth.

2.1 Hardware (Arduino)

Table 3: Components of the Robotic Guide and its Purposes

Component	Purpose
Arduino Mega Microcontroller	Provide digital and analog inputs/outputs to interface components
Arduino Motor Shield	Control and drive motors with the Arduino microcontroller
HC-05 Bluetooth Module	Bluetooth serial transceiver to enable wireless communication
Joystick Control	Allow for precise and intuitive control of the robot's movement
Vibration Motor	Produce mechanical vibrations as a form of haptic feedback
Ultrasonic Sensors	Detect and measure presence and distance of obstacles
Infrared Sensors	Detect and measure presence of changes in surface level
RFID Tag and Sensor	Enable security to the system by providing wireless identification

2.2 Software

The Arduino IDE was selected as the software development tool for the robotic system for its convenient features which includes libraries. The mobile application RoboGuide was created using MIT App Inventor, an online mobile application development platform.

3. RESULTS AND DISCUSSION

3.1 Results of Questionnaire to Target Audience

The questionnaire was distributed to the members of the Malaysian Association of the Blind (MAB) in order to gather quantitative response from the target audience, as well as an online blind community forum. A total of 37 participants took part in the questionnaire. The respondents have stated that the main factors which are considered for the robotic guide are cost, convenience, accuracy, and safety.

3.2 Results of Interview with Members of MAB

The interviewees provided valuable inputs and insights during the interview, particularly regarding the navigation system for blind individuals. They expressed interest in using a medium-to-small-sized robot for easier mobility in crowded areas. The consensus was to include audio alerts when obstacles are detected, while vibration feature was seen as an optional addition, as it was considered useful for hearing-impaired individuals. Aspects of the robot which was suggested including providing different sounds for various scenarios encountered and detecting changes in surface level to avoid from falling due to uneven surfaces.

3.3 Features Implemented in the Robotic System

Based on the results of the fact-finding techniques, the following features have been implemented into the system:

Table 4: Features and Functionalities of the System

Feature	Functionality
360-degree movement	Dynamic movement of the robot, including rotation
Bluetooth connectivity with mobile	Connect to the RoboGuide application which provides 2-

application	way data communication between the app and the robot
Obstacle detection and avoidance	Detect obstacles within 20cm and avoid collisions
Surface change detection and avoidance	Detect changes in surface level such as curbs and holes
Sound alerts	Alert user of stimuli such as obstacles and surface changes
Vibration alerts	Additional alerts for users who are hearing impaired
Voice commands	Provide audio command to on/off vibration settings
RFID security	Enables security in the system by authenticating RFID key

3.4 Testing Process of the Developed System

Three types of testing have been conducted on the system which are unit testing, integration testing and acceptance testing:

Table 5: Types of testing conducted on the System

Unit Testing	Integration Testing	Acceptance Testing
Testing the system in terms of its individual components. Results of the test were as expected, all components of the system are functioning properly.	Testing the system on how different components interact with one other. Results of the test are as expected. Data exchange was occasionally delayed due to Bluetooth connectivity.	Testing was done by distributing a survey on satisfaction towards the target audience. Responses received were positive indicating that the system has achieved its objectives.

4. CONCLUSION

The development of the robotic guide system has achieved its objective of being able to guide visually impaired people in navigating their environment. Literature review was conducted, and its results were then analyzed to produce the suitable features needed for the robot. Future enhancements for this robotic model include GPS navigation, increased mobility, over-head obstacle detection, added security features, and an emergency assistance alert.

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The author would like to express thanks to Universiti Teknologi MARA (UiTM) Terengganu and the organizers of GDIID2023 for this opportunity to present the author's project. The author would also like to express sincere appreciation and profound gratitude to her supervisor, Dr. Malathy Batumalay, for her unwavering support and invaluable guidance throughout the research journey. The author would also like to express sincere thanks to her mother, friends, and colleagues for their unwavering support and encouragement throughout the research. Their assistance and motivation have been instrumental in the successful completion of this project.

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INVENTORY MANAGEMENT SYSTEM FOR BOUTIQUE D'RASULI WITH THE APPLICATION OF DEMAND FORECASTING

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Abstract

Inventory management poses a complex challenge within supply chain management, which also poses significant challenges to the business owner, leading to growing concerns. The manual methods traditionally employed by business owners have proven highly inefficient and prone to inaccuracies. In order to meet customer demand, companies must maintain inventories in warehouses. These inventories are the second most valuable asset for businesses, following fixed assets, necessitating close monitoring of factors such as realizable value, market value, production stock, and finished stock. However, these inventories come with holding costs and tie-up funds that could potentially be lost. Therefore, this paper explores the challenges of the manual inventory management system for Boutique D'Rasuli by conducting interviews with the owner and assistant director of Boutique D'Rasuli to gather factual information and become the primary research method for this study. The findings reveal the difficulties inherent in manual inventory management systems, including the need for daily item counting, the prevalence of human errors during counting and recording, and the vulnerability of manual inventory records to disasters like fire, flood, or communication failures. Building on these findings, this paper emphasizes a potential solution to the aforementioned problems by introducing a web-based inventory management system capable of ordering, updating stocks, and determining the optimal quantity of inventories that fulfills demand while avoiding excessive stock levels. It incorporates users' dashboards and timely demand forecasting that predicts the anticipated customer demand for the products, taking into account different levels of specificity. By implementing this system, the inherent drawbacks of the manual approach can be effectively mitigated, resulting in improved efficiency and accelerated processes. Furthermore, the system has been successfully developed and can be readily utilized for enhanced inventory management, offering the potential for future reuse.

Keywords: inventory management system, inventory management, demand forecasting, demand forecast

1. INTRODUCTION

In the dynamic landscape of the retail industry, efficient inventory management plays a pivotal role in the success and sustainability of businesses, particularly for specialized boutiques that offer distinctive products and services. The effective management of inventory not only ensures that businesses have the right products available to meet customer demands but directly impacts their profitability and customer satisfaction. Inventory management is also said to perpetually revolve around enhancing inventory for

outstanding business performance, advancement, effectiveness, and heightened efficiency [1]. Thus, for small-scale enterprises like Boutique D'Rasuli, which prides itself on delivering unique and exclusive products to its discerning clientele, a robust inventory management system is crucial. However, like many businesses in the fashion sector, this boutique faced challenges in maintaining a diverse inventory while ensuring that items stay updated and are well-stocked. To address this boutique's challenges and opportunities, this research endeavors to explore the implementation of an Inventory Management System (IMS) with a specialized focus on demand forecasting for its pursuit of operational excellence and customer satisfaction. Effective inventory management for this boutique is paramount to ensure that the right products are available at the right time to meet customer demand while minimizing excess stock and associated costs.

The primary objective of this research is to design, implement, and evaluate an Inventory Management System that incorporates demand forecasting techniques tailored to the unique characteristics of Boutique D'Rasuli. By leveraging state-of-the-art technology and advanced analytical tools, this system aims to provide Boutique D'Rasuli with the insights and tools necessary to optimize its inventory levels, strike a delicate balance between supply and demand, and enhance its overall operational efficiency.

2. MATERIALS AND METHODS

The methodology for this research involves a systematic approach to designing and implementing the software solution and, at the same time, is designed to provide a comprehensive understanding of how inventory management can be optimized through the integration of demand forecasting. The adapted waterfall model of software development life cycle (SDLC) origin from [2] had been selected as the system development approach for developing this proposed inventory management system for Boutique D'Rasuli (see Figure 1).

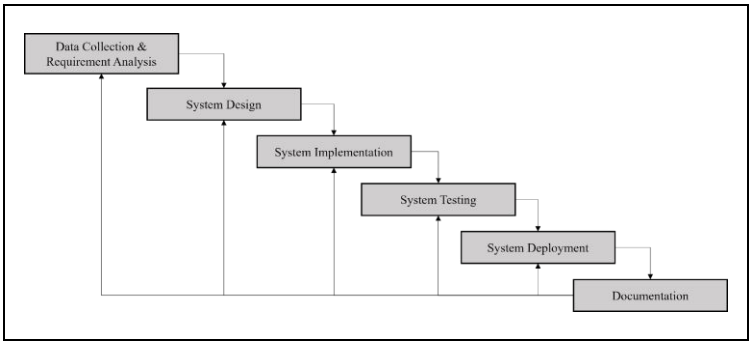


Figure 1. Methodology for the Proposed System

The first phase of the research involves data collection and requirement analysis. Historical sales data and inventory records will be gathered from Boutique D'Rasuli to establish a baseline for inventory performance. This will be supplemented with data on functional and non-functional requirements for the proposed system. In addition, interviews and surveys were conducted with boutique staff and customers to gain insights into the subjective aspects of demand forecasting. Following data collection, the research will focus on the design, development, and implementation of the inventory management system. Demand forecasting features will be designed and applied to the proposed system to predict future demand patterns based on historical data. Once the inventory management system is developed and implemented, the research will move into the testing phase. In this phase, the system developer conducted

testing to test the system's functionality using a test plan. Finally, the research will conclude with a deployment and documentation.

3. RESULTS AND DISCUSSION

3.1. Business Process Improvement

The implementation of an inventory management system with demand forecasting gave substantial business improvements for Boutique D'Rasuli. One of the most important improvements of this proposed system is the comprehensive dashboard it offers to the Director and Managers of Boutique D'Rasuli. The Director and Managers can now access a comprehensive dashboard that offers valuable predictive insights with accurate sales and restock predictions. This enables the management team to make informed decisions regarding inventory levels and sales strategies. The stock alert feature further ensures that all levels of management, including the staff, are promptly notified when stock is running low below ten units. These enhancements empower the boutique to operate more efficiently, minimize stockouts, and effectively meet customer demand. Other business improvements are shown in the table below (see Table 1).

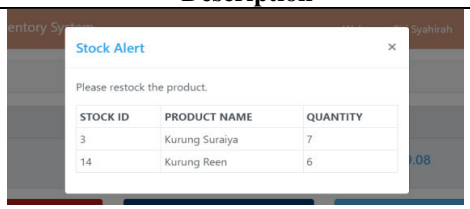
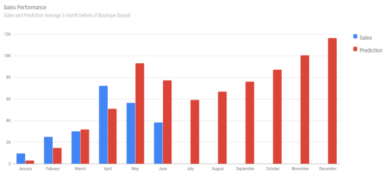
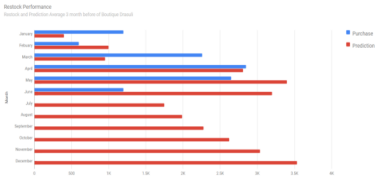
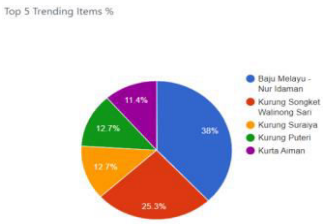
Table 1. Business Process Improvement for Boutique D'Rasuli

Process	Current Process	Business Process Improvement
Dashboard	No sales or restock predictions or stock alerts.	Provides sales and restock predictions for the Director and Managers, and they can notify stock alerts, including the Staff.
Inventory Management	Manual stock tracking, no automated additions or deductions.	Automatically adds and deducts stock after restocking and sales for Managers and Staff.
Data Management	Limited or no organized data storage for customers, suppliers, restocks, and sales.	Stores and organizes data for customers, suppliers, restocks, and sales, allowing Managers and Staff to view and search data. The director has access to all data and can view sales and restock.
Reporting and Invoicing	Manual report generation for customers, suppliers, restocks, and sales. No invoice generation.	Enables the Managers to print reports for customers, suppliers, restocks, and sales. Also generates invoices for sales and restocks for Managers and Staff. The director can print reports for sales and restock.

3.2. Implementation of Demand Forecasting

The implementation of demand forecasting within the inventory management system for Boutique D'Rasuli has yielded significant insights and improvements in the boutique's overall operations. By integrating a sophisticated demand forecasting model into the inventory management processes, several key advantages have become apparent. The table below shows the implementation of demand forecasting (see Table 2).

Table 2. Implementation of Demand Forecasting in the Proposed System

Feature	Description
Stock Alert	 The system displays the notification stock alert after the user logs in to alert that the stock is in a lower quantity.
Sales Performance / Sales Forecast	 The system provides the sales performance and the sales prediction for the future month to make advance plans before the time of the event using a simple forecasting technique, the Moving average (3-month average method). This Prediction and performance can be visualized to the Director and Managers.
Restock Performance / Restock Forecast	 The system provides the restock performance and the restock prediction for the future month for easier decisions for the future using a simple forecasting technique, the Moving average (3-month average method). This Prediction and performance can be visualized to the Director and Managers.
Trend Analysis	 The system shows the Top 5 Trending items in percentages and quantity in the dashboard. This Top 5 Trending can be visualized to all users, which is the Director, Managers, and Staff.

4. CONCLUSION

In conclusion, the inventory management system for Boutique D'Rasuli has been successfully developed based on the system requirement specification by the Director, Managers, and staff of the boutique. The main purpose of developing the proposed system is to streamline inventory management and enhance the overall business operations of the boutique. Furthermore, this proposed system alleviates the workload of the staff involved in inventory management by incorporating features rooted in the principles of Demand Forecasting theory. However, the system's straightforward design could impede its capability in accommodating extensive operations and advanced features, thereby diminishing its suitability for businesses with complex inventory requirements. Thus, it is advisable for future research to continually seek ways to refine and innovate inventory management systems with the integration of emerging technologies, such as artificial intelligence and machine learning, and thus, further enhance the accuracy of demand forecasts and automate inventory management processes.

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PJI – CONTENT MANAGEMENT SYSTEM (PJI-CMS)

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Abstract

UiTM Kuala Terengganu Branch (UiTMCTKKT) began operations in January 2008. Research and Industrial Linkages, known as '*Bahagian Penyelidikan dan Jaringan Industri'* (PJI) Universiti Teknologi MARA (UiTM) Cawangan Terengganu was established on February 1, 2009. PJI is a center of staff, student, and alumni professionalism in quality self-transformation, focusing on expertise, entrepreneurship, research, intellectual property, commercialization, community, and innovation in line with the university's goal of producing glorious and utter outstanding citizens. PJI has also been entrusted with assisting academicians in writing by increasing the added value of research findings for publication in high-impact journals. PJI worked with government agencies, private organisations, and communities to develop programs that improve graduate employability, generate research opportunities, and provide community services to residents. PJI comprises several sections: Research and Management (RMU), Industry, Community and Alumni Network (ICAN), Writing and Publication (WPU), and Malaysian Academy of SME & Entrepreneurship Development (MASMED). As UiTM Terengganu is moving towards a digital campus, PJI has created an efficient Content Management System (CMS) as an initiative to support the campus. One of the key advantages of implementing a CMS is enhanced information accessibility. Authorized personnel at PJI can easily update, edit, and publish new content without relying on technical expertise or external web developers. Moreover, an improved web presence through a CMS leads to an enhanced user experience. A well-designed, intuitive interface, straightforward navigation, and organized content create a positive user experience. Staff and other visitors can stay informed about the latest happening and effortlessly find the information they need, resulting in higher engagement and satisfaction with this one-stop PJI Centre.

Keywords: PJI, UiTM, Content Management

1. INTRODUCTION

In January 2008, UiTM Kuala Terengganu Campus began operations after the full acquisition of operations from Yayasan Terengganu College. Research and Industrial Linkages or known as Bahagian Penyelidikan dan Jaringan Industri (PJI) Universiti Teknologi MARA (UiTM) Cawangan Terengganu manages all aspects of entrepreneurship, research, consulting alumni, intellectual property, and commercialisation. PJI has also been entrusted with assisting academicians in writing by increasing the added value of research findings for publication in high-impact journals. PJI worked with government agencies, private organisations, and communities to develop programmes that improve graduate employability, generate research opportunities, and provide community services to residents. PJI consists of several sections, namely Unit Penyelidikan dan Inovasi or known as RMU; Unit ICAN, which is Industry, Community and Alumni Network; Unit Penulisan dan Penerbitan, Unit MASMED; Unit Penjanaan, Unit Alumni.

2. PROBLEM STATEMENT

Currently, PJI Kuala Terengganu has no webpage and still relies on manual methods to provide forms to staff and lecturers. This manual process can be time-consuming and inefficient. To address these challenges, it is recommended that PJI consider implementing a content management system (CMS) for its website.

2.1 Objectives

This study aims to develop a content management system for the Research and Industrial Linkages Unit (PJI) UiTM Kampus Kuala Terengganu.

2.2 Project Significance

The implementation of a content management system (CMS) and the improvement of the web presence of Research and Industrial Linkages (PJI) hold significant importance and offer a range of benefits (Amsler, 2021). One of the key advantages of implementing a CMS is enhanced information accessibility (Sean O'Hare, 2023). Using a CMS, PJI can ensure that relevant and up-to-date information is easily accessible to staff (Edmondson, 2022). This includes providing timely news updates and more. With a well-structured and informative website, PJI can foster better communication and transparency within the institution. Staff can stay informed about the latest happenings and can have access to the necessary information they need.

3. RESULTS AND DISCUSSION

3.1. The Content Management System

Figure 1 shows the login page for the admin. On this log-in page, the admin must enter their staff ID and password and click the login button to log into the system.

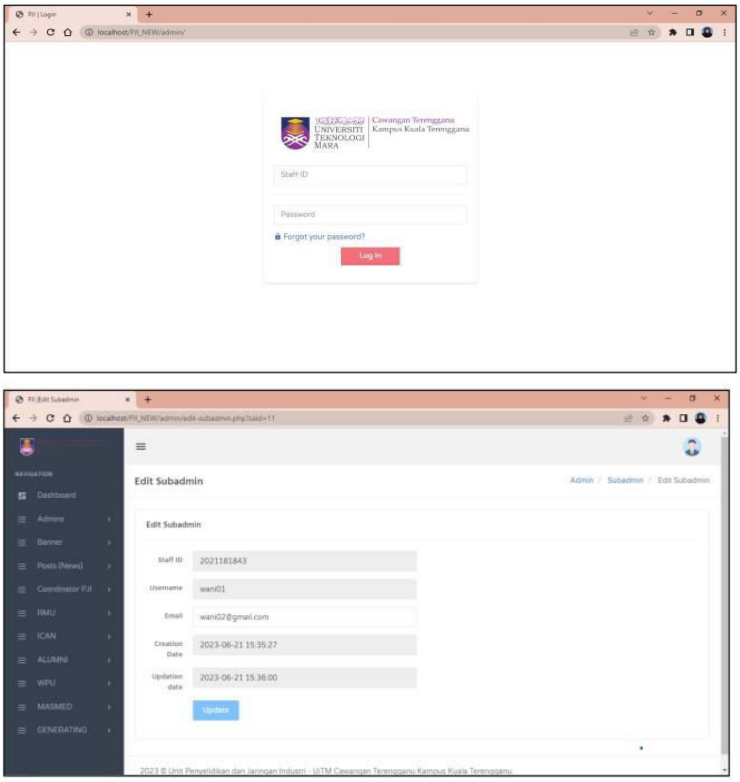

Figure 1. User Admin

Figure 2 shows the add post page where the admin needs to enter the post title, post details (news including image, video, link to other pages), and the feature image displayed on the Discover Us page. Next, the admin must click the save and post button to post the news or articles.

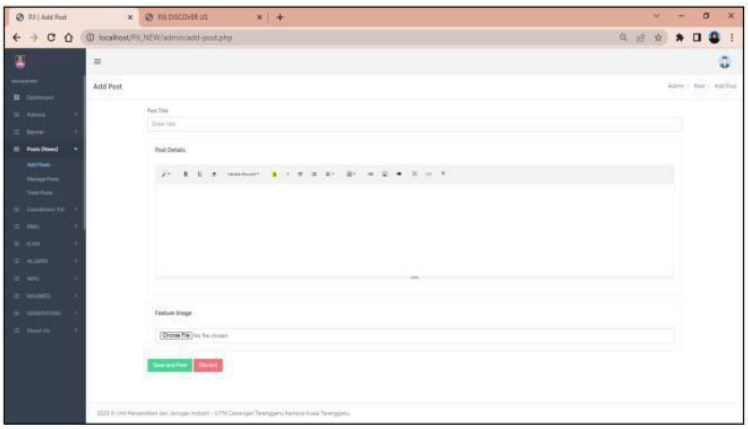

Figure 2. Post Page

4. CONCLUSION

Considering the growing prominence of mobile devices, optimizing the website for mobile responsiveness is essential. Users can conveniently access the website and its content on their smartphones and tablets by ensuring it adapts seamlessly to different screen sizes and mobile platforms. This would enhance the overall user experience and enable users to engage with the website while on the go. By continuously enhancing and adapting the website, PJI can effectively cater to its users' evolving needs and preferences, ensuring a positive and user-friendly digital experience.

ACKNOWLEDGEMENT

PJI Team Universiti Teknologi MARA (UiTM) Cawangan Terengganu Kampus Kuala Terengganu.

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AR TMI: AN AUGMENTED REALITY (AR) IN LEARNING THALASSAEMIAFOR HIGH SCHOOL STUDENTS

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Abstract

Thalassaemia is Malaysia's most common inherited disease, particularly alpha and beta thalassaemia. In Malaysia, the school thalassemia screening programme was started in 2016 and involves fourth form students. Since the Health Ministry (MoH) introduced thalassemia screening among fourth form students in 2016, it has detected 31,716 carriers out of a total of 689,460 students who were screened. AR TMI is an interactive mobile application that is developed in order to help high school students understand better about Thalassaemia. The target user for this project focuses on high school students from the age of 13 years old to 17 years old. The use of the ADDIE instructional model can ensure the development of the AR application runs smoothly and in accordance with the planning that has been set. The significance of this project is to employ 3D models and augmented reality to inform and raise awareness about thalassaemia among high school students. This research also intends to improve student visualisation of the thalassemia blood condition with the use of 3D models and augmented reality. Hopefully, by developing 3D models explaining thalassaemia, it makes it easier for high school students to learn and raise awareness about thalassaemia and by using augmented reality technology.

Keywords: Thalassaemia, Augmented Reality, learning, high school student, awareness.

1. INTRODUCTION

Thalassaemia is a genetic blood disorder that causes the body to either produce an abnormal form or insufficient amounts of haemoglobin. The protein in red blood cells that carries oxygen is called haemoglobin. Thalassaemia is an inherited disorder characterized by the inability or diminished ability to produce haemoglobin, which affects the oxygen-carrying capacity of red blood (Alnaami & Wazqar, 2019). Augmented Reality (AR) is defined as a real-time direct or indirect view of a physical real-world environment that has been enhanced/augmented by adding virtual computer-generated information to it. By introducing virtual information to the user's immediate surroundings as well as to any indirect view of the real-world environment, such as a live-video feed, augmented reality (AR) strives to make the user's life easier. Lack of awareness about thalassaemia causes many people to not know about this blood disorder. Many people are unaware of thalassaemia due to a lack of awareness of the condition.

According to research by Ghafoor et al. (2020), based on the researcher's respondents, public knowledge regarding Thalassemia was found to be poor among the general population. Public educational campaigns and Thalassemia awareness programs should be organized and practiced in cultural, teaching, and religious belief sites. The The AR TMI: Thalassaemia Medical) application is an innovative product that harnesses the power of Industry 4.0 technologies to revolutionize the way medical information about Thalassaemia is accessed and utilized. By incorporating Augmented Reality (AR) technology, AR TMI provides an immersive and interactive platform for users to explore comprehensive medical information related to Thalassaemia. This cutting-edge application takes advantage of the advancements in data analytics, connectivity, and artificial intelligence, which are integral components of Industry 4.0.

2. MATERIALS AND METHODS

2.1. Software Requirements

The AR TMI: Thalassaemia Medical Info application is developed using Unity Software, whereas Adobe Illustrator is utilized to design the user interface (UI) for both the application and the book. For the 3D objects of the AR TMI Camera is done in Blender. The video in the application is edited using Adobe Premiere Pro.

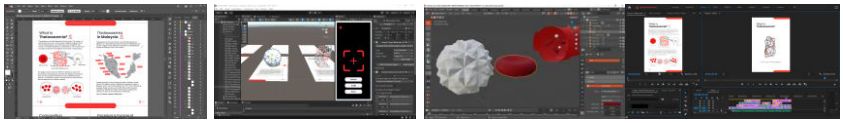

Figure 1: The Production Process

The mobile application's scripts were created using Visual Studio 2019, employing C# scripting for development purposes. These scripts were responsible for handling scene transitions, managing sound effects, controlling buttons and the menu panel, tracking point collection, and overseeing the movement of 3D objects. The researcher is currently working on the following scripts. User can utilize the AR TMI: Thalassaemia Medical Info book along with an Android phone, as depicted in Figure 6 by scanning the image marker on the book.

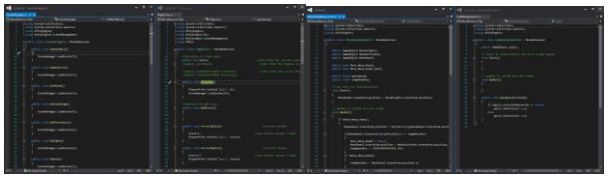

Figure 2. C# Scripts in Viusal Studio

Table 1. Software Requirements

Software	Function	Logo
Unity	Used to develop the overall project and the augmented reality app	unity
Vuforia	A software development kit (SDK) for building augmented reality apps is called Vuforia Engine.	vuforia™

Blender	Used to create 3D models.	
Adobe Illustrator	Used to create AR marker and mobile application interface.	
Adobe Premiere Pro	Used for video editing	

2.2. Hardware Requirements

User can utilize the AR TMI: Thalassaemia Medical Info book along with an Android phone, as depicted in Figure 3 by scanning the image marker on the book.

Figure 3. AR TMI: Thalassaemia Medical Info Book and android phone

Table 2. Hardware Requirements

Hardware	Detail	Function
Acer E15 Laptop	Processor: Intel Core i7 2.5GHz with Turbo Boost up to 3.1 GHz Operating System: Windows 10 – 64 bits Memory: 4GB	To create overall project.
Mouse	Model: M22	For easier and quicker clicks when developing the project
Seagate Backup Plus Hard Disk	Storage: 2TB	To store the backup files
Android Smartphone	Model: Samsung A30	Used to run and test the application

3. RESULTS AND DISCUSSION

3.1. Results

A total of 30 high school students between the ages of 13 and 17 years old has filled out the questionnaire using Google Form. The questionnaire can be found in Appendix A of this report. The questionnaire is

divided into three sections where the first section asks about the demographic of the respondent, the second section asks about augmented reality (AR) and the third section asks about application usability. Below are the findings from the survey that has been conducted.

According to the results of the testing, the majority of respondents are pleased with and agree that the AR TMI: Thalassaemia Medical Info mobile application is simple to use, can raise awareness of the thalassaemia blood disorder, and can effectively and interactively increase high school students' knowledge about thalassaemia. AR TMI: Thalassemia Medical Info mobile has achieved all three of its initial planning goals. According to the results of the application testing, users of the mobile AR TMI: Thalassaemia Medical Info application are happy with it.

3.2. Discussion

According to the results of the testing, the majority of respondents are pleased with and agree that the AR TMI: Thalassaemia Medical Info mobile application is simple to use, can raise awareness of the thalassaemia blood disorder, and can effectively and interactively increase high school students' knowledge about thalassaemia. AR TMI: Thalassemia Medical Info mobile has achieved all three of its initial planning goals. According to the results of the application testing, users of the mobile AR TMI: Thalassaemia Medical Info application are happy with it.

4. CONCLUSION

In conclusion, the researcher’s goals have been met based on the findings of the testing. It has been established that high school students can benefit from using AR TMI: Thalassaemia Medical Information mobile application to increase their knowledge and information. Apart from that, people are fairly adept at using the programme. Additionally, this application may raise awareness and lead to future thalassemia disease prevention. According to the survey's findings, all of the users are happy with the mobile application and have made suggestions for ways to make it even better for spreading awareness about thalassemia.

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DEVELOPMENT OF DATA RECORDING SYSTEM FOR COMPRESSED NATURAL GAS

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Abstract

The project aimed to improve the data recording process for Compressed Natural Gas (CNG) discharge from a tube skid trailer to a storage tank. The reasons for the improvement were to reduce the usage of paper, reduce time, and gain access to the data all the time. The company Aba Gas Technologies Sdn. Bhd. (AGT) data recording process that was currently in use was ineffective. Two categories of data had to be saved on file: Discharge Summary and Hourly Inspection. Both data were recorded by utilizing paper sheets and the WhatsApp applications. The data recording process was supposed to be digitalized to improve organizational effectiveness, time, and workload. It also protects the environment by reducing paper waste. To improve work effectiveness, the current process needs to be improved. The approach to establishing the desired outcome from this project was to develop a digital system. The web pages involved in this project were Google Forms, Google Sheets, and Google Data Studio. Lean manufacturing tools were used to determine the causes of delay and error in the manual data recording process. The lean technique used in this project is Plan-Do-Check-Action (PDCA). The lean manufacturing tools used in the Plan Phase of PDCA were the 5-why analysis and the fishbone diagram. By applying these Lean Manufacturing Tools, the core causes that AGT faced can be found and fixed. The required process enhancements, such as the online real-time data recording system and sharing data platform, were able to anticipate a decrease in the amount of time and workload required to perform the data recording for the discharge of CNG.

Keywords: Waste reduction; real-time data recording system; lean manufacturing tools; organizational effectiveness.

1. INTRODUCTION

Since Aba Gas Technologies SDN. BHD. (AGT) As a CNG supplier, it was crucial to keep track of the CNG being discharged to clients and monitor the CNG discharge process. The data that needed to be recorded were times, date, tube skid number, total discharge for one tube skid, the pressure, temperature, and totalizer from starting the process until the process ended. Lots of papers were required to record all this data. Thus, it was possible to complete the data recording process without using paper using current technologies and knowledge. The real-time online data recording system was an information system that employees could access over the Internet [1]. This system uses cloud computing to store, manage, access, and acquire data. The cost for the previous data recording process involved the papers and stationaries.

Aside from that, it also took a long time for the workers to record the data on paper. This inefficient data recording process involved lots of waste in motion and movement. Waste reduction and organizational efficiency are crucial for project success, and this project utilized lean management techniques to achieve these goals.

2. MATERIALS AND METHODS

The development process of the online service sheet system is explored by utilizing various research methodologies such as the PDCA Method, Fish Bone Diagram, and 5-why analysis. These tools will be used to identify the problems, causes, and effects that arise during the process.

2.1 PDCA Method

The fundamental component of the Lean Manufacturing concept is PDCA. The PDCA technique is a straightforward yet effective tool that allows you to repeat the cycle if the solutions can still be better. The fundamental PDCA approach includes four stages: planning, execution (integration of process improvements), checking (effects control), and action (corrective) [2].

2.2 Fishbone diagram

The fishbone diagram, which is also known as an Ishikawa cause-and-effect diagram, offers a technique to search for the consequences, the unplanned line stops, and the factors that lead to those effects [3]. As demonstrated in Figure 2, the fishbone diagram illustrates all the causes in terms of machine, material, man, and method in delay and errors of the data recording process for CNG.

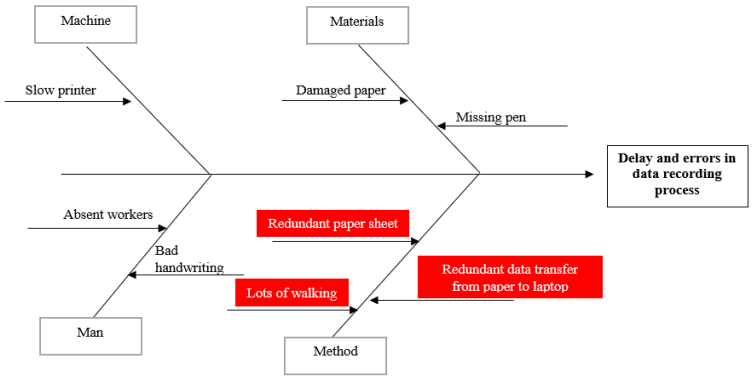

Figure 1: Fishbone Diagram

2.3 5-Why Analysis

The 5-why analysis makes it possible to find deeper fundamental causes. In addition, the 5-Why approach of root cause analysis calls for determining the cause-effect failure route as well as examining the sequential causes of a failure event. The question "Why" is used to track out each earlier trigger and reach the incident's underlying cause [4].

3. RESULTS AND DISCUSSION

The project will deliver the analysis outcome in the form of a digital mockup, graphs, calculations, and a revised standard operating procedure. These results will help establish explicit knowledge of what needs to be accomplished.

3.1 Development of Digital Mock and SOP

To create the Digital Mock, Google Form, Google Sheet, and Google Data Studio were chosen. All the software is free to use and easy to access using a laptop or smartphone. This project proposed digital mock as a new improvement with no investment to meet objectives. Other than that, the staff members are already familiar with the Google Forms platforms.

3.2 Time Studies after Kaizen Implementation

Table 1: A Time Study was Conducted Before and After the Kaizen Implementation

Work Elements	Time	
	Existing	Online
The employee needs to record the amount of CNG distributed to customers hourly.	1 minute	1 minute
The workers bring the service sheet to the company from the site (Variables, depending on the distance of the site)	30 minutes	-
Engineer key in the data on Microsoft Excel.	30 minutes	-
Total cycle times	**61 minutes**	**1 minute**

3.3 Cost Eliminate

By using an online system, all these costs can be cut down to zero. The data will be collected and shared using a smartphone where at this current time all workers have their smartphone.

3.4 Data Visualization

Data may be shown in reports and dashboards that are simple to edit using Google Data Studio. Widgets, graphs, charts, and maps are additional tools in Data Studio for data visualization. It produces view and share reports in seconds thanks to its simple functionality [5].

Figure 2: Data visualization from Google Data Studio

4. CONCLUSION

This project successfully achieved all its objectives. First, it identified the causes of delays and errors in data recording through Lean Manufacturing tools like fishbone diagrams and 5-Why Analysis. Secondly, the project improved data management by using Google Forms, allowing users to easily create, modify, and analyze forms online. This digital system increased efficiency and saved time. Thirdly, a data visualization dashboard was created using Google Data Studio, enabling real-time data monitoring and easy sharing of insights. Users could customize the dashboard's appearance and design. Overall, the organization benefited from cost savings and improved efficiency by transitioning to electronic data storage, reducing the time and effort required for physical paperwork.

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RESEARCH ON DIGITIZATION PROTECTION AND INHERITANCE OF MANCHU FOLK EMBROIDERY

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Abstract

With the rapid development of information technology, digital preservation has become a new type of cultural heritage protection. As an important part of the intangible cultural heritage of the Chinese nation, Manchu folk embroidery deserves in-depth study and extensive inheritance for its rich and varied art forms, exquisite and unique craftsmanship techniques and profound national cultural connotations. However, the traditional preservation methods are difficult to achieve the expected preservation effect due to technical condition limitations and shortage of human resources. Therefore, this study aims to explore and practice the digital preservation and inheritance methods of Manchu folk embroidery. This research firstly analyzes the history, characteristics, production techniques, and cultural connotations of Manchu folk embroidery in depth, and then, through extensive field research and collection, expects to establish a comprehensive and detailed database of Manchu embroidery art, in order to enhance the public's understanding of Manchu embroidery art, so as to realize the extensive inheritance of embroidery art. This research result theoretically proposes a set of effective digital preservation and inheritance models for intangible cultural heritage. However, it should be noted that digital preservation is only a means, not an end, and we must respect and protect the rights and interests of embroidery artists and promote the optimization of related policies and social environment in order to truly achieve the long-term protection and development of intangible cultural heritage. The research on the digital preservation and inheritance of Manchu folk embroidery not only provides new possibilities for the development of Manchu embroidery art, but also provides new ideas and methods for the preservation and inheritance of other intangible cultural heritage, which is of great theoretical and practical significance for the promotion of China's cultural heritage protection.

Keywords: Manchu folk embroidery; digital preservation; inheritance

1. INTRODUCTION

Manchu folk embroidery, a vibrant and rich element of the Chinese intangible cultural heritage, has long been celebrated for its exquisite artistry and profound cultural significance. However, the emergence of modernization and the limitations of traditional preservation methods have prompted the need for innovative approaches to safeguard and perpetuate this unique heritage. The focus of this paper, the

digitization protection and inheritance of Manchu folk embroidery, stands at the intersection of technology and tradition, and its exploration holds substantial implications for cultural preservation. This introduction aims to set the context by reviewing the existing literature and highlighting the novelty of the present research.

Many scholars have recognized the importance of Manchu folk embroidery and extensively studied its history, techniques, and cultural connotations (Wang,2012;Kuang et al.)). However, the preservation of this art form has often been hindered by technical condition limitations and a shortage of human resources. Traditional methods of preservation, as explored by Zhang et al. (2020), have proven difficult to sustain in the modern era, leading to an urgent call for innovative solutions.The potential of digital preservation as a means of protecting cultural heritage has been a burgeoning field of study. Research by Huang and Tan (2012) and Zhuo et al. (2014) has demonstrated the efficacy of digital techniques in preserving various forms of intangible cultural heritage. Yet, a specific focus on Manchu folk embroidery has been sparse in the existing literature, creating a gap that this paper aims to address.While some initiatives have been taken towards the digital preservation of textile arts (Yang, 2017), they have been somewhat generalized and lack an in-depth exploration of the distinct characteristics and requirements of Manchu folk embroidery. Moreover, the existing studies have often overlooked the rights and interests of embroidery artists and the need for optimizing related policies and the social environment.This study embarks on a comprehensive examination of Manchu folk embroidery, bridging the historical analysis with extensive field research and technological practice. Unlike previous works, it not only provides a detailed database of Manchu embroidery art but also proposes an effective model for digital preservation and inheritance. More importantly, the research emphasizes the ethical considerations and policy implications for the broader application of digital methods. In doing so, it offers new possibilities for Manchu embroidery art and other intangible cultural heritage, marking a significant departure from previous approaches.

The research on digitization protection and inheritance of Manchu Folk Embroidery stands as a vital inquiry into the future of cultural preservation. By identifying the limitations of existing literature and emphasizing the novel contributions of the current study, this introduction sets the stage for an in-depth exploration that promises to enhance our understanding of both the art form and the methodologies that can ensure its longevity.

2. MATERIALS AND METHODS

The methodology adopted for this research is structured into three main phases to create an extensive understanding and preservation model for Manchu Folk Embroidery. Each phase builds upon the previous one, interlinking historical, cultural, technical, and ethical aspects. Below are the detailed methods and materials used in each phase.

2.1. Historical and Cultural Analysis

2.1.1 Literature Review

A comprehensive review of existing literature related to Manchu Folk Embroidery, including books, peer-reviewed articles, and archival materials. The focus is on understanding the history, characteristics, production techniques, and cultural connotations of Manchu folk embroidery.

2.1.2 Expert Interviews:
Conducting interviews with historians, artists, and cultural experts to gain insights into the traditional practices and cultural importance of Manchu embroidery.

2.2. Field Research and Data Collection

2.2.1 Site Visits
Visiting various museums, workshops, and communities known for Manchu folk embroidery. Observing the techniques, materials, and cultural practices first-hand.

2.2.2 Interviews and Surveys with Artists:
Direct interaction with the embroidery artists to understand their views, challenges, and insights on preservation. This includes structured interviews and questionnaires.

2.2.3 Photography and Videography
Capturing the art form visually to record the intricate designs and techniques. High-resolution photographs and videos are taken to document various embroidery styles and methods.

2.3. Development of Digital Preservation Model

2.3.1 Creation of a Digital Database
Building a comprehensive database that integrates the collected textual, visual, and audio data. This includes digitizing the art form using 3D scanning techniques and virtual reality (VR) tools where applicable.

2.3.2 Technological Analysis
Employing data analytics and artificial intelligence (AI) to analyze patterns, techniques, and trends in Manchu embroidery, providing a framework for digital preservation.

2.3.3 Ethical Considerations and Policy Recommendations
Engaging with legal and ethical scholars to explore the rights of artists, and working closely with policymakers to recommend ways to ensure that the digital preservation respects and promotes the interests of the embroidery community.

The methodology for this research on Manchu Folk Embroidery is multi-faceted, aligning historical understanding with modern technological capabilities. It emphasizes not only the aesthetics and cultural relevance of the art form but also recognizes the need to ethically and sustainably preserve and promote this valuable heritage. This integrated approach ensures a comprehensive and nuanced understanding of Manchu folk embroidery, paving the way for its long-term protection and inheritance.

3. RESULTS AND DISCUSSION

3.1. Historical and Cultural Insights

3.1.1 Rich Historical Background:

The research unveiled the complex history of Manchu folk embroidery, tracing its origins, evolution, and cultural connections. The fusion of diverse ethnic influences, motifs, and techniques was revealed, depicting a rich and nuanced heritage.

3.1.2 Cultural Significance:
The study affirmed the intrinsic cultural values embedded in Manchu folk embroidery, reflecting themes like spirituality, societal norms, and artistic expression. The art form's unique craftsmanship techniques were found to carry profound national cultural connotations.

3.2. Field Research Findings

3.2.1 Current State of Preservation:
Field visits and artist interactions painted a vivid picture of the challenges in preserving Manchu embroidery. The limitations of traditional preservation methods and human resources were keenly felt, underlining the need for innovative solutions.

3.2.2 Artists' Perspectives:
The voices of the artists emphasized the importance of respecting their rights and interests in any preservation effort. Their insights provided valuable guidance for the digital preservation model developed in this research.

3.3.Development of Digital Preservation Model

3.3.1 Comprehensive Digital Database:
The research successfully created an extensive and detailed digital database of Manchu embroidery art, encompassing high-resolution images, videos, and 3D scans. This database is expected to enhance public understanding and support the extensive inheritance of the art form.

3.3.2 Effective Digital Preservation Model:
The study proposed a novel digital preservation and inheritance model that aligns technological capabilities with ethical considerations. It recognized digital preservation as a means, not an end, respecting the rights of embroidery artists and promoting policy optimization.

3.3.3 Broad Applicability:
The digital model offers potential applications beyond Manchu folk embroidery, suggesting new possibilities for the preservation and inheritance of other intangible cultural heritage.

Conclusion
The results of this research on the digitization protection and inheritance of Manchu folk embroidery present new horizons for understanding, preserving, and disseminating this valuable cultural heritage. By intertwining historical context, field insights, and technological innovation, the study offers a holistic approach that respects both artistic integrity and modern necessities. Its findings and methodology offer significant contributions to the broader field of cultural heritage studies and digital preservation, embodying a harmonious marriage between the past and the future.

4. CONCLUSION

This research has forged a groundbreaking digital preservation and inheritance model for Manchu folk embroidery, offering a new pathway to safeguard and promote this intricate art form. The study's synthesis of technology with cultural respect opens new possibilities not only for Manchu embroidery but also for other intangible cultural heritages. Future works must focus on the adaptability and scalability of this model, exploring its application across diverse cultural contexts, and continuing to refine its ethical alignment and technological effectiveness.

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"WE CARE" BEYOND BOUNDARIES: MULTI-DOMAIN TELEHEALTH INTERVENTION IN REVERSING COGNITIVE FRAILTY AMONG OLDER PEOPLE

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Abstract

Cognitive frailty (CF) is associated with dementia risk. Telehealth has become an encouraging option to enhance the quality of life and support in place among this population. However, the information related to a multi-domain telehealth among community-dwelling older adults with CF was still limited. The purpose of this research is to develop a multi-domain telehealth intervention for older adults living in a community that aims to reverse cognitive frailty. This study was an ongoing development of a multi-domain telehealth system, WECARE iAGELESS that incorporates evidence-based approaches from cognitive training, nutrition, physical activity, psychosocial and management of metabolic risk and vascular. The application was developed in an iterative cycle. The development comprised of four phases; literature review and user requirement, conceptual design framework, system design and prototype development and user acceptance testing. A multi-disciplinary team of geriatricians, physiotherapists, psychologists, dietitians and system developers collaborates to design a personalised intervention that enables remote monitoring and feedback. The principal features of this web-based platform are dementia risk screening, individualised goals and coaching, interactive educational and guided videos, brain games and messaging. The development process highlights tailoring the intervention to individual profile, maximizing user interfaces and focusing more on the health of the elderly. Developing a healthcare system for older adults is challenging work. Leveraging multi-domain telehealth intervention such as remote accessibility, monitoring, and individualised intervention delivery as a novel platform could encourage the older population to become independent, improve their well-being and strengthen cognitive resilience. The system will be tested for feasibility among older people.

Keywords: Telehealth, multi-domain intervention, older adults, cognitive frailty

1. INTRODUCTION

Cognitive frailty (CF), a coexistence of physical frailty and cognitive impairment, is associated with functional decline among older people such as falls, related injuries and disability [1]. Its prevalence among Malaysian community-dwelling older adults was 2.2% while 37.4% for pre-CF and influenced by several risk factors such as vascular, physical activity, nutritional and psychosocial [2]. The reversal of CF could be accomplished by multi-dimensional approach to lifestyle changes [3]. Given the projected global demographic shift towards an aging population which is expected to double in 2050, these statistics will be increased significantly, thereby presenting a burdensome to healthcare systems worldwide [4]. Immediate action is required for the nation to be ready for challenges posed by an ageing population, as this transformation will put pressure on healthcare providers, caregivers and the community [5]. Preliminary results suggested that internet accessibility was associated with health literacy among community-dwelling older adults with cognitive frailty [6].

In conjunction with this situation, telehealth intervention has emerged as an engaging approach to address the needs of cognitively impaired older adults [7]. Telehealth is a part of eHealth which integrates information and communication technology (ICT) in managing, educating and monitoring healthcare services between patients and providers in remote or underserved areas [8]. Several multi-dimensional interventions were effective in enhancing cognitive outcomes and reducing the risk of dementia, yet these were completed via face-to-face method [9]. Some studies were focused on older adults with mild cognitive impairment (MCI), subjective cognitive decline (SCD), dementia or Alzheimer's disease. Contrarily, the research related to cognitive frailty and health-related ICT usage such as telehealth was still underexplored. The adoption of ICT aiming for the reduction of dementia risk among community-dwelling older people was still ongoing and some related studies were accomplished in developed countries [10]. Hence, the "WE CARE iAGELESS" program which is a part of AGELESS trial represents a novel multi-domain telehealth intervention, aiming for the reversal of cognitive frailty among older adults [11]. This extended abstract highlights the development of "WE CARE iAGELESS" which encompasses the overview of the system, its key components and interactive intervention components to improve their cognitive function.

2. METHODS

This platform is particularly designed for AGELESS trial, a multi-domain telehealth intervention in improving cognitive outcomes. Close interaction between healthcare providers, academic researchers and software developers was the main element in the development phase. In general, this development is categorized into four phases as indicated in Figure 1.

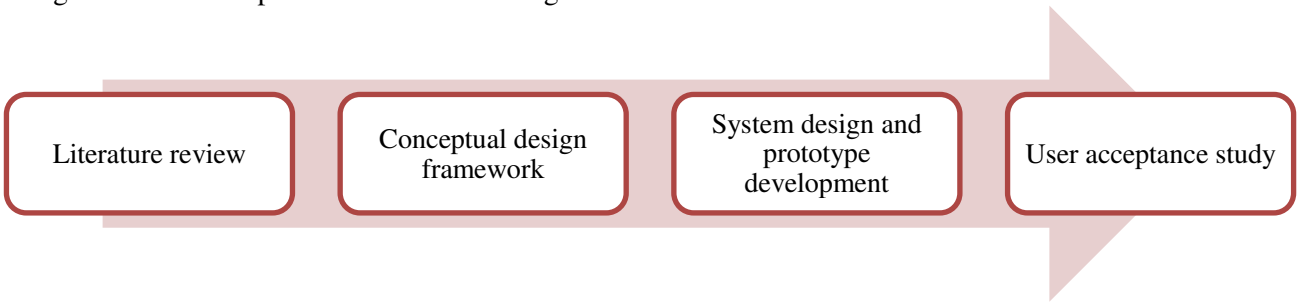

Figure 1: Phases of platform development

We performed a systematic search for literature and a scoping review related to the adoption of telehealth and older adults with cognitive impairment or frailty [12]. The platform used for this system was a web-based interactive platform for self-management with coaching from healthcare providers. We proposed that this platform could allow the end-users to learn the related educational videos, set a goal, have online consultations with providers and monitor their personal health progress. In parallel, we conducted several brainstorming sessions with a multidisciplinary team that consisted of geriatricians, physiotherapists, psychologists, dietitians and system developers to revise the guideline for cognitively impaired older people and articulate the concept and functional design of the platform.

3. RESULTS AND DISCUSSION

This application was built in an iterative cycle and highlighted five modules for the reversal of cognitive frailty such as cognitive, physical activity, nutrition, psychosocial and metabolic risk and vascular management. The cognitive training game and physical activity were adapted from previous studies named WE-RISE and WE FIT [13], [14]. The brainstorming discussions yielded a significant insight into specific requirements for a platform, including font size, the need for a simple layout with large icons or buttons. The end-user older adults will participate in an interactive web-based telehealth intervention with some key components representing this platform such as dementia risk screening, personalized health record and coaching, cognitive training games, interactive educational and guided videos with audio, telehealth consultation, messaging and reminders. The multi-domain telehealth intervention starts with an evaluation of the dementia risk screening, followed by initial assessments, initial consultation, scheduled multi-domain intervention and personal health reports generated from the system. Evidence indicates users who do not log in for almost three weeks, their motivation disappeared. Thus, it is advisable to keep allied to the platform by giving a personal call from researchers and reminder to the participants [15]. The development process highlights tailoring the intervention to individual profile, maximizing user interfaces and focusing more on the health of the elderly. This system offers potential benefits by tailoring to personalized older adults, providing cost efficiencies, time-saving, enhancing the nation's digital health and aligning with World Health Organization (WHO) global strategy on digital health 2020-2025 that emphasizes digital health as a health promotion and disease prevention.

4. CONCLUSION

In summary, developing a healthcare system tailored to the preferences of elderly individuals is challenging work. Harnessing multi-domain telehealth intervention consisting of remote access, monitoring capabilities and customised intervention delivery, as an innovative platform could empower older people, and enhance their well-being and cognitive outcome. This system will undergo the acceptability and feasibility among the elderly.

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DEVELOPING THE EFFECTIVE YOUNG RESPECT MOBILE APPS FOR KIDS

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Abstract

Kids nowadays often lack a strong foundation in moral values. Many are unaware of the appropriate attitudes, body language, and words they should use in their interactions with parents, friends, and even themselves. Hence, the purpose of this study is to develop a new friendly mobile application that focusing on young respect, the objectives of this study are to i) identify an appropriate interface layout for young respect kid's mobile application and ii) identify an appropriate element combination in young respect mobile application. This research applies literature-based methodology, which is data will be collected from various literature. The user-friendly mobile application is expected to utilize captivating colours and designs that appeal to children's interests while providing essential information on respecting others. It offers examples of respectful language for seeking attention, expressing appreciation, and making polite requests. Additionally, the app will teach children the importance of respectful communication with their parents, contributing at home, and following parental guidance. Furthermore, the application will emphasize the value of self-appreciation and rewards to boost children's confidence and happiness, fostering a positive atmosphere among peers. Considering the significant amount of time that digital-native children spend on their mobile devices, using an app for educational purposes proves more effective than traditional approaches like books. The inclusion of visually appealing illustrations and a well-designed interface tailored to children enhances the messages' memorability and comprehension. The application also incorporates simple animations, which research by Bhutto et al. (2018) suggests can enhance learning and understanding. With its features, visual appeal, and functionality, this application is poised to educate children about the importance of showing respect to those around them.

Keywords: Respect, moral value, mobile application

1. INTRODUCTION

The new generation, often referred to as Digital Natives, is immersed in technology, and digital languages have become an integral part of their lives (Prensky, 2001). According to Prensky (2001) as well, this new generation are "native speaker" and speak with digital language. Amazingly, this generation don't have to read the user manual or asking for the lesson to use devices such as computers or mobile phone, they have very strong intuition in exploring and gathered information related with all those electronic devices.

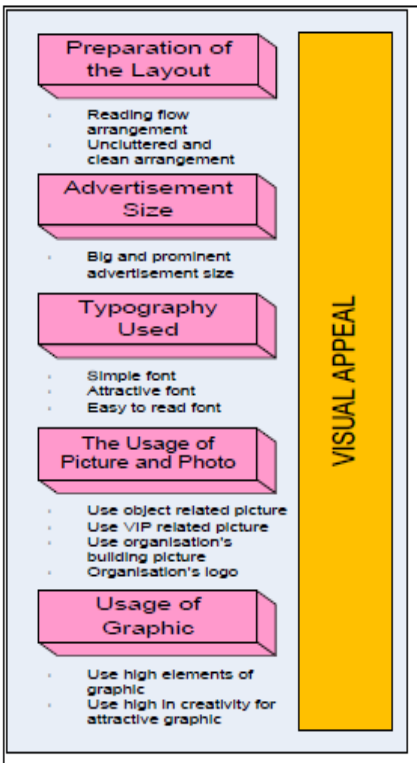
However, this generation frequently lacks an understanding of, and practice in, manners. They may not fully comprehend how to respect themselves, their parents, and their friends, in contrast to earlier generations (Arumugam et al., 2015). In this modern era, a wealth of knowledge is derived from the technologies that surround us, such as mobile phones and internet access. The new generation is exposed to a multitude of new technologies, which have altered the patterns of communication, work styles, and the dissemination of information (Mulyana, Soeaidy, & Taufiq, 2019). Yet, the existing knowledge and information available on mobile phones, including applications and approaches, tend to focus primarily on manners in specific contexts. Most interactive applications mainly concentrate on education, language, and health, as seen in the study by Laranjeiro (2021), and do not emphasize manners among children and teenagers. Consequently, many of these applications fail to underscore the importance of manners and respect toward oneself, parents, and the people in our immediate surroundings. As a result, some young individuals struggle to find the right words when seeking help from others and lack the appropriate words to use in such situations. Moreover, practicing self-respect can significantly boost their self-esteem and self-motivation, ultimately leading to a more productive and meaningful life. This underscores the significance of teaching the younger generation about manners for themselves, their parents, and society. The existing games and applications tend to prioritize entertainment over promoting self-respect.

2. MATERIALS AND METHODS

This research begins with a preliminary study in which literature-based data are collected from various sources in the literature. Subsequently, an analysis is conducted prior to the development of a new application tailored to the target audience. Following this, the layout and functionalities were determined based on literature review analyzed. The interactive application is designed with the primary objective of teaching children and teenagers about good manners. It includes lessons on using polite language, practicing self-respect, and demonstrating respect towards parents and friends. The application features captivating color combinations, a well-structured layout, engaging animations with high-quality sound effects, and informative dialogues to facilitate understanding. Furthermore, the application's navigation is intuitively designed to cater to its target audience, which includes children, teenagers, and parents.

3. INFORMATION CONTENT EFFECTIVENESS FACTORS MODEL

Shahibi et al. (2017) asserted that, to identify the optimal solution and enhance the effectiveness of layout arrangement for print advertising, emphasis should be placed on the development of information content. In accordance with the guidelines, an effective and aesthetically pleasing design should prioritize the preparation of the layout, the size of the advertisement, the characteristics of the chosen font, the selection of images, and the choice of graphic elements.



Guideline for an Effective Advertising Information Content for Newspaper Advertisement
Source: Shahibi, M. S., Mazlan, M., & Dollah, W. A. K. W. (2017).

3. RESULTS AND DISCUSSION

3.1. Mobile Apps Interface

Figures 1 to 9 present the layout designs created for the mobile application interface. These interface designs have been developed based on the observations and literature review conducted.

Figure 1. Front page.

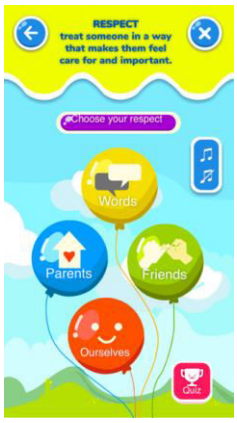


Figure 2. Selection page.

Figure 3. Word's page

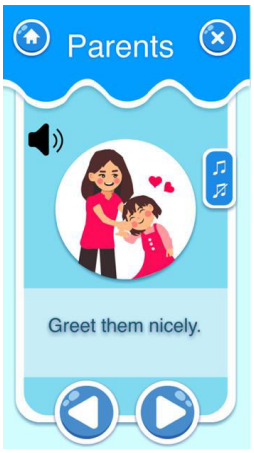


Figure 4. Parent's page.

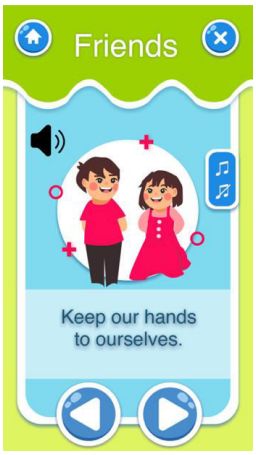


Figure 5. Friend's page.

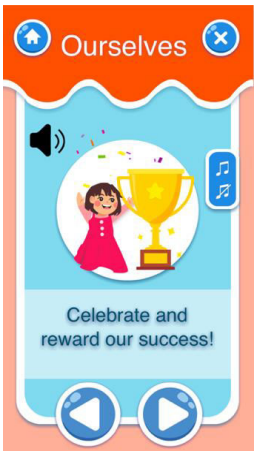


Figure 6. Reward page

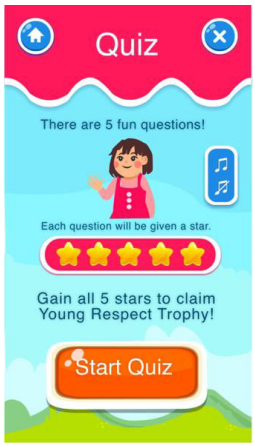


Figure 7. Quiz's page.

Figure 8. Reward page.

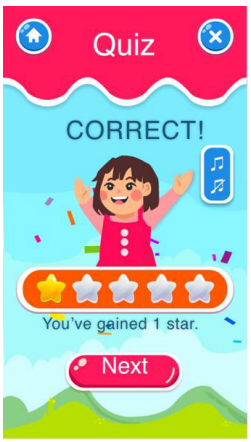


Figure 9. Score page

4. CONCLUSION

The Self-respect application serves as a comprehensive guide for individuals to learn how to respect themselves and others. By using this application, people can discover greater happiness, foster mutual respect in their interactions, and earn the respect of those around them. Furthermore, families can strengthen their bonds, develop a deeper appreciation for one another, and live in harmony. Within the realm of friendships, positive changes can lead to the cultivation of a community with heightened awareness of good manners and etiquette. The interactive application is also available for download on both the App Store and Google Play, making it easily accessible as a guide for children and teenagers at any time. Its wide-reaching appeal allows it to quickly reach a broad audience and raise awareness within society. This application is particularly well-suited to the target audience, especially Digital Natives who are accustomed to technology and digital experiences.

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EXPLORING ON CULTURAL AND CREATIVE PRODUCT DESIGN OF THE YUDONG BUHU TIGER FROM THE PERSPECTIVE OF REGIONAL CULTURE

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Abstract

As the combination of cultural and creative design and tourism economy is getting closer and closer, the combination of intangible cultural heritage and cultural and creative design vigorously promotes the development of the local economy, and the requirements for the visuality of artistic and innovative design are getting higher and higher. The brand-building of tourist cities is reflected in the charm of regional culture (Li, 2016). In the context of cultural and tourism integration development, the Yudong region in eastern Henan also built itself into a cultural tourism city, and cloth tigers are cloth folk crafts sold at temple fairs, which have the significance of blessing and praying for good fortune. The local tourism industry urgently needs cultural and creative design to create a unique cultural brand. The Yudong area has a deep, rich, intangible cultural heritage with a regional brand advantage. Many tourist destinations have recognized the critical role of building a distinctive culture and creating a cultural tourism brand through artistic and creative products to sustain the city's tourism economy. Yudong Cloth Tiger is a cloth folklore toy and intangible cultural heritage, so the shape of the tiger is not only the worship of the tiger totem but also the inheritance and continuation of the "tiger culture" of the Chinese nation for thousands of years, and also the conceptual modeling symbols of the collective consciousness of the people at the grassroots. It is also an abstract modeling symbol constructed by the collective consciousness of the grassroots. The study shows that by extracting and innovating the tiger symbols, we can create a cultural and creative design belonging to the Yudong tiger culture and form a tiger culture brand, which can be used for cultural tourism, heritage protection, and innovative design.

Keywords: Yudong,cloth tiger, intangible cultural heritage, cultural and creative product design

1. INTRODUCTION

China has made significant decisions in recent years in terms of urban cultural tourism in order to promote the integration and development of the tourism industry and the cultural industry, advocating the protection and innovation of regional intangible cultural heritage along with the development of cultural tourism, which is also a meaningful way to promote the quality, efficiency, transformation, and upgrading of the two industries(Yudong Rongmedia, 2023).
Yudong cloth tigers are unique folk handicrafts in the Yudong region, and in November 2019, they were selected for the list of national intangible cultural heritage representative project protection units. This study takes the intangible cultural heritage of cloth tigers in Yudong District, Zhoukou City, Henan Province, as an example to explore the importance of cloth tigers in the integrated development of urban culture and tourism.

2. MATERIALS AND METHODS

The emergence and development of cloth tigers have a long history in China, from the Shang Dynasty and Zhou Dynasty to the Sui and Tang Dynasties. Tiger-related folk artwork formed a blossoming situation; cloth tiger art creations were born during this period (Li, 2019). The cloth tigers of Yudong are sold at the temple fair, and during the Yudong February temple fair, a cloth tiger stall can sell 1,000 finished products in a day. Zhang Huaixia said in an interview, "During the Spring Festival and up to the February temple fair, slightly more expensive cloth tigers can be sold for more than 100,000" (Yudong Media, 2023). The integration of culture and tourism has significantly impacted China's cultural tourism industry.
In the context of the fusion of culture and tourism development, many cities, in order to achieve the development of the local economy, use regional culture to promote the city brand and create their unique cultural brand; when tourists experience the regional culture, the cloth tiger, as a representative feature of Yudong folk crafts, it is highly decorative and is very suitable for cultural creative design as a folkloric element, and now, in order to adapt to the people's fast-paced life, the cloth tiger Now in order to adapt to people's fast-paced life, the pattern of the cloth tiger has also been modified. In order to adapt to people's fast-paced lives, the pattern of cloth tigers has been innovated to a great extent. The use of mechanized mass production has begun. However, the cloth tigers, sold as local cultural tourism products, have a single shape, such as single-headed tiger, double-headed tiger, pillow tiger, etc. Moreover, the cloth tigers are relatively large, making carrying them inconvenient.
This study's research methods include observation, interview, and questionnaire methods.

2.1. Observation Method

(He, 2017) suggested that the observation method requires the researcher to have an essential purpose and make a detailed plan. During the temple fair, observe the production artists of cloth tigers, sellers of Yudong cloth tigers, and purchasing, using the POEMS framework observation method, completing the data collation after the observation, imitating consumers, and participating in the consumption of cloth tigers' cultural and creative products.

2.2. Interview

Spradley (1979) emphasizes that interviews are more purposeful and are designed to meet the requirements of the interviewee. It was determined that the interviewees were handicraft inheritors,

Cultural and Tourism Bureau staff, and tourists, and semi-structured interviews were used.

3. RESULTS AND DISCUSSION

From the results of the study, the folk cloth tiger art in the innovation and development the challenges and difficulties encountered; cloth tigers rely solely on handmade, the process is complex and time long, so most business people will choose to machine mass production, which also led to the cloth tiger pattern tends to imitation biochemical. The innovation of the cloth tiger while retaining the aesthetics and meaning of its traditional patterns can be carried out in the following aspects:

3.1. Pay attention to cultural heritage and protect traditional patterns

Regarding cultural heritage, cloth tiger cultural design is vital in promoting. By integrating traditional patterns into modern design, the continuation and inheritance of culture are realized.
Yudong cloth tiger production in the early 1980s was purely handmade; the filler in the cloth was a tiger for the sawdust, and the tiger shape was painted directly. 2000 there was mechanization; cutting cloth could use machines, and the tiger shape was embroidered. In recent years, the filler changed to pearl cotton, so the cloth tiger felt more comfortable.

Figure 1: Evolution of Huayang cloth tigers

3.2. Innovating the beauty of patterns and enriching cultural and creative carriers

Buhuo cultural and creative design plays an active role in preserving traditional patterns. By applying traditional patterns to various products and creative ideas, they can take on a new life, and this kind of design is not only a simple copy but also through creative re-conceptualization and re-interpretation so that the traditional patterns can maintain their vitality in modern society.

For example, at the Xihuang Cultural and Creative Centre, the shop's style is designed around the cultural theme element of "Ten Thousand Surnames with the Same Roots, Roots in Yudong" and the traditional Chinese auspicious patterns and local cultural characteristics of Yudong are integrated into the five senses of the tiger, with the "Scholar Tiger," which symbolizes that heaven, earth, and man are the same, and the "Scholar Tiger," which symbolizes that heaven, earth, and man are the same. There are the "Scholar Tiger," which symbolizes the harmony between heaven and earth; the "Taoist Tiger," the "Fortune Tiger," the "Son-Sending Tiger," which represents the prosperity of children and grandchildren, and the "Tiger," which represents the repelling of calamities and evil spirits. The "Peace Tiger" represents repelling disasters and evil spirits, and the "Kang Le Tiger" represents health and happiness. There are many innovations in this tigress, and it is impossible to reflect the characteristics of the traditional Yudong tigress in the cultural and creative products.

Figure 2: Huayang Cloth Tiger Cultural and Creative Products

Located in Zhengzhou, Henan Province, "only Henan Theatre Fantasy City," in the non-heritage exhibition hall will Yudong cloth tigers into more creative cultural and creative products in the design of the tigers to retain the appearance tigers, remove the complexity of the five senses, but from the appearance of the tigers can also be distinguished from the budding.

Figure 3: Huayang cloth tiger shape cultural and creative products

4. CONCLUSION

The cloth tiger's cultural and creative design expresses cultural innovation. By integrating the elements of cloth tigers into daily necessities, artworks, and other fields, we witness the collision of tradition and modernity and feel the beauty of cultural inheritance and innovation. Cultural and creative design not only brings the cloth tiger back into people's lives but also provides an opportunity for the younger generation to reacquaint themselves with tradition and promotes the cultivation of cultural confidence.

Buhu Tiger's cultural and creative design is also facing some challenges. How to keep the traditional heritage in innovation and inject the cultural weight behind commercialization needs our in-depth thinking and efforts to explore. Therefore, the creative design of the cloth tiger is a combination of inheritance and innovation, which not only reflects the rich cultural connotation of China but also adapts to the needs of modern society. In the future, we should continue to explore how to find a balance between tradition and modernity in cultural and creative design and how to make the unique element of cloth tigers inherited and developed globally.

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RESEARCH ON THE APPLICATION OF ILLUSTRATION VISUAL ELEMENTS IN CHINESE FOOD PACKAGING DESIGNS

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Abstract

With the continuous development of the economy, people's material standard of living is also improving. Consumers' requirements for commodities are also getting higher and higher, and consumers not only pay attention to the practicality of commodities, but also pay more and more attention to the external image of commodities when they are shopping for commodities. In modern packaging design, the application of illustration is becoming more and more widespread, especially in food packaging design, the use of illustration of the diversity of styles, enriching the external form of food packaging, not only can be a good publicity for the product, but also to give the product its own sense of art, from the point of view of aesthetics to the consumer is a very strong attraction to enhance the consumer's desire to buy, and enhance the competitiveness of the market. The application of illustration in food packaging is the unity of function and form, as well as the organic combination of business and art (Hua,Jia,2019) The purpose of this paper is to start from the development status quo of illustration design, summarize the application forms of illustration in food packaging, and explore the application of visual elements of illustration in the design of Chinese food packaging through a combination of theory and actual case study, and adopting a qualitative research method according to the consumer's consumption habits and aesthetic characteristics. Chinese food packaging design. From the analysis, it can be seen that the advantages and functions brought by illustration in Chinese food packaging design can enhance the sales value and brand effect of commodities.

Keywords : Food; Package design;Illustration; Market; Consumer analysis

1. INTRODUCION

Excellent food packaging can promote the consumer's desire to buy, while conveying the product concept and product culture will also stimulate their purchasing behavior. There is also a mutual influence between illustration in packaging design and consumer psychology and behavior. As a form of artistic expression, illustration is now widely used in business, and at the same time, the commercial benefits brought by illustration are clearly visible (Tan,2019). The intimacy as well as the deep cultural value unique to illustration is not found in other art forms and expressions. This is precisely as a kind of personalized symbol between consumers and commodities, which will further sublimate the product image while enhancing the cultural connotation of the commodity packaging design and improving the

value of the product. Illustration is one of the most important forms of visual communication at present, and is widely used in food packaging design. The purpose of illustration is to more fully express the needs of the commodity, to increase the consumer's sense of definition of the painting, and to convey the idea of the commodity to the consumer. A good food package must have a good illustration, illustration not only reflects the needs of the commodity perfectly, but also makes it more artistic value (Ye, 2022). And as a carrier of food, food packaging is an important factor in the competition of food commodities, an excellent packaging design can largely promote consumers' desire to buy and increase the added value of the product, thus increasing the sales of the product.

2. RESEARCH OBJECTIVE

The aesthetics of food packaging play a crucial role in engaging consumers. By understanding what kind of illustrations resonate with Chinese consumers, companies can tailor their designs to the needs of their target market, thereby increasing sales and brand loyalty (Li, 2020). As Chinese food products become increasingly popular around the world, understanding illustrative design can help make products more universally appealing without sacrificing their inherent cultural values. However, the Chinese market, like all markets, evolves over time. Research can help designers keep up with modern trends while finding innovative ways to combine the traditional with the modern in illustration. Understanding the cognitive impact of certain illustrations can provide insight into how consumers perceive and remember products (Mi, 2020). For example, research may find that certain colors or symbols evoke feelings of trust, hunger, or nostalgia. In the field of food packaging, illustration is an important bridge between products and consumers, carrying cultural, aesthetic, and brand messages. Studying illustration in Chinese food packaging design not only enhances the visual appeal of the product, but also ensures that the design communicates effectively and resonates deeply with the target audience. As the Chinese food market grows both domestically and globally, this type of research is invaluable for brands aiming to build memorable and trustworthy brand images (Zhang, 2021).

3. RESULTS AND DISCUSSION

Qualitative research refers to art design research through specific directions and objectives, and the development of qualitative research has gone through the process of successively experiencing from nothing to something and from qualitative to quantitative. Among them, some scholars believe that qualitative research is to better meet the social needs and market demands (Huang, 2012), and some researchers believe that qualitative research is to better explore the inner laws and aesthetic principles of art design (Li, 2019). In this paper, we will delve into the nuances, meanings and perceptions of illustration in Chinese food packaging design through qualitative research methods. Through semi-structured interviews, packaging designers of Chinese food packaging design; marketing professionals in the Chinese food industry; and consumers of Chinese food are targeted to collect their perceptions and interpretations of illustration. Meanwhile, through data collection and organization, a series of Chinese food packaging designs from different periods and regions will be collected, which will be analyzed to determine their patterns, styles, techniques and themes. Fieldwork will also be conducted, visiting supermarkets and grocery stores in China. Observations will be made on the prominence, placement and design of illustrated packaging. Thematic analysis will be used. Interview transcripts, visual analysis notes and field observation notes will be coded and themes will be identified. The analysis will attempt to understand the meaning, significance and trends associated with illustrations in packaging design.

Figure 1: China Supermarket Food Shelves

4. CONCLUSION

Illustration is a powerful tool for brands to stand out in a competitive marketplace. From the minimalist to the complex, the diversity of illustration styles allows brands to establish a unique visual identity, cater to different market segments and evoke specific emotional responses. Many packaging designs show active participation in modern and global aesthetic trends. This reflects China's status as a world power and its openness to international influences, showing a delicate balance between tradition and modernity. MARKET DIFFERENTIATION: Illustration is a powerful tool for brands to stand out in a competitive marketplace. From the minimalist to the complex, the diversity of illustration styles allows brands to establish a unique visual identity, cater to different market segments and evoke specific emotional responses. Many package designs go beyond mere aesthetics to fulfill an educational role. For example, illustrations depicting the origin story of an ingredient or traditional production methods can inform and enrich the consumer experience. As societal norms and values change, the narratives presented in package illustrations also evolve. Contemporary designs are more inclusive, reflecting a variety of cuisines from different regions and sometimes breaking down traditional gender and social roles. As the Chinese market continues to evolve, the role of illustration in food packaging design will only become more complex. Future research may focus on the evolving role of digital technology in packaging, the impact of sustainability issues on design practice, or delve into the psychology of consumer interaction with products in the Chinese context. This research emphasizes the important role that design plays not only in marketing, but also in cultural preservation, education and shaping social narratives. In a rapidly globalizing world, where products often transcend national boundaries, understanding the nuances of this localized design is critical for global companies looking to succeed in different markets.

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BEE ADVENTURE: AN AR ENGLISH GRAMMAR GAME FOR PRIMARY SCHOOL STUDENTS

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Abstract

Teaching and learning in schools with traditional methods may lead to an uninteresting learning environment for the students, especially at the elementary level. This affected the motivation of the students to study. Game-based Learning (GBL) has proven its effectiveness in assisting students in learning while having fun. This research was developed in collaboration with an English teacher and students from Sekolah Kebangsaan Marian Convent (SKMC) students. The school has a problem with low passing rates in English subjects, especially building sentences with correct grammar. This research aims to create a serious game to assist students in SKMC to learn English using Augmented Reality (AR) technology. Based on previous research, AR may help in boosting the learning experience and make the learning activities more interesting and fun. The objectives of this research are to investigate the problems in learning English among the students in SKMC, develop a game to assist learning activities in the classroom, and evaluate the effectiveness of the developed game among the students in SKMC. The game used adventure and exploration as the gameplay genre. It lets the students explore one place to another in finding the quest of constructing English sentences with the correct grammar. A bee was created as the avatar representing the player during the quest. Each quest uses AR technology to get the mission. Students use a tablet to play the game. The activities help increase the student's motivation to play and learn. This research used a mixed method of qualitative and quantitative. Testing will be carried out on the targeted students in SKMC.

Keywords: primary school, English, game-based learning, serious game, augmented reality

1. INTRODUCTION

Living in the technology era, everything in life has been associated with technology since the day we were born. The use of technology in education is widely implemented to deliver knowledge efficiently and effectively. A lot of research shows how better use of technology, such as augmented reality can be a big help in increasing the interest of elementary school students in learning [1]. This can be applied to all kinds of subjects. Why English? The English language has been widely used in Malaysia. Malaysia's government has declared English as the second language [2]. therefore, this has made English subjects very important to be taught at an early age. Hence, this project may help students have a better learning experience in and out of the classroom. Not just that, but the use of AR started to enter the education

world, and it has become a well-known topic [3]. The reason for this is increased student achievement and self-confidence [3].

1.1. Problem Statements

- Low passing rate in English subjects among the SKMC students.
- Students have a hard time building sentences with correct grammar.

1.2. Research Objectives

- To investigate the problems in learning English among the students in SKMC.
- To develop a serious game to assist learning activities in the classroom.
- To evaluate the effectiveness of the developed game among the students in SKMC.

1.3. Significance of the study

- To improve the learning experience.
- To enhance the classroom activities and ambiance.
- To assist teachers during the teaching and learning process.

2. MATERIALS AND METHODS

The research uses mix of quantitative and qualitative methods. Interviews and questionnaires are used for data collection before and after development. SKMC is the target implementation hub to test the effectiveness of the game. English teachers were interviewed to identify the problem before developing the game. The ADDIE model is used as the research methodology during the research development process. Additionally, the ADDIE model is also known to be a helpful tool to improve the learning process [4]. It is also known that the ADDIE model can provide a systematic phase that can help developers initiate and develop a good project [4].

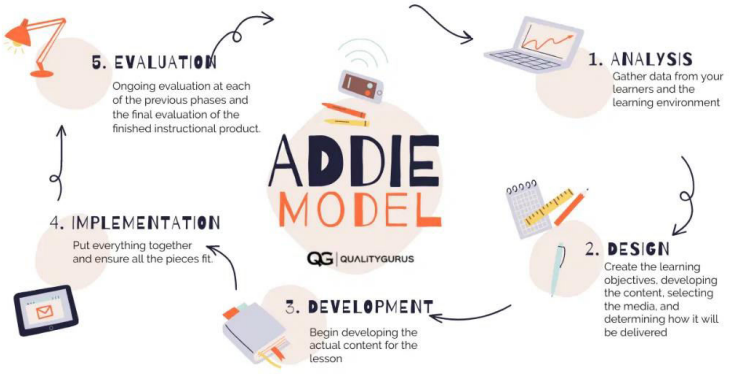

Figure 1: ADDIE Model from qualitygurus.com

2.1. Development Process

The AR game was developed using Unity 3D as the game engine. The game is a 3D mobile game. Characters and assets for the game were developed using Blender. In Figure 2, the screenshot shows the game development environment in Unity 3D.

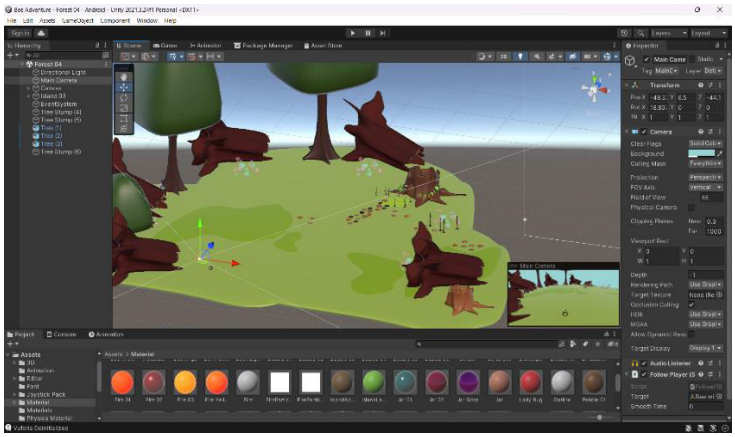

Figure 2: Creating Gameplay with Unity 3D.

2.2. How to Access the Application

Since this application is specially designed for elementary school students, it will be distributed via an educational book, and any student who wants to use it to review their studies will receive a copy of the instructional book.

Figure 3: The book cover page.

The application flow was created as simply as possible for it to be easy to use for the student. The application flow is as below:

i. Get the application from the QR given inside the book,
ii. Download the application,
iii. Finally, you can start playing/ studying using the game application.

Figure 4: The application main menu.

3. RESULTS AND DISCUSSION

3.1. Result of Interview with SKMC Headmistress

During a preliminary interview with the SKMC Headmistress the English teacher, it was found that students at SKMC have problems constructing English sentences with the correct grammar, even the basic sentences. This led to the low passing rate in the English subject at SKMC. Therefore, a technology solution has been requested to assist in solving the problem and improve the learning activities in the classroom. As a result, a discussion on using augmented reality and game-based learning was proposed to improve the English subject teaching and learning process at SKMC. AR educational methods have become a trend, especially after the COVID-19 outbreak [5]. The decision is made due to the six advantages identified in AR that might help the learning process:

i. increase achievement,
ii. enhance motivation,
iii. develop positive attitudes and behaviours',
iv. enhance social skills,
v. fun learning environment [6].

3.2. Testing with SKMC students

An official test with the SKMC students will be carried out in the second half of 2023. Therefore, the effectiveness of the game is postponed until the end of the testing period.

4. CONCLUSION

This game has great potential to be used as a tool to assist English teachers in SKMC to enhance the learning environment in the classroom. It is hoped that the game can continue to develop as a fully functional tool for the school.

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EXPLORING AUGMENTED REALITY TO PRESERVE HERITAGE HOUSES OF MALAYSIA

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Abstract

Unique structural designs can be seen throughout Malaysian heritage houses. The Malaysian Heritage Houses were the focus of this study since they had unique architectural styles. Malaysia has 14 states and each state has a distinctive traditional house design. The main goal of this study is to evaluate the effectiveness of additional realities that can nurture Malaysian society, so as not to forget the origins of traditional Malaysian houses. This is crucial since many historic houses are in danger of disappearing owing to contemporary development, and it is necessary to inform the public about these priceless cultural treasures, especially the younger generation. By giving users a virtual tour of historical homes, an augmented reality application hopes to transport users back in time. Younger generations can learn about the cultural value and historical context associated with this architectural marvel through this interactive digital experience. To accomplish this, the researchers created an augmented reality (AR) application utilising the Unity 3D game engine. With the help of this application, users may interact and experience traditional houses virtually just as if they were in the actual thing. A booklet that provides further context and details about the historic houses is also included with the application. Using 3D modelling software called Blender, the researchers could properly recreate the architectural elements and textures of the traditional dwellings in the virtual setting. The study uses a quantitative approach in terms of research methods. The young generation of UniKL (Universiti Kuala Lumpur) students will assess the efficiency of the AR application. To determine how successfully the AR technology adds to the preservation and understanding of traditional houses, this evaluation will probably involve collecting data through surveys, user comments, and potentially other metrics.

Keywords: Augmented Reality, Young generation, Malaysian traditional house, cultural heritage preservation

1. INTRODUCTION

Recently, cultural heritage conservation has been a global priority. Heritage houses are important architectural, cultural, and cultural symbols of a nation. Many heritage houses in Malaysia are threatened by urbanization, neglect, and natural degradation. Thus, innovative methods are needed to preserve and enhance these irreplaceable treasures for future generations. This concept research examines how AR could preserve Malaysia's heritage dwellings. Augmented reality improves perception and engagement by overlaying digital information in the real world. AR creates immersive, past-present experiences that provide visitors with new and exciting ways to enjoy cultural assets. Recently, AR has been successful in tourism, education, and cultural preservation. Few studies have examined AR's protection of Malaysia's heritage houses. This project seeks to address this research gap by examining the feasibility, challenges, and potential benefits of integrating AR technology into the conservation efforts of Malaysian heritage houses [1]. It is also an architectural and cultural heritage that exists in Malaysia, and it is important to maintain it today. Traditional Malay house architecture serves as a visual representation of the religious and cultural beliefs of the community's ancestors, as well as their religious and cultural practices and beliefs [2]. This research will also look at design principles and best practices for creating effective mixed reality experiences. It will also give the designer the ability to use his imagination to build the desired shape by using this technology [3]. The project is still ongoing and the testing phase is expected to be done in January 2024.

1.1 PROBLEM STATEMENT

The problem statement of this project is Malaysian traditional houses that are becoming extinct. Traditional Malaysian houses are disappearing due to urbanization and urban modernization where typical traditional Malay houses with original materials and architectural style can hardly be seen [4].

1.2 RESEARCH OBJECTIVES

- Investigate how AR technology might help younger generations recognize Malaysia's traditional houses.
- Develop augmented reality apps to educate future generations on the decline of traditional Malaysian houses.
- Evaluate the impact of augmented reality on fostering the new generation while preserving traditional Malaysian dwellings.

1.3 SIGNIFICANT OF STUDY

- To educate Malaysian youth.
- To prevent young Malaysians from losing knowledge about traditional dwellings.

2. MATERIALS AND METHODS

In terms of research methodologies, this study applies quantitative methods. The ability of an augmented reality application will be evaluated by UniKL (University of Kuala Lumpur) students. The study examines historical home maintenance and tourism in Malaysia using the ADDIE approach (Analysis, Design, Development, Implementation, and Evaluation). The ADDIE model is a well-known framework of instructional design that has been successfully used in a variety of fields, including education and training [5]. This application tool employs the idea of expanded reality as a teaching tool. A multitude of programmers are used by the application, such as Adobe Illustrator, C#, Unity 3D, Blender, and Vuforia. The steps involved in content development are depicted in Figure 1.

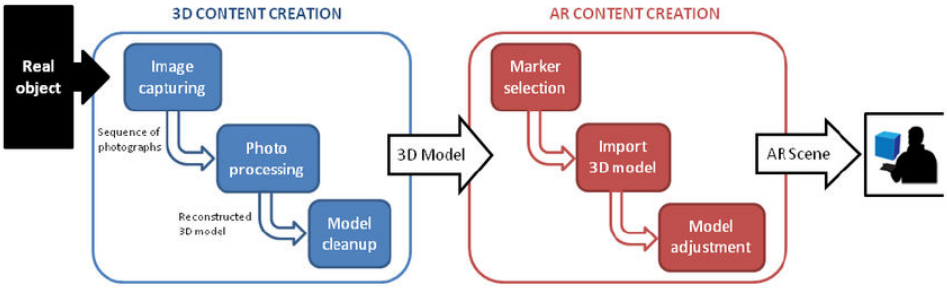

Figure 1: Process involved in creating content for AR.[6]

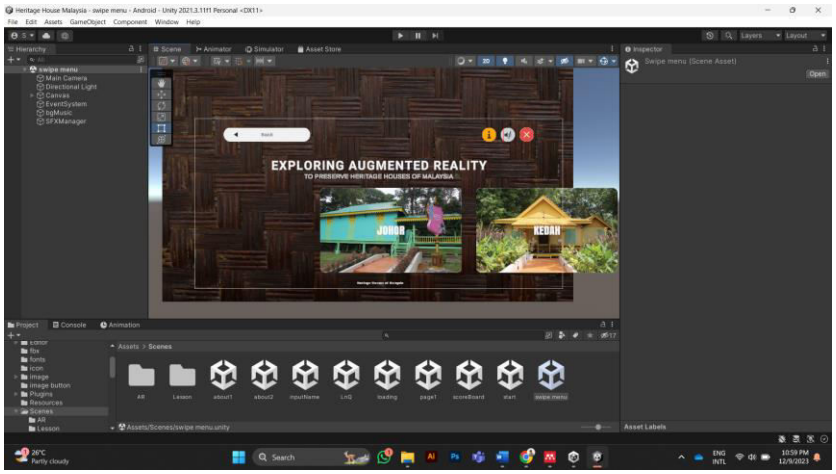

Figure 2: Process of building the AR application.

3. RESULTS AND DISCUSSION

As expected in "Exploring Augmented Reality to Preserve Malaysian Heritage Houses," the results show the potential of AR technology in heritage preservation. This study developing and implementing AR applications aims to improve user experience, raise cultural awareness, and preserve Malaysia's rich architectural history. The conversation stressed the value of AR for heritage education and preservation, as it bridges the past and present, helping people recognize Malaysia's historic homes. UniKL students will take an official test in the second half of 2023. Thus, the product's effectiveness is postponed until the testing period ends.

4. CONCLUSION

In conclusion, the project explores the potential for expanded reality in preserving Malaysian heritage houses. It found that AR can enrich user experiences, promote cultural appreciation, and protect architectural and historical values by combining the virtual and real worlds. By paying attention to technical, cultural, and ethical factors, AR can play an important role in preserving Malaysia's cultural heritage for generations to come. It is believed that augmented reality will be widely used in all fields in the future.

ACKNOWLEDGEMENT

Thank you to UniKL MIIT (Universiti Kuala Lumpur Malaysian Institute of Information Technology) for funding this project to participate in GDIID2023. Last but not least, the deepest appreciation to GDIID2023 for giving this project an opportunity to participate in the event.

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INTERACTIVE GAME-BASED THERAPY FOR OBSESSIVE COMPULSIVE DISORDER (OCD) TO HELP CALM THEIR ANXIETY

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Abstract

In the era of the Fourth Industrial Revolution (IR 4.0), we are varying the way we are communicating and self-entertaining especially after the pandemic of the Covid. Recent intervention game therapy with applicable CBT or Exposure Response Prevention (ERP) practical, which is an effective treatment, especially for people with OCD in the industry game-based technology. According to the studies World Health Organisation's statistical studies, 2%-3% of the population suffers from OCD. People with OCD tend to distress themselves or affect the point of the disorder. However, there are 5 main OCD classified with contamination, intrusive thoughts, checking and hoarding that result in engaging in unpleasant repetitive ritualistic habits to reduce their anxiety. As refer to (Siriaraya, et al., 2021), there is lack of knowledge in game design with therapy content combined. To provide users an engaging gamification with cognitive or working memory training tasks alter behaviour. Therefore, we tend to build game-based content with Cognitive Behavioural Therapy (CBT) practical that relates to their mental well-being and exposure response prevention. Moreover, this study uses the Agile methodology, which is using sprints in-game concept, design, development, coding, testing, and maintenance according to the game development that has been produced. Moreover, this methodology indicate by its iterative and adaptable approach to software development, can seamlessly extend its principles to game development. Then, Agile encompass collaboration, adaptability and a focus on user satisfaction. Here, we present a concise overview of how Agile principles applied int the game context of game development.

Keywords: Obsession Compulsive Disorder (OCD), Cognitive Behavioural Therapy, game therapy, Agile Methodology.

1. INTRODUCTION

Obsessive Compulsive Disorder (OCD) is an anxiety disorder described as having intrusive and unwanted continuous thoughts which lead to compulsive acts and repetitive extreme habits which can impact daily life and be time-consuming. Recent intervention game therapy with applicable CBT or Exposure Response Prevention (ERP) practical, which is an effective treatment, especially for people with OCD in

the industry game-based technology. Therefore, we tend to build game-based content with Cognitive Behavioural Therapy (CBT) practical that relates to their mental well-being and exposure response prevention. The statistic mental wellness increasing globally and inclusively in Malaysia. In addition, it is inevitable that the influence of technology with digital interventions and habits will enhance our mental and physical well-being. Nowadays, the mental health game is a popular update in society, enticing them to utilise these gamification platforms. However, between game design and therapy versions of these serious games, there is little knowledge on how to integrate the elements of games into a psychoeducational treatment component. (Anastasiadis et al., 2018)

However, digital games give benefits potential in the scope of mental health increasing beyond the assignation of mental health involvement. It's important to note that not all games will be helpful for people with OCD, and it's essential to work with a mental health professional to develop a personalized treatment plan. Therefore, it can be a tool to help reduce anxiety and a coping mechanism for their mental health. (Mandryk et al., 2017). The aim of the project is to improve mental health therapy through a digital therapy game specifically for people with OCD in an entertaining and interesting way. For example, cognitive behavioural therapy CBT is an effective method that can improve an individual's mental and physical well-being. (Veale, 2007)

Interventions Therapy	Strength	Weakness
1. The Guardians: Unite the Realms	The adaptation real-world habits in gameplay	Do not have narrator for the storyline to voice the story gameplay
2. MindLight	Deliver positive impact on the environment which associated through easing observance and mindfulness and overcome their fear with darkness.	Using neurology as the game controller in the game perspective
3. Open Source Based Physical Therapy Games for Parkinson Patient	Patient can immerse in the game intervention and make therapy fun to do for the treatment.	Game User Interface need some improvement to match target audience.

Figure 1: Comparison Findings

2. MATERIALS AND METHODS

Based on this study, the agile methodology, which many experienced developers use in the development of their game projects, was chosen for this development. Agile methodology is an iterative, constant and progressive approach to software implementation that emphasises flexibility, collaboration and continuous improvement. The requirement material for this research requires a PC or laptop to use this application. This research is developed in the Unity application for development. All materials and methods that have been used in the work must be stated clearly and subtitles should be used when necessary.

2.1. Project Agile Methodology

In the modern game development mostly, developers use Agile methodology. Currently, the building of game is remarkable multitask contains with design, audio, gameplay, artificial intelligence control systems, collaborate with discipline mission which increase complexity and difficult an individual can imagine. Therefore, a methodology needed to be use in this complex development toward this expertise software engineering in the filed course of games (Rula Al-Azawi). The chosen methodology for this development is AGILE includes requirements, design, development, testing, deployment, review. It is known as a lightweight method than the other technique methodology.

3. RESULTS AND DISCUSSION

3.1. Data Survey Questionaire

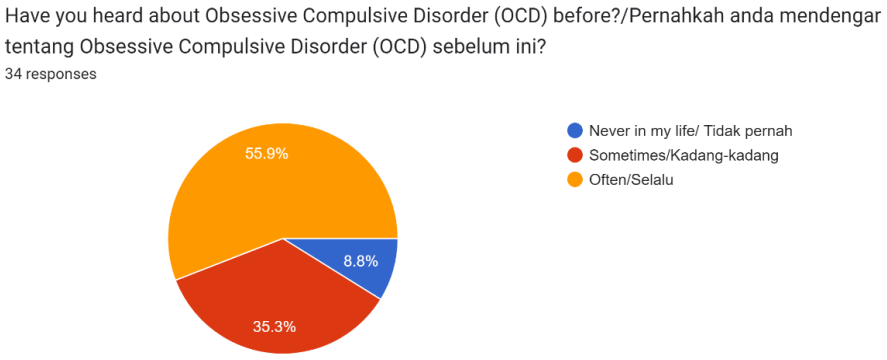

Figure 2: Respondent's Knowledge On Obsessive Compulsive Disorder (OCD)

3.2. Summary Data Survey

A survey form data collected through online about Obsessive Compulsive Disorder (OCD).This shows 55.9% often heard about OCD AND 35.3% sometimes know this mental illness. Moreover, 8.8% never heard about OCD. As a result, many people aware of this mental illness.

4. CONCLUSION

To summarise, the development of effective game therapy to support people with OCD also requires an adaptation of accurate research, analysis of information and technique that produces a psychoeducational therapy game through their rehabilitation treatment in an interesting way and requires full engagement in this game-based platform. This project can contribute to the support of the society and especially OCD fighters. I am grateful for the opportunity to do this final project and hope that it will be a successful project as I have received all the knowledge from respectful people.

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BREAST CANCER PREDICTION USING MACHINE LEARNING

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Abstract

Breast cancer is a widely occurring health issue among women worldwide, and early detection is vital for increasing the chances of successful treatment. The disease presents in two distinct forms: benign and malignant. This study is intended to develop a prediction system for breast cancer using a Random Forest algorithm. Based on the symptoms input, the prediction recognizes the malignant or benign cancer type. Random forest algorithm uses a decision tree to predict whether a patient has malignant or benign cancer. This study uses a set of secondary datasets from the Wisconsin Breast Cancer dataset as the training and testing data. The training dataset is used to train the algorithm in decision tree form, and the trained algorithm is used to predict the type of breast cancer of a patient based on the criteria needed by the system. During the process of running the dataset through the decision tree algorithm, overfitting was detected. To address this issue, the dataset was then resampled using bootstrapping, thus enabling the implementation of the Random Forest algorithm. This prediction system demonstrates an accuracy rate of 91% in the prediction of breast cancer, and although it may not match the results achieved by other researchers, it still offers satisfactory performance. The system has also been evaluated by an expert (medical professor) from UniSZA University Hospital, resulting in a good review.

Keywords: breast cancer, random forest, decision tree, benign, malignant

1. INTRODUCTION

Breast cancer is a global health concern, becoming the most prevalent malignancy among women worldwide. Recent data from 2020 reveal that it has surpassed lung cancer as the leading cancer in the world [1]. Early and accurate diagnosis is crucial for successful treatment and reducing mortality risk. Various methods like clinical breast tests, mammograms, ultrasound, MRI, blood tests, breast biopsy, and molecular breast imaging aids have been applied in detecting breast cancer [2]. Early detection significantly improves survival rates, with a 99% 5-year relative survival rate when cancer is localized. This proposal aims to use the Random Forest, a supervised machine learning algorithm, to predict breast cancer risk, analyzing data to identify individuals at risk of developing the disease.

This study is motivated by the increasing trend of breast cancer among the Malaysian women. Recently, breast cancer is a leading global cause of cancer-related deaths. Early diagnosis is vital but can be time-consuming and subject to pathologist disagreements. Moreover, low awareness in medicine and psychology describes minimal consciousness or near-vegetative state in patients. In Malaysia, breast

cancer incidence steadily rises from age 30 to a peak at 50-59. Most critical cases occur between ages 40-60. Approximately 50% of breast cancer deaths (1,299) can be prevented with early detection and optimal treatment access, indicating insufficient community awareness, as many only recognize the disease at its critical stage. In 2020, 2.3 million women worldwide received breast cancer diagnoses, resulting in 685,000 deaths [2]. By year-end, 7.8 million women diagnosed in the previous five years made it the most widespread cancer. Without intervention, breast cancer diagnoses will continue to rise. Therefore, this study proposes the development of an expert system that has the ability to assist in the enhancement of the cancer prediction accuracy. The study aims to investigate breast cancer symptom criteria, develop a diagnosis system using the random forest method, and evaluate it through expert-based assessment.The rest of this study is arranged as follows: section 2 discusses the materials and method, section 3 details out the results and discussion, and the last section summarizes the main points about the article.

2. MATERIALS AND METHODS

In this study, the Random Forest method is applied as the main algorithm to predict the existence of breast cancer. The flowchart in Figure 1 shows the visual representation of the framework of breast cancer type prediction, including the training based on the data set. The framework scrutinizes the system designed to predict breast cancer using the Breast Cancer Wisconsin (Diagnostic) Dataset, emphasizing the implementation of decision trees and bagging sampling for improved accuracy. The first step in the system's operation is data preprocessing. To prevent overfitting and ensure that each decision tree in the ensemble uses unique data, a bagging sampling method, specifically the bootstrap technique, is employed. This approach involves random resampling of the original dataset to create multiple modified datasets. Each decision tree will be trained on one of these modified datasets to minimize the chances of using the same data for every decision tree, thus reducing overfitting [3]–[5].

The heart of this system lies in creating decision trees, a versatile tool in machine learning. The entropy information gain formula is utilized to construct these decision trees. Entropy measures the impurity level in a dataset, and information gain aims to maximize the reduction of this impurity. By using this formula, the system ensures that each node in the decision tree splits the data in a way that maximizes information gain, leading to more accurate predictions. With decision trees constructed, the system trains them using the modified datasets. Each decision tree is provided with its unique dataset, thereby ensuring diversity and reducing the risk of overfitting. The training phase involves recursively splitting the data at each node of the decision tree based on specific features until a prediction is reached. The predictions are binary, classifying breast tumors as malignant (1) or benign (0) [3]–[5].

After the decision trees have been trained, the next step involves combining their predictions. The system adopts a voting mechanism to determine the final prediction. If more decision trees predict malignancy (1), the final result will be classified as malignant cancer. Conversely, if most decision trees predict benignity (0), the final diagnosis will be benign cancer. This ensemble approach enhances the system's predictive power by leveraging the wisdom of multiple decision trees. In order to predict a new patient, the user needs to enter all the input needed. After that, the system process the data to predict whether the cancer is malignant or benign, and the cancer type is displayed [3]–[5].

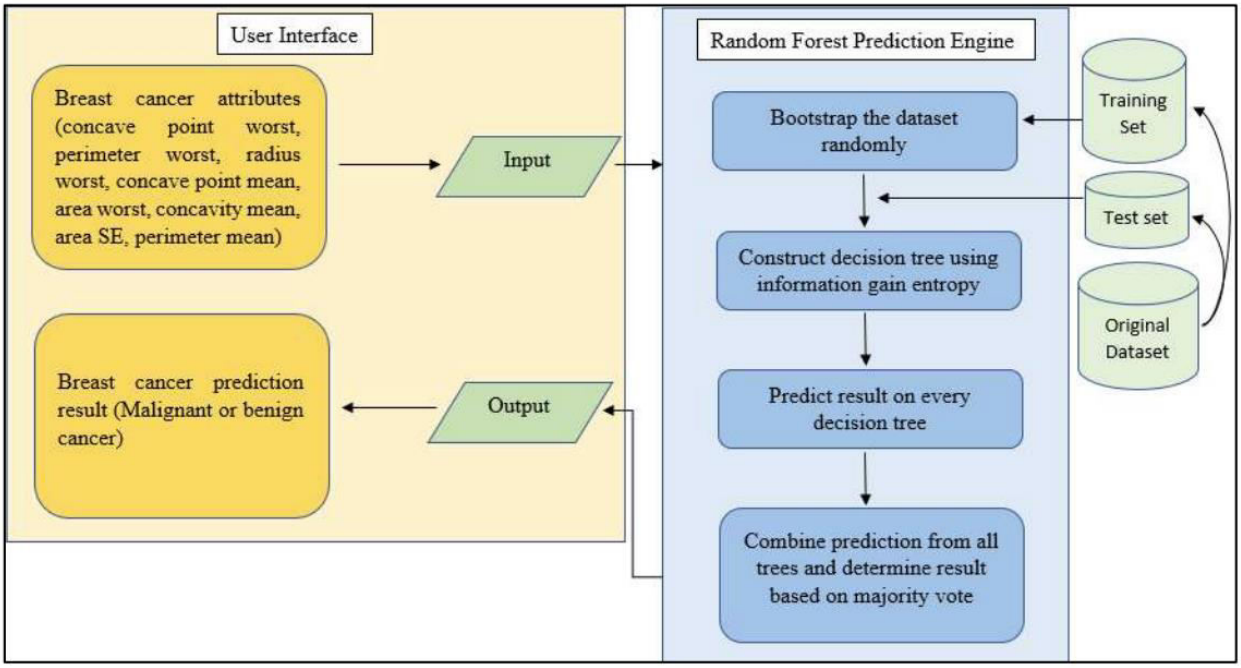

Figure 1: Breast cancer prediction system framework

3. RESULTS AND DISCUSSION

The outcome of this project is presented in a user interface form. The user interface, as well as the algorithm engine, were developed by using Python programming language. In the user interface (refer to Figure 2), the user needs to input eight attributes of breast cancer, which are the concave point worst, perimeter worst, radius worst, concave point mean, area worst, concavity mean, area standard error (SE), and perimeter mean. Then, the user needs to click Predict to get the result of the cancer. Figure 3 shows an example of prediction results.

In this project, the system undergoes evaluation by a qualified medical expert. The expert-based evaluation method is a form of assessment that relies on the insights and judgments of experienced individuals who possess knowledge in a particular domain. This evaluation specifically scrutinizes the breast cancer dataset, the attributes employed within the prediction system, and the outcomes produced, particularly concerning the classification of cancer types.

An expert evaluation of a breast cancer prediction system was performed by a professor at Sultan Mizan Zainal Abidin University (UniSZA). The system used a breast cancer dataset collected through the Fine Needle Aspiration (FNA) method, ensuring accurate attributes. The dataset was processed using the XCyt program for precise cytological analysis. The system's prediction results were verified as accurate. While the system is reliable, it is not a standalone diagnostic tool. It can complement traditional diagnostic procedures, aiding doctors in making informed decisions and enhancing screening efficiency, but it should differ from comprehensive medical evaluations.

Figure 2: User interface input

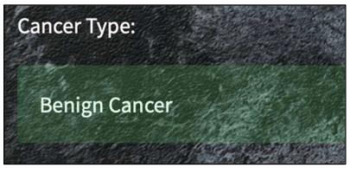

Figure 3: the breast cancer prediction output sample

4. CONCLUSION

In conclusion, this study addresses the pressing global issue of breast cancer by proposing an innovative approach using the Random Forest method for prediction. With breast cancer surpassing lung cancer as the most prevalent worldwide, early, and accurate diagnosis is imperative for improved survival rates. The research, driven by the escalating trend of breast cancer in Malaysia, focuses on developing an expert system to enhance prediction accuracy. The Random Forest algorithm, employed for its versatility and robustness, creates decision trees through entropy information gain, contributing to a powerful ensemble model. The user interface, developed in Python, facilitates the input of attributes for cancer prediction. The expert evaluation confirms the system's accuracy, positioning it as a valuable complement to traditional diagnostic methods, aiding healthcare professionals in making informed decisions and potentially enhancing screening efficiency.

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NATURAL FIBRE COMPOSITE FOR TRUCK BODY PANEL - BASALT FIBRE AND NANO SILICA

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Abstract

The truck body panel business guarantees commercial vehicles' structural security and safety in the automotive industry. The composites are manufactured utilising manual lay-up and vacuum silicon mould techniques. These composites use basalt/glass fibre as reinforcements and polyester resin as the matrix. The main objective is to assess the advantages of using nano silica to improve the impact characteristics of these materials by different concentrations of nano silica (1%, 3%, and 5% by weight). Experimental investigations were run to evaluate impact characteristics. According to the findings, adding 1% nano silica to basalt and glass fibre-reinforced composites improves their impact properties. The 1wt% Nano Silica Basalt Fiber-Reinforced Polymer Composite (1NSBFRPC) achieved the most outstanding value, with an impact strength of 21.27kJ/m2 and energy absorption of 103.21J. The promising findings of this study point to the possibility of commercial applications in the automobile sector. These improvements demonstrate their potential for greater use in commercial vehicles and make them suitable choices for truck body panel materials.

Keywords: nano silica; basalt fibre; impact properties; polyester; vacuum silicon mould

1. INTRODUCTION

Granite waste refers to the byproducts generated during granite stone extraction, cutting, and processing. These waste materials can include granite dust, slurry, and smaller leftover pieces not used for the intended applications, like countertops or tiles. Utilising granite waste presents opportunities for resource conservation, economic gain, and innovation in the construction industry. However, addressing environmental, health, and safety concerns associated with waste disposal and processing is crucial. Nano Silica, also known as nano silicon dioxide or nano SiO2, is a nanomaterial that has gained significant

attention in various industries and research fields due to its unique properties and potential applications [1]. Nano silica holds promise as a material with the potential to enhance various materials' mechanical properties, durability, and sustainability. However, notable challenges related to health and safety, dispersion, cost, and long-term performance need to be carefully addressed [2]. As research and development continue, finding effective ways to harness the benefits of nano silica while mitigating its limitations will determine its widespread adoption and success across different industries [3]. Research and development efforts are ongoing to optimise the incorporation of nano silica in various composite systems. As with any nanomaterial, ensuring proper safety during handling and processing is crucial to mitigate potential health and environmental risks associated with nano-sized particles [4] because it Nano-sized particles have the potential to be inhaled deep into the respiratory system, reaching areas such as the alveoli. This can lead to respiratory issues and long-term health effects, making respiratory protection essential during handling.

Basalt fiber composites offer numerous advantages, including high strength, durability, corrosion resistance, and thermal stability [5]. As research and development continue, addressing these challenges and optimising the production and processing of basalt fibre composites will determine their broader adoption across various industries [6]. Using composite materials for truck body panels presents both opportunities and challenges Click or tap here to enter text. While composites offer advantages such as weight reduction, corrosion resistance, and design flexibility, there are concerns related to manufacturing complexity, repair and maintenance, material costs, and recycling. Manufacturers must carefully consider these factors when deciding whether to adopt composites for truck body panels especially to find way to change the manufacturing material from synthetic or unrecycled to green material for sustainability [7]-[10].

2. MATERIALS AND METHODS

The manufacturing procedure encompassed the production of basalt and glass composites by incorporating varying weight percentages (1, 3, and 5wt.%) of nano silica as the filler substance. The materials used in this study consisted of woven glass fibre, woven basalt fibre, and a polyester resin referred to as CRYSTIC® 272E Isophthalic Polyester Resin. The resin and hardener, provided by Carbon Tech Global Sdn Bhd located in Rawang Selangor, were combined in a ratio of 100:2. Weight percentages were employed during the mixing stage to achieve uniform dispersion of the filler material within the resin. In the study by Issa, Ovitigala, and Ibrahim (2016) [11], a mechanical stirrer was employed for approximately 120 minutes to achieve a comprehensive mixing effect at a rotational speed of 400 rotations per minute (rpm). A silicon mould is employed to enclose the specimen, facilitating the amalgamation process of the composite material. Once the FRP (fibre-reinforced polymer) specimen has been sealed, it is extracted from the mould and allowed to undergo a curing process for approximately 8 hours under ambient conditions. Completing the task involves utilising a circular saw apparatus and strict adherence to the established testing protocols while employing the provided specimens.

2.1. Drop weight Low-Velocity Impact

The study followed the ASTM D7136 standard, and the Instron Dynatup 8250 Drop Weight Impact Tester was used for experimentation. The dimensions of the specimens utilised in this experiment were 50 mm x 50 mm x 5 mm. The drop tower had a hemispherical tip impactor measuring 13 mm in diameter and weighing 13.24 kg. By subjecting the weight to a vertical displacement of 0.78 m, we observed kinetic energy amounting to 101.3 J while maintaining a consistent gravitational acceleration of

approximately 9.81 m/s. To ensure precision, the researchers tested five identical specimens of each system. This experiment enables the assessment of the composite laminates' energy absorption and impact strength to be examined. The impact properties obtained from the test were as follows:
Total energy absorbed, Et, was the sum of propagation energy, Ep and initiation energy, Em as demonstrated in Eq. (2.1):

$$E_t = E_m + E_p \quad (2.1)$$

Impact strength value, σ_i in joule per meter square [J/m^2] was determined by dividing the initiation energy with the area of an impactor. Where d_i was impactor diameter with a value of 10 mm. Eq. (2.3) displays the formula of impact strength value.

$$\sigma_i = Em/(\pi d_i^2 4) \quad (2.3)$$

3. RESULTS AND DISCUSSION

The findings obtained in this study align with the mean values acquired through the analysis of five separate samples for each category of composite laminate. The present study extensively examined the impact of various characters in the subsequent subsection.

3.1 Effect of nano-silica on the impact strength of Basalt Fibre Reinforced Polymer Composites (BFRPC) and Glass Fibre Reinforced Polymer Composites (GFRPC)

After examining Figure 1, it reveals a noteworthy surge of 61.14% in impact strength. The performance enhancement is evident when comparing the initial state of 0wt% NS-BFRPC to the introduction of 1wt% Nano Silica-BFRPC. The impact strength notably escalated from 13.20 kJ/m² to 21.27 kJ/m². Subsequently, there was a marginal decline, settling at 16.22 kJ/m² and 15.12 kJ/m², respectively. The GFRPC exhibits a similar trajectory in a parallel pattern. The impact strength gradually increases from 0wt% NS to 1wt% NS, with a significant percentage rise of 15.22%. However, after the addition of 1% NS, there is a decrease in the impact strength value, reaching a final value of 11.57 kJ/m² and 9.41 kJ/m².

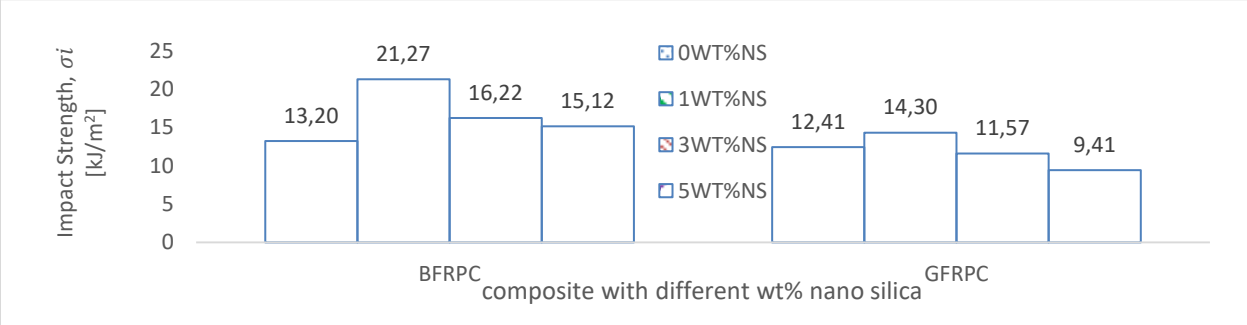

Figure 1: Impact strength vs composite with different composite with different wt% of nanosilica

3.2 Effect of nano-silica on energy absorbed of Basalt Fibre Reinforced Polymer Composites (BFRPC) and Glass Fibre Reinforced Polymer Composites (GFRPC)

Examination of Figure 2 reveals a notable upswing in energy absorption. The observed increment aligns with a 6.4% upsurge in energy absorption for BFRPC. The energy absorption values progressed from 96.76J to 103.21J. Upon the introduction of 1wt% Nano Silica (NS), the

value experiences a minor decline, eventually stabilizing at 101.02J and 96.25J. Similarly, GFRPC follows a similar pattern, with energy absorption gradually increasing as the weight percentage of nano silica elevates from 0wt% to 1wt%. This improvement culminates in a substantial 8.02% growth. Post the inclusion of 1% nano silica, there is a slight dip in the energy absorption value, resulting in measurements of 102.50J and 100.79J.

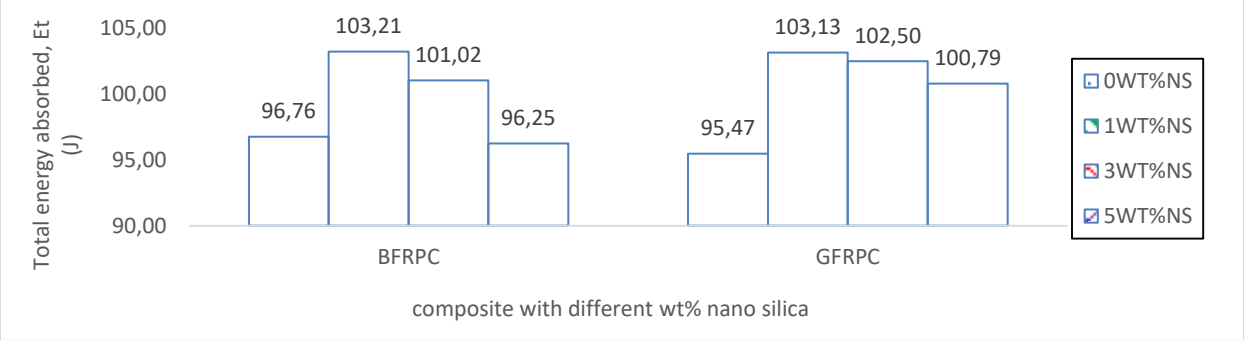

Figure 2 : Energy absorbed vs composite with different composite with different wt% of nanosilica

4. CONCLUSION

From the result of impact testing, we can conclude that the incorporation of nano silica will enhance the impact properties of the composite. The highest impact strength and energy absorption value happened at 1wt%NS at both composites. The impact strength and energy absorbed value is higher than the CTG value. Therefore, incorporating nano silica will improve the properties, and the value of basalt is higher than glass. So, it is relevant to change fibre glass to basalt fibre and using nano silica will enhance the impact strength and energy absorbed because there is a significant increment in value of strength properties when incorporating nano silica and using basalt fibre.

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INTERPOLATION OF QUASI-QUARTIC AND QUASI-QUINTIC TRIGONOMETRIC BÉZIER CURVES WITH APPLICATION ON RECONSTRUCTING THE OUTLINES ART OF ARABIC CALLIGRAPHY

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Abstract

With the advancement of technology, the mathematical method of Computer Aided Geometric Design (CAGD) application is becoming increasingly popular for obtaining curves and surfaces. CAGD is an applied mathematics subdivision concerned with algorithms for designing smooth curves and surfaces, together with efficient mathematical representation. This paper presents the application to Khat Thuluth on Arabic calligraphy. To be certain, calligraphy is difficult to create and requires extensive training and expertise. In this paper, the researcher applies two methods of Trigonometric Bézier Curves: Quasi-Quartic, and Quasi-Quintic in reconstructing on Arabic calligraphy. Based on the changes of shape parameters, the elements that influence the curve modification results have been investigated. By comparing the smoothness, precision and consistency of the resultant figure compared to the actual image, and the performance of the methods based on CPU time required to create the whole Arabic calligraphy, the two of interpolations of Quasi-Quartic, and Quasi-Quintic are examined. As the result, the best method for reconstructing the outline art of Arabic calligraphy is Quasi-Quartic Trigonometric Bézier curve with the least CPU time taken 8.453 second.

Keywords: Arabic calligraphy, Quasi-Quartic curves, Quasi-Quintic curves, trigonometric Bézier curves

1. INTRODUCTION

Advances in technology have led to the increased popularity of the mathematical method known as Computer Aided Geometric Design (CAGD) for generating curves and surfaces. CAGD, an applied mathematics discipline, focuses on algorithms for creating smooth curves and surfaces with efficient mathematical representations [1]. In this study, the researcher employs two trigonometric Bézier curves: Quasi-Quartic and Quasi-Quintic. Bézier curves offer advantages due to their ease of computation, stability at lower control point degrees, and the ability to rotate and interpret a Bézier curve through point operations. Despite the existence of newer representation algorithms, Bézier curves remain more widely utilized in comparison, as the newer methods with complex formulae are not suitable for curve construction in CAGD applications [1].

Arabic calligraphy, a splendid art form, historically involved skilled artisans manually crafting intricate letterforms. The challenge in digital redesign lies in replicating this level of precision and artistry, as highlighted in [2]. The application of CAGD in redesigning Arabic calligraphy offers numerous advantages such as precision, scalability, accessibility, and a bridge between tradition and modernity in the realm of calligraphy. This paper applies two methods of Trigonometric Bézier Curves—Quasi-Quartic [3] and Quasi-Quintic [4]—to reconstruct Arabic calligraphy. The study investigates the elements that influence curve modification outcomes by varying shape parameters. Both methods are assessed by comparing the smoothness, precision, and consistency of the resulting figures against the actual image, along with evaluating the CPU time required to create the entire Arabic calligraphy.

2. MATERIALS AND METHODS

This paper presents the design of a two-dimensional shape using the Quasi-Quartic and Quasi-Quintic Trigonometric Bézier curves method. The figures were created and visualized using Mathematica software.

2.1 Quasi-Quartic Trigonometric Bézier curves

Based on [3], for $t \in \left[0, \frac{\lambda}{2}\right]$, $b_{0,4}(t), b_{1,4}(t), b_{2,4}(t), b_{3,4}(t)$, and $b_{4,4}(t)$ are called Quasi-Quartic Trigonometric polynomial base functions with a shape parameter λ which can be defined below:

$\{b_{0,4}(t) = \left(1+\frac{\lambda}{2}\right) - (1+\lambda)2t, b_{1,4}(t) = (1+\lambda)(-\frac{3}{2} + 2\ sin\ sin\ t\ + cos\ cos\ t\ - \frac{1}{2} sin\ sin\ 2t + \frac{1}{2} cos\ cos\ 2t)\ \ b_{2,4}(t) = 2(1+\lambda)(1 - sin\ sin\ t - cos\ cos\ t + \frac{1}{2}\ \ sin\ sin\ 2t \qquad b_{3,4}(t) = (1+\lambda)(-\frac{3}{2} + sin\ sin\ t\ + 2\ cos\ cos\ t\ - \frac{1}{2}\ sin\ sin\ 2t - \frac{1}{2}\ cos\ cos\ 2t\ \ b_{4,4}(t) = \left(1+\frac{\lambda}{2}\right) - (1+\lambda)\ cos\ cos\ t\ 2t$ where $-1 \leq \lambda \leq 1.5$ (1)

The Equation of The Quasi-Quartic Trigonometric Bézier curves

For five control points P_i, ($i = 0,1, \ldots, n$), are given, $t \in \left[0, \frac{\pi}{2}\right]$, we define the curve as:

$B(t) = \sum_{i=0}^{n} \quad P_i b_{i,n}(t)$ (2)

2.2 Quasi-Quintic Trigonometric Bézier curves

Based on [4], for $t \in \left[0, \frac{\pi}{2}\right]$, the following six functions are defined as Quasi-Quintic Trigonometric blending functions

$\{b_0(t) = (1 - \lambda\ sin\ sin\ t) \qquad b_1(t) = sin\ sin\ t\ (1 - sin\ sin\ t\ )^4[5 + \lambda(1 - sin\ sin\ t\ )], \qquad b_2(t) = \frac{1}{7}(1 - sin\ sin\ t)^{\ 2}(1 - cos\ cos\ t)[74 + (94\ sin\ sin\ t\ + 17)(1 - cos\ cos\ t\ ) + 66t\ ],\ b_3(t) = \frac{1}{7}(1-)^{\ 2}(1-)[74 + (94\ cos\ cos\ t\ + 17)(1 - sin\ sin\ t\ ) + 66t\ ],\ \ b_4(t) = cos\ cos\ t\ (1 - cos\ cos\ t\ )^{\ 4}[5 + \mu(1 - cos\ cos\ t)\ ], \qquad b_5(t) = (1 - \lambda\ cos\ cos\ t),$ (3)

where λ, μ are shape parameters and $-5 \leq \lambda,\ \mu \leq 1$

The equation of the Quasi-Quintic Trigonometric Bézier curves

For the control points P_i, ($i = 0,1, \ldots . , n$), in R^2 , $r(t)$ we define the curve as

$f(u) = \sum_{i=0}^{n} \quad f_i(u)P_i , u \in [0, \frac{\pi}{2}], \lambda, \mu \in [-5,1]$

(4)

For the control points $f_i(u)$, $i = 0, 1, \ldots, n$ in R^2 are the Trigonometric basis function.

2.3 Application in Reconstruction of The Arabic Calligraphy Outline

In this paper, both methods are utilized to reproduce the outlines of the Thuluth in Arabic Calligraphy, as detailed in Table 4. The specific figure chosen was divided into 69 curves. Data points were determined according to the respective curve degrees: 5 data points for each curve set in the Quasi-Quartic method, and 6 data points for each curve set in the Quasi-Quintic method. With these defined data points, both methods were used to regenerate the outlines of this figure, displayed in Tables 2 and 3.

Table 1. Result of shape design for Quasi-Quartic Trigonometric Bézier

λ	Without control polygon	With control polygon
-1		
0.25		
1.5		

Table 2. Result of shape design for Quasi-Quintic Trigonometric Bézier

λ, μ	Without control polygon	With control polygon
-5		
-2		
1		

Tables 1 and 2 present the outcomes derived from combining 69 curves with varying shape parameters using each method. For the Quasi-Quartic curves, the parameters employed are λ = -1, 0.25, and 1.5, while the Quasi-Quintic method utilizes parameters λ, μ= -5, -2, and 1. A comprehensive side-by-side comparison of all the produced results is made against the actual figure, assessing the contours of each

curve in detail. The use of intermediate values within each parameter range effectively reproduces the precise contours of the actual figure, yielding smooth curves. Conversely, employing other parameter values leads to inconsistent curve contours, resulting in dissatisfactory images.

Table 3. CPU Time of different values of shape parameters

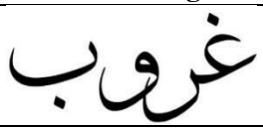
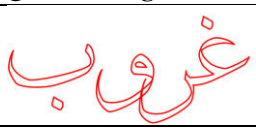
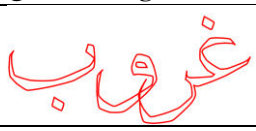
Methods	Degree	Number of control points	Number of curves	Shape Parameter	CPU Time (seconds)
Quasi-Quartic Trigonometric Bézier	4	345	69	λ = -1	5.483
				λ = 0.25	8.453
				λ = 1.5	9.734
Quasi-Quintic Trigonometric Bézier	5	414	69	λ and μ= -5	9.594
				λ and μ = -2	9.344
				λ and μ = 1	9.015

The performance of each method was assessed by analyzing the CPU time required to generate the entire figures. Table 3 presents the findings, indicating that the Quasi-Quartic method had the shortest CPU time, averaging 7.89 seconds, in contrast to the Quasi-Quintic method, which averaged 9.317 seconds.

3. RESULTS AND DISCUSSION

This paper illustrates the reconstruction of Arabic calligraphy outlines using Quasi-Quartic and Quintic Trigonometric Bézier Curves. After analyzing the resulting figures against the actual image, Table 4 presents the images that are comparable for each method to the actual image, as detailed in Tables 1 and 2.

Table 4. Comparison of outline designs with the actual image.

Actual image	Quasi-Quartic Trigonometric Bézier	Quasi-Quintic Trigonometric Bézier
		
Shape Parameter	λ = 0.25	λ and μ = -2
CPU Time (seconds)	8.453	9.344

Presented in Table 4, the comparison between the methods was made based on the accuracy in replicating the actual image through smooth contouring and the CPU performance in reconstructing the complete figure. Upon analyzing both sets of figures, it becomes evident that the Quasi-Quintic method yielded uneven curves for the entire image, unlike the Quasi-Quartic method, which generated more precise, consistent, and smoother contours. The results lead to the conclusion that the Quasi-Quartic curve stands out as the optimal method for recreating the smoothest outlines with the least CPU time.

4. CONCLUSION

Comparative studies in CAGD methods are essential for understanding the strengths and limitations of different approaches. The integration of Quasi Trigonometric Bezier curves in the redesign of Arabic calligraphy offers promising avenues for preserving the tradition, enhancing precision, and unlocking creative possibilities. Further research and exploration in this field are crucial to advance the use of CAGD methods in Arabic calligraphy redesign while respecting its cultural significance.

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A COMPARATIVE STUDY OF TRIGONOMETRIC BEZIER CURVE AND HYBRID TRIGONOMETRIC BEZIER CURVE TO THE MODEL OF SYMMETRIC ROTATION SURFACE

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Abstract

Computer-Aided Geometric Design (CAGD) is extensively utilized for ideating designs, visualizing concepts, and simulating real-world performance. This paper concentrates on the redesign of a 3-dimensional symmetrical object, specifically the shape of a decorative bottle. The design is formulated using both Trigonometric Bezier and Hybrid Trigonometric Bezier techniques, implemented with the Sweep Surface method. These methods incorporate various shape parameters, allowing for the exploration of object design based on the varied values of these parameters. The optimal solutions are determined by analysing the resultant images, aiming for designs most closely resembling the actual image while requiring minimal computational time to generate the 3-dimensional symmetric object. According to this study, the findings indicate that the Trigonometric Bezier method outperforms the Hybrid Trigonometric Bezier as the optimal approach for this purpose.

Keywords: Trigonometric Bezier, Hybrid Trigonometric Bezier, Sweep Surface

1. INTRODUCTION

In contemporary times, Computer Aided Geometric Design (CAGD) has gained widespread acceptance for exploring design concepts, visualizing ideas through animations and renderings, and simulating real-world design performance. Notably, the use of trigonometric Bezier curves with shape parameters has shown advantages in terms of continuity compared to polynomial Bezier curves [1,2]. The flexibility to modify shapes according to one's preferences is achieved through the manipulation of these shape parameters [3,4].

This study aims to conduct a comparative analysis of manipulation of the shape parameters of the Trigonometric Bezier Curve and the Hybrid Trigonometric Bezier Curve for the modelling of symmetric rotation surfaces. This extension provides increased flexibility and the ability to represent complex shapes with improved continuity. By comparing the performance of Trigonometric Bezier Curve [3] and Hybrid Trigonometric Bezier Curve [4] in the context of symmetric rotation surface modelling, this study aims to determine the optimal method based on the closest final image to an actual. The evaluation is based on criteria of the ability to generate a precise smoothness contour compared to the actual image and the least

total computation of time taken. The findings in this study are significant in contributing to the understanding of contour curve types with the optimal method defined, which is more practical to use in modelling symmetric rotation surfaces and provide valuable insights for practitioners in various fields such as industrial design, animation, and virtual reality.

2. METHODS

The methods used are the Trigonometric Bezier curves, the Hybrid Trigonometric Bezier and the Rotational Sweep Surface method. All the methods are presented in the Section 2.1 – 2.3:

2.1. The Trigonometric Bezier Curve

For two arbitrarily selected real values of λ and μ, where λ, μ∈ [-2,1], the following four functions of t (t∈[0,1]) are defined as Trigonometric Bezier basis functions with two shape parameters [3].

$$b_n(t) = \{b_0(t) = (1 - sin\frac{\pi}{2}t)^2\left(1 - \lambda sin\frac{\pi}{2}t\right) \quad b_1(t) = sin\frac{\pi}{2}t\left(1 - sin\frac{\pi}{2}t\right)\left(2 + \lambda - \lambda sin\frac{\pi}{2}t\right) \quad b_2(t) = cos\frac{\pi}{2}t\left(1 - cos\frac{\pi}{2}t\right)\left(2 + \mu - \mu cos\frac{\pi}{2}t\right) \quad b_3(t) = (1 - cos\frac{\pi}{2}t)^2\left(1 - \mu cos\frac{\pi}{2}t\right) \tag{1}$$

Given points $P_i(i = 0,1,2,3)$ in R^2 or R^3, then, the equation of the Trigonometric Bezier Curves $R(t) = \sum_{i=0}^{3} P_i b_i(t)$, where t∈ [0,1], $\lambda, \mu \in$ [-2,1] (2)

2.2. The Hybrid Trigonometric Bezier Curve

Let consider the shape parameters μ, α, ω ∈ [−1, 1] and λ ∈ [−1.5, 0.5], the following function in terms of variable t, [4]:

$$\{S_{0,2}(t) = (1 - sin\, sin\left(\frac{\pi}{2}t\right)\,[(1 - \mu sin\left(\frac{\pi}{2}t\right))e^{\omega t} + \lambda\left(1 - cos\, cos\left(\frac{\pi}{2}t\right)\right)], S_{1,2}(t) = 1 - S_{0,2}(t) - S_{2,2}(t), S_{2,2}(t) = (1 - cos\, cos\left(\frac{\pi}{2}t\right)\,[1 - \alpha cos\left(\frac{\pi}{2}t\right))e^{(1-\omega)t} - \lambda\left(1 - sin\, sin\left(\frac{\pi}{2}t\right)\right)], \tag{3}$$

is called the Hybrid Trigonometric Bernstein-like basis function of degree 2. For any integer n, where (n ≥ 3) the function $S_{i,n}(t)$ (i = 0, 1, 2, . . ., n), defined by the following recursive formula,

$$S_{i,n}(t) = (1 - t)\, S_{i,n-1}(t)\ (t) + tS_{i-1,n-1}(t) \tag{4}$$

For the given control points $P_i(i = 0,1,2,3, \ldots, n)$, the curve $\{\Pi_t\} : H(t; \mu, \alpha, \omega, \lambda) = \sum_{i=0}^{n} P_i S_{i,n}(t)$, where $0 \leq t \leq 1$.

2.3. The Sweep Surface Method

In the rotation sweep surface method [1], the two-dimensional cross-section curves are rotated at an axis that can be parallel to the x, y or z axis to construct the symmetric surface. The angle of rotation is denoted as w and the curve rotate at the axis r that is denoted as r = (r_x, r_y, r_z), then, the rotation matrix was simplified based on the axis. This rotation matrix of y-axis is shown in equation (5) and the rotation surface equation is presented in (6).

y-axis: T(w) = $[cos\ cos\ w\ \ 0\ \ \square\square\square\ sin\ w\ \ 0\ 1\ 0\ -\ sin\ sin\ w\ \ 0\ \ \square\square\square\ cos\ w\ ]$ (5)

P (t, w) = P(t). T(w) (6)

where,

P (t, w) = Surface Revolution
P(t) = Cross Section
T(w) = Matrix Revolution

3.0 IMPLEMENTATION

This paper centers on the redesign of 3-dimensional symmetrical objects, with the selected image being the decorative bottle shape created using various contour curves. Figure 1 displays the chosen decorative bottle image as the reference, which is then transformed into a symmetrical image and segmented into 17 curves. This process identified 68 data points, and based on this dataset, an example of 2-dimensional symmetrical cross-section curves is presented in Figure 2.

Figure 1. Actual mage and symmetrical actual image
Reference: https://www.notino.ie/yves-saint-laurent/manifesto-eau-de-parfum-for-women/

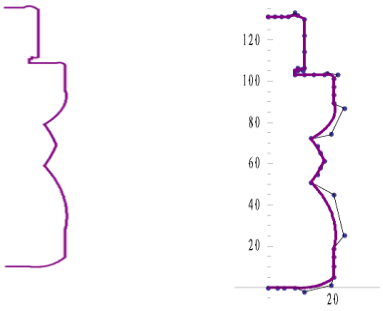


Figure 2. The 2-Dimensional symmetrical cross-section curves

3.1 The Manipulation of Shape Parameters in Designing 3-Dimesional Symmetrical Objects

In this section, from the data set defined, the cross-section of 2-dimensional contour curve was manipulated based on different value shape parameters. These cross-sections were employed with the rotational sweep surface method to generate the complete design of bottle shape. Each contour curve was evaluated by comparing it directly to the corresponding segmented curve in the actual image. The smoothest and consistent contour curves were considered as the accurate design. Subsequently, the method's performance was assessed by measuring the CPU time required to produce the complete image. The best method was determined by identifying the one that produced a design closest to the actual image with the least CPU time consumption.

Table 1. The 3-Dimensional of Trigonometric Bezier Curve

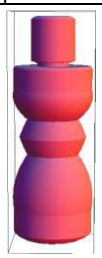
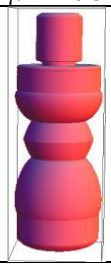
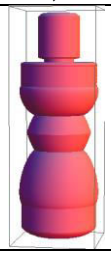
Method	**Shape Parameter**		
	Image A	**Image B**	**Image C**
	$\lambda = -1.9$, $\mu = -1.9$	$\lambda = -0.5$, $\mu = -0.5$	$\lambda = 1$, $\mu = 1$
Trigonometric Bezier			
CPU Time (second)	11.249	9.531	10.39

Table 2. The 3-Dimensional of Hybrid Trigonometric Bezier Curve

Method	**Shape Parameter**		
	Image D	**Image E**	**Image F**
	$\alpha = -0.5$, $\lambda = -1$, $\mu = -0.5$, $\omega = -0.5$	$\alpha = 0$, $\lambda = -0.5$, $\mu = 0$, $\omega = 0$	$\alpha = 1$, $\lambda = 0.5$, $\mu = 1$, $\omega = 1$
Hybrid Trigonometric Bezier			
CPU Time (second)	65.907	42.109	50.39

Tables 1 and 2 display the diverse bottle designs created by varying the shape parameters. Higher values of these parameters within each method resulted in uneven contours as the curves approached the control polygon. Conversely, lower values produced smoother images that closely resembled the actual image. The performance was evaluated based on CPU times, revealing that the Trigonometric Bezier curve generated the designs more rapidly compared to the Hybrid Trigonometric Bezier curve.

3. RESULTS AND DISCUSSION

Analyzing the results in Tables 1 and 2, it's evident that images A and D closely resembled the actual image in their final designs. Nevertheless, image D exhibited uneven contour curves compared to image A, and it required more CPU time. When comparing these two methods, it becomes clear that Trigonometric curves stand out as the optimal solution for creating decorative bottle designs with smooth contour curves and improved CPU time performance.

4. CONCLUSION

The methods discussed in this paper hold great significance as alternative approaches for creating and enhancing 2 and 3-dimensional images. Both methods are built around multiple shape parameters, providing a wide range of adjustments in the design process. They offer precision, customization, and the capability to create aesthetically pleasing results within the same dataset. Furthermore, these methods enhance the efficiency of the design and prototyping processes.

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ANALYSIS STUDY OF CONJUGATE GRADIENT METHOD IN IMAGE RESTORATION PROBLEM

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Abstract

Optimization is a mathematical model that can be found in everyday life, business, and scientific research. This aim of study is to determine the maximum and minimum of functions, which are often used in decision making. The conjugate gradient (CG) method is one of the optimization methods. The CG methods are quite famous among researchers in previous studies where it is widely used due to unconstrained problem-solving. The major characteristic of the CG method is low memory requirement and strong local and global convergence properties. CG method is widely used in various applicability in life problems. In this research, the CG method is applied to the image restoration problem in order to recover or improve the quality of a digital image that has been degraded, damaged, or corrupted. The PRP, HS and NMRI methods are compared under a strong Wolfe line search. The numerical result of the number of iterations (NOI) and CPU times are assessed by the performance of each method. The chosen CG methods also are tested for applicability in image restoration problem. The Camera, Monarch and Cat images are chosen to be compared. Each method is compared based on CPU times, relative error, and peak signal-to-noise ratio (PSNR). The PRP method gives the best result in terms of efficiency and robustness followed by NMRI and HS methods respectively. The HS method yields better results compared to PRP in image restoration problems but has slight differences while the NMRI method can only solve for cat image. As a conclusion, PRP is the best method in terms of robustness and efficiency and for application in image restoration problems.

Keywords: Optimization**,** Conjugate Gradient Method, Strong Wolfe, Convergence, Image Restoration.

1. INTRODUCTION

Optimization is a decision-making tool for determining the maximum or minimum value of a function. It can be applied in business such as the allocation of resources in logistics and investment. An optimization method has been developed to optimize difficult problems which are constrained and unconstrained problems. The unconstrained optimization problems can be solved by any iterative method. The iterative method formula is shown in equation 1.1.

$$x_{k+1} = x_k + \alpha_k d_k \tag{1.1}$$

The problem is minimized at each iteration until the next iteration function value is lesser than the current function value. The line search is used to calculate step size in the iterative method. The search direction in

the iterative method can be solved using optimization methods such as Steepest Descent (SD), Conjugate Gradient (CG), Newton and Quasi-Newton. The SD method is the simplest method, but it is not as efficient as the CG method. Newton and Quasi-Newton are quite efficient, but the formulations are difficult because the method deals with the inverse Hessian matrix. As a result, the CG method was selected as the most favorable among the researchers. The evolution of the CG method has been widely explored in the optimization field. CG method is classified into Classical, Hybrid, Spectral, Three-term and Parametric. Nowadays, CG coefficients are widely implemented in real life applications such as regression analysis [1], portfolio selection [2], robotic motion [3] and image restoration problems [4].

2. METHODOLOGY

Firstly, the field of the research is determined. This step discusses the unconstrained optimization method in solving large scale problems. This project attempts to determine the best CG method that gives a better performance that applied in image restoration problem. The chosen CG methods for this study are NMRI, PRP and HS due to their good performance to solve optimization problems. These methods are compared under Strong Wolfe line search. The numerical tests for these methods are conducted using MATLAB subroutine programming to solve the test functions in CUTE library. According to Harun et al. [5], the MATLAB software's interface and coding language are simple to use while providing excellent performance in numerical computing.

The numerical performance of these methods is assessed by comparing the number of iterations (NOI) and the time required by the CPU time to achieve the minimizer. The numerical performances of all tested methods are noted and interpreted into graphs using the Sigma plot. The comparative findings are studied and discussed in order to determine the efficiency and robustness of these methods. Finally, the CG method is implemented in image restoration and compared the performance based on CPU times, relative error, and peak signal-to-noise ratio (PSNR).

3. RESULTS AND DISCUSSION

3.1. Numerical Result

Sixteen test functions listed by Andrei [6] are used to be solved by PRP, HS and NMRI CG methods using MATLAB Subroutine programming. Hence, the numerical results based on the NOI and CPU times are illustrated by the performance profiles as in Figure 1 and Figure 2.

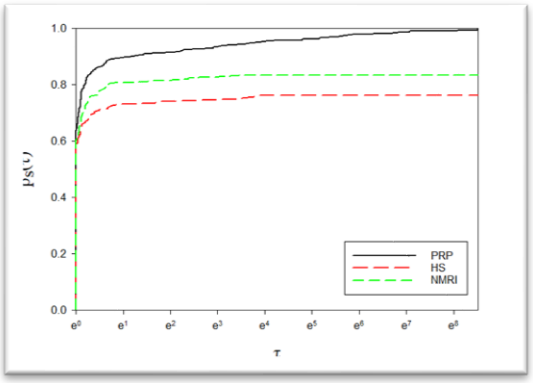


Figure 1. Performance Profile of NOI

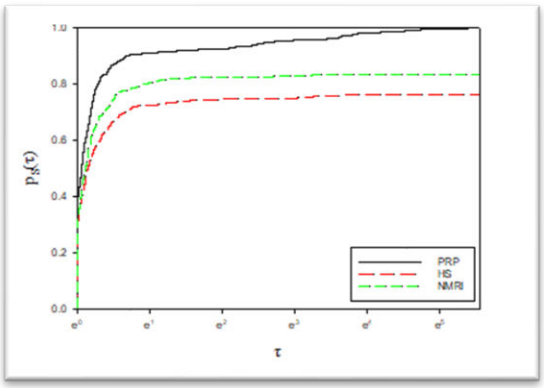


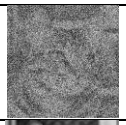
Figure 2. Performance Profile of CPU Time

Based on Figure 1, the PRP method is the most efficient cause it has the highest convergence rate followed by the NMRI and HS methods respectively. Based on the robustness of the methods, the PRP method has the highest robustness since it shows the highest number of the test functions that can be solved at the right side of the graph followed by the NMRI and HS methods. Based on both performance profiles, PRP has a 100% success rate in solving test functions. NMRI can solve 83.3% of the test functions while HS is able to solve 76.3% of the test functions. Therefore, it can be said that PRP is the most efficient and robust based on these two figures.

3.2. Application

The PRP, HS and NMRI CG methods have been applied in image restoration problems under strong Wolfe line search. A 256 x 256 cat grayscale image has been chosen for implementation. The corrupted and recovered images by 30%, 45%, 50%, 55% and 70% are shown in Table 1.

Table 1. Images corrupted by 75% salt-and-pepper noise.

Noise Degree	30%	45%	50%	55%	75%
Method					
PRP					
HS					
NMRI					

The best method yields the least CPU time, least relative error and highest PSNR. PSNR shows the quality difference between the original and reconstructed images. The higher the PSNR value, the smaller the perceptual difference between the original and reconstructed signals. The numerical results for image restoration problem are tabulated as in Table 2.

Table 2. Numerical Results based on CPU time, relative error and PSNR

Noise Degree/ Method	PRP	HS	NMRI
30%	39.1279/0.5781/28.4733	31.9115/0.5495/28.5395	66.4004/0.5349/28.8096
45%	41.1260/0.7650/26.3697	41.8699/0.7786/26.3831	73.8189/0.7191/27.0493
50%	41.5035/0.8390/25.8192	42.1101/0.8228/25.8410	71.2130/0.8006/26.5542
55%	80.3504/0.9601/25.2473	45.7456/0.9488/25.2509	26.3181/0.7939/26.5936
75%	66.1841/1.0763/25.0757	35.5821/1.0650/25.1100	35.7543/1.0773/25.0621
Average Values	53.65838/0.8437/26.19704	**39.44384**/0.83294/26.2249	54.70094/**0.78516/26.81376**

Based on Table 2, HS yields the least CPU time while NRMI produces the least CPU time and highest values of PSNR.

4. CONCLUSION

As a conclusion, PRP method is known to be the best method based on the CPU time and iteration number. Then, it is followed by NMRI and HS methods. All these methods can be implemented in image restoration problems.

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SELLERS' PREFERENCES FOR ONLINE SHOPPING PLATFORM USING FUZZY AHP

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Abstract

As e-commerce is rapidly growing and gaining vast popularity, sellers are actively selling their products through online shopping platforms. Many online platforms have emerged and become instantly popular among people in Malaysia such as TikTok, Shopee, Lazada and many more. Each platform has its own strengths and advantages to attract more customers to shop. Some criteria or factors might influence the customers' decision, which will directly impact the sellers' profit. Therefore, this study is aimed to help sellers to choose the best online shopping platform based on seven main criteria: website quality, payment methods, product attributes, delivery and guarantee, external influences, experiences, and advertisement. Each criterion has its own sub-criteria such as design, user-friendly, payment platform and a few more. Focusing on the three chosen platforms which are TikTok (A1), Shopee (A2) and Lazada (A3), three experts were chosen to express their opinion via guided interview session. The data obtained were analyzed using Fuzzy Analytical Hierarchical Process (FAHP) method that comprises four main steps. The four steps are developing pairwise comparison matrices, computing the consistency test, generating the weights, and finally ranking the alternatives. The finding shows that the website quality carries the highest weight value for the criteria, while the lowest is advertisement. For the alternatives, A1 is the best platform, followed by A2 and A3.

Keywords: Online Shopping Platform, AHP, Criteria

1. INTRODUCTION

Most people prefer online shopping platforms to purchase goods [1]. Online shopping can be defined as configuration of electronic commerce (e-commerce) that allows the customers to purchase the goods or get the service only through internet [2]. Shopping on online platforms can help customers to make comparisons, check the quality and the discount, and spend lesser time on shopping compared to that at physical stores [3]. There are many online shopping platforms available including web stores and social media. However, sellers are indecisive to identify which platforms that give the most benefits to them. Hence, this study proposes a multi-criteria decision making (MCDM) method which is Fuzzy AHP

(FAHP) to help the sellers to choose the best platform. FAHP which is a method that can solve complex problems was utilized to assess the criteria and rank the alternatives in this study.

2. MATERIALS AND METHODS

The method comprises four steps which are as follow:
STEP 1: Identify the criteria, sub-criteria, alternatives and experts.
STEP 2: Construct the questionnaire.
STEP 3: Compute the consistency test based on AHP [4].
STEP 4: Calculate the weight and rank using FAHP [5].

Any platform created should be based on many criteria, which were chosen by reviewing the literature. In choosing online shopping platforms, this study considered 7 criteria with 21 sub-criteria (Table 1). Three alternatives were chosen; TikTok (A1), Shopee (A2) and Lazada (A3). The data from three sellers who were considered as experts were collected from interview sessions and questionnaires. The sellers with a minimum of three years' experience in the online shopping platform were chosen as experts. These experts also need to have an online shop on the three alternatives chosen in order to preserve the significance of the data.

Table 1. Criteria and sub-criteria for online shopping platform.

Criteria	Sub-criteria
C1. Website Quality	C11. Design
	C12. User-friendly
C2. Payment Methods	C21. Payment Platform
	C22. Security Policy
	C23. Privacy Policy
C3. Product Attribute	C31. Quality
	C32. Price Range
	C33. Different Sellers
	C34. Campaigns and Discount
C4. Delivery and Guarantee	C41. Return Policy
	C42. Quality of Delivery
	C43. Guarantee Policy
C5. External Influences	C51. Family Recommendations
	C52. Friend Recommendations
C6. Experiences	C61. Good Experiences
	C62. Bad Experiences
	C63. Customer Support
C7. Advertisement	C71. Social Media
	C72. Television and Radio
	C73. Other Channels

The questionnaires were distributed to three experts to evaluate the criteria, sub-criteria, and alternatives. The three experts need to respond based on a nine-point linguistic scale (Table 2) [5]. The data obtained were used in FAHP to determine the weight and rank, helping identify which platform is better for sellers to choose.

Table 2. Linguistic variables

Linguistic Variables	Scale	Triangular Fuzzy Scale
Equally Preferable	1	(1,1,1)
Lightly Preferable	2	(1,2,3)
Weakly Preferable	3	(2,3,4)
Preferable	4	(3,4,5)
Moderately Preferable	5	(4,5,6)
Fairly Preferable	6	(5,6,7)
Highly Preferable	7	(6,7,8)
Strongly Preferable	8	(7,8,9)
Highly Preferable	9	(8,9,9)

3. RESULTS AND DISCUSSION

Table 3 shows the normalized weight and ranking criteria. The top three rank criteria were considered as preferable criteria that affect online buying. The website quality (C1) carried the highest weight value followed by product attributes (C3) and payment methods (C2).

Table 3. Normalized weight and ranking of criteria.

Criteria	Weights	Rank
C1. Website Quality	0.355	1
C2. Payment Methods	0.175	3
C3. Product Attribute	0.203	2
C4. Delivery and Guarantee	0.138	4
C5. External Influences	0.068	5
C6. Experiences	0.041	6
C7. Advertisement	0.020	7

Regarding the three highest rank of criteria, design (C11) carried the highest weight in website quality (C1). Quality (C31) recorded the highest weight for product attribute (C3). Payment platform (C21) recorded the highest value in payment methods (C2). Those sub-criteria are contributing factors in choosing the most suitable online shopping platform.

Table 4. Weights of sub-criteria.

Criteria	Sub-criteria	Weights
C1. Website Quality	C11. Design	0.789
	C12. User-friendly	0.211
C2. Payment Methods	C21. Payment Platform	0.693
	C22. Security Policy	0.219
	C23. Privacy Policy	0.088
C3. Product Attribute	C31. Quality	0.612
	C32. Price Range	0.215
	C33. Different Sellers	0.109
	C34. Campaigns and Discount	0.064
C4. Delivery and Guarantee	C41. Return Policy	0.593
	C42. Quality of Delivery	0.203
	C43. Fast Delivery	0.132
	C44. Guarantee Policy	0.072
C5. External Influences	C51. Family Recommendations	0.829
	C52. Friend Recommendations	0.171

C6. Experiences	C61. Good Experiences	0.746
	C62. Bad Experiences	0.162
	C63. Customer Support	0.091
C7. Advertisement	C71. Social Media	0.778
	C72. Television and Radio	0.135
	C73. Other Channels	0.087

The results in Table 5 indicates that TikTok (A1) was recorded at the first ranking followed by A2 (Shopee), whilst the lowest ranking is Lazada (A3). TikTok (A1) was considered as the best platform among the other two alternatives and it is the most preferred alternative with weight value of 0.653.

Table 5. The normalized weight for alternatives with respect to each criterion.

Criteria	Weights	TikTok (A1)	Shopee (A2)	Lazada (A3)
C1. Website Quality	0.355	0.702	0.226	0.072
C2. Payment Methods	0.175	0.536	0.371	0.093
C3. Product Attribute	0.203	0.657	0.261	0.082
C4. Delivery and Guarantee	0.138	0.631	0.295	0.074
C5. External Influences	0.068	0.731	0.197	0.072
C6. Experiences	0.041	0.629	0.293	0.078
C7. Advertisement	0.020	0.689	0.229	0.082
Total (Alternative x Weight)		0.653 **(1)**	0.269 **(2)**	0.078 **(3)**

4. CONCLUSION

FAHP was fully utilized in this study and proven to be a suitable method to solve decision-making problems. The criteria which were successfully identified for online shopping platforms were weighted and ranked by using FAHP. The finding from the study shows that the best online shopping platform is TikTok (A1). It is hoped that the result of the study can give the insights to the sellers to choose the best selling platform for them.

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IOT MONITORING of A MASTER-SLAVE ROBOT USING MIT APP INVENTOR

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Abstract

The work focuses on developing an application for monitoring a 4-degree-of-freedom (4-DOF) master-slave robot system. The system has a master which controls the robot, and has previously worked effectively, but the user must be in the same room to monitor robot's movements. To operate the robot from a distance, an IOT-based platform must be used. The objectives of this project are to investigate a suitable IOT method and its specifications, construct the programming codes for different interface platforms and validate the proposed method for displaying robot information. Determining the suitable interface communication method is very important in order to ensure the transmission of data between the sensors, controllers, and the application can be monitored in real time. The selected IOT platform is MIT App Inventor, utilizing Firebase Cloud to store data from the master and slave controllers. Users can monitor robot's data remotely from their devices by using the AI2 companion application. In addition, Bluetooth module is used to connect the master and slave, while NodeMCU ESP32 enables Wi-Fi connectivity between controllers, cloud and MIT App Inventor. The verification test showed that the MIT App Inventor has successfully displayed the sensor data and motor increment readings from the master and slave controllers for several human arm gestures.

Keywords: master-slave robot; IOT application; cloud storage; interface platform; MIT App Inventor.

1. INTRODUCTION

The development of master-slave arm robots can be traced back to the late 1970s and early 1980s, when researchers first began exploring the use of multiple robots for complex tasks [1]. Master-slave robot refers to a configuration of a master that controls a robot called "slave" through it commands. The development of master-slave systems has advanced in many applications such as in industrial assembly, auxiliary medical treatment, extreme environments, and inspection [2].

Master-slave robots have shown themselves to be useful in a variety of industries, enhancing daily living. In the studies covered, master-slave technology creates positive results in various disciplines. These include a low-cost LED light control system that allows for energy conservation through continuous light intensity management [3]. A PCB-based module for dental systems is another application that simplifies hardware and lowers development costs [4]. It gathers IOT data for monitoring and provides the

possibility of future integration. Also, master-slave IOT devices were used in fitness and healthcare for biofeedback visualization, recognizing patterns and delivering customized solutions in [5]. Fabrication-as-a-Service (FaaS) is also investigated, with the goal of allowing large amount of users to flexibly access an IoT based laboratories (Fab Labs) via remote internet-based control [6]. Meanwhile, work by [7] has demonstrated an IoT system that can dynamically adapt to changes in environment parameter, IoT devices and selection criteria of measurement thus making the proposed IoT system flexible and easy to use.

2. METHODS

2.1. Phase I: Selection of suitable IOT method and its specifications.

Several types of IoT applications have been investigated and considering ease of use, applicability for intended use and complexity of programming, MIT App Inventor has been chosen for this work. Users may simply develop graphical interfaces and define app behavior with a user-friendly Designer and Blocks Editor. A standalone emulator or the MIT AI2 Companion app allows for real-time testing. The platform simplifies Android app development by transforming visual blocks into Java code for seamless operation. Overall, MIT App Inventor provides a low-cost, code-free alternative for developing Android applications.

2.2. Phase II: Setting up the interface platform

The proposed configuration combines both hardware and software elements. The NodeMCU ESP32 (microcontroller), flex sensor and Bluetooth module (HC-05) are the essential hardware elements used. The NodeMCU ESP32 carries the functions as the microcontroller, receiving and processing data from the flex sensor and sending it via the module's Bluetooth interface to the cloud. The bending action is captured by the flex sensors and transformed into electrical signals in voltage by the NodeMCU ESP32. The Bluetooth module enables wireless connection between the master and the slave.

The system's software is vital for data transfer, storage, and user interface. The NodeMCU ESP32 board's built-in Wi-Fi facilitates secure transmission and storage of flex sensor data in Firebase Cloud. Firebase is used to create a project and establish a connection with the app for real-time data transfer. The Realtime Database serves as the platform for storing and updating data. The Firebase Console and Realtime Database are crucial tools for managing the Firebase Cloud system effectively.

The system architecture as shown in **Figure 1** includes a master-slave robot system, Bluetooth communication between the master and slave, a NodeMCU ESP32 board for Wi-Fi connectivity to Firebase Cloud, Firebase Cloud for data storage, and finally MIT App Inventor for user interface and remote access to robot information. Users can connect their devices to Firebase Cloud via the MIT AI2 Companion application to access real-time data and remotely monitor the robot's motion.

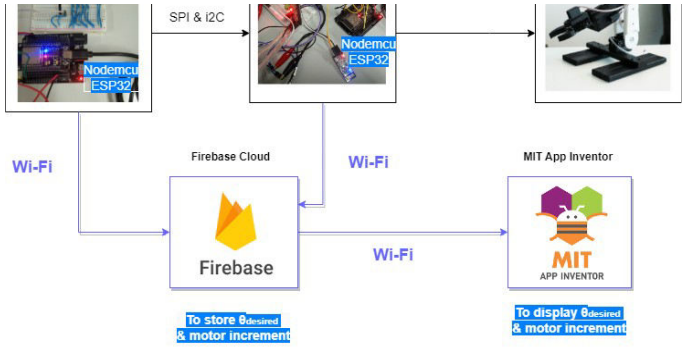
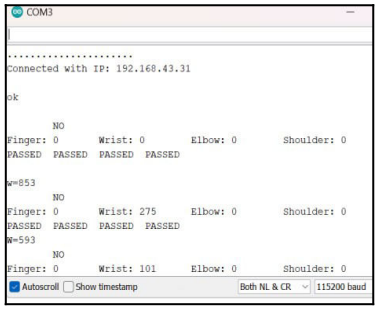


Figure 1: Master-Slave robot monitoring system architecture

3. RESULTS AND DISCUSSION

It can be observed that the robot information can be displayed on their home screen after launching the app, as well as monitor real-time data and details. Serial monitor numbers were compared to Firebase's real-time database to validate data consistency, confirming successful transmission and storage as in **Figure 2**. The joint angles include the angle for the finger (open and close only), wrist, elbow and shoulder.



a) Robot information appeared on Serial monitor

b) Robot information appeared on Firebase Database

Figure 2: Confirming the data transmission between the cloud and the controller.

The application is designed for the user to monitor the desired angle and motor increment from the master and slave controllers, represented in real-time line graphs of the values over time as shown in **Figure 3**. Joints' angles from the master are displayed as $\theta_{desired}$ and the motor actuation to the motor driver as calculated by the slave controller are displayed as motor increments. Meanwhile, the comparison between the MIT display and robot motions when all joints were applied with the same 0° and 45° positions is shown in **Figure 4**. The MIT display shows the applicability of the application design for the robot motion monitoring purpose.

Position tracking accuracy for the robot is not discussed in this paper because evaluation of robot control performance is beyond the scope of this work. Furthermore, evaluation on different angle movements of robot is not necessary because instructions by the user's gesture will definitely provide different $\theta_{desired}$ and motor increments to be displayed data on MIT application as they are calculated not by the IoT platform but by both robot controllers.

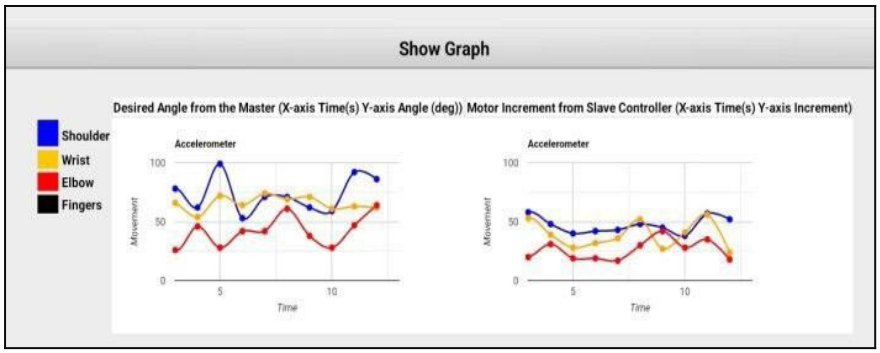


Figure 3: Line graph of the desired angle from the master controller and the motor increments from the slave controller.

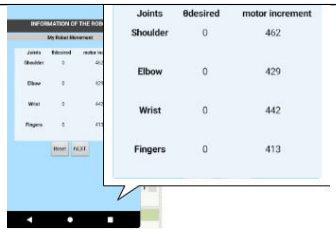
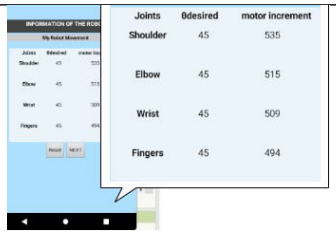
Joint angle	MIT display	Robot Diagram
0°		
45°		

Figure 4: Comparison results between MIT App Inventor and Master-Slave Robot at two different angles

4. CONCLUSION

The proposed work has successfully sent robot information to the developed application using selected interfaces and Firebase real-time database. The results have shown the feasibility and effectiveness of the IoT system, and its future potential application in various disciplines.

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CASING SMART

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Abstract

Since the beginning of the 20th century, the word "technology" and its applications have gone through significant changes and this evolution continues to this day. The COVID-19 pandemic brought a paradigm shift using technology where school-going kids continued their studies from home and schools facilitated imparting education by their teachers online from home. This means that people of all ages have begun to use gadgets in their daily lives, even young kids. There have been numerous phone gadget innovations worldwide. So, Casing Smart, a new unique innovation casing that suitable for all ages mainly for people who likes playing games, watching dramas, wireless phone users, content creators, students, workers and even for kids, they can use it as watching cartoon or any education related using their parents' phone. This product is a modification of the market-available casing that has been added and modified features to make it more user-friendly. Additionally, this item offers multiple functions in a single unit, including stand phone, power bank, and thermal pad capabilities that are useful for users in all circumstances. The concept of combining all the components into a single product that is portable, versatile, and reasonably priced emerged. Making innovations in technology to make this case an affordable phone accessory, especially when playing games. Gamers frequently experience phone heating issues. Due to its numerous features that make phone administration simple, this case may also be used by non-gamers to use their phone on a regular basis.

Keywords: innovation casing, user-friendly, multifunction, innovation

1. INTRODUCTION

Casing Smart can be quite advantageous in a variety of ways. In this project, the product will be focused on up-to-date advancements like integrating features such as magnetic for wireless charging, stand phone, powerbank and thermal pad functionality that are beneficial for customers in any situation. It is because if a customers had problems with did not bring charger, their phones keep lag because overheat and the surface is slippery so they cannot put their phones straight to watch movies, then they must buy separated items for each problem that they faced. Therefore, it is also quite burdensome, expensive and previous research has revealed that this product will be a good investment.

2. MATERIALS AND METHODS

As industry became more aware of the significance of new products to business, the number of innovations in products substantially climbed. For businesses, managing the NPD process has grown difficult because it calls for significant financial and human resources and is time sensitive [1]. Numerous articles and blog posts on websites that are linked to business, innovation, and marketing to get started with for this new development product. Technology is widely used in medicine, science, industry, communication, transportation, and everyday life. In this innovation, all the problems listed by the respondents in online marketplace such as Shopee, Lazada and Tiktok are taken into consideration.

From observation, there are so many existing products in the market but they still cannot meet human needs. As technological advances per year, all the industries kept trying to create new products that would satisfy their target customers. In this research, an observational approach includes studying all the existing products. From that, there will be a better outcome from what is lack of those existing products and meet human needs in their life. Indeed, [2] argue that the human species can be described as a homo prospectus, taking effective actions because of forward-looking capabilities, expectations, goals, and plans. These prospective characteristics are critical to experiment, test, and flexibly adjust when goals or expectations are not met [3].

2.1. Design Features

Casing Smart can be commercially as multi-purpose casing. All modifications will be made to meet market demand while keep the price reasonable. The main function of the product is dissipating heats using the thermal pad as the main material. The casing material is silicone and magnet have been attached with the casing to provide additional features that help to make the product more user friendly such as wireless charging and phone stand. The additional features that can be used by magnet is magnetic powerbank. It also can be a connector for wireless charging from phone to phone that help avoid this charging disconnected but this features only applicable for phone that have the wireless charging phone to phone features. This magnet also can be used for magnetic phone stand and it is removable so it will be more user friendly. Because it is so advantageous, good, and makes consumers' life easier, casing smart strives to be one of the most sought-after products.

A survey is conducted using Google Forms and distributed via social apps such as WhatsApp and Telegram. As a result, the survey will reveal the target market. A method for getting direct information from the target population is a marker survey. Researching the features, expectations, and demands of different customers or clients is necessary to examine their capacity, such as investment characteristics and purchasing power.

3. RESULTS AND DISCUSSION

3.1. Prototype

A prototype is an early, preliminary version of a product, system, or concept created to visualize, test, and refine ideas before full-scale production or implementation. It serves as proof of concept, providing a tangible representation of the final product. Prototypes can vary from basic sketches to interactive models, allowing designers and developers to gather feedback, identify issues, and make necessary improvements.

By enabling testing and iteration, prototypes help in mitigating risks, reducing development time and costs, and ensuring that the final product meets user requirements and expectations. Prototyping is a crucial step in the design and development process, aiding in innovation and problem-solving across various fields.

Figure 1 shows the prototype of the Casing Smart with the powerbank and phone cooler. Figure 2 shows the top view of the casing where the magnetic plate is located at the center of the casing and the thermal pad at the bottom of the casing.

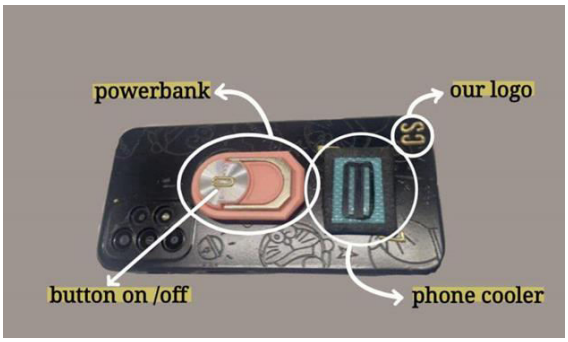

Figure 1. Prototype of Casing Smart

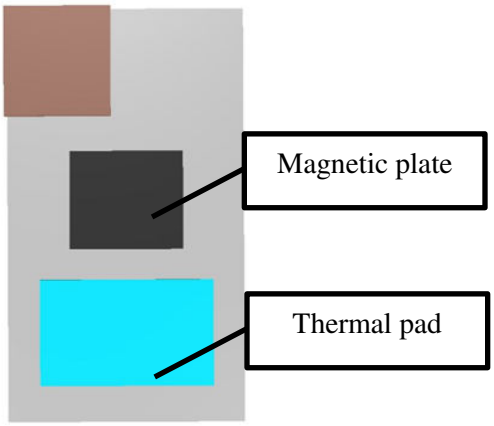

Figure 2. Top view of Casing Smart

3.2. Marketing Test

In the New Product Development (NPD) process, test marketing is an important stage because throughout the test period, tracking sales data, customer feedback, and any pertinent performance metrics will prove whether or not the product will satisfy customers' needs. Additionally, the target market will be known. According to the survey, college students expressed more interest and excitement for this project. Therefore, UiTM Kuala Terengganu students make up the majority of the market. It's because some students enjoy watching dramas, work as part-time content creators, and playing games. However, a few employees who had wireless-capable phones showed enthusiasm for the product's magnet feature for wireless charging and believe it would attract a lot of customers as a result.

4. CONCLUSION

To sum up, the development of Casing Smart is inspired by all problems that happened in human life. This product aimed to solve the problems that are sold with different products in one product, which is Casing Smart. This product offers a customized solution for the target customer and appears to be competitive in the global market. The majority of respondents show interest from the online survey in buying the product once available in the market.

Casing Smart will mostly be promoted through e-commerce or online as it is aligned with the preference of today's consumers. Additionally, Casing Smart has a strong chance of being commercial success because it fits human nowadays lifestyle. The product's viability is highlighted by its potential for future feature expansion and user-friendly improvements. The demand for such all-in-one products is projected to increase as society continues to adopt a fast-paced, convenience-focused lifestyle, with e-commerce platforms and easy human life.

ACKNOWLEDGEMENT

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THREE-TERM CONJUGATE GRADIENT METHOD UNDER ARMIJO LINE SEARCH FOR UNEMPLOYMENT RATE IN MALAYSIA

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Abstract

The Conjugate gradient (CG) method is widely used in unconstrained optimization problems. Most studies have shown that CG is capable of handling unconstrained optimization techniques due to its simple algorithm, which requires little memory storage. It also satisfied global convergence properties. Three coefficients, Rivaie-Ismail-Mustafa-Leong (RMIL+), Dai-Yuan (DY), and Conjugate-Descent (CD), are exerted into the three-term CG method under Armijo line search to determine the most efficient method. Other than that, the application of the CG method in regression analysis is not widely used. Thus, research is being made to compare these methods using MATLAB R2022b subroutine programming. Several initial points with different dimensions are chosen. The effectiveness and reliability of the suggested method are demonstrated by numerical results, including NOI and CPU time. TTDY is the most effective method based on numerical results, but only TTRMIL+ can be applied in regression analysis.

Keywords: Optimization, Conjugate Gradient Method, Armijo, Regression Analysis.

1. INTRODUCTION

Optimization has two categories, which are constrained and unconstrained problems. Unconstrained optimization problems are mainly discussed in this research. The CG method is typically applied to solve unconstrained optimization problems. Consider the following optimization model:

$$f(x), \quad x \in R^n ,$$

where f: $R^n \rightarrow R$ is a continuous function. This function is solved by an iterative method as follows,

$$x_{k+1} = x_k + a_k d_k, \quad x = 0,1, \ldots,$$

where a_k can be obtained by several line searches. Ghani et al. [1] stated that the well-known inexact line search are Armijo, Wolfe and Goldstein. Armijo [2] is the simplest method where it is easy to be implemented in computation procedure. Basically, the CG method is improvised the CG coefficient, β_k and search direction, d_k. Nowadays, there are few different CG methods that have been used in research nowadays which are classical, hybrid, modified, spectral, three-term and parametric.

The first general three-term CG method was proposed by Beale [3] using the Hestenel-Stiefel (HS) algorithm as

$$d_k = -g_k + \beta_k d_{k-1} + \theta_k y_{k-1},$$

where $\theta_k = -\frac{g^T{}_k d_{k-1}}{g^T{}_{k-1} g_{k-1}}$ and $y_{k-1} = g_k - g_{k-1}$and search direction, d_k is computed as follows:

$$d_k = \{-g_{k,} \qquad if\ k = 0, -g_k + \beta_k d_{k-1} + \theta_k y_{k-1} \qquad if\ k \geq 1,$$

The CG methods proposed by Conjugate-Descent (CD) by Fletcher, Dai-Yuan (DY) and Rivaie-Mustafa-Ismail-Leong (RMIL+) are defined by:

$$\beta_k{}^{CD} = -\frac{||g_k||^2}{g^T{}_{k-1} d_{k-1}} \qquad \beta_k{}^{DY} = \frac{||g_k||^2}{d^T{}_{k-1} y_{k-1}} \qquad \beta_k{}^{RMIL+} = \frac{g_k^T (g_k - g_{k-1} - d_{k-1})}{d_{k-1}^T (d_{k-1})}$$

These methods have been widely used by current researchers such as Arman et al. [4], Abdullahi et al. [5] and Ibrahim Mohammed Sulaiman et al. [6].

2. METHODOLOGY

This paper focuses on the RMIL+, DY and CD method and tested under three-term CG method and Armijo line search. Fifteen test functions with four random initial points are chosen for testing purposes which are listed in Table 1.

Table 1: Test Functions

No	Test Function	Initial Points
1	Extended Rosenbrock	(2,…,2), (4,…,4), (10,…,10), (100,…,100), (1000,…,1000)
2	Extended Beale	(2,…,2) (4,…,4) (10,…,10) (100,…,100)
3	Raydan 1	(2,…,2) (4,…,4) (10,…,10)
4	Extended Tridiagonal 1	(2,…,2) (4,…,4) (10,…,10) (100,…,100) (500,…,500)
5	Extended Himmelblau	(2,…,2) (4,…,4) (10,…,10) (100,…,100) (500,…,500)
6	Sum Square	(2,…,2) (4,…,4) (10,…,10) (100,…,100) (500,…,500)
7	NONSCOMP	(2,…,2)
8	Extended Penalty	(2,…,2) (4,…,4) (10,…,10) (100,…,100)
9	Hager	(2,…,2) (4,…,4) (10,…,10) (100,…,100)
10	BIGGSB1	(2,…,2)
11	Three Hump	(2,…,2)

12	Trecanni	(2,…,2)
13	Quadratic QF2	(2,…,2), (4,…,4), (10,…,10), (100,…,100), (1000,…,1000)
14	Shallow	(2,…,2), (4,…,4), (10,…,10), (100,…,100), (1000,…,1000)
15	Sphere	(2,…,2), (4,…,4), (10,…,10), (100,…,100), (1000,…,1000)

3. RESULTS AND DISCUSSION

The performance profile was first proposed by Dolan and Moré [7] and it could be applied to compare the performance of the three-term method RMIL+, DY and CD in terms of NOI and CPU time. The left side of the graph represents the efficiency of the methods while the right side shows the amount of the test problem that can be solved.

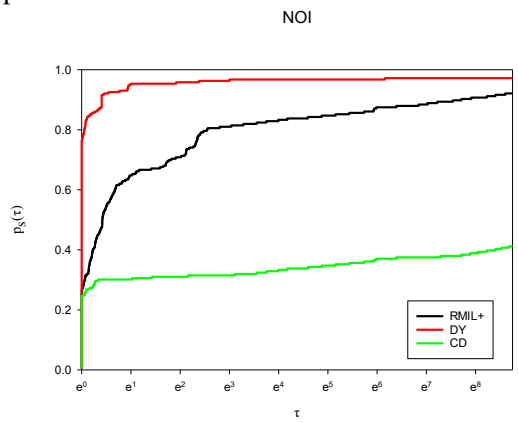

Figure 1: Performance Profile of NOI

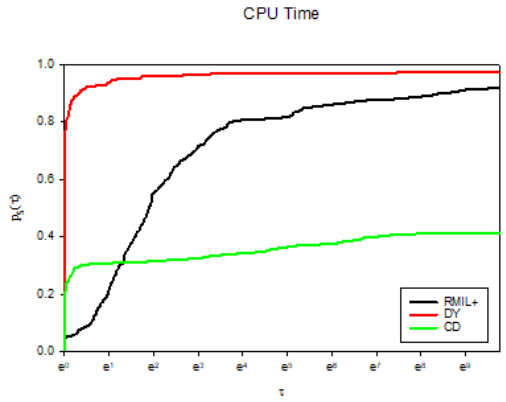

Figure 2: Performance Profile of CPU time

Both figures above illustrate the comparison between TTRMIL+, TTDY and TTCD in terms of NOI and CPU times. According to both figures above, TTDY is the fastest as it takes the least CPU time to solve the test functions. Referring to the left side of the performance profile, it is clearly shown that DY is at the top which implies that it solves the highest number of test problems with the least NOI. It solves almost all test functions which is greatly better than TTDY and TTCD. TTRMIL+ is better in terms of NOI and CPU time compared to TTCD.

Table 2: Relative Error for All Methods.

Method	Sum of Error (Linear)	Average Error (Linear)
RMIL+	1.510531586	0.100702106
DY	FAIL	FAIL
CD	FAIL	FAIL
Least Squares	1.510531603	0.100702107
Trendline	1.510531602	0.100702107

TTRMIL+ is the only method that yields results for a linear model. TTDY and TTCD failed which are not applicable in solving real life problems under Armijo line search. Even though TTDY leads the graph by having the least CPU time and NOI to solve the test problems, it is not applicable

enough to solve real problems in regression analysis. Thus, TTRMIL+ is the best method to apply in regression analysis other than TTDY and TTCD.

4. CONCLUSION

As a conclusion, the TTRMIL+ method seems to be the best method for application in regression analysis with the least relative error under Armijo line search. The failed methods, TTDY and TTCD in regression analysis could be improved by applying them to different line searches such as the Wolfe line search.

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ELEVATING NEW PRODUCT DEVELOPMENT: THE TOAFFLE MULTI-PURPOSE MACHINE

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Abstract

Breakfast in the morning can be a nuisance as it takes time to prepare it. Sometimes, people skip breakfast just because they do not have enough time to prepare it. Breakfast is very important as it can boost energy levels to fuel up body and helps through a daily routine. Due to that problem, intensive research and surveys are performed and finally came up with this concept to produce a multipurpose technology named Toaffle, which is a technology that combines a waffle and toaster maker in one machine. This multipurpose machine has many advanced features, such as touch screen LCD, can be connected via a mobile application, an automatic jam spreader based on user preferences, a see-through jam indicator level, has a child lock and a vacuum compartment which is use for storing the bread and waffle. Instead of pressing buttons, this machine is modernized by equipping it with a simple and easy-to-understand Graphical User Interface (GUI). All they need to do is put the bread or waffle in Toaffle's vacuum compartment, and then give instructions through the touch screen which can also be accessed from the user's smartphone. After that, user can focus to get ready for the day while Toaffle is preparing the food. Toaffle is also perfect for big families. Oftentimes, preparing toast or waffle for many people would mean a lot of different preferences on how they want their food to be done, causing the kitchen to be messy. This problem can be solved when using Toaffle as the preparation process took place inside the machine. These mentioned features are going to be helpful for people and now everyone can make a delicious go-to food effortlessly without taking much of their time.

Keywords: Multipurpose machine, technology, features, advanced, GUI

1. INTRODUCTION

The process of making breakfast decisions for a family can be quite challenging, often leading to chaotic situations. According to Howden et al. (1993), lack of time and lack of appetite are the most frequently cited excuses for skipping breakfast [1]. Prolonged decision-making inevitably extends the time required to begin breakfast preparation, adding to the overall time spent on breakfast preparation. This is because breakfast preparation does not conclude with cooking; it also involves cleaning, which can be

cumbersome and time-consuming. Finally, there is a safety concern, especially for children, who might accidentally touch hot appliances that often lack safety features to prevent accidents.

The project aims to analyze the development of our product based on market demands and expectations, ensuring it can effectively meet societal needs and simplify daily tasks. Additionally, it serves as a platform to introduce our product to the target market, exposing it to the public and potentially establishing its presence in the business industry. The project's objectives include reducing the time required for morning waffle and toast preparation, minimizing the number of cleaning tasks after breakfast, enhancing safety measures during appliance use, and preserving food quality and taste even if left unattended for a few hours.

2. MATERIALS AND METHODS

The project aims to analyze our product's development in line with market demands, ensuring it meets societal needs and simplifies daily tasks. The development of Toaffle involves the process shown below:

2.1. Research

Firstly, all kinds of information related to New Product Development (NPD) were collected. Schilling & Hill (1998) stated that a new product needs to meet new features, superior quality, and appealing pricing requirements for it to achieve significant and quick market penetration [2]. Extensive research was conducted to identify common problems faced by people in this era, drawing insights from various articles and websites on the Internet. Next, a review of popular online marketplaces like Shopee, Lazada, and Amazon was conducted to identify existing products addressing the issue. With none found, a preliminary plan was devised to create a solution to the problem.

2.2 Observation

An observational approach involves examining the existing products in our surroundings, including various types of appliances such as office and kitchen equipment. This method entails direct interaction with these appliances, facilitating an understanding of machine operation, technology, and working principles.
According to Krishnan & Bhattacharya (2002), the task of selecting the appropriate technologies for integration into new products stands out as a notably challenging facet of defining and developing new products [3].

2.3 Design Features

Toaffle, designed both physically and aesthetically, addresses several market needs identified through research, including space constraints for toasting and waffle-making, varying jam container sizes, bread storage, and the multitude of tools required for breakfast preparation. By combining the functions of a waffle maker and toaster while streamlining the process, Toaffle aims to simplify breakfast preparation, recognizing the importance of meeting user needs in terms of utility, usability, reliability, and safety.

2.4 Questionnaire Survey

A survey was conducted using Google Forms, widely distributed to the public through messaging apps. Bhuiyan (2011) stated that this deeper level of understanding is derived from customers creating the

customer-based ideas [4]. To ensure the survey reached the target audience, demographic questions encompassing age, gender, and employment status were included. Furthermore, valuable feedback was obtained regarding necessary improvements to enhance the product's quality. Inquiries about the likelihood of purchasing the product were integrated to understand the target audience's purchase intent. Finally, proto monadic testing involved respondents rating various ideas to identify their preferred concept.

i. The survey received 70% responses.
ii. 66.7% of the respondents were female, and 33.3% were male.
iii. Half of them is employed, 25% are housewives, with the remainder being unemployed or students.

3. RESULTS AND DISCUSSION

A new product development, Toaffle, falls under the category of improvements on existing products. Toaffle enhances features and benefits, replacing conventional toasters and waffle makers. Marketers must grasp the types of new products to effectively launch them in the market.

3.1. Build Prototype

A prototype is a crucial pre-production sample, model, or preview used to test ideas and processes, primarily aimed at identifying flaws and detecting missing functionalities. It plays an integral role in the design process, employed by architects, engineers, and designers to validate plans before committing to mass production. Prototypes serve to provide tangible solutions to issues discussed during the conceptual stage, allowing designers to test concepts with real consumers and gather early feedback.

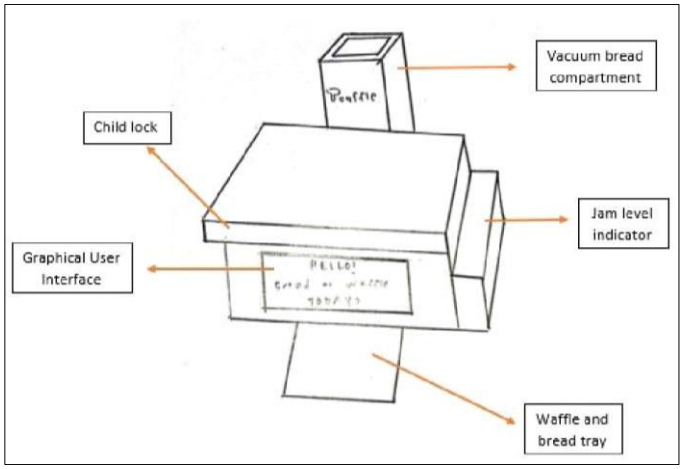

Figure 1. Sketch of Toaffle Features

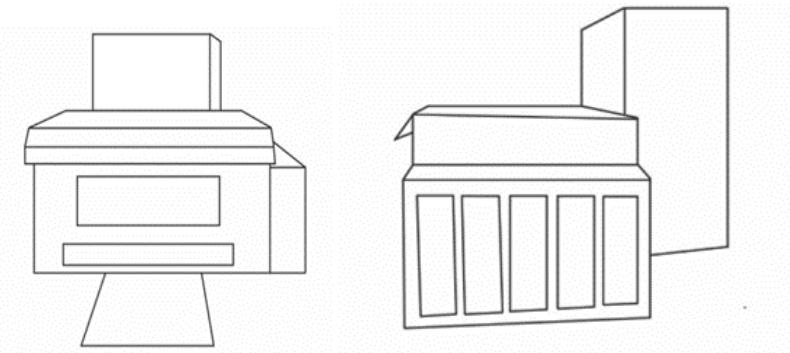

Figure 2. 3d Side View of Toaffle Product

3.2 Marketing Test

According to Ernst et al. (2010), marketing needs to be coordinated in order to share pertinent information and create a new product that satisfies market demands and provides the company with adequate financial returns [5]. Hence, test marketing was done both before and during the early stages of a product's development. Test markets are crucial because they can show if a product will fulfill current customer demand or not and can assist manufacturers to avoid potentially expensive mistakes. As a result, it is possible to identify the advantages and disadvantages of items utilizing customer feedback that could aid in its improvement.

The target market includes UiTM students, employees, officers, housewives, and the food and beverage industry. Tests were conducted in various locations across Malaysia, including hotels, UiTM colleges, cafes, and electrical product carnivals. The month-long test market resulted in numerous positive reviews, with customers expressing satisfaction with the product's functionality and fair pricing. Overall, the feedback indicates strong interest in Toaffle and future purchase intent.

Many responses were received, and all the better ideas provided by respondents were geared toward producing the best product possible in the future. This product received positive feedback based on the overall response. According to the survey, 52.5% of respondents agreed that Toaffle could make breakfast preparation easier for them. In addition, 39.1% of respondents said they were very likely to buy the product.

4. CONCLUSION

In conclusion, various methods inspired the development of Toaffle to address highlighted problems. The product appears feasible for the global market, offering a tailored solution for the specific target audience. Based on the online survey conducted, the majority of respondents expressed interest in purchasing the product once available. Toaffle will primarily be promoted through e-commerce platforms, aligning with modern consumer shopping preferences.

Furthermore, Toaffle's potential for commercial success is high, catering to the fast-paced, modern lifestyle. Its unique all-in-one features, including an automatic jam spreader, make it particularly attractive to large families and individuals with busy schedules, reducing kitchen time. The product's

viability is underscored by its potential for user-friendly enhancements and the addition of more useful features in the future. As society continues to embrace a high-speed, convenience-oriented lifestyle, the demand for such all-in-one products is likely to grow, with e-commerce platforms serving as the preferred avenue for access.

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AGROLIZER

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Abstract

Many consumers, including farmers, homeowners, and gardeners, have recently developed a greater interest in sustainability. They are more inclined to purchase eco-friendly gardening equipment since they are concerned about the environment. However, there are several issues, like the quickly depleting supply of fertilizer and hot, muggy days. We decided to address these challenges by creating a solution that will assist in overcoming these concerns. Agrolizer is a hybrid vacuum that also produces auto-fertilizer from dried leaves. An internal motor drives this product, spinning the bars up to 60 times per second. Additionally, it includes a controller that can operate the Agrolizer up to 30 km away, reducing the need for manual labor. The controller is made specifically with older users in mind, making it user-friendly and accessible to them. It has a monitor with an LCD screen that can display reports in real time. It will also display the fertilization mode, show the battery level, and provide wireless control of the Agrolizer. Agrolizer also can be controlled using the app. Agrolizer is ideal for the creation of high-quality fresh fertilizer since they may be processed and shredded into minuscule pieces that resemble powder by rotating blades. It also features sensors for navigation, which makes it simple for it to avoid obstacles and follow pre-established paths. The sensor may also find dried leaves, in addition. Pebbles and sticks will also be drained out of the holes underneath it in addition to that. A fertilizer box serves as a useful storage container for the collected leaves and processed fertilizer. Since it can run on both electricity and solar power, the Agrolizer may be adaptable for many areas.

Keywords: eco-friendly gardening, auto fertilizer machine, hybrid vacuum

1. INTRODUCTION

Today's hot, humid weather impacts everyone's ability to maintain their gardens by making it necessary for gardeners to remove dried leaves. Long-term sun exposure has a negative impact on people as well. As a result, there are a number of connected issues, the most prevalent of which is that people lack the tools necessary to maintain their gardens and that there is no practical way to address this problem. According to observations, a lot of people still use leaf rakes to remove and burn dry leaves because they are useless and continually produce till our gardens are unkempt. Other than that, we have seen that the

leaves rake we use now only has the ability to gather dry leaves into one location; there is no way to remove clumps of dry leaves other than by burning them. Instead, gardeners are currently facing the problem of running out of fertilizer since the price of purchasing it is too expensive. Additionally, new technology demonstrated how crushed dried leaves might be converted into fertilizer. All plants can use this fertilizer, which contains a lot of nutrients that encourage plant growth.

2. MATERIALS AND METHODS

All data was gathered using a variety of approaches, including:

1. Observation.

Most of our family members and friends' difficulties served as the basis for the observation. We discovered that there were several issues they encountered while gardening.

2. Market Survey.

Market survey have been conducted from April to July 2023. The goal of this survey is to determine whether other people had the same difficulty, as well as the likelihood that the market would approve the suggested solution (market acceptance). For the survey, we created questionnaires using Google Form. It is divided into Section A (respondents' demographics), Section B (issues and difficulties encountered when maintaining the garden or lawn), and Section C (innovation/implementation of Agrolizer) for the purpose of gathering information and assessing the market survey's approval among our respondents. Through WhatsApp, Telegram, and other social media platforms including Facebook, Twitter, and Instagram, the links to the surveys were shared. 158 individuals in Malaysia were given the questionnaire using a random sampling technique.

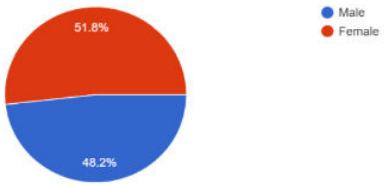

Figure 1. Numbers of respondent

3. Research through New Product Development (NPD) process.

Starting from idea generation, idea screening, market survey, product design to concept testing for better evaluation on the idea. Based on the issue defined, Agrolizer appears to be a viable solution.

3. RESULTS AND DISCUSSION

According to the poll, the majority of our respondents said they encountered a number of difficulties while gardening (Figure 2). So, this is one of the reasons Agrolizer is required to address the problems. Additionally, they concurred that a hybrid dried leaf vacuum with an automatic fertilizer maker will be more beneficial.

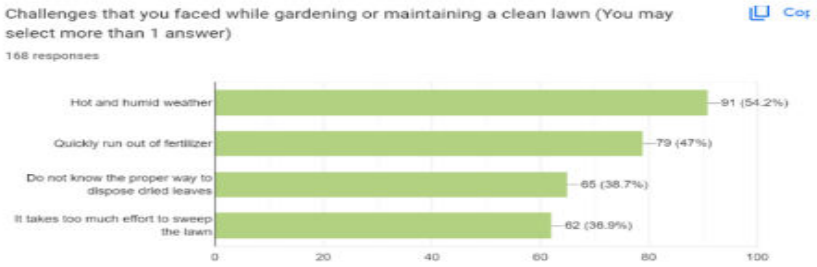

Figure 2. Challenges faced by user

3.1. Improvement on existing products

From the data gathered through our survey, we believed that the improvement on the existing product were needed. Improvement on existing products consists of four characteristics which are addition to existing lines, improvement and revisions to existing products, cost reductions and repositioning [1]. Agrolizer were classified in the second group which is improving an existing product. Agrolizer is one of the upgraded products over traditional techniques of leaf gathering like manual raking or regular vacuuming.

3.1.1 Performance

Vacuum Controller: Agrolizer develops a mobile application for users to download and use remotely to operate Agrolizer from a comfortable distance. For elderly people that are not familiar with gadgets, Agrolizer comes with a physical wireless controller that operates Agrolizer remotely. This enhances conveniences which saves time and reduces physical effort [4].

LCD Screen: Agrolizer's main features are Intelligently shown reports in real time. It has a monitor on the controller devices that can give reports in real-time on the LCD screen. There are also real-time reports on the mobile application. The reports include battery percentage of Agrolizer and fertilization mode.

Integrated Digital Motor: Agrolizer has an integrated digital motor that spins the Agrolizer's blades up to 60 times a second. Agrolizer can easily shred dried leaves into a powder. The blades are detachable, making it convenient for users to clean the blades safely.

Sensor: Agrolizer has a sensor that can detect dried leaves. Things other than dried leaves such as pebbles and sticks will be flushed out from the holes under it. The sensor keeps hard objects from going to the blades which may damage the blades and Agrolizer's interior.

Innovative Fertilizer Box: Agrolizer has two fertilizer modes which the user can choose to fertilize plants on the grounds or inside a pot. For plants in a pot, users can bring out the fertilizer and pour it on the plants. The fertilizer box has a nozzle that is specifically designed to deliver fertilizer in an effective manner while minimizing crop damage.

Fertilizer hole: The fertilizer hole is designed to make it convenient for users to pour fertilizer into crops. User can control Agrolizer to pour the fertilizer. Ground crops mode is one of the fertilizers modes that

Agrolizer provides. In this mode, the fertilizer is poured down from a hole below Agrolizer's body which saves physical efforts of user to pour it manually.

3.1.2 Reliability

User-friendly: Agrolizer is user friendly because there are free mobile applications for users to download. The interface of the application is very understandable even for anyone that is unfamiliar with digital devices. A physical controller is also provided for those that do not want to use their mobile devices. The controller is designed for elderly people because there are buttons which make it easy for them to operate Agrolizer.

Save physical effort, cost, and time: By using Agrolizer, user does not need to buy fertilizer again. There are unlimited number of dried leaves that are scattered mostly in the lawn which can be turned into fertilizer. Users also can just sit back while cleaning the lawn which saves a lot of physical effort. Using remote dried leaves vacuum will save much time than sweep leaves using rake.

3.1.3 Safety

Automatic Shut-off: Agrolizer includes an automatic shut-off feature that turns off Agrolizer's power after a certain period of inactivity. This feature helps conserve energy and reduce the risk of accidental operation [3].

3.1.4 Durability

Agrolizer's body is made of High-Density Polyethylene (HDPE). HDPE is a plastic that is strong, lightweight, and resistant to corrosion. It can tolerate exposure to chemicals, heat, and sunshine. It is frequently used as outdoors's product which is very suitable for Agrolizer. Agrolizer's blades are made of stainless steel. Stainless steel is known for its strength and heat resistance which is very good to ensure durability and longevity under hot weather conditions.

3.1.5 Special features

Agrolizer uses solar power as the energy source which brings several advantages. Solar power is environmentally friendly because it generates clean energy from the sun compared to usage of electricity. Using solar power as an energy source also saves cost because the Agrolizer can benefit from free energy from the sun which significantly reduces electricity consumption.

3.2. Prototype

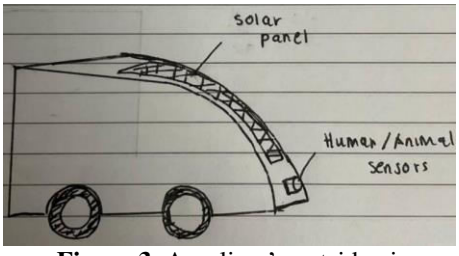

Figure 3. Agrolizer's outside view

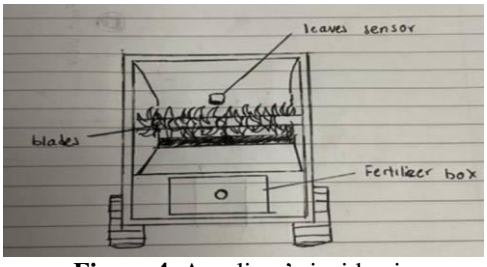

Figure 4. Agrolizer's inside view

Figure 5. Agrolizer's prototype

4. CONCLUSION

Being automatic and easy to use makes Agrolizer one of the user targets because it can help many ages of people to clean their lawn. Additionally, the function of solar and USB ports allows users to use it whether daylight or night. Because Agrolizer is connected to technology which has applications in phones and can be controlled with any phone devices such as Samsung or Iphone. The controller will help to perform the same tasks if phone reach is limited. So, Agrolizer will benefit many humankinds in a variety of ways.

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TELECOMMUNICATION COMPANY REPUTATION SENTIMENT ANALYZER

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Abstract

Telecommunication companies provide telecommunication services that allow people to communicate with each other. Many choices of services offered by these companies allowing customers to change their telecommunication providers easily. However, customers need to choose among these services wisely, where in this case the telecommunication companies reputation might come in handy. Unfortunately, it is difficult to get the grasp on a company's reputation. This is because the related information might be available implicitly from comments or feedbacks that are scattered in any platform. Gaining significant and related feedbacks used to be quite difficult due to lack of data available. However, since the occurrence of COVID-19, people are enforced to work from home or conduct classes online. This impacting in the increasing number of the use of services from telecommunication companies. This project focuses on Twitter feedbacks for Celcom, which is one of the main telecommunication companies in Malaysia. Telecommunication Company Reputation Sentiment Analyzer is developed, where it is expected to classify the feedbacks into two categories; positive and negative. Support Vector Machine algorithm has been chosen to train the classification model of the system due to its effectiveness in giving a precise classification even if the data is in textual format. This system can be used by customers or any other company in discovering the company's reputation. Test results shows that the performance of the system in classifying the Twitter feedbacks is proven to be good and reliable.

Keywords: Telecommunication, Celcom, Feedbacks, Twitter, Support Vector Machine.

1. INTRODUCTION

A feedback detection system for telecommunication company reputation has been developed using a supervised machine learning algorithm, Support Vector Machine (SVM), where it was able to classify the type of feedback precisely including textual feedback. With this system, the feedbacks, comments or critiques shared by the users in Twitter can be detected whether it is positive or negative. Data from Twitter were chosen because Twitter is a popular social media among public especially for young age people because they let their user to express their writing within 140 characters and it can be an informal message format [1]. Not only that, Twitter is more open for everyone to view and compare, especially during promotions or sale period [2]. This system will be helpful for telecommunication users where they can easily distinguish the feedbacks, then come up with a valid conclusion of their chosen

telecommunication company. Meanwhile, for telecommunication company itself, it will help them to gain their brand perception, which later can be used to improve themselves. The main objective of this project is to develop a system for sentiment analysis of telecommunication company reputation using Twitter data and Support Vector Machine (SVM) algorithm.

2. MATERIALS AND METHODS

There are several phases involved during the project development, starting from data collection, data pre-processing, data labelling and feature extraction. Once the phases mentioned are completed, a model is developed using Support Vector Machine. In order to make use of the developed model, a graphical user interface build separately and linked to the model so that it can be accessed publicly. Figure 1 shows the conceptual framework of the project development. It began with the data collection phase where Apify – a web-based tool for web scrapping and data extraction, were used to collect raw data from Twitter and then being saved in .csv (Comma Separated Value) format of files. Data pre-processing phase was conducted on the collected data, which consists of several steps such as removing the hashtags, twitter handles, mention, tokenization, stop words removal and more. The clean dataset will be labelled using Textblob, in Python, where value between 0 and 1 indicates positive feedback, and the value between 0 and -1 indicates negative feedback. After a labelled dataset was obtained, the relevance of word for every document and vectorization will be computed in feature extraction process by using Term Frequency-Inverse Document Frequency (TF-IDF). For training and testing phase, dataset will be split accordingly, so that a trained Support Vector Machine (SVM) model can be obtained from the training dataset. During evaluation phase, the effectiveness of the model are evaluated. Once completed, a Graphical User Interface (GUI) for end users is developed, where it will be integrated with the model.

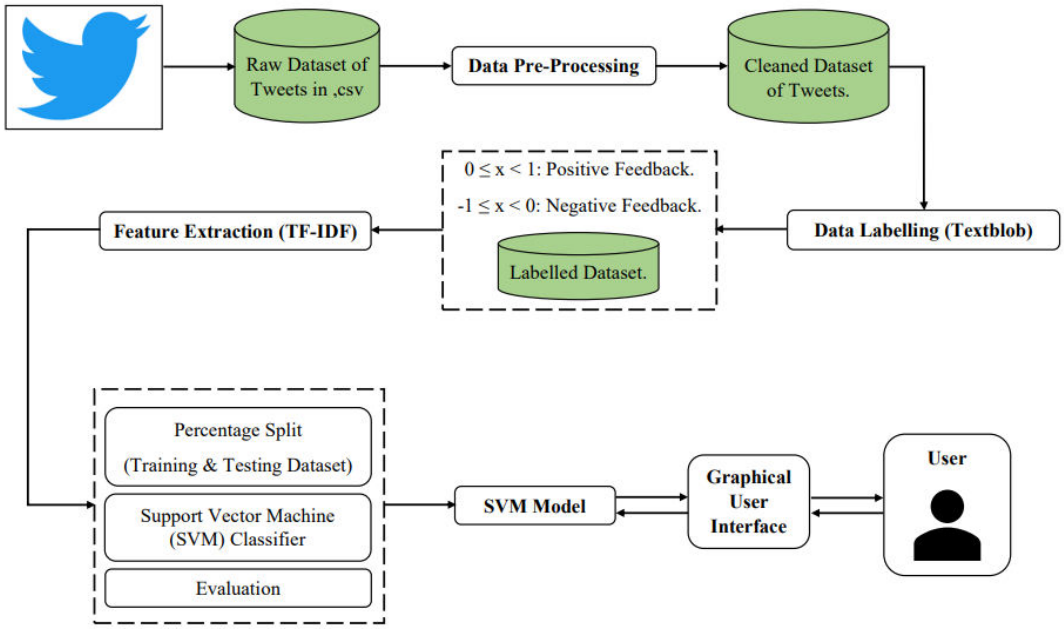

Figure 1. Conceptual Framework of Project Development.

3. RESULTS AND DISCUSSION

3.1. Performance Evaluation

During project development, there are four data splits being chosen in order to produce model with high performance, which are 60:40, 70:30, 80:20 and 90:10. The first part indicates percentage for training data while the second part represent percentage for testing data. Every split resulted to different output for accuracy, which became the reason why numerous splits is used until the best performance gained. Based on Table 1, 80:20 data split has produced the highest results for all four important criteria in the performance evaluation. The results are 88.42% for accuracy, 88.15% for precision, 87.82% for recall and 87.50% for F1-Score. Thus, 80:20 data split was used for the whole product development.

Table 1. Each Data Split and its Performance Evaluation.

Data Split	Accuracy	Precision	Recall	F1-Score
60: 40	86.47%	83.46%	86.45%	84.93%
70: 30	88.29%	87.23%	86.32%	86.77%
80: 20	**88.42%**	**88.15%**	**87.50%**	**87.82%**
90: 10	86.71%	85.48%	84.13%	84.80%

3.2. Confusion Matrix

According to [3], choosing evaluation metric is important because it will affect the performance and effectiveness of a model. Confusion matrix, which also known as error matrix or truth table, is used to evaluate and summarize the performance of the classification model. It visualizes the number of correct and incorrect predictions where the information can be obtained from confusion matrix are true positive (TP), false positive (FP), true negative (TN) and false negative (FN), as shown in Figure 2. This information is used to calculate the accuracy, precision, and recall. When the TP and TN are high, it shows that the model is good, and otherwise. Based on Figure 3, 0 indicates negative class, while 1 indicates positive class. The number of "Negative Feedback" being correctly predicted as it is, called as TN, is 133. 119 is for TP, where the number of "Positive Feedback" correctly predicted as it is by the model. For FP, which normally known as Type 1 Error where the number of "Negative Feedback" being falsely predict as positive, is 16. And lastly, for FN where the value of "Positive Feedback" misclassified as negative is 17, which also known as Type 2 Error. From these results, it shows that TP and TN, both has high values which support the conclusion before, where the system is reliable and accurate.

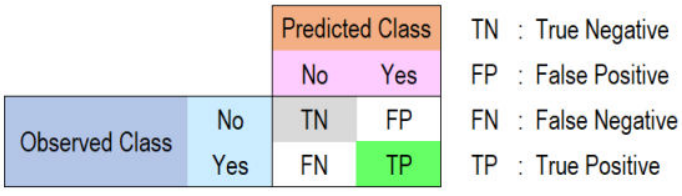

Figure 2. General Confusion Matrix
(*Source*: [4]).

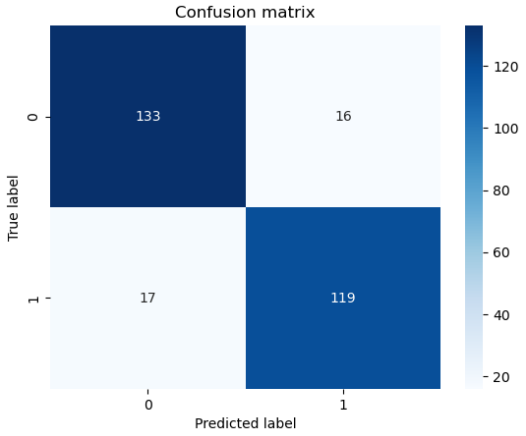

Figure 3. Confusion Matrix.

4. CONCLUSION

This system will benefit the telecommunication companies to discover their reputation among users and help the community in finding honest and accurate review that reflect the company reputation. With 88.42% accuracy, it proves that the system is good and reliable. In the future, the system is expected to be able to detect multi-language tweets, allow users to give input in .csv files for bulk detection and more data should be scrapped continuously for better classification results.

ACKNOWLEDGEMENT

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RIVER WATER QUALITY PREDICTION SYSTEM

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Abstract

In machine learning, the prediction is an assumption that may be supported by past data and is often used in various fields. It may be used to forecast environmental factors such as the river water quality, which is a major source of life, particularly for humans. The health of the river is impacted by the river's diminishing water quality, thus increasing the danger to human health and making it more difficult to ensure the sustainable production of drinking water. Water contamination may be the result of civilization and the rapidly fast developing economy. Based on this motivation, the river water quality prediction system was developed to aid the environmental department and also the consumers. The system could forecast the condition of the river water in terms of its state, as well as the classification of its condition. The system could assist the environmental agency in determining whether a river could serve as a primary source for the processed water for consumers. This technology could reduce the amount of time needed for the environmental agency to get the categorization of the river water quality. The prediction system could assist the agency to be more efficient in monitoring all the main rivers. The river water quality prediction system is a user friendly system and is based on the Artificial Neural Network (ANN) algorithm. ANN is analogous to the brain's system of neurons and synapses and has been implemented in various prediction systems. The good performance of ANN has been demonstrated in various applications and in various fields such as in environment, education, medical, business and engineering. The performance of this prediction system, which is based on ANN has proven to be acceptable and reliable in the prediction of the river water quality.

Keywords: River water quality, Prediction, Artificial Neural Network

1. INTRODUCTION

The crucial step toward improving river water quality management is the creation of water quality prediction model. Due to the lengthy study of the water quality characteristics, in addition to the significant work and time required for gathering and analyzing water samples, the traditional method for calculating WQI (Water Quality Index) is always accompanied by inaccuracies [1]. Given that rivers provide the majority of daily water supplies, particularly in Malaysia, hence, water managers must control the quality of river water [1]. Large water quality datasets that might be difficult to examine and synthesize must be compiled and evaluated in order to manage water quality [4]. Any site's classification of the water quality could use prediction to get findings as quickly as feasible and with the fewest parameters [3]. In that case, a mechanism for predicting water quality must be put in place. It can

eliminate the error-prone manual WQI computation issue that can produce incorrect information. For example, different researchers' works have been done to estimate the river water quality and avoid the restrictions of traditional WQI for the Godavari River in India [2]. The suggested approach combines the Levenberg-Marquardt algorithm with an artificial neural network (ANN). They were successful in estimating the Godavari River's water quality due to the presented algorithm. Therefore the objective of the project is to develop the river water quality prediction system based on ANN. In this project, the ANN parameters have been adjusted to maximize the system performance. The number of neurons in the hidden layer, the epoch number, the split data ratio, and the learning rate were some of the parameters that have been adjusted. The accuracy of the system's performance will have an impact on whether or not the forecast result is precised. The expected outcome in this project is presented in two formats, namely the class and water status.

2. MATERIALS AND METHODS

2.1. Experimental Data

The experimental dataset was collected from the Selangor Environmental Department, which involves the Selangor's three main rivers. Due to the river water quality, numerous complaints have been made by the Selangor residents. In order to categorize the future water quality for a specific river, the dataset will be used for the ANN model's training and testing phases. This will allow the model to learn from previous river water characteristics. The characteristics or elements which can determine whether or not the supplied river samples were contaminated are the Biological Oxygen Demand (BOD), Dissolve Oxygen (DO), Sulfate, PH, Nitrite, Conductivity, Nitrate, Phosphate, and Water Quality Index. There were 683 data and 9 characteristics or input that had been selected.

2.2. System Architecture

The system architecture of the river water quality prediction system is depicted in Figure 1. It is divided into three basic phases: data gathering and preparation, user interface, and system engine. As previously indicated, the raw dataset for this study was obtained from Selangor's environment department. The collected data will go through data preparation phase to replace missing values, eliminate unnecessary characteristics, and other tasks. The procedure is crucial in order to get the meaningful data ready to be processed by the system's engine. For the user part, the value of attributes such as Dissolve Oxygen (DO) and other input could be entered from the user interface. After that, the input will be processed by the ANN model's computation engine to produce the results. The initialization of the weight, bias and neurons in each layer of the ANN will be the first step in the algorithm’s process. The engine will then compute each neuron's value and provide the final results, which represent what is predicted. The results will indicate different water quality classes, categorized on a scale from 1 to 5. The lower the number, the better the quality of the water should be. In addition, it displays the level of pollution in the river's water, which are clean, polluted or slightly polluted.

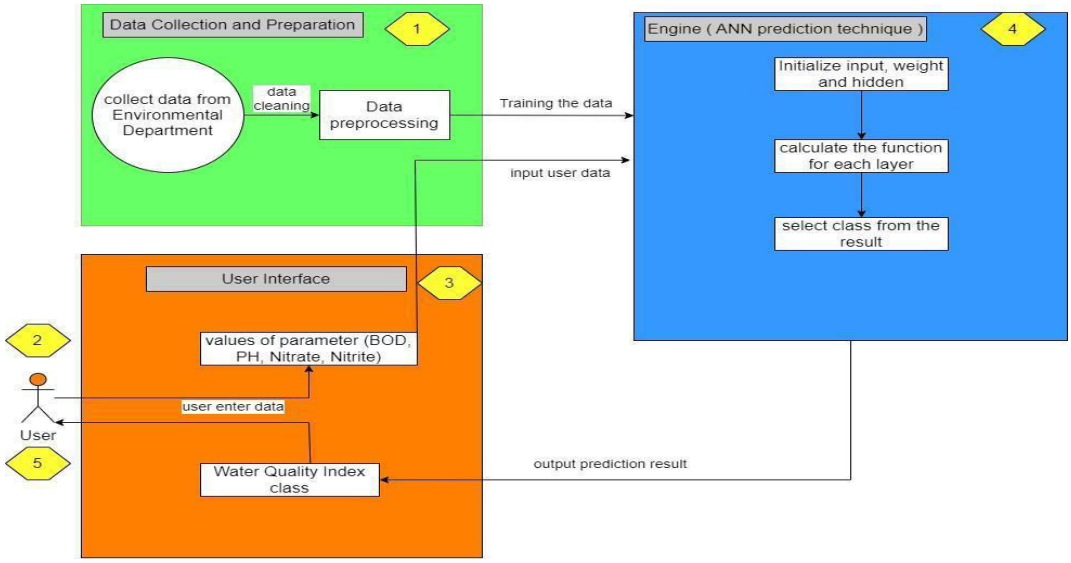

Figure 1. System Architecture

3. RESULTS AND DISCUSSION

The system's performance was assessed in terms of accuracy using four key parameters. The parameters that have been fine-tuned in order to improve the system's performance are the number of neurons in the hidden layer, the number of epochs, the split data ratio and the learning rate. Table 1 compares the performance of different numbers of neurons in the hidden layer, where 16 neurons provide a high accuracy value of 88.02%. Based on Table 2, the best accuracy is 88.44% while employing the split data ratio of 70:30. For the number of epochs, 700 epochs were chosen as it produced the maximum accuracy of 88.37%. Finally, Based on Figure 2, the accuracy of the 0.1 learning rate, which is 88.11%, has been selected. These results have shown that the performance of ANN in the prediction is good and acceptable.

Table 1. Number of Neuron in Hidden Layer

Number of neuron	Accuracy	Loss
8	87.16%	0.088
16	88.02%	0.082
32	84.98%	0.107

Table 2. Split Data Ratio

Split	Accuracy	Loss
70:30	88.44%	0.081
80:20	85.48%	0.104
90:10	86.75%	0.096

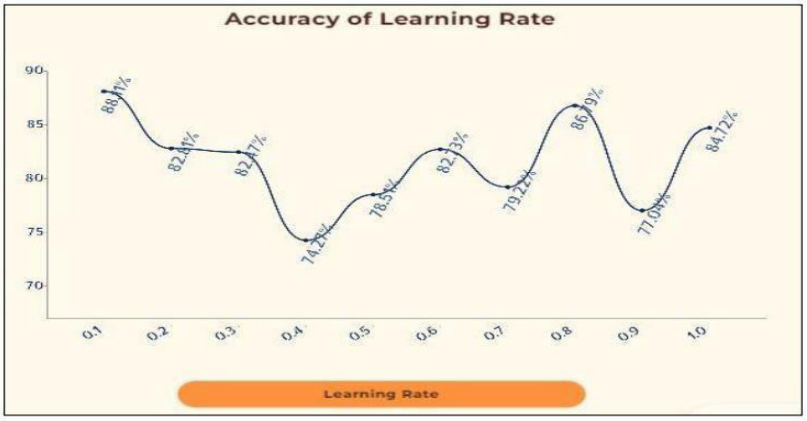

Figure 2. Accuracy of Learning Rate

4. CONCLUSION

As a conclusion, the project has implemented the Artificial Neural Network (ANN) technique, which is good and reliable in the river water quality prediction. The future improvement is to add more data for the training and testing of the algorithm in order to produce better and more precise results. This river water quality prediction system is expected to be reliable and useful to the Selangor Environmental Department and also to the community.

ACKNOWLEDGEMENT

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AN APPLICATION OF NEUTROSOPHIC FUZZY SIMPLE ADDITIVE WEIGHTING METHOD IN SELECTING HIGHER EDUCATION INSTITUTIONS

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Abstract

University is a higher education institution that provides undergraduate and postgraduate programs to obtain academic and professional degrees. The number of public and private universities is increasing in Malaysia. Enrolling in a great university has always been everyone's dream as it will possibly secure good learning opportunities and environment. Choosing the university may be influenced by many factors including scholarship opportunities, location, job opportunities after graduation, parents' advice, high school teachers' advice, inspiration from successful people and many more. Therefore, this study focuses on proposing the factors or criteria that might influence more than others, and suggesting the alternatives that students can choose from. The selected criteria in this study encompass scholarship opportunities, location, job opportunities after graduation, parents' advise, high school teacher's advice and inspiration from successful people. One applicable method for multi criteria decision making is the Neutrosophic Fuzzy Simple Additive Weighting (NFSAW) method. Therefore, this method was chosen for its simplicity and effectiveness in this study. The NFSAW involves finding the truth, indeterminacy, and false membership rating values for each criterion using triangular fuzzy numbers. There are four phases involved in this study: data collection, calculation of weights for criteria, determining the normalized weights for alternatives and finding the total score for each alternative. Three experts were interviewed on six criteria and six alternatives. The findings show that the criteria of job opportunities after graduation turn out to carry the highest weight value among other criteria, followed by high school teachers' advice and inspiration from successful people. As for the alternatives, Universiti Sains Malaysia (USM) hit the first place in the ranking order, followed by Universiti Malaya (UM), Universiti Teknologi MARA (UiTM), Univerisiti Teknologi Malaysia (UTM), Universiti Putra Malaysia (UPM) and Universiti Kebangsaan Malaysia (UKM).

Keywords: Education selection, Neutrosophic FSAW, Criteria

1. INTRODUCTION

Higher education encompasses post-secondary education provided by institutions like universities, colleges, and technical schools after completing secondary education. Universities offer undergraduate

and graduate programs, as well as foster advanced study and research [1]. They are typically funded through government subsidies, tuition fees, and private contributions, and operating independently [2]. In Malaysia, both public and private universities have proliferated, reflecting the growing importance of education for career prospects. The decision to pursue higher education is complex and can shape one's future significantly [3]. However, students must consider their personal needs, limitations, and evolving self-perception, which can be challenging during adolescence. It is crucial for them to have an awareness of the educational system and their own abilities.

As furthering study in higher education institutions is always a constant trend, it leads to the need for effective selection methods. Neutrosophic fuzzy simple additive weighting (NFSAW) is proposed as a method to determine the best university in Malaysia from a student's perspective. NFSAW extends the Fuzzy Simple Additive Weighting (FSAW) method and employs linguistic scale variables and triangular fuzzy numbers to evaluate criteria [4]. In NFSAW, weight values are expressed as fuzzy integers, which accommodate ambiguity and uncertainty. This research employs NFSAW to select the best university based on various criteria and alternatives.

2. MATERIALS AND METHODS

In this study, the criteria that influence students to choose university were selected including scholarship opportunities, location, job opportunities after graduation, parents' advice, high school teachers' advice, and inspiration from successful people. Alternative data taken in this study was adapted from Times Higher Education [5].

Table 1. List of alternatives

Alternative	Names of alternative
A_1	University Malaya (UM)
A_2	Universiti Teknologi Malaysia (UTM)
A_3	Universiti Putra Malaysia (UPM)
A_4	Universiti Kebangsaan Malaysia (UKM)
A_5	Universiti Teknologi MARA (UiTM)
A_6	Universiti Sains Malaysia (USM)

The step of NFSAW method are as follow [6]:
Step 1: Transform linguistic variables to corresponding triangular fuzzy number.

Table 2. Linguistic variables of triangular fuzzy number

Number	Linguistic variable	Code	Fuzzy number
1	Very low	VL	(0.0,0.0,0.1)
2	Low	L	(0.0,0.1,0.3)
3	Medium low	ML	(0.1,0.3,0.5)
4	Medium	M	(0.3,0.5,0.7)
5	Medium high	MH	(0.7,0.9,1.0)
6	High	H	(0.7,0.9,1.0)
7	Very high	VH	(0.9,1.0,1.0)

Step 2: Evaluate average fuzzy score.
Step 3: Evaluate defuzzified value.

Step 4: Evaluate normalized value.
Step 5: Calculate the centroid weight value

Data were obtained from the distribution of questionnaire and guided interview session with the decision makers. Three decision makers were high school counsellor from Batu Pahat area, each with more than three years of experience in the field. The data then were analyzed subsequently [6]. The implementation of NFSAW method produced the weight for each criterion, combined normalized value of each alternative over all criteria and weight of each alternative.

3. RESULTS AND DISCUSSION

Table 2 shows the weight of all criteria. The results demonstrate that, among other variables, the criteria for job opportunities after graduation turn out to bear the highest weight value, followed by high school teachers' advice and inspiration from successful people.

Table 3. Centroid weighted value

Criteria	Name of Criteria	Centroid Weighted Value
□ 1	Scholarship opportunities	0.136
□ 2	Location	0.147
□ 3	Job opportunities after graduation	0.183
□ 4	Parents' advice	0.176
□ 5	High school teachers' advice	0.179
□ 6	Inspiration from successful people	0.179

Table 4. Combined normalized neutrosophic

	C_1	C_2	C_3	C_4	C_5	C_6
A_1	0.126	0.148	0.178	0.178	0.186	0.184
A_2	0.136	0.142	0.182	0.176	0.175	0.189
A_3	0.140	0.141	0.176	0.177	0.182	0.184
A_4	0.147	0.139	0.181	0.184	0.171	0.179
A_5	0.138	0.133	0.179	0.187	0.183	0.180
A_6	0.142	0.117	0.187	0.181	0.184	0.189

From table 3, the highest criteria, inspiration from successful people (C_6), is shared by Universiti Teknologi Malaysia (A_2) and Universiti Sains Malaysia (A_6). Meanwhile, the parents' advice (C_4) are demonstrated by Universiti Kebangsaan Malaysia (A_4) and Universiti Teknologi MARA (A_5). High school teachers' advice (C_5) are the top criteria for admission to University Malaya (A_1).

Table 4. Rank of alternative

Alternatives	Value	Rank
A_1 - University Malaya (UM)	0.16901	2
A_2 - Universiti Teknologi Malaysia (UTM)	0.16880	4
A_3 - Universiti Putra Malaysia (UPM)	0.16864	5
A_4 - Universiti Kebangsaan Malaysia (UKM)	0.16841	6
A_5 - Universiti Teknologi MARA (UiTM)	0.16896	3

A_6 - Universiti Sains Malaysia (USM)	0.16940	1

The total score from the result determined the final ranking for this study. Based on table 4, the rank of the alternatives was $A_6 > A_1 > A_5 > A_2 > A_3 > A_4$. Universiti Sains Malaysia (USM) hit the first place in the ranking order, followed by Universiti Malaya (UM), and then Universiti Teknologi MARA (UiTM).

4. CONCLUSION

As a conclusion, NFSAW method was effectively applied to determine the weight for each criterion and then rank the best alternative of university from students' perspective. The study successfully calculated the weight for each criterion, with job opportunities after graduation being found to be the most influential (weight of 0.183). Based on these weights, University Sains Malaysia (USM) was ranked first, indicating it as the best higher education choice from students' perspective. It is hoped that the result will benefit the students to find out the best university in Malaysia to continue their studies. For future studies, different number of factors and different approaches are recommended to be considered to yield more comprehensive results.

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DEWAN KENANGAN TUN ABDUL RAZAK COURT BOOKING SYSTEM

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Abstract

The integration of online reservation systems is imperative due to their ability to optimize operational efficiency, enhance customer accessibility, and provide real-time booking convenience, surpassing the limitations of traditional reservation methods. Currently, the Dewan Kenangan Tun Abdul Razak administrator uses Microsoft Excel to record all the customer's reservation. Issues such as inaccuracy, security issue where anyone without any authorization able to tamper any data in the file and missing reservation information have led to inefficient reservation scheduling. To address identified issues, the existing business processes require reengineering to integrate an online web-based reservation system, which will be developed using the Adapted Waterfall Model in the information system development. Every phase in Adapted Waterfall Model will be carried out carefully to ensure the success of the information system. The system allows customer to choose court on a specific date and time, and the booking receipt will be sent via email to the customer and administrator. The implementation of this system significantly streamlines the reservation process, resulting in increased customer satisfaction, reduced administrative workload, and improved resource allocation.

Keywords: booking, business reengineering, information system, online reservation, web

1. INTRODUCTION

The emergence of Internet technology may affect current business operations nowadays. Organizations shift their existing manual operation to the Internet application solution. The changes required current business operation needs to be reengineered to suit the desired solution [1]. Currently, customers have two methods to place a court reservation, either come physically to the Dewan Kenangan Tun Abdul Razak or through a phone call. Payment only in cash at the counter. Person in charge needs to check the reservation records in the Microsoft Excel file, if there is an empty slot, the reservation will be recorded in the Microsoft Excel file, else, the customer needs to give either a new date or time. Checking the empty slot is time consuming. The court operator identified various issues with the reservation records stored in the Microsoft Excel file, including overlapping reservations, missing records, unauthorized access, and discrepancies in the collected reservation fees.

Based on the interview session, the court operator agreed to do a collaboration to develop the information system. The court operator emphasized on having online reservation whereby customer able to view all empty slots and choose any available slot for the reservation. Having the online payment functionality is good for the customer convenient. Therefore, a thorough user requirements collection was done to ensure the desired solution can solve the problems [2]. The court operator especially the person in charged need to be ready with changes on their daily tasks, which, before this they deal with customer either face-to-face or through a phone call and accept cash payment, but soon, they must monitor the court reservation and payment in their email and also in the information system. They must learn on how to use the information system as well.

The Badminton Court Booking System is going to be developed to overcome those identified problems. The information system is accessible through the Internet, thus, it allows customers to place a reservation without having to come to the Dewan Kenangan Tun Abdul Razak or through a phone call. The reservation process is more convenient to the customer because the information system can be accessed using the desktop or mobile device that has Internet connection [3]. The information system will use the bootstrap front-end framework to enable responsive design to support the desktop and the mobile device [4]. Online payment functionality also will be included to make it easier for the customer to pay for the reservation.

2. MATERIALS AND METHODS

2.1. Comparison between existing systems and proposed information systems

Comparison studies was made between the existing information systems and proposed information system. The comparison is shown in the Table 1 below. Based on the comparison studies, the basic and compulsory functional requirements of the proposed information system can be identified and matched with the user requirements [5].

Table 1. Comparison between similar systems and proposed information systems

Features	Champion Badminton Courts and Pro Shop	Michael's Badminton Academy	Courtsite	Proposed Information System
Registration via online	/	/	/	/
Payment via online	/	/	/	/
Customer Feedback [6]	/	/	/	/
View in Mobile		/		/
Online store	/	/	/	
Search engine	/	/	/	/
Choose Plan [7]		/		
Calendar [8]	/	/	/	/

2.2. Development Methodology

The proposed Badminton Court Booking System will apply the Adapted Waterfall Model. The five

phases in Adapted Waterfall Model are illustrated in the Figure 1 below. Phase 1, the Requirement Analysis is where the user requirement is collected from the end user primarily using the interview and document review methods. Phase 2, the Design is where the information system is designed according to the user requirements and system requirements. Figure 2 below shows the Context Diagram of the information system that going to be developed. Phase 3, the Implementation is where the information system is being developed by the developer. It involves creating a database and source code writing. Phase 4, the Testing is where every functionality in the information system goes through testing activities to confirm with the user requirements and system requirements. Finally, Phase 5, the Documentation is where every information related to the information system will be documented. The model is chosen because it is simple to apply and prioritizes user needs in designing the system [9, 10].

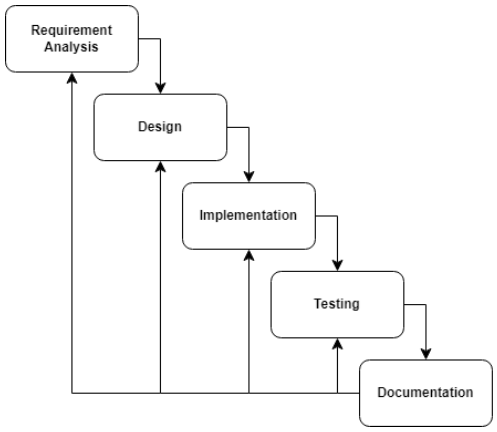

Figure 1. Adapted Waterfall Model

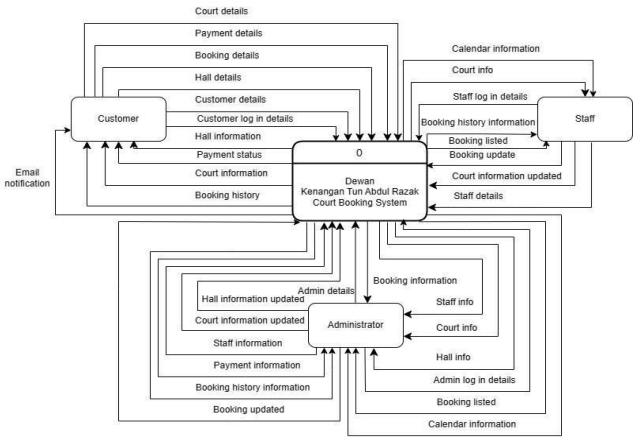

Figure 2. Context Diagram

3. RESULTS AND DISCUSSION

Figure 3 below shows the home page of the Badminton Court Booking System, while Figure 4 shows the reservation screen which only can be accessed by the registered customer. The user interface is developed using the Tailwind CSS framework and the back-end scripting is using PHP. The Tailwind CSS is used to enable the responsive design user interface [4].

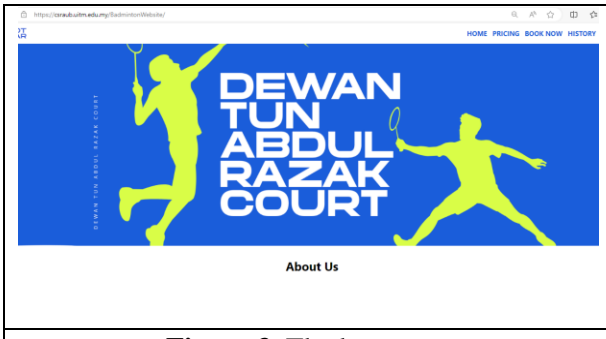

Figure 3. The home page

Figure 4. Reservation screen

4. CONCLUSION

The proposed Badminton Court Booking System is successfully developed. It has been tested by the badminton court operator and customers. All user requirements are fulfilled, except the online payment feature. The current online payment feature in the information system is a dummy feature. The online payment feature is going to be the future enhancement by integrating the information system to the any online payment gateway in Malaysia. Future enhancement also will cover the membership registration feature and request for a coaching and training.

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PODIAWEAR

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Abstract

Podiawear is an innovation massage home slipper that emphasizing innovation, simplicity, and ultimate comfort. It offers a groundbreaking massaging technology that simulates the expertise of professional masseurs. Designed for those seeking relief from foot fatigue or desiring relaxation, this slipper targets crucial pressure points with precision-engineered nodes. Beyond its primary massage function, Podiawear boasts adjustable settings, allowing users to customize their experience with various massage modes, intensity levels, and heat therapy. The added heat function enhances blood circulation, eases stiffness, and elevates relaxation, thereby helps the wearer to dive in tranquility. Podiawear offers a convenient alternative to professional spas and therapists, empowering individuals to take control of their foot health and overall well-being.

Keywords: Slippers, Comfy, Heater, Massage

1. INTRODUCTION

Foot pain can make people difficult to move around, which can lead to weight gain, weakness, and poor heart function. Up to 87 percent of people have painful feet at some time in their lives for many different reasons [1]. One-third of older adults has foot pain, stiffness, or aching feet [1]. Massage home slippers are a beautiful andcomfortable footwear choice that is designed to soothe and relieve sore feet right in the comfort of your own home. These slippers combine the relaxing effects of traditional massage techniques with the ease of everyday footwear, making them a popular choice for anyone looking for relaxation and comfort.

These slippers are usually one-of-a-kind, with built-in massage nodes or beads carefully positioned on the insoles. These nodes are intended to target important pressure areas on your feet when walking or standing, offering a gentle, therapeutic massage. After a long day, the sensation of these massage nodes kneading and stimulating your feet can help reduce tension, enhance blood circulation, and relieve stress and weariness. PodiaWear is available in a wide range of shapes and materials, from soft and cozy to sleek and ergonomic. They are available for both men and women and frequently have adjustable straps or buckles for a bespoke fit. Some even have heat therapy alternatives for additional relaxation. These slippers are attractive as well as soothing, making them a versatile choice for regular wear around the house. Massage home slippers provide a lovely sensory experience that can increase your entire well-being, whether you're resting, performing chores, or simply unwinding.

2. MATERIALS AND METHODS

2.1. Prototype

Figure 1 shows the sketch of the PodiaWear, while Figure 2 and 3 are the respective side and upward view of the PodiaWear. The type of material for sole is rubber which function as anti-slip. The top material uses the velvet fabric. The slipper consists of LED light with built in massage tools and heater. These functions can be controlled using TriAina apps that can be installed from Google Apps or Apple Store.

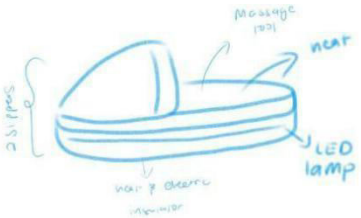

Figure 1. Sketch of PodiaWear

Figure 2. 2-D model from the side

Figure 3. 2-D model from top

2.2. Components

Components	Description
Light	The light can be switched on using TriAina apps which can be installedfrom the Apple store or Google PlayStore. This light can also be an emergency light when the house is blackout and the phone runs out of battery.
Massage	For massage, serpentine jade that contains iron, magnesium and calcium is used to allow the jade to hold heat very well [2]. It is a good stone to be used in a thermal massage which aids the massaging tools to work more efficientlyinto the deep tissue of the human body. User can just use the TriAina application to turn on the massage button. For example, if user has back pain, then just click on back pain massage, then user's feet will be massaged at a certain pointat the user's footprint.
Heater	The serpentine jade functions relatively the same as the massage where heat travels equally in the human body. Similar as massage, the heater button is turned on using TriAina application. There are two features, one for on and off the heater and another one is for choosing the preferred temperature. For effective heater usage, the feet must be heated first to loosen some muscle before the massage.

3. RESULTS AND DISCUSSION

The result of concept testing of the customer's satisfaction and knowledge towards the Podiaware is as follows:

3.1. Concept Testing

In the context of testing the concept of PodiaWear, a subtle protomonadic testing consisting of sequential monadic testing and comparison test are done. Firstly, respondents are presented with two or more concepts at the same time and needed to evaluate each concept without direct comparisons. Followed by the comparison test, the target audience then assesses and chooses the preferred concepts. In contrast with other tests such as the monadic test that needed to break down the target audience into several groups, comparison tests are much easier to understand and select the result [3].

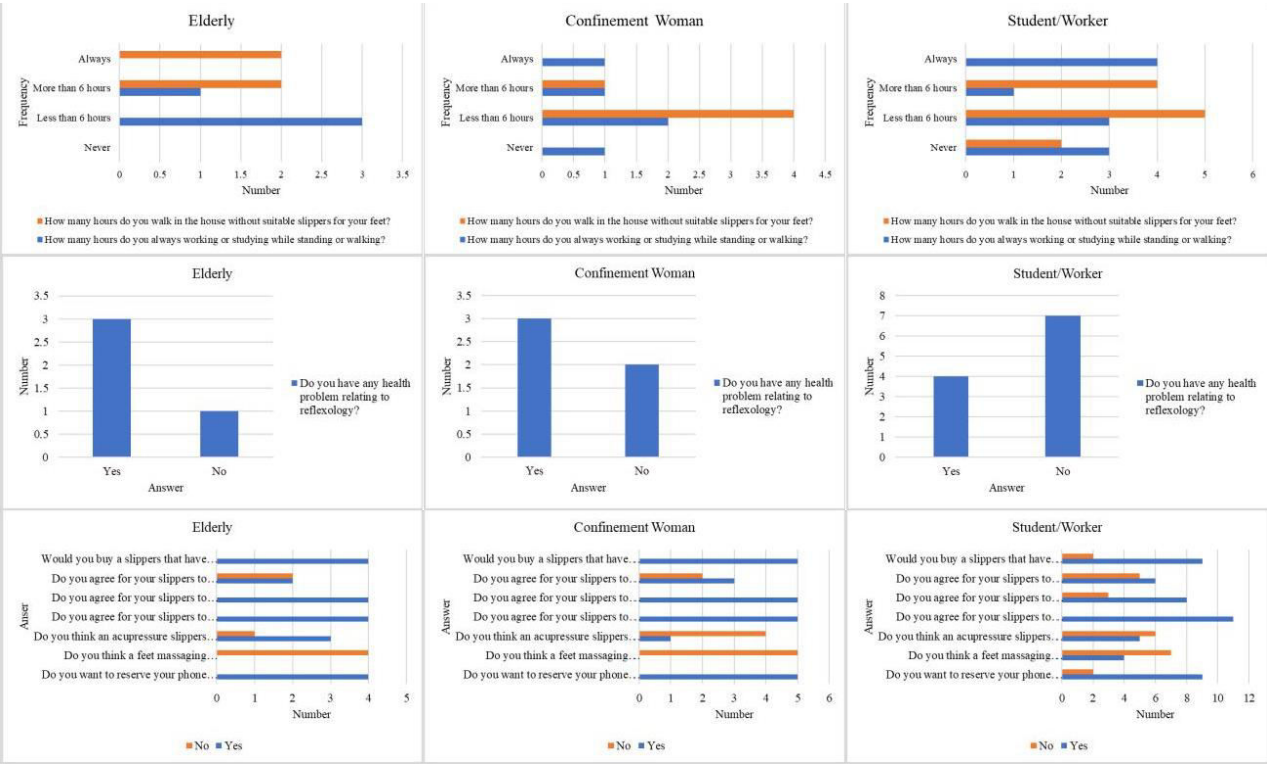

Figure 4. Concept testing's data

The data collected were categorized into three distinct groups: the elderly, confinement woman, and individuals who are either students or workers. These categories represent the primary target audience crucial for the evolution of PodiaWear. For each group, inquiries focusing on their health, daily habits, and personal preferences were made. The feedback obtained from these queries was instrumental in designing and refining the prototype of PodiaWear. Consequently, the final product has been tailored to be portable and comfortable, with an emphasis on addressing health concerns related to reflexology. Table 1 below shows honest review from the three categories.

Table 1. Feedbacks and opinions

Category	Elderly	Confinement Woman	Student/Worker
Feedback and Opinion	• Can help to lessen my health problem symptom.	• Help to overcome before and after pregnancy's health problem. • Is this suitable for pregnant woman?	• Interesting • Make it more sizeable. • LED function might cause shock current or why it is necessary.

4. CONCLUSION

Massage home slippers offer a convenient and accessible solution to address various foot-related issues and promote overall well-being. These innovative footwear options are designed to alleviate foot fatigue, reduce stress and tension, improve circulation, and provide a simple form of self-care within the comfort of one's home. They cater to a range of needs, from practical foot health concerns to fashion preferences and self- care routines. Ultimately, massage home slippers are a valuable addition to the world of comfort footwear, offering a blend of therapeutic benefits and style to enhance the daily lives of individuals seeking relaxation and relief for their tired feet.

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ABELLA HONEYCOMB

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Abstract

Travelling is easier and more affordable nowadays which leads people to travel around the world. Travel kit is one of the products that can help travellers pack faster and more efficiently. Example of travel kits are health kits and toiletries travel kits. By using toiletries travel kits, travellers can bring only a small quantity of toiletries for their journey instead of bigger containers. Although the usual toiletries travel kits did help travellers in packing, there are still a few problems that could be improved. The aim of this study is to create toiletries travel containers that meet the needs of consumers mainly travellers and tourists. Abella Honeycomb is a hexagon-shaped toiletries container made for travelling. The product is designed by utilising data that has been gathered from questionnaires detailing the issues that travellers confront while using standard toiletries travel kits. Abella Honeycomb has a few features that can provide all the solutions to the traveller's problems. Additionally, the product incorporates a mirror and rechargeable Light Emitting Diode (LED) lamp for added functionality. The hexagonal containers are equipped with strong magnets on each side, facilitating easy attachment to one another. This product is primarily designed for liquid-type toiletries. Our target market comprises travellers and tourists seeking high-quality toiletries travel kits that offer durability and a range of useful features.

Keywords: liquid toiletries, travel kit, hexagon-shaped container

1. INTRODUCTION

Nowadays, more people are travelling either locally or abroad. As stated by Hyde and Lawson (2003) [1], the travel industry is one of the fastest-growing sectors in the tourism industry worldwide. Travelling has become easier and more affordable. Millions of individuals have joined travel blog websites, to share their travel experiences online [2]. People travel for various reasons such as business trips, leisure, or for education purposes. Travelling takes proper planning, from deciding the budget, choosing the destination, booking the transportation and accommodation, and researching things to do. Another thing that needs attention when preparing for travelling is packing because people choose to bring fewer things. Some of them use travel kits to pack their things. Based on Neves and Silva (2018) [3], it is intended to create a travel kit that simplifies usability, organization and carry-on luggage transport. Besides, it is difficult to bring liquid toiletries since the Transportation Security Administration (TSA) regulates that all liquids,

aerosol, and gel must be in 100 ml containers or less to be brought in carry-on bags [4]. Thus, it is a good idea to use toiletries travel kits to store a small quantity of toiletries enough for short-term travelling.

There are several problems when using the toiletries travel kit. One of the problems is that the containers take up more space than desired. Furthermore, it can be hard to pack and retrieve from the bag when needed. The most common problem in toiletries travel kits is leaking. Some containers cannot be closed properly or still leak even though it is closed properly. The leakage can also happen due to the containers being crushed or tumbled along the journey. The toiletries travel kit in the market today does not allow the consumers to know how much toiletries were left inside the containers. This makes it hard for consumers to know when they need to refill the toiletries or if they have enough toiletries in the containers. For frequent travellers, it is easier for them if they put aside their toiletries ready to pack for their next trip as it will save time. Abella Honeycomb is developed to meet the needs of toiletries travel kit. This product was created to save more space even with a lot of containers and to minimize leakage. In order to give more convenience to the customers, it can also display the level of toiletries in the container.

2. MATERIALS AND METHODS

The development of Abella Honeycomb involves the process shown below:

Step 1: Identify the problem.
Step 2: Research and development.
Step 3: The design of Abella Honeycomb is proposed and sketched as in Figure 1.

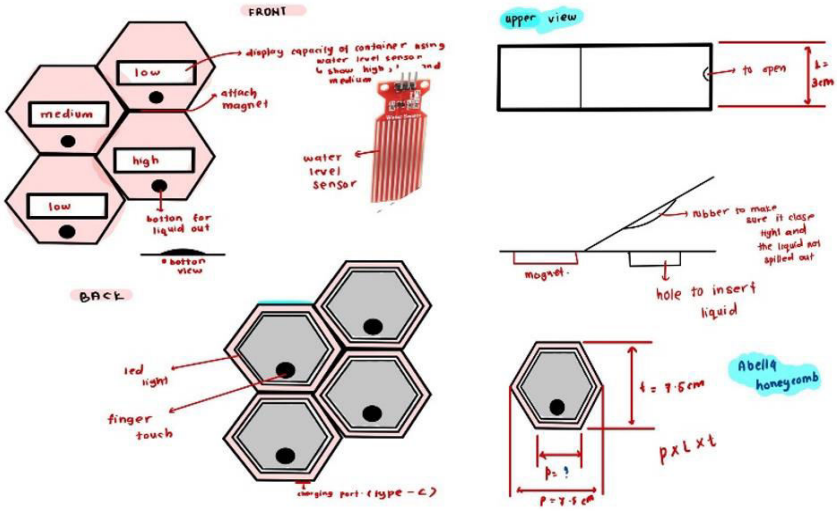

Figure 1. Sketch of Abella Honeycomb

Step 4: The materials to develop Abella Honeycomb are proposed.
Step 5: The prototype of Abella Honeycomb is developed.

3. RESULTS AND DISCUSSION

Abella Honeycomb's targeted markets are travelers and tourists to help them with packing liquid toiletries more efficiently. Customers can use Abella Honeycomb to fill their liquid toiletries to save space in their luggage or carry-on bags. With that, travelers don't need to buy new toiletries or bring the original bottle of toiletries. Abella Honeycomb offers a few enhancements in the quality of the material used as well as some extra features. Abella Honeycomb comes with a display monitor, USB charging ports, and an LED light mirror. The hexagon shape provides mechanical stability and minimizes space wastage [5]. The magnets at the sides of the product facilitate the products to connect to one another. The Abella Honeycomb is compact in size which makes it highly portable for both travel and daily use. The special feature of this product is the ability to display the level of liquid in the container through the incorporation of the water level sensor. The features of Abella Honeycomb are shown in Figure 2.

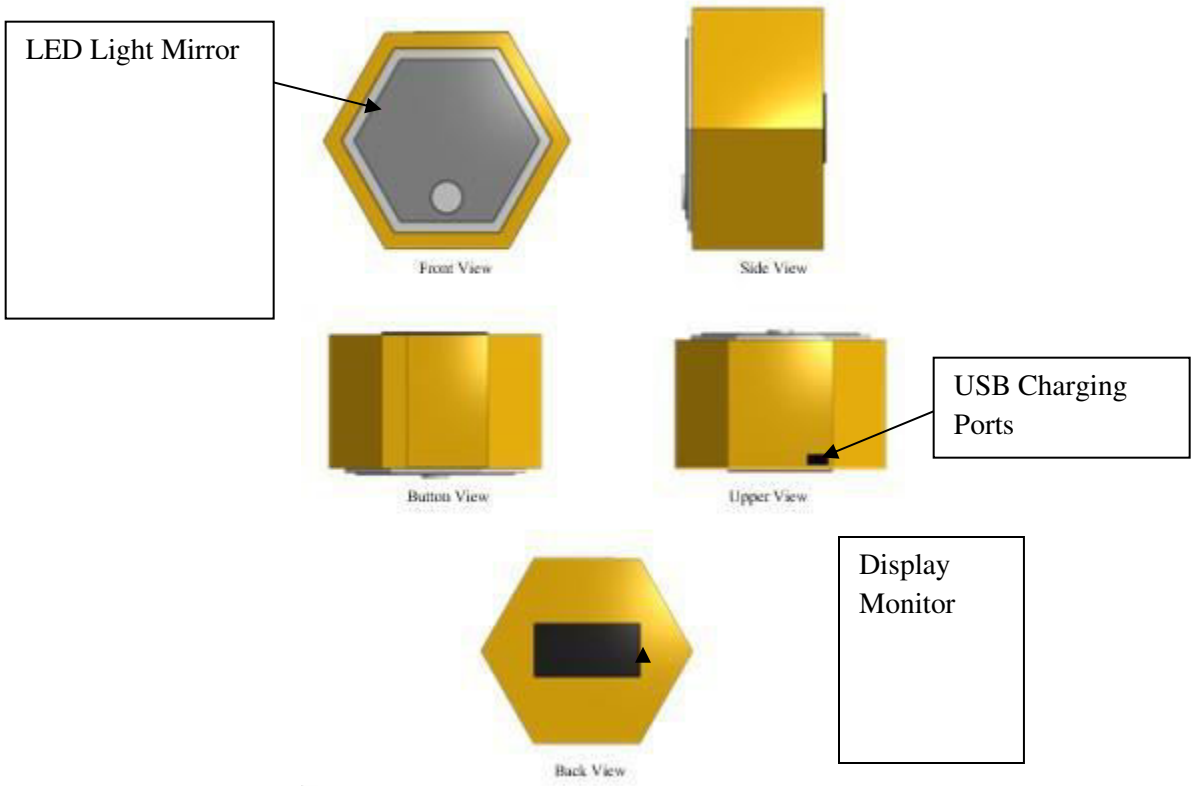

Figure 2. Abella Honeycomb prototype

4. CONCLUSION

In conclusion, Abella Honeycomb is designed for customers to conveniently carry the product anywhere, without worrying about the space in their bag. It also meets customer expectations by displaying the estimation of liquid capacity in the container. Customers no longer need to worry about the challenges of bringing toiletries when travelling or going out.

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FLOOD DAMAGE PREDICTION SYSTEM

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Abstract

Prediction involves making educated assumptions about potential future occurrences, results or trends using information, data or patterns that are already known. Machine learning-based prediction refers to the use of cutting-edge technology in disaster events to predict outcomes and contribute to more efficient disaster management more accurately. One of the applications is to predict flood damage costs, which provides information for efficient resource management and risk management. The potential costs connected with flood disasters can be assessed by analysing historical data and related factors. Malaysia often experiences floods every year and the most affected states are the east coast states such as Terengganu, Pahang and Kelantan. Floods bring about not only loss of life but also substantial damage to property. Although floods can have an impact on a country's economy, less attention is often paid to flood damage predictions than to general flood predictions. This perception stems from the belief held by many that predicting damage is unimportant once a flood has already occurred. The Flood Damage Prediction System focuses more on structural damage of Department of Irrigation and Drainage (JPS) in Terengganu. This system has the ability to predict the expense of the damages suffered by JPS. JPS can save the budget to repair structural damage by optimizing the allocation of resources from the government. In addition, future flood damage costs can be reduced by making good decisions to improve damaged structures. The system is a user-friendly system which has been developed based on the Random Forest algorithm. Random Forest offers significant technical and is widely used for both regression and classification issue analysis. The accuracy testing of the system has proven that it is capable to predict the flood damage cost with an acceptable performance.

Keywords: Flood damage, Random Forest, JPS

1. INTRODUCTION

Floods are one of nature's worst tragedies, wreaking irreparable and severe havoc on the socioeconomic system, agriculture, and human life [1]. Malaysians are frequently affected by floods, a serious natural calamity. Floods have caused a lot of economic damage such as damage to buildings, agriculture and others. Furthermore, most of the studies on this issue that have been found concentrate on calculating the probability of flooding, with studies on damage prediction being less common [2]. Therefore, flood damage prediction needs to be implemented to make decisions and reduce the losses experienced. Prediction is a statistical technique that uses Machine Learning (ML) and data mining to anticipate and forecast possible occurrences using the help of past and current data. ML learns from data and gets better with practice. It can keep practicing being even better or handle new situations [2]. The Flood Damage

Prediction System focuses more on the cost of structural damage of the Department of Irrigation and Drainage (JPS) in Terengganu. There are a few similar works which are related to flood damage prediction. García *et al.* [2] predict the level of damage to similar buildings affected by river flood in a specific area in Spain. Jiang *et al.* [3] have adapted ML algorithms and weather forecast for the prediction of farmland flood disaster in China. Other similar work is the prediction of flood damage grades for building in Nigeria which was carried out by Malgwi *et al.* [4].

2. MATERIALS AND METHODS

2.1. Random Forest

The system has been developed based on the Random Forest (RF) algorithm. RF algorithm is a supervised machine learning technique that is built using Decision Tree algorithms [5]. As a result of its versatility and simplicity, it is also one of the most often used algorithms. RF is appropriate when training on data similar to a decision tree, and the output is provided in the form of a mean prediction [6]. In conventional ML, RF is a well-liked and often applied ML model [7].

2.2. System architecture

Figure 1 illustrates the system architecture for the project. The system was built using Python programming language. Data was collected from JPS. Based on Figure 1, after collecting data, data is preprocessed by replacing missing values, removing noisy data and saving the cleaned data into a csv file. The processed data will go to the next section to be trained and tested. Data is trained and tested using percentage splits of (90:10), (80:20) and (70:30). Random Forest regression will be applied to the data. Then, calculation of the Mean Squared Logarithmic Error (MSLE), Coefficient of determination (R^2) and Accuracy for performance evaluation are conducted. After testing and evaluation, the model of Random Forest Prediction will be created. The user will inputs the data of rainfall from November until February and river streamflow in the user interface and connect with the model. The user interface design was based on Streamlit Web App. The model will give the result of flood damage cost in Malaysian ringgit (RM) to the user.

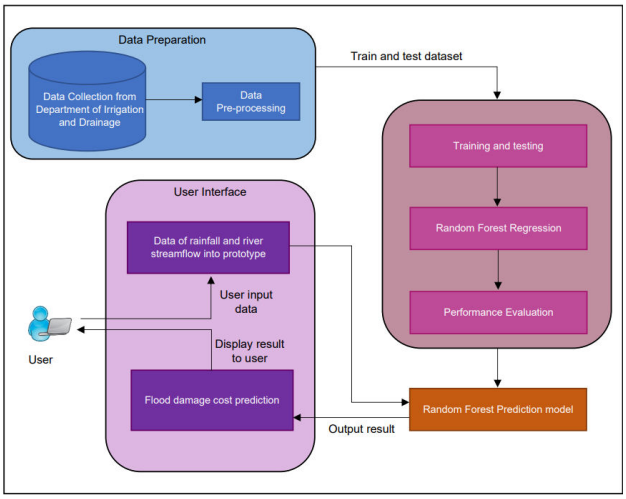


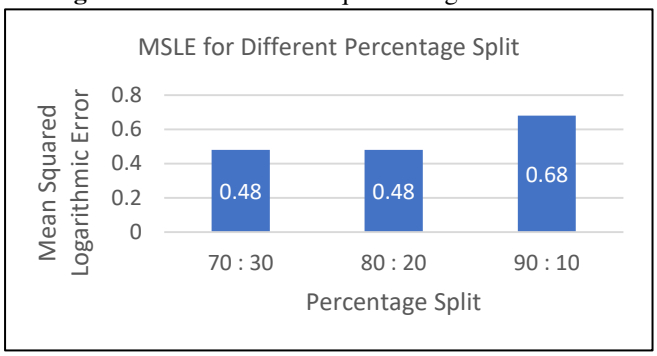
Figure 1. System Architecture

3. RESULTS AND DISCUSSION

3.1. Mean Squared Logarithmic Error

The assessment outcomes achieved by applying the MSLE approach are shown in Figure 2. The 90:10 split has the largest error of 0.68 among the percentage splits. The errors produced by the 80:20 and 70:30 splits are comparable and both are 0.48. A lower MSLE value indicates better model performance.

Figure 2. Chart of Mean Squared Logarithmic Error



3.2. Coefficient of Determination

The results of the evaluation utilising the R^2 approach are shown in Figure 3. With an R^2 of 0.73, the 90:10 split has the lowest value. The 80:20 split has the greatest R^2 value, 0.92. R^2 values for the 70:30 split remains constant at 0.91. Predictive models should avoid having low R^2 values.

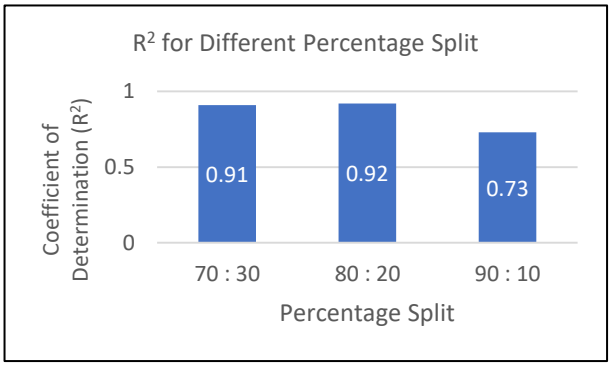


Figure 3. Chart of Coefficient of Determination

3.3. Accuracy

The assessment results achieved using the accuracy method are shown in Figure 4. The 80:20 split has the highest accuracy of the percentage splits under consideration, reaching a remarkable 91.47%. In contrast, the accuracy of the 90:10 split is the lowest, coming in at 69.14%. A higher accuracy value indicates better model performance.

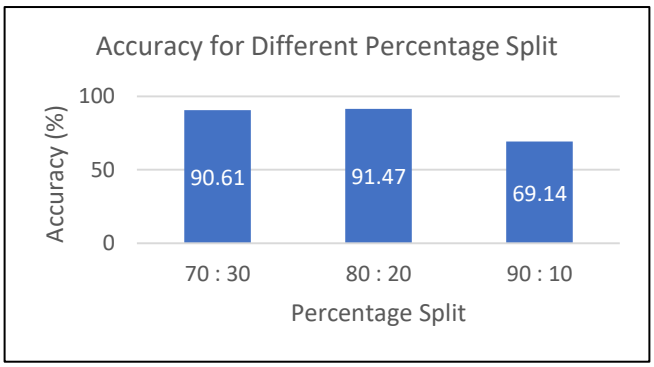


Figure 4. Chart of Accuracy

4. CONCLUSION

Based on the findings of the performance metrics, the best model performance is from the percentage split of 80:20, achieving an accuracy of 91.47%, an R^2 score of 0.92, and an MSLE value of 0.48. In future work, it is expected that this system could be further improved by making prediction for more detailed JPS infrastructures with their damages information.

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RUNNING-PRO SHOES

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Abstract

Selecting an appropriate running shoe is essential for lowering the risk of injury, maximising one's running performance, maximising one's general comfort, and contributing to one's enjoyment of the activity of running. Accurate knowledge of distance, pace, and heart rate is crucial for runners. Running with phone to track these elements is a common practice. However, there are also some potential risks associated with running with a phone such as injury risk, distraction and security concern. Running-Pro shoes is an innovation from existing shoes whereby technology is added to the shoes. It is made from Gore-Tex material to provide lightweight, waterproof, and breathable shoes. Photoplethysmography (PPG) technology is added to the shoes to detect the heart rate of a runner and it's also installed with a GPS to track the distance and pace of users. The shoes also equipped with Bluetooth capability that allows it to connect to earbuds and notify users about current status of their heartrate, distance, speed, and even location via audio function. These technologies are installed in the midsole of the shoes in a suitable place and wrapped securely so that it will not be damaged during running. Earbuds are included with the shoes and will be put in the midsole. The midsole of the shoes is designed to be detachable so that it can be use as compartment for earbuds. A market survey is carried out to gain insight towards this product. A sample of 264 respondents involved in the survey and 231 of the respondents brought their phones along with them while jogging or running. 87.5% of them are interested with this innovation that can replaced the function of phone and sport watch while running. 62.5% of the respondent willing to purchase the product in the future. Running while holding a phone causes a subtle imbalance in the body that can lead to issues with the runner's hip, leg, and shoulder muscles. By introducing this new innovative concept in sports footwear, this product aimed to provide one of the most valuable and effective solutions for runners, addressing the issues arising from holding a phone while running. Choosing the right running shoes can greatly impact the comfort, performance, and overall running experience of the runners. Experience a new level of comfort and convenience while running and everyone should try this innovative sports footwear designed to eliminate the challenges of holding a phone while running. Embrace a smoother, distraction-free run and just focus on the stride and goals.

Keywords: Running, sports, shoes, performance, innovation

1. INTRODUCTION

Running persists as a common and efficient approach to get in shape and promote long-term exercise. Numerous people engage in running for enjoyment or as a necessary aspect of their lives and jobs [1] Running with wearable technology has become a popular practice. Highly developed motion capture technologies are frequently utilized to analyze changes in movement and gait. Researchers can measure and infer various movement and force characteristics using modern motion capture methods [2, 3]. Accurate knowledge of distance, pace, and heart rate is crucial for runners. However, issues arise when using a phone; several runners have voiced concerns about the precision of their distance and pace. Running performance will be affected by this situation because runners are unable to accurately gauge their pace and distance. Additionally, they are unable to create a proper plan for improving their performance. Owing to running's widespread appeal, a wide range of services are offered to help runners' efficiency, drive, or concentration: Wearable technology can offer technical running feedback [4, 5]. While the trend toward increasingly sophisticated sports applications and devices has many benefits, such as improved performance or more enjoyment, there are also possible drawbacks. One major concern is that encounters with such gadgets might irritate runners on several levels. Current HCI research often assesses interactive activities while moving by evaluating the interaction itself. These gadget interactions might obstruct running movement. This, in turn, can have an impact on pleasure of the run, as well as performance and/or injury risk [6]. Additionally, some runners have voiced concerns about the possibility of their phones slipping from their hands while they are moving. This incident demonstrates how using a phone while running can interfere with the smooth performance of that activity. Additionally, there are problems with annoyances and an unreliable heart rate detector when wearing a sport watch. Runners not only expressly liked smartwatches, but they also scored highly in terms of interference with flexibility [7]. Although smart watches are an excellent piece of technology, many runners suffer from sensitive skin, which will demotivate them. Running enthusiasts must always be aware of their heart rates during or after exercise because it will affect their heart health, which is related to the issue with heart rate detectors when wearing smart watches. Without proper operation, after their actions, there will be additional serious issues. As a result, there is a need to evaluate wearable gadgets in terms of their effect on mobility and assessed measures from general mobile computing and gait measurements. Hence, the study attempts to provide solutions with pace calculation issues when using a phone, issues with phones that might fall off while running, heart rate detector and irritations issues when using a sport watch and to identify issues with miscalculated distances when using sport watches and phones.

2. MATERIALS AND METHODS

The research and development team had to take a lot of factors into consideration before coming up with this product. Simply put, this product is an innovation that satisfies the demands of a running purpose based on current technology. A questionnaire was developed by using Google form to identify the issues or problems that runners face daily towards their running. The target population of the study are all students from UiTM Cawangan Terengganu, Kampus Kuala Terengganu and 264 samples are involved in the survey. According to the survey's findings, 62.5% of respondents were men and 37.5% were women. They brought their phones 87.5% of the time, and 75% of respondents wore sport watches while they were running. To identify the type of issue that arises among them, we also asked the respondents from the survey about the accuracy of the distance, pace, and heart rate results when using phones and smart watches.

New product development is an evolvement of existing product or a new type of product creation to be sold to customer. For our product, Running-Pro shoes is an innovation from existing shoes whereby we add technology to add more features to the shoes. The shoes are made from Gore-Tex material to provide lightweight, waterproof, and breathable shoes. Just like any other shoes, our product also uses some of the materials that are used for normal running shoes such as leather and synthetic fiber. However, for Running-Pro shoes we add technology such as photoplethysmography (PPG) technology to detect heart rate and we also install a GPS for tracking the distance and pace of users. Furthermore, what distinguishes our shoes from others is that they include a Bluetooth capability that allows the shoes to connect to earbuds notify users about current status of their heartrate, distance, speed, and even location via audio function. These technologies are installed in the midsole of the shoes in a suitable place and wrapped securely so that it will not be damaged during running. Earbuds are included with the shoes and will be put in the midsole. The midsole of the shoes is designed to be detachable so that it can be use as compartment for earbuds. Footstep detectors is equipped in both shoes, which detect each step based on pressure at the shoe's base. This will make calculating footstep more precise than any other technology or software now in use. Moreover, to add a safety aspect to our product, we also produced reflective tape behind our product's midsole to allow users to jog at night and alert vehicles of the runner's presence.

Figure 1: Features of Running Pro-shoes

3. RESULTS AND DISCUSSION

Running-Pro Shoes is a new product of its kind. It is the first running shoes that can detect runner's running pace, distance ran and even the heart rate while running. There were no shoes that can do as our product yet. The already existing products of running sport shoes only provide high material with no features and technology to operate such as our product does. Existing products of running sport shoes only give buyers comfortability and lightweight function. Meanwhile our products provide more than that so that buyers could also improve their performance in running with our product's help. Our product falls under the running sport shoes market because technically it purpose is for physical activity such as running. Our product could also be used for another purpose such as medical use to locate patients and measure their physical health. Certain designs and materials will be modified to match what is required for that specific function. Those modifications might reduce or increase the cost of manufacturing depend on what will be modified. Furthermore, our product also can be used for another purpose than medical purpose such as security and video games purpose. Its all depend on human imagination on how it can be used and in future in might be a normal used for daily purpose.

Product design is an important step in order to develop an innovation of a product to distinct our product with other brands and to fulfill customer's needs. The most important thing about designing a product is whether the product can solve the customer's problem. In designing a product, a company should pin down the customer's request, the problems faced by the customers that needs solutions, and creating a solution for the said problems. In designing Running-Pro Shoes, we compiled problems that often happen among runners. Thus, we are designing a product which can solve all the said problems. Materials For Running-Pro Shoes, our shoe design is inspired by existing running shoes in the market such as Adidas UltraBoost and Asics running shoes. The design is intended to make the shoe looks suitable and also comfortable for jogging and running.

The material used for the outer part of Running-Pro Shoes is Gore-Tex, which is famous with very breathable, extremely lightweight, and waterproof. These characteristics are important to make sure that the performance of the runner can be increased. A breathable material can keep the temperature of runner's feet stay low even after running for a long time. In addition, a lightweight shoe will help the runner to run faster. For the midsoles part, Running-Pro Shoes uses flytefoam materials to absorb shocks and protect the runner's feet and it can also increase bouncing effect while running, which helps a lot in long distance running. At the shoe tongue, we put our Running-Pro Shoes logo to make sure the logo can easily be seen by our customers.

Features On the inside of the shoes, we put a high sensitivity heart rate detector to replace the heart rate detector function on your sport watches. The heart rate detector in Running-Pro Shoes will trace the heart rate from the pulse at the back of your foot, that is posterior tibial artery. The high sensitivity detector will detect your heart rate even if the runner wear socks. At the bottom of Running-Pro Shoes, we installed footstep sensors so that you can record your footsteps more accurately than your phone. Every time your foot hit the ground; the sensor will count your step as one. That will continue for the next steps as well. At the back of the midsoles, we put a reflective material for the runner's safety if he or she is running at night.

The uniqueness in Running-Pro Shoes is we have detachable midsoles. The midsoles and the shoes are connected with a magnet called graphene. Graphene is a magnet type which is lightweight but strong and can be a good electric conductor. On the detachable midsoles, we have built-in earbuds for the runners to use to acknowledge to their heart, pace, and distance travelled while you are running so you are no longer needed to bring your phones with you. Next, GPS tracker is also built on the left midsoles. The tracker is used to record current location information to the earbuds, as well as the path travelled by you. On the right midsoles, we can see that the layout is similar with the left midsoles, except that the right one has Bluetooth chip built in it. The Bluetooth chip is used to transfer the recorded information like pace, GPS, and so on to the earbuds and to Running-Pro Shoes application. The application use is just to save the recorded information from your previous running or jogging session into your phone. The application is not usable while running because it will not reach the objective of creating the Running-Pro Shoes

Based on the survey, 87.5% of the respondent are interested in using our product, and we received a favorable response. 62.5% of them are willing to purchase our product in the future. Our product's materials are made of Gore-Tex, which makes the shoes waterproof, breathable, and incredibly light. We are replacing the heart rate detector on sport watches with a heart rate detector for the purposes of our product. The pulse that will measure heart rate is called the "posterior tibial artery." Additionally, we added step counters to track the number of steps taken while running and reflective material to improve runners' safety at night. Additionally, our product features detachable midsoles that are joined together by

the magnet "graphene." We have integrated earbuds for the runners on the detachable midsoles so they can monitor their current heart rate, pace, and distance without using their phones. After that, a GPS tracker and Bluetooth chip were also installed in our shoes to record our current location and send it to the earbuds and "Running-Pro" application. The application's purpose is to save the recorded data from earlier running activities to the phone. We firmly believe that our product will be well received by consumers in the future and that it will satisfy their needs, particularly those of novice and experienced runners.

4. CONCLUSION

In conclusion, the results and discussion indicate that the issues that arise when a runner uses a smartphone and sport watch are related to the pace calculation, heart rate detector, and incorrect distance calculations. Running while holding a phone causes a subtle imbalance in the body that can lead to issues with the runner's hip, leg, and shoulder muscles. On the other hand, some runners may experience irritation when wearing a sport watch while running due to their sensitive skin. To solve this issue, a brand-new style of sport shoes was innovated which perform the same functions as a phone and a sport watch. “Running-Pro Shoes" have technology that can measure heart rate while running and calculate distance, pace, and heart rate. People who have been actively involved in the running community for a long time and have encountered the same issue when using a phone and sport watch are the target market. The product is ready to be sold to retailers once the concept has been approved, the design has been completed, the concept testing has been completed, and the test marketing has been successful. The survey that was conducted supports this proposed product as well. Most of the respondents wanted something new or technologically advanced based on current technology that might help runners resolve this issue to enhance their running performance. We believe that introducing an innovative concept in sports footwear will be a successful product for our target market in the future because, according to statistics, the number of runners has been rising steadily. Therefore, our product will be among the most useful and successful solutions for the runners to assist them in resolving this issue.

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APPLICATION OF CUBIC TRIGONOMETRIC HERMITE INTERPOLATIONCURVE WITH PARAMETERS IN 2 DIMENSIONAL OBJECTS

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Abstract

The mathematical representation of an object's geometry created by a computer or piece of software is known as geometric modelling where the information that is both graphical and text-based is included. This data is shown as an image and kept in a database. The model can then be altered and subjected to various analyses. Geometric modelling frequently uses curves to build surfaces because they are simple to manipulate and bend to suit the purpose. A set of points, analytic functions, or other curves can all be used to create curves. Geometric models can be divided into two categories which are two-dimensional models for technical drawing and three-dimensional models for computer-aided design and manufacturing. For further information, two-dimensional is commonly used for flat objects since it displays an image in two dimensions while for three-dimensional, the model's complicated geometry can be fully viewed in three dimensions due to the illustration. In this project, cubic trigonometric Hermite interpolation will be used to construct two-dimensional objects where the properties of this method will be discussed further. Then, using Mathematica, the design process is carried out using cubic trigonometric Hermite interpolation, and the outcomes are obtained. The best value of shape parameter is determined for both objects in order to produces curves that are both smooth and flexible.

Keywords: Cubic, Hermite Interpolation, Shape Parameter, Tangent Point

1. INTRODUCTION

In Computer Geometric Aided Design (CAGD), curved things are designed, computed, and represented digitally **[1]**. Vlachkova (2020) says the important issue in approximation theory and CAGD is the interpolation of scattered data. It has uses in several industries, including architecture, computer graphics, design of ships and aeroplane, and more. Several multivariate interpolation algorithms have been presented over the past thirty years. Next, a crucial component in modelling interpolation curves is the cubic Hermite interpolation curve, but it has three drawbacks: poor continuity, challenging form adjustment, and a limited ability to adequately represent several typical engineering curves [3]. To finally address the three issues with the cubic Hermite interpolation curve. The cubic trigonometric Hermite

interpolation curve accurately represents the elliptical arc, circular arc, quadratic parabolic arc, cubic parabolic arc, and astroid arc that frequently occur in engineering. It also achieves C2 continuity and has local and global adjustability [4].
Therefore, this project's main objective is to conduct the construction of a two dimensional object using cubic trigonometric Hermite interpolation. Curves are created using the same control point for each approach. The produced curves are examined, and the behaviour of those curves is discussed. In addition, in this project the coordinate and the tangent are given in the journal where the variables that can be change are parameters that can control characteristics of cubic trigonometric Hermite interpolation.

2. METHODOLOGY

The Cubic Trigonometric Hermite will be used to form the two dimensional objects. All the calculations are using Mathematica software.

2.1 Cubic Trigonometric Hermite Interpolation curve

Relying on the research made by Li and Liu in 2022, the cubic trigonometric Hermite interpolation curve is afterwards obtained naturally. The following shows the basis function of cubic trigonometric Hermite interpolation curve [4].

$$F_{i,0}(t)=(1-\alpha_i)+3(\alpha_i-1)S^2+2(1-\alpha_i)S^3+\alpha_i C^3$$
$$F_{i,1}(t)=2(\alpha_{i+1}-1)+3(1-\alpha_{i+1})S^2+\alpha_{i+1}S^3+2(1-\alpha_{i+1})C^3$$
$$G_{i,0}(t)=-\beta_i+S+3(\beta_i-2)S^2+(1-2\beta_i)S^3+\beta_i C^3$$
$$G_{i,1}(t)=\frac{1}{3}\left(2(3\beta_{i+1}-5)-3C+9(2-\beta_{i+1})S^2+3(\beta_{i+1}-8)S^3+(13-6\beta_{i+1})C^3\right)$$

where $S=\sin(t)$, $C=\cos(t)$, $t\in\left[0,\frac{\pi}{2}\right]$, α_i, α_{i+1}, β_i, and β_{i+1} are free parameters.
Then, the cubic trigonometric Hermite interpolation curve (also known as the CTHI curve) is defined as follows given a set of points pj and the corresponding tangent vectors mj;

$$TH_i=F_{i,0}(t)\,p_i+F_{i,1}(t)p_{i+1}+G_{i,0}(t)\,m_i+G_{i,1}(t)\,m_{i+1},\quad \text{where } i=0,1,.....,n-1,\ 0\le t\le 1,$$

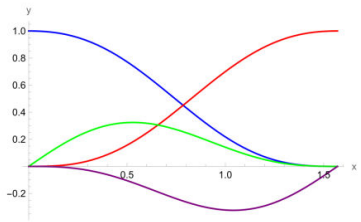
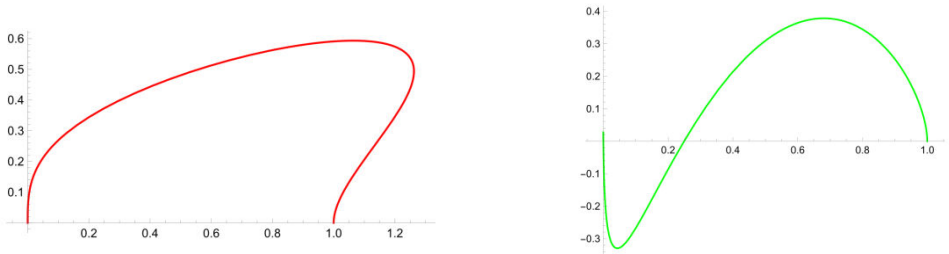


Figure 1: The basis function graph for cubic trigonometric Hermite interpolation



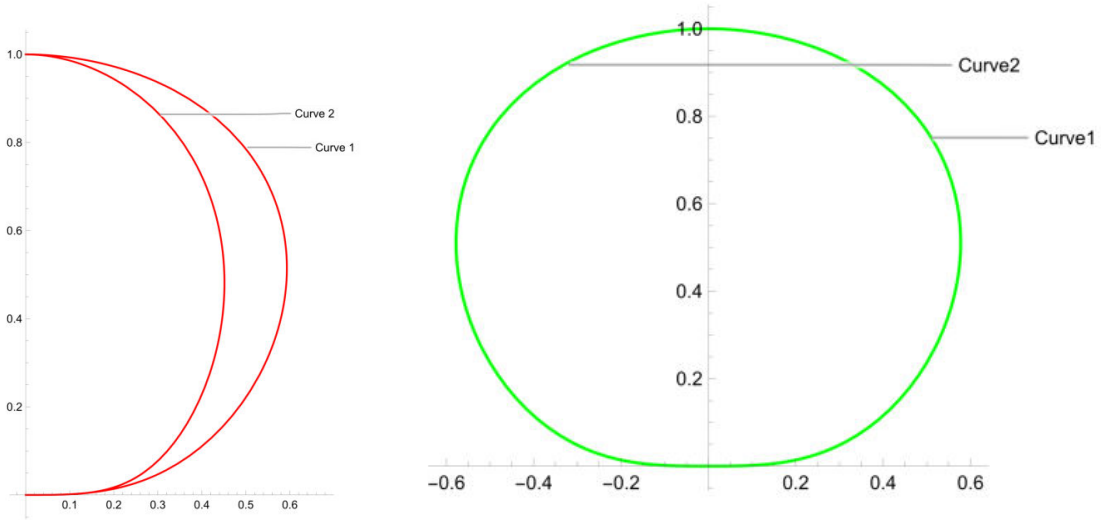
(a) (b)

Figure 2: Variety shape of curve obtained by using difference value of shape parameter

The cubic trigonometric Hermite interpolation curve can be modified by changing the shape parameter value. Figure above shows the difference shape of curves obtained if difference values of shape parameters are used. Curve (a) and curve (b) used the same value of control point which are $P0 = P2 = (0,0)$ and $P1 = P3 = (-1,0)$ while the tangent points for curve 1 and curve 2 also are same at $T0 = T2 = (1,0)$ and $T1 = T3 = (-1,0)$. Shape parameter that used to form curve (a) is $\alpha_i = -0.5, \alpha_{i+1} = 5, \beta_i = 1, \beta_{i+1} = 0.5$ and $\alpha_i = 0.5, \alpha_{i+1} = 0, \beta_i = -5, \beta_{i+1} = -1$ for curve (b).

3. RESULTS AND DISCUSSION

3.1 Application of Cubic Trigonometric Hermite Interpolation curve in 2-dimensional



(a) Crescent shape (b) Circle shape

Figure 3: Two dimensional object by using Cubic Trigonometric Hermite Interpolation curves

Figure above shows crescent shape and circle are design using cubic trigonometric Hermite interpolation. The curve has been constructed based on the control point, and the curve has been drawn according to the

shape parameters where all the parameters' values are positive in range 0.5 until 2, as shown in the figure above. The resulting curve for the function is smooth and crescent shape are formed.

For crescent shape the control points for curve 1 and curve 2 are same at $P0 = P2 = (0,0)$ and $P1 = P3 = (-1,0)$ while the tangent points for curve 1 and curve 2 also are same at $T0 = T2 = (1,0)$ and $T1 = T3 = (-1,0)$. The best shape parameters for each curve have been chosen to generate a two dimensional crescent shape are shown as in table below:

Table1: Shape parameter values for Crescent shape

Curve	α_i	α_{i+1}	β_i	β_{i+1}
Curve 1	2	1.5	1	0.5
Curve 2	2	1	0.5	1

Table2: Shape parameter values for Circle shape

Curve	α_i	α_{i+1}	β_i	β_{i+1}
Curve 1	2	1.5	1	0.6
Curve 2	2	1.5	1	0.6

4. CONCLUSION

The findings of this study enable us to reach the conclusion that every one of the research goals has been well achieved. The correct images of the two dimensional objects are also located and the suitable shape parameters can be obtained after studying the behavior of the curve using free parameters. Therefore, utilizing Mathematica will allow you to design a two dimensional object using cubic trigonometric Hermite interpolation without making any easy blunders or errors.

The behavior of the curve can be changed by adjusting the curve's shape parameters. Although a smooth curve is generated, if some of the shape parameters are modified, a sharp curve will be generated. A relatively small difference between the parameters of two curves may be discernible. The shape that is assigned to the curves constructed using the cubic trigonometric Hermite interpolation function depends on the shape parameters of the shape that is created with the control points and tangent vectors. When it comes to the creation of two-dimensional shapes, the cubic trigonometric Hermite interpolation function results in smooth curves. It is possible to decide the suitable shape parameters of the cubic trigonometric Hermite interpolation function. Additionally, using the appropriate shape parameters is the only way to produce tidy and respectable results. Because each shape has a unique combination of curve features, using the software is quite helpful when undertaking research that involves the development of two dimensional shapes.

ACKNOWLEDGEMENT

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THE EFFECT OF RUNGE-KUTTA IN ADAMS-BASHFORTH METHOD FOR SOLVING FIRST ORDER ORDINARY DIFFERENTIAL EQUATION

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Abstract

Numerical problems can be solved using the multi-step method. Adams-Bashforth method is one of the multi-step methods that are often used together with Runge-Kutta as a starter to the multi-step. A linear multi-step method is a method that begins from one point, then moves one step forward in time to determine the next point of the solution, and then keeps on with further steps to determine the answer. While single-step method only uses the previous point and its inverse to find the answer. The objective of this study is to compare the numerical method using Adams-Bashforth method with theoretical method using linear differential equation, separable differential equation and Bernoulli's differential equation and to find the accuracy between these two methods, to determine which order of Runge-Kutta are more accurate in AB2, AB3 and AB4. Hence, each order of Adams-Bashforth have been applied with RK3, RK4 and RK5 and the results have been compared with the exact solution in order to find the error. The Graphical User Interface (GUI) has been used to solve this problem to minimize the time taken in solving first order ODE. The highest accuracy in this study reached at h=0.01. Then, the best order of Runge-Kutta AB2 and AB4 is when applied together with RK4, while the best order of Runge-Kutta for AB3 is when applied together with RK3. The findings of this study are to determine which step of Adams-Bashforth more accurate to RK2, RK3, RK4 and the results of this study can be used in any fields of study.

Keywords: Runge-Kutta, Adams-Bashforth, single-step, multi-step

1. INTRODUCTION

The single-step approach and the multi-step method are two numerical methods for solving IVP for ordinary differential equations. Adams-Bashforth is one of the best linear multi-step methods to solve the ODE using numerical solution [1]. A linear multi-step method is a method that begins from one point, then moves one step forward in time to determine the next point of the solution, and then keeps on with further steps to determine the answer. While single-step method only uses the previous point and its inverse to find the answer. By maintaining and reusing the data from the previous step instead of attempting to remove, multi-step methods strive to improve efficiency. When a precise or theoretical solution cannot be determined, one method for obtaining an accurate solution to a particular differential equation is the linear multi-step method [2]. The multi-step method is one of the best predictors in order

to make an estimation. Therefore, this study chooses Adams-Bashforth method to solve the ODE problem over Adams-Moulton method since Adams-Bashforth is an explicit method and the predictor method. Runge-Kutta is the best method as a starter since it is highly precise, stable, and simple to programmed. Other than that, Runge-Kutta also does not need a higher order method since the extra computing work offsets the improved accuracy [1].

There are a few previous studies that proved the multi-step method are more precise than single step method. Study that conducted by Eunseong Son et al. in 2019 focus on solving numerical Orbit Integration using single-step and multi-step method. They stated that the result for time computation by using integration of multi-step is faster than integration of single-step [3]. According to study conducted by Xiao et al. in 2009, they did a heart rate study on a 33-year-old man using Euler's and Adams-Bashforth method and used data that was gathered from his regular daily activities using portable device. The result of this study is the prediction on heart rate using Adams-Bashforth method was more accurate than Euler's method since when the real heart rate increased or decreased dramatically, the Adams-Bashforth method's results were considerably sharper [4]. However, based on study conducted by Peinado and others in 2010 regarding solving Riccati equation using Adams method stated that the implementation of Adams-Bashforth has the best execution time if the differential matrix Ricati equation (DMRE) is not stiff [5]. The common studies for multi-step method and single-step method are often related to 2-step, 3-step, 4-step of the multi-step method, and RK4. Therefore, this study was carried out to determine which steps of Adams-Bashforth are more accurate towards RK3, RK4 and RK5.

2. MATERIALS AND METHODS

This study involves numerous steps, including numerical and theoretical methods. The methods used are multi-step method which consists of 2nd-step, 3rd-step, and 4th-step of Adams-Bashforth, and single-step method which consists of Runge-Kutta of order 3, 4, and 5. These methods have been selected to study the effect of order Runge-Kutta in Adams-Bashforth method. In order to choose the best order of Runge-Kutta, the result will be compared to theoretical method. Table 1 below shows the formula that has been used in this study.

Table 1. List of formula

Runge-Kutta Method	**Adams-Bashforth Method**
3rd order Runge-Kutta $y_{i+1} = y_i + \frac{1}{6}(K_1 + 4K_2 + K_3)$	**2nd step Adams-Bashforth** $y_{i+1} = y_i + \frac{h}{2}[3f(t_i, y_i) - f(t_{i-1}, y_{i-1})]$
4th order Runge-Kutta $y_{i+1} = y_i + \frac{1}{6}(K_1 + 2K_2 + 2K_3 + K_4)$	**3rd step Adams-Bashforth** $y_{i+1} = y_i + \frac{h}{12}[23f(t_i, y_i) - 16f(t_{i-1}, y_{i-1}) + 5f(t_{i-2}, y_{i-2})]$
5th order Runge-Kutta $y_{i+1} = y_i + \frac{1}{90}(7K_1 + 32K_3 + 12K_4 + 32K_5 + 7K_6)$	**4th step Adams-Bashforth** $y_{i+1} = y_i +$

	$\frac{h}{24}[55f(t_i, y_i) - 59f(t_{i-1}, y_{i-1}) + 37f(t_{i-2}, y_{i-2}) - 9f(t_{i-3}, y_{i-3})]$

2.1. Implementation

In order to determine which steps of Adams-Bashforth are more accurate based on order of Runge-Kutta, various functions needed to be applied in the multistep method. Only then can one decide on a model with more functions that are accurate to it that corresponds with the exact value and determine which model is more accurate based on different functions. Each function is implemented with the same model, which is AB2, AB3, and AB4, and applied together with RK3, RK4 and RK5 for the value of step size, h, are equal to 0.01, 0.1, and 0.2.

2.2. Graphical User Interface (GUI)

All the functions will be calculated using Matlab since all of them must be implemented in each model and performing the computations manually would require plenty of time. This project was implemented using Graphical User Interface (GUI) based on the Runge-Kutta and Adams-Bashforth method. The output from the data has been saved in Excel document automatically based on the step of Adams-Bashforth. Figure 1 shows the GUI that has been used in this project.

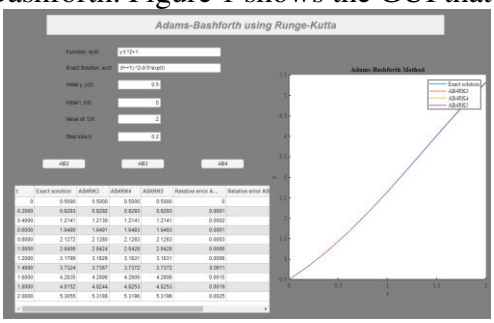

Figure 1. Graphical User Interface (GUI)

3. RESULTS AND DISCUSSION

3.1. 2-step Adams-Bashforth (AB2)

The results from the GUI for each function have been shown in Table 1 until Table 3 based on the steps of Adams-Bashforth. The results show the step size, h=0.01 for all four functions are more accurate in all steps of Adams-Bashforth compared with h=0.1 and h=0.2 since the value of relative error for h=0.01 are smaller than the other two. Hence, the Tabe below shows the error analysis based on h=0.01. From Table 1, AB2 is more accurate and has the smallest error by applying RK4 compared by using RK3 and RK5. From Table 2, AB3 is more accurate and has the smallest error when applying RK3 compared by using RK4 and RK5. Then, from Table 3, AB4 is more accurate and has a smallest error when applying RK4 compared by using RK3 and RK5.

Table 2. Error analysis for AB2

Function	RK3	RK4	RK5
$y' = y - t^2 + 1$	5.73853E-05	5.73862E-05	5.73862E-05
$y' = te^{3t} - 2y$	0.000318521	0.000318521	0.000318521
$y' = cos2t + sin3t$	5.73853E-05	5.73862E-05	5.73862E-05
$y' = \frac{y}{t} - \left(\frac{y}{t}\right)^2$	2.70273E-05	2.70268E-05	2.70268E-05

Table 3. Error analysis for AB3

Function	RK3	RK4	RK5
$y' = y - t^2 + 1$	5.09832E-07	5.11539E-07	5.11544E-07
$y' = te^{3t} - 2y$	9.55277E-06	9.55277E-06	9.55277E-06
$y' = cos2t + sin3t$	5.74E-06	5.74103E-06	5.74104E-06
$y' = \frac{y}{t} - \left(\frac{y}{t}\right)^2$	1.16972E-06	1.17064E-06	1.17064E-06

Table 4. Error analysis for AB4

Function	RK3	RK4	RK5
$y' = y - t^2 + 1$	2.1585E-09	4.70185E-09	4.70866E-09
$y' = te^{3t} - 2y$	2.92102E-07	2.92102E-07	2.92102E-07
$y' = cos2t + sin3t$	2.57592E-08	2.57592E-08	2.5756E-08
$y' = \frac{y}{t} - \left(\frac{y}{t}\right)^2$	6.75195E-08	6.61776E-08	6.61823E-08

4. CONCLUSION

Based on this study, the results and analysis show that the best accuracy for each step of Adams-Bashforth when the step size, h=0.01. Then, the best order of Runge-Kutta for AB2 and AB4 is RK4, while the best order of Runge-Kutta for AB3 is RK3. Based on the error analysis table for each step or Adam-Bashforth, AB4 has the highest accuracy compared to AB2, and AB3.

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EMPOWERING QUANTUM TECHNOLOGIES: NOVEL RAMAN COUPLER FOR SQUEEZED LIGHT

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Abstract

Squeezed light is a quantum state of light that has reduced uncertainty in one of its physical properties, like amplitude or phase, while having increased uncertainty in the corresponding property as stipulated by Heisenberg's uncertainty principle. Reduced uncertainty in a particular property permits more precise measurements of that property. Squeezed light is essential in quantum information processing and quantum key distribution protocols as it enhances measurement precision and decreases noise in quantum systems. The Raman process is a phenomenon in which photons interact with solid matter, leading to an energy exchange between the photons and the medium. It is a nonlinear inelastic scattering process of the third order. Raman-based nonlinear devices possess the potential to function as quantum light generators. In this work, we present a coupler system comprised of two waveguides, one of which exhibits active Raman processes and the other is linear. The waveguides exhibit mutual linear interaction through the field's evanescent waves. It is presumed that classically powerful lasers pump the nonlinear process in the Raman-active waveguide. Due to its straightforward design and experimental realizability, this system could function as a squeezed light generator. The feasibility of generating squeezed states within this Raman coupler system is investigated using the Heisenberg picture of quantum mechanics. The spatial evolution of squeezed states is investigated using the analytical perturbative method, considering various nonlinear coupling coefficients. The study reveals the possibility to achieve squeezed light characterised by a regular oscillation pattern. Increasing the nonlinear coupling parameter leads to significant improvement in squeezing below the shot-noise level of a coherent state, while maintaining the original oscillatory behaviour. This research provides important insights into the generation of squeezed light via a Raman nonlinear process, with possible implications for future applications in the realm of quantum technology.

Keywords: Quantum Optics; Directional Coupler; Raman Process; Squeezed States of Light

1. INTRODUCTION

In the pursuit of future technological advancements, classical physics does not provide the fundamental breakthrough needed. The incorporation of quantum phenomena, notably squeezed states, has arisen as an imperative requirement. Squeezed states, characterized by their capacity to reduce uncertainty in one of

the propagating electric field's quadratures (either amplitude or phase) while augmenting uncertainty in the other, demonstrate immense potential across a diverse array of applications, including but not limited to quantum teleportation [1], precision measurements [2], and quantum communication [3].

The current work is focused on investigating squeezed states within a Raman nonlinear coupler, consisting of one Raman active waveguide and one linear waveguide, as depicted in Figure 1. In the Raman active waveguide, two key phenomena are observed: Stokes and anti-Stokes scattering. The choice of a Raman nonlinear coupler is deliberate because of its structural simplicity and feasibility in experimental setups, making it an ideal platform for exploring squeezing phenomena. Previous work on quantum properties of Raman nonlinear couplers have been scarce due to the demanding mathematical and numerical complexities associated with this research. Nevertheless, this fundamental investigation has become imperative to harness this phenomenon for future quantum technology applications.

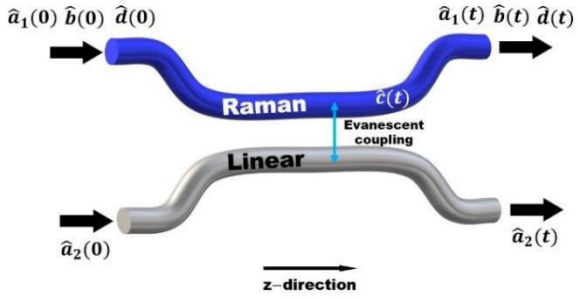


Figure 1. Schematic diagram for Raman nonlinear coupler

2. MATHEMATICAL DESCRIPTION OF THE SYSTEM

To delve into the examination of possible squeezed states generated in the present system, we utilize the analytical perturbative (AP) method initially introduced by Sen and Mandal in their work on the quantum properties generated in nonlinear medium with second-Harmonic generation [4] and has since been effectively applied to explore the quantum optical characteristics of various quantum systems (see e.g. [5]). The quantum mechanical depiction of the current dual-waveguide system is described using the momentum operator $\hat{G}$ in terms of creation and annihilation operators $(\hat{a}^\dagger, \hat{a})$, as below [6].

$$\hat{G} = \hbar k_1 \hat{a}_1^\dagger \hat{a}_1 + \hbar k_2 \hat{a}_2^\dagger \hat{a}_2 + \hbar k_b \hat{b}^\dagger \hat{b} + \hbar k_c \hat{c}^\dagger \hat{c} + \hbar k_d \hat{d}^\dagger \hat{d} + \left(\hbar g \hat{a}_1 \hat{b}^\dagger \hat{c}^\dagger + \hbar \chi \hat{a}_1 \hat{c} \hat{d}^\dagger + \hbar \kappa \hat{a}_2 \hat{a}_1^\dagger + \text{h.c.}\right) \quad (1)$$

On the right-hand side of equation (1), the expression $\hbar k_1 \hat{a}_1^\dagger \hat{a}_1 + \hbar k_2 \hat{a}_2^\dagger \hat{a}_2$ corresponds to the pump modes in the first and second waveguides, respectively. The term $\hbar k_b \hat{b}^\dagger \hat{b} + \hbar k_c \hat{c}^\dagger \hat{c} + \hbar k_d \hat{d}^\dagger \hat{d}$ represents the Stokes mode, phonon mode, and anti-Stokes mode, respectively, with k_j denoting the wavenumber for each mode. The segment $\hbar g \hat{a}_1 \hat{b}^\dagger \hat{c}^\dagger + \hbar g \hat{a}_1^\dagger \hat{b} \hat{c}$ signifies Stokes Raman scattering, where 'g' stands for the Stokes nonlinear coefficient. Conversely, the portion $\hbar \chi \hat{a}_1 \hat{c} \hat{d}^\dagger + \hbar \chi \hat{a}_1^\dagger \hat{c}^\dagger \hat{d}$ denotes anti-Stokes Raman scattering, responsible for generating the anti-Raman mode. The parameter χ represents the anti-Stokes nonlinear coefficient. Lastly, the evanescent linear coupling between the fundamental modes is contained in the final term, $\hbar \kappa \hat{a}_2 {\hat{a}_1}^\dagger + \hbar \kappa {\hat{a}_2}^\dagger \hat{a}_1$. The strength of this coupling is directly

proportional to the evanescent coupling coefficient κ. In the Heisenberg picture, the dynamics of the system are defined by the spatial evolution of the quantum operators. When we incorporate the momentum operator from Eq. (1) into the Heisenberg equation of motion, $\frac{d\hat{a}_j}{dz} = \left(\frac{i}{\hbar}\right)[\hat{a}_j, \hat{G}]$, we arrive at a system of interconnected differential equations that describe the spatial evolution of the quantum operators $\hat{a}_1, \hat{a}_2, \hat{b}, \hat{c}, and\ \hat{d}$. Solution of these equations is assumed in the form of the Baker-Campbell-Hausdorff (BCH) formula, which can be expanded as

$$\hat{a}_j(z) = \hat{a}_j(0) + (iz/\hbar)\left[\hat{G}(z), \hat{a}_j(0)\right] - \left(z^2/2\hbar^2\right)\left[\hat{G}(z), \left[\hat{G}(z), \hat{a}_j(0)\right]\right] + \ldots \quad (2)$$

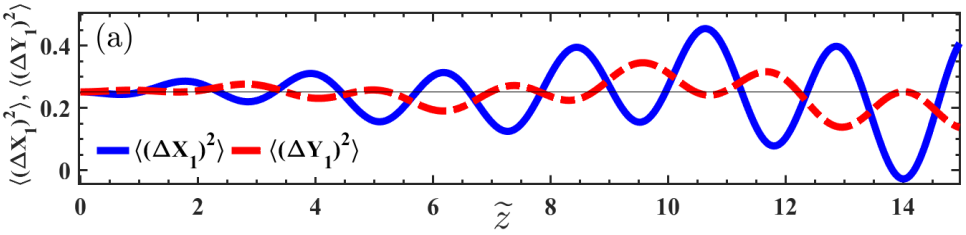
Where in Eq. 2, $\hat{a}_j(0)$ represents the operator at its initial state, i.e., at $z = 0$. For a thorough understanding of the intuitive mode solutions employed by the AP method, the reader should refer to our previous work [5,7]. The investigation of squeezing is carried out utilizing the following expression for electric field's quadrature variances.

$$\begin{bmatrix} \left\langle (\Delta \hat{X}_j)^2 \right\rangle \\ \left\langle (\Delta \hat{Y}_j)^2 \right\rangle \end{bmatrix} = \frac{1}{4}\left\{1 + 2\left\langle \hat{a}_j^\dagger \hat{a}_j \right\rangle - 2\left\langle \hat{a}_j^\dagger \right\rangle \left\langle \hat{a}_j \right\rangle \pm \left[\left\langle \hat{a}_j^2 \right\rangle - \left\langle \hat{a}_j \right\rangle^2 + \left\langle \hat{a}_j^{\dagger 2} \right\rangle - \left\langle \hat{a}_j^\dagger \right\rangle^2\right]\right\} \quad (3)$$

In equation (3), the bracket $\langle\ \rangle$ indicates the quantum expectation value of the operators in normal order.

3. RESULTS AND DISCUSSION

Figure 2 illustrates the spatial evolution of quadrature variances for the first pump mode. In these plots, regions below the shot noise level (y = 0.25) of a coherent state, indicate the presence of squeezing. These outcomes are derived when considering only Stokes scattering in the Raman active channel, specifically with $\tilde{g} \neq 0$ and $\tilde{\chi} = 0$. Practically achieving these conditions entails careful adjustment of experimental parameters. Importantly, these assumed conditions result in the generation of squeezing characterized by a consistent oscillatory pattern. Intriguingly, our findings suggest that increasing the nonlinear coupling parameter can significantly enhance the degree of squeezing below the shot-noise level of a coherent state, thereby expanding the potential applications of this phenomenon. Remarkably, despite the amplification of squeezing, the oscillatory pattern remains unaffected.



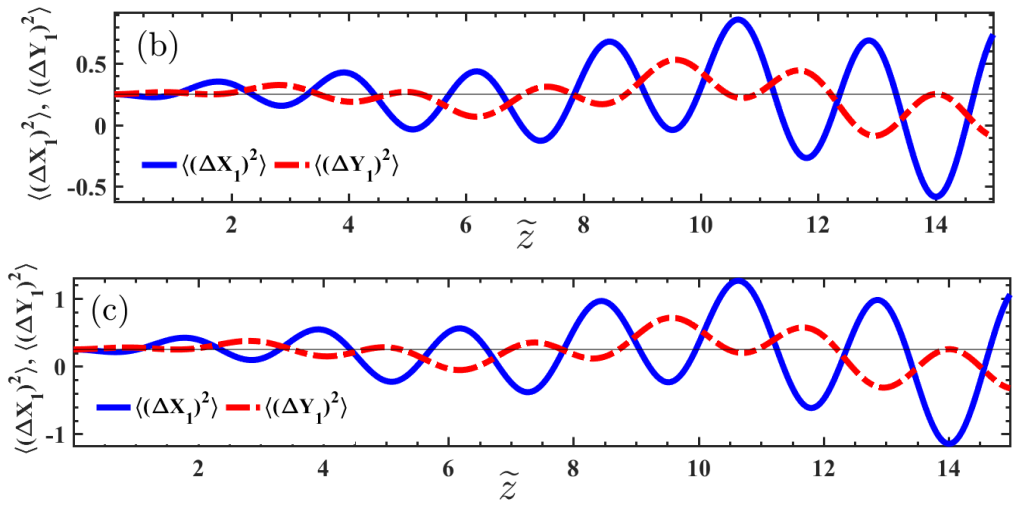


Figure 2. Spatial evolution of the electric field's quadrature variances $(\Delta X_1, \Delta Y_1)$ of the mode in the Raman channel as a function of a scaled distance $\tilde{z}$ for different values of scaled nonlinear coefficients $\tilde{g}$. The thin horizontal line represents the shot-noise level of a coherent state. (a) $\tilde{g} = 0.01$, (b) $\tilde{g} = 0.03$ and (c) $\tilde{g} = 0.05$. Other parameters are fixed at $\alpha_1 = 1$, $\alpha_2 = 1$, $\alpha_b = 0.8$, $\alpha_c = 0.001$, $\alpha_d = 0.9$, $\tilde{k}_1 = 1$, $\tilde{k}_2 = 1$, $\tilde{k}_b = 1$, $\tilde{k}_c = 0.01$, $\tilde{k}_d = 1$, $\tilde{\chi} = 0$ and $\tilde{\kappa} = 0.8$

4. CONCLUSION

In summary, our research successfully detected squeezing in a practically achievable Raman nonlinear coupler through the application of the analytical perturbative method. This investigation significantly contributes to our comprehension of squeezed states within Raman nonlinear coupler, highlighting their pivotal role in shaping future technological progress. The outcomes presented here pertain exclusively to the first pump mode considering only Stokes nonlinear interactions. The results demonstrate the feasibility of achieving squeezing under these conditions. We found that increasing the nonlinear coupling parameter can intensify the squeezing effects while preserving the characteristic oscillation pattern. This work offers potential pathways for enhancing quantum technologies.

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Abdel-Baset M. A. Ibrahim wishes to express sincere appreciation to the Malaysia Ministry of Higher Education (MOHE) for their financial support of this research project through the national grant FRGS/1/2021/STG07/UITM/02/10.

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E-WASTE BIN

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Abstract

The E-waste Bin is a creative solution to address the growing issue of managing electronic garbage (e-waste). E-waste disposal has become a primary environmental concern due to the quick advancement of technology and the resulting rise in the use of electronic gadgets. The E-Waste Bin is a great option for people and organizations looking for a convenient and environmentally friendly solution to dispose of their electronic gadgets. It is accessible to users of all technical backgrounds because its user-friendly interface leads users through the disposal procedure. The bin can automatically classify and separate different forms of e-waste, such as smartphones, laptops, batteries, and cables because it is outfitted with cutting-edge sorting and recognition technologies. The recycling bin includes crusher and compressor technologies to maximize space utilization and promote optimal trash treatment. The compressor feature then compresses the garbage, lowering its volume and increasing the bin's capacity. The trashcan also has methods for secure data wiping, which permanently deletes private and sensitive information from devices before recycling or disposal. The E-Waste Bin promotes a circular economy by maximizing resource recovery, which lessens the need for raw material extraction. The bins are linked to a centralized management system, allowing for real-time fill level monitoring, optimum collection routes, and preventive maintenance. The E-Waste Bin has a significant market potential for residential areas, educational institutions, corporate offices, and public spaces. Thanks to its many advantages, including environmental impact reduction, convenience, data security, efficient resource management, and data-driven decision-making capabilities. Overall, this novel approach to e-waste disposal provides a thorough and sustainable method, paving the way for a cleaner and more sustainable future.

Keywords: E-waste disposal, electronic garbage, electronic gadgets, recycling bin

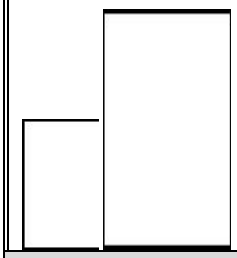
1. INTRODUCTION

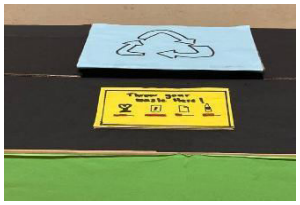
In Malaysia, E-waste is categorized as Scheduled Wastes under the Code SW110, First Schedule, Environmental Quality (Scheduled Wastes) Regulations 2005. E-waste is generally divided into two main types, according to its generation sources, i.e. E-waste generated from industrial sector and household e-

waste (https://ewaste.doe.gov.my/index.php/what-is-e-waste/). Referring to the Forti et al. (2020), its reported that the global electronic waste generation in 2019 was approximately 53.6 million metric tons, indicating a significant surge of 21% within a span of five years. The data reveals that a mere 17.4% of the e-waste generated worldwide was appropriately collected and recycled, while the rest remained susceptible to ecologically detrimental disposal methods. The improper disposal of electronic refuse causes environmental contamination. When discarded in landfills or burned, hazardous substances such as lead, mercury, cadmium, and brominated flame retardants can leach into soil and water sources. These pollutants endanger human health, contaminate ecosystems, and destabilize natural habitats. The presence of hazardous components in e-waste presents a considerable threat to the health of individuals residing near disposal sites or engaged in informal recycling activities. Exposure to hazardous substances via inhalation, skin contact, or ingestion can result in a range of health complications, such as respiratory ailments, neurological disorders, reproductive issues, and malignancies. A study by Mahat et al. (2019), showed that e-waste management practices among respondents in Selangor were at a medium level overall, but could be improved over time. The results of this study indicate that most of the respondents are aware of the proper method of e-waste disposal, as they had been informed about e-waste's negative impact on the environment. However, due to the incomplete e-waste collection infrastructure in some places, the respondents tend to dispose of e-waste in the river and accumulate it together with other solid waste. Thus, this study aim to design e-waste bin in helping the people dispose the waste in a proper way continuously sustain the environment effectively.

2. MATERIALS AND METHODS

This section describes the design and features of the product, the e-waste bin. According to the table, the proposed design satisfies the demands of the market today.

Design	Explanation
	• Box shaped design for stability and durability • Space efficiency design.
Feature	**Explanation**
 Automatic opener	• Automatic opener using motion detection technology. • Detect the presence of people. • Automatic open the door of waste bin.

 Auto sorting.	• Auto sorting using multi sensor and AI technology. • Sort the waste to its category. • Able to detect e-waste product.
 Volume detector	• Volume detector using detection technology. • Accurately calculate volume of bin. • Show the volume of the bin.
 Crusher and compressor	• Crusher and compressor technology. • Crush and compress the waste to optimize the use of bin. • Able to accommodate more waste.
 Connection with company	• Connection using internet technology. • Accommodate collection once the bin full.

3. RESULTS AND DISCUSSION

The design of the system is carefully crafted to provide users with an exceptional experience, effectively guiding them through the process of disposing of e-waste without any interruptions. The E-Waste Bin's user interface is designed to be user-friendly, enabling individuals to easily act and contribute to the fight against electronic waste. This results in a measurable impact on the reduction of electronic waste. The bin's several compartments provide an optimal equilibrium between systematic arrangement and utility, facilitating the uncomplicated categorization and separation of diverse electronic waste materials. The E-

Waste Bin is a product that is made from sturdy and eco-friendly materials, exemplifying the principles of conscientious design, and making a lasting impact on the natural world. The E-Waste Bin is equipped with visibility features and safety mechanisms that enhance its reliability and trustworthiness. This fosters confidence among users as they undertake their pursuit of a more sustainable future.

4. CONCLUSION

The E-Waste Bin facilitates responsible disposal practices and safeguards personal information through the provision of a user-friendly interface, advanced sorting capabilities, and secure data wiping mechanisms.. The E-Waste Bin is not only a technological innovation but also a representation of our dedication to conscientious consumption and ecological guardianship.

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WET-TO-DRY DISPENSER

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Abstract

The Wet-to-Dry Umbrella and Raincoat Dispenser is an innovative solution designed to improve user convenience and address the challenges posed by rainy weather conditions. The system consists of an automated dispenser unit strategically placed in high foot-traffic areas, such as building entrances, public transportation stations, and shopping centres. The primary function of the dispenser is to provide users dry their umbrella and facilitate the storage of wet raincoats. By addressing environmental impact, the Wet-to-Dry Dispenser provides a considerable improvement over current umbrella dispenser. Unlike traditional umbrella dispensers that use plastic to wrap wet umbrellas, which can contribute to environmental pollution due to improper disposal. The Wet-to-Dry Dispenser eliminates the need for plastic entirely. This enhancement lessens the amount of plastic garbage produced and the harm it does to the environment. Upon entry, users can interact with the dispenser's intuitive interface to request a dry umbrella or deposit their wet raincoat. The dry umbrella module employs an advanced drying mechanism, ensuring moisture-free umbrellas before dispensing, preventing indoor dripping and maintaining comfort and safety. The raincoat storage feature features a specially designed compartment with quick-drying technology, minimizing moisture accumulation and maintaining a clean environment. Key features of the Wet-to-Dry Dispenser include an automated dispenser, an intuitive user interface, an advanced drying mechanism, and a raincoat storage compartment with quick-drying technology. The system is made of eco-friendly materials and operates on energy-efficient power, with regular maintenance and cleaning protocols to ensure optimal performance. In conclusion, the Wet-to-Dry Dispenser for both umbrella and raincoat is a forward-thinking solution to the challenges posed by wet weather, improving user comfort, reducing indoor maintenance efforts, and contributing to a more pleasant and functional public space experience.

Keywords: umbrella, raincoat, drying, dispenser

1. INTRODUCTION

People frequently struggle to stay dry while moving about outside in bad weather, such as rain. Malaysia experiences year-round heat and humidity due to its tropical environment. Between 2000 to 4000 mm of rain fall with 150 to 200 rainy days occur in Malaysia each year [1]. In addition, there is already a dispenser similar to this on the market. On the other hand, it offers plastic to wrap a wet umbrella to

prevent a damp floor. Plastic is a man-made substance made of polymers that are difficult to biodegrade. Because of their affordability and durability, synthetic polymers are used extensively. Yet because they are a significant source of pollution, disposing of packaging material creates a problem for solid waste management. In-vitro degradation of synthetic polymers is a time-consuming process. These days, these kinds of artificial substances are bothersome since they contaminate natural resources like soil fertility and water quality [2]. Disposable plastic covers are common on rainy days, with a domestic department store company buying over 4.5 million in 2014. Waste vinyl, which makes up nearly one-third of all recycled items, has become a significant issue as of 2015 [3].

By addressing environmental Impact, the Wet-to-Dry Dispenser eliminates the need for plastic entirely. This enhancement lessens the amount of plastic garbage produced and the harm it does to the environment. Aside from that, the Wet-To-Dry Dispenser features a drying system that uses hot air to dry wet umbrellas in a manner akin to hand dryers or hair dryers. This minimizes the chance of water dropping and creates a safer environment indoors. A compartment for drying wet raincoats is another feature of the Wet-To Dry Dispenser that is not present in conventional umbrella dispensers. The wet-to-dry dispenser is an important advance over current umbrella dispensers since it combines the advantages of less plastic usage, better drying capability, and the inclusion of a compartment for drying raincoats.

2. MATERIALS AND METHODS

The prototype was created from both a 2-dimensional and 3-dimensional perspective to portray the Wet-To-Dry product.

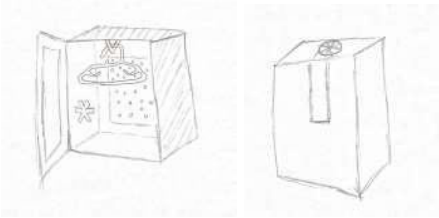

Figure 1. Sketch of Wet-To-Dry

Figure 2. Prototype of Wet-To-Dry

Wet-To-Dry Dispenser has two compartments, one for an umbrella and the other for a raincoat. It is quite easy to use both compartments because of the automatic approach and self-service technology used.

Table 1. The Features of Wet-To-Dry

Component		Description
Umbrella Compartment	Umbrella Grip	The grip serves to maintain the stability of the umbrella's handle. The grip will become looser once the operation is finished
	Wall Blower	Hot air is to be blown into the umbrella compartment by the wall blower.
	Yellow Rotator	The yellow rotator is responsible for rotating the umbrella.
	Curtain Walls	The purpose of the curtain walls is to stop the umbrella from

		slamming once the grip has loosened.
	Automatic Door	The automatic door is where the customer to take out umbrella after the process is complete. It opens automatically.
Raincoat Compartment	Fan	The blower's hot air is circulated by the six-bladed fan.
	Wall Blower	Hot air is to be blown into the raincoat compartment by the wall blower.
	Hanger	The raincoat is to be hung on the hanger. It allows the water to drain and dry more quickly
	Automatic Door	The automatic door has a translucent mirror so that the user can observe the condition of the raincoat as it dries.

2.1. Concept Testing

The method of concept testing is used to verify and improve ideas, obtain information, and make defensible choices. It entails measuring consumer responses to our product idea through the use of both quantitative and qualitative approaches. Potential customers are given brief explanations in order to determine their level of interest and willingness to buy. Prototype preparation may move forward if there is strong public support. The phases of idea testing are as follows:

i. Determine purpose to identify market acceptance of the product in public.
ii. Analyze feedback from 155 people as sample population from various age groups and working status.
iii. Conduct an online survey via Google Form.
iv. Record all customer responses in understanding whether it meets their needs and expectations.

3. RESULTS AND DISCUSSION

3.1. Customer Feedback

Customer comments were evaluated using the questionnaire that was given out during the concept testing. This survey was divided into two primary sections: the first section asked respondents' demographic questions, and the second asked them to provide input on our proposed new product. The Wet-To-Dry Dispenser has potential for commercialization, according to data gathered during the concept testing phase, with a sizable percentage of respondents indicating this product. Here are a few questions that add to our concern regarding public acceptance:

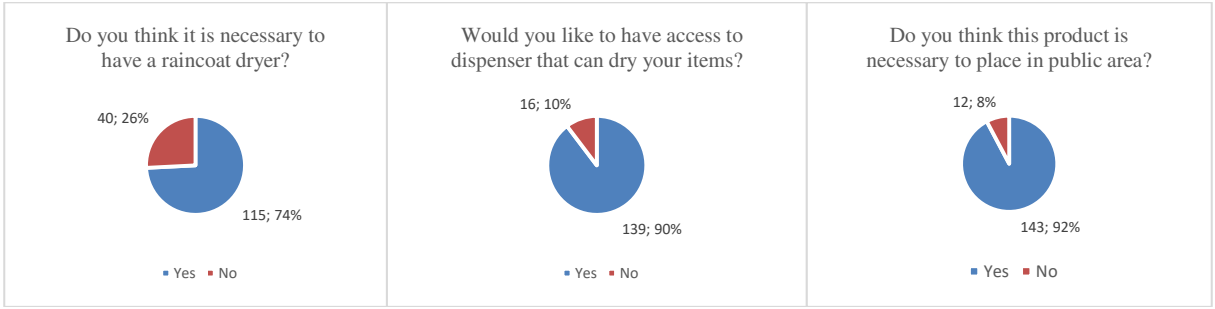

Figure 3. Feedback from Concept Testing

3.2. New Product

There must be certain issues that drive us to create new products when we wish to. But there are always going to be limitations to take into account. We have gone through the concept generation, idea screening, and market survey phases of research and development to improve the Wet-To-Dry Dispenser. To give a verbal description and to illustrate how the product might look, a product drawing is required. The sketches will serve as a guide for building the prototype. In order to gather some insightful responses from the respondents, a market study has been carried out.

4. CONCLUSION

In summary, the Wet-to-Dry Dispenser is an eco-friendly alternative to traditional umbrella dispensers, offering practical solutions for drying wet raincoats and umbrellas. It reduces slip hazards and simplifies janitors' workload. Despite its higher cost, its durability outweighs the use of plastic.

ACKNOWLEDGEMENT

The Wet-to-Dry Dispenser project was made possible for innovation and sustainability. The guidance and mentorship of Madam Zanariah binti Mohd Yusof were instrumental in shaping the project's direction. The project was a collaborative effort, with individuals contributing their time, knowledge, and expertise in testing, research, and data collection.

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MEDIBEAR

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Abstract

It is common for young children to be afraid and uncomfortable during health checkups. The main reason could be due to their fear of the doctor; a stranger who is trying to get really close in order to examine all that is necessary. With this fear, even simple and short checkups can lead to meltdowns. This brings a major implication to all involved parties. As it is obvious that the children will be throwing tantrums, it is difficult for the parents or responsible guardians to keep the situation under control. It also hinders the professional health workers from doing their job during these checkups. As an initiative, this project was conducted to develop a product that could tackle this issue. By going through the stages of research and development, product designing, concept testing, prototype building, and test marketing, MediBear was put together. To help kids get over their fear of doctor visits, a health device was built with the form of a teddy bear, hence the name. This teddy bear consists of an infrared temperature sensor, oximeter, and heart-rate sensor. In addition to these medical components, MediBear also has a built in Bluetooth speaker. All of the electrical components are connected together through an internal wiring system to allow recharging. Based on consumers' responses during concept testing, it was determined that the product has commercialisation potential. 87% of the respondents found the product to be helpful, and 81% stated to have interest in purchasing. MediBear's market test also showed promising results as it displays the product's high selling potential. With the emergence of MediBear as the pioneer, the health industry will continue to develop more products that are suitable for children's use.

Keywords: Young children, Health checkups, Fear

1. INTRODUCTION

Child medical checkups are essential for monitoring a child's development and safeguarding their overall health and well-being. Numerous research published by professionals in paediatric healthcare has revealed that regular medical checkups greatly improve the health and wellness of kids [1]. They are important in the prevention, early detection, and treatment of both acute and chronic illnesses. While child medical checkups are vital for tracking growth and health, it is also crucial to address challenges and gaps to ensure they perform effectively. Anxiety, fear, and limited communication skills may impact children's behaviour during checkups, affecting their cooperation and the healthcare provider's ability to assess their health [2]. Negative experiences during previous medical checkups can also lead to fear and resistance in children during subsequent visits, hindering the establishment of a positive doctor-patient relationship [3]. Children may exhibit troublesome behaviours during checkups, causing stress for parents and difficulties when preparing their child for the appointment [4].

MediBear is an innovative product designed to address the difficulties associated with monitoring a child's health and well-being. The device's primary purpose is to aid in health inspections and to be approachable by children. Without any outbursts, parents can quickly assess their child's health using its built-in thermometer and oximeter sensor. Simply place their finger inside the right paw to measure their heart rate and oxygen level and point the left paw to their forehead to monitor their body temperature. Parents can view all readings, including previous ones, via a mobile application. Additionally, MediBear may comfort toddlers by playing their favourite songs through the speaker under its foot. MediBear will undoubtedly lessen children's tantrums during doctor appointments, familiarise them with basic checkup procedures, and assist parents in simply tracking their children's health.

2. MATERIALS AND METHODS

Figures 1 and 2 below show the sketch and rendering of MediBear, respectively. The product design was then followed.

Figure 1. Sketch of MediBear

Figure 2. Rendering of MediBear

Basic product performance parameters such as performance, dependability, safety, and durability were considered during the design process. In line with the name, the product's design is based on the traditional teddy bear. The ideas are merged to incorporate more components. The following are the main features of MediBear's design.

Table 1. The Main Features of MediBear

Component	Description
Appealing appearance	This feature is intended to attract the attention of young children by resembling a stuffed animal, making it familiar and appealing to them.
Medical components	MediBear's design incorporates functional medical features such as two sensors that assess the child's body temperature, oxygen level, and heart rate.
Additional elements	MediBear features a Bluetooth speaker for playing audio from a phone. It also includes an internal wiring system that allows its components to be charged via a single charging point at the back of its body.
Linked mobile application	A mobile app is developed in association with the product for parents to keep track of all their children's health records including previous ones.

2.1 CONCEPT TESTING

The purpose of MediBear's concept testing is to gather input from potential customers, learn their perspectives on the product, determine the target demographic, and make necessary improvements. The stages to concept testing are by:

i. Determining the product's market, focusing on the health sector due to its medicinal properties, and primarily targeting paediatricians and parents of small children.

ii. Choosing the survey sample population by approaching individuals with small children, assuming they are parents, with the purpose of gathering responses from 180 people.

iii. Creating a Google Forms questionnaire for the survey and performing it in person for clarity and authenticity. Respondents may also complete the survey online by scanning a QR code.

iv. Assisting respondents in understanding the product's characteristics, express the idea of MediBear through verbal explanations and visual aids such as illustrations.

v. Carrying out a market test by distributing five items to three random-selected Subang Jaya locations, including a pharmacy, a baby supply store, and a supermarket.

3. RESULTS AND DISCUSSION

3.1. Consumer Feedback

Our questionnaire distributed during concept testing was used to evaluate customer reactions. This questionnaire was divided into three parts. The first part was to determine our respondents' demographics, the second part was to get their feedback on our new product concept, and the final part was for them to express any further opinions. Based on the replies gathered during the idea testing stage, it was determined that MediBear had commercialisation potential. The majority of respondents has the intention to buy when the product launches.

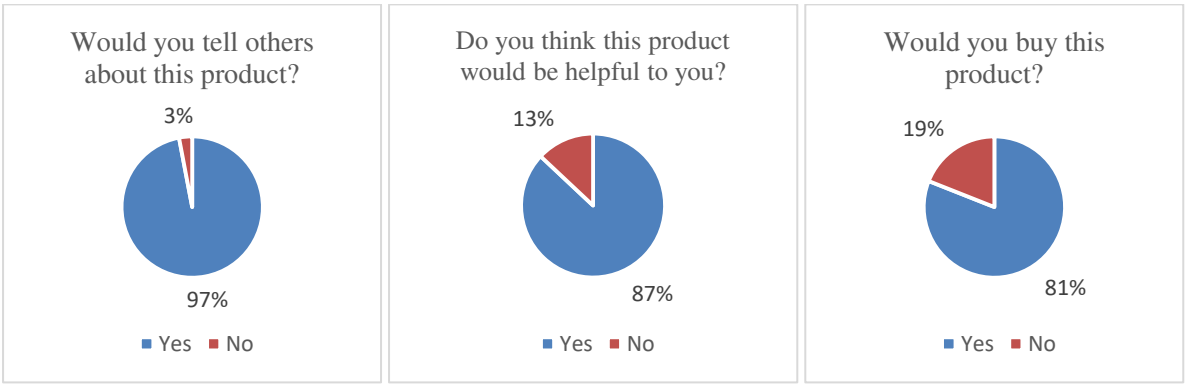

Figure 3. Feedback from Concept Testing

3.1. New Product

Beginning with research and development stages, the idea of creating a product that would tackle the issue with children's fear of doctors was brought up. By conducting concept testing, the feedback received through distributed questionnaires clearly shows that the product idea is one that could be successful. With this confidence, a prototype was built to be evaluated before the final design was confirmed. Taking this project to the next step, the actual product will be developed before launching MediBear into the market.

Figure 4. Prototype of MediBear

4. CONCLUSION

In summary, MediBear is an innovative and creative concept that can help paediatricians and parents do medical examinations on children whether in healthcare settings or simply at home. Based on the feedback from concept testing, MediBear obviously has commercialisation potential and can possibly be the pioneer for future technologies that prioritizes children's wellbeing.

ACKNOWLEDGEMENT

A special appreciation towards Madam Zanariah Mohd Yusof, the supervisor of this project. Without her support and guidance, this entry would not have been possible.

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WAIPRO

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Abstract

A projector is a device that is used by people worldwide. It helps individuals like lecturers relay their messages regarding a topic easily by simply showing the slide they would like to explain to the whole class. However, despite having a great advantage to people, it has some weaknesses that the users had to face. Normally, it takes time for the users to connect to the projectors in classes and causes both sides, the students and the lecturer tend to waste their time waiting for the projector to start working. Other than that, the projectors used in classes and meeting rooms need to be plugged in and would not function if there is no power source. After identifying the problems faced by the users of projectors, a multi-functional projector called WAIPro was chosed to be our New Product Development (NPD) project. This product is a combination of entirely new items and upgrades made to already existing products. By creating WAIPro, it is helpful in providing more engaging and interactive learning environment as well as help create opportunities for individuals to spend quality time together and create happy memories. Questionnaires were conducted to obtain data from 150 respondents regarding their views and opinions on the projectors they normally use and their interest in our product. After receiving feedback and opinion from the respondents, WAIPro's prototype that is equipped with multiple features was built. It can be connected via Bluetooth, a built-in Bluetooth speaker, a portable wireless charger and several compartments to put stationaries, tablets and so on. WAIPro is also equipped with a strap for it to complete the requirement of being portable. The strap enables the user to bring WAIPro anywhere without worrying about needing to bring so many things at a time.

Keywords: projector, product development, prototype

1. INTRODUCTION

In this advancing and full of technology world, there are a lot of approaches to make the learning and teaching environment more engaging and effective for both lecturers and students for instance. One of the approaches is displaying the learning materials to the whole class by using a projector so that everyone in the same class can discuss the same thing at the same time. However, there are some problems and issues that were faced by the users that we have identified that resulted in the creation of WAIPro. Firstly, it is hard to connect devices to the existing projectors. For students studying on campus, it is common to experience a delay in starting a lecture because of the projectors. Usually, it will take time for the lecturers to set up the projector when they want to display slides and so on to the students. Some lecturers even resorted to coming to class earlier than they were supposed to because they would not want to put

their lectures on hold. The next issue commonly faced by consumers is that they had to watch movies on laptops. For students who live in their dorms, it is normal to watch movies together in their rooms after submitting assignments, surviving their test week and so on. However, they will need to share a single device, usually a laptop, to display the movie because they have no other alternatives to spend quality time together but to only use their laptops that have small displays and limited space. This will result in them being uncomfortable because they are all cramped together to watch a single movie and ended up making the movie not enjoyable. Lastly, it is common for consumers to have too many things to bring around. Whenever they want to go to places such as classes, they need to have separate bags to bring the projector, the cables, and their personal belongings making it burdensome for them to go about from place to place.

2. METHODS AND IMPLEMENTATION

2.1 Research and Development

2.1.1 Idea Generation

In this project, ideas are produced to learn how to construct portable and usable items, with lecturers as our primary aim. In class, we had a group discussion and brainstormed the idea. We attempt to assist lecturers in teaching students wherever, even if the institution lacks adequate facilities. To teach students face-to-face, lecturers may need to use a projector. Because projectors are used in class, we believe they are necessary in every classroom. This is extremely typical in the classroom. Teenagers can also use it if they want because it is available to anybody. Following that, people always use cutting-edge technology such as smartphones, tablets, and other devices. As a result, we tend to incorporate a few technologies into our product as shown in Figure 1. We add some of it so that everything is in sync and some compartments.

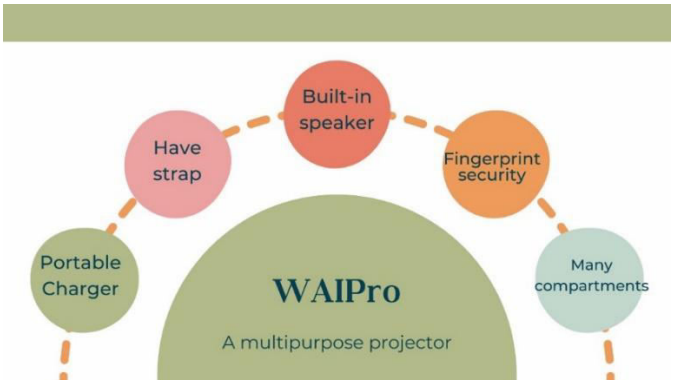


Figure 1: Attraction of WAIPro

2.1.2 Idea Screening

The concept of combining a standard projector with a portable charger, a built-in speaker, fingerprint security and stationary boxes. We believe that it is a very nice product to improve because the main aim is to produce a multipurpose product. A projector with a built-in speaker inspired the idea of using it for

many purposes. From there, we continue to brainstorm to add any extra functions that are distinctive enough to ensure that potential customers are delighted with our product.

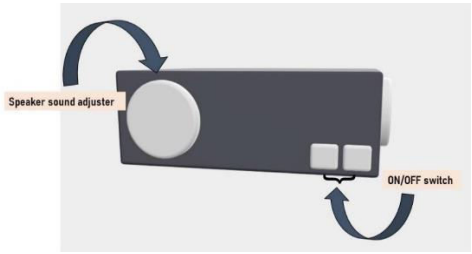
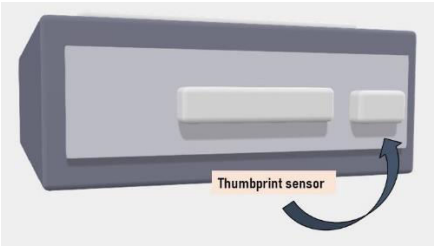
2.1.3 Market Survey

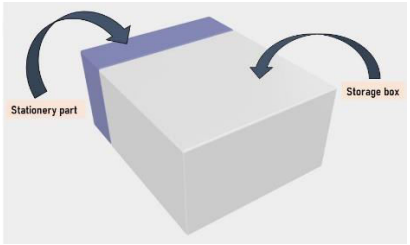
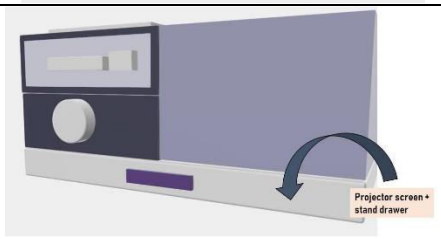
A survey was conducted to meet all the requirements which comprises 150 participants, all of them are of a certain age. Each of them was asked to fill out a questionnaire on our WAIPro. The purpose of this survey is to learn what they know about WAIPro and the challenges they face without a projector.

2.2 Product Design/Features

WAIPro is a multipurpose projector because it is provided with a portable charger, safety drawer, Bluetooth access to a projector or speaker, projector screen with a stand, and many compartments with their own function as shown in Table 1 below:

Table 1: Design and Details of WAIPro

DESIGN	DETAILS
	**Projector** • Display an excellent quality of picture or video on the projector screen. • Higher resolution • Contrast ratio • Mercury-free • The body is made of plastic, so it is lightweight.
	**Speaker & ON/OFF switch** • A speaker with a sensitivity rating over 90db • Freedom to control using Bluetooth, Airplay 2, Voice-control from Amazon Alexa or Google Assistant • Powered by a built-in rechargeable battery. • Optimum impedance rating around 6 – 8 ohms • Frequency response of "40Hz-20kHz +/-3 dB" • Power handling: 10 watts • Material for thermoformed speaker cones – Polypropylene (PP)
	**Compartment for valuable things with thumbprint sensor** • Material (drawer): hard leather to hold the shape of the drawer. • Material (thumbprint sensor): screen protector made of thin plastic, waterproof. • Thumbprint sensor: high resolution, capacitive scanner, tiny capacitor to store electrical charge, ultrasonic sensor, security chip **Wireless charger** • Material: large thin plastic, wireless charging IC, MOSFETS, microcontroller, EiceDRIVER™ gate driver, authentication for Qi wireless charging, waterproof • The wireless charger cover (plastic) will be attached to the light leather material used for the whole product.

	**Storage box & stationery part** • Made of light leather in a shape of cube and cuboid. • The stationery part will be attached with elastic band so that the stationaries will be organized. • Storage box to put stuffs such as electric hand fan, thermos cup, mini first-aid kit. **File & tablet compartment** • Made of light leather to hold files and tablets. • Since the size of the tablet and file is approximately the same, we used one measurement so it can fit both files and tablet.
	**Projector screen drawer** • Material : hard leather to hold the weight of the upper compartments (drawer), white polyester (projector screen), aluminium.(projector stand). • The projector screen is the usual projector screen used that can be folded into smaller form and the projector stand has been designed as foldable umbrella

2.3 Build Prototype (2D/3D)

The most suitable look for the product is a cuboid shape. It is the basic shape for most of projectors since we can assemble it with many things. The multipurpose has been combined with many types of functional compartments. Such as projector with an excellent quality speaker, wireless charger, drawer compartment for valuable things that are attached with a thumbprint sensor, compartment to store the projector screen with the stand, file compartment that is also functional to fit a tablet, storage box and stationery to fit in the marker and pen. The multi-purpose projector also has been attached to a strap to make it easier to bring it everywhere. 3D prototype are shown as below in Figure 2, 3, 4, 5 and 6.

Figure 2: Front View

Figure 3: Top View

Figure 4: Left side View

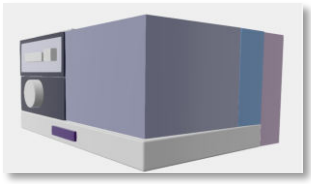


Figure 5: Right side View

Figure 6: Full View

3.0 RESULTS AND DISCUSSION

Projectors are commonly used by all groups of individuals, be it students, lecturers or even normal citizens. The result that we got from the respondents from the previous questionnaire we had conducted proves that a single person had interacted with projectors at least once in their life regardless of the event. Projectors are used in classes, homes, conference rooms, movie theatres and even museums.

At the beginning of this project, we aim to be able to create a more engaging and interactive learning environment for both students and lecturers. However, it does not have to specifically be only students and lecturers. It can also be a medium of learning for children in kindergartens, old folks who are learning to read religious books, and so on. We also aimed to help create opportunities for individuals like family members, roommates, classmates and so on to spend quality time together. By creating WAIPro, we hoped that people can use this product to create core memories they can remember for the rest of their lives and the happy moments they spent together.

The features of this product will be able to help the users in multiple ways because of the numerous functions it has. Being a portable projector, it is the greatest help it can do because instructors could conduct a lecture anywhere, and not only in classrooms and lecture halls if the place is suitable to project and display the media. Having a built-in speaker also helps because the user does not need to buy any external speakers to be able to hear the projected videos. If the users' devices are low on battery, the users can simply charge the battery by using the wireless charger that was equipped with WAIPro. The user does not need to worry about needing to bring extra handhelds such as handbags because WAIPro has numerous compartments where the user can put stationaries, tablets and even wallets in the compartment with a fingerprint feature to ensure its safety. Lastly, having a strap that helps it easy to bring WAIPro around. Having this product will help individuals to solve the problems they face in their daily lives that revolve around projectors

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MOSQUE CENTRALIZED INFORMATION MOBILE APPLICATION WITH MOBILE NOTIFICATION SYSTEM

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Abstract

MyMasjid is a mobile application that has been developed with the purpose of centralising information related to mosques. Its primary objective is to optimise mosque operations and facilitate more community interaction. The programme has a news feed feature that is designed to be easily navigable for users. This feature includes real-time notifications, which aim to keep mosque-goers updated on the most recent events, announcements, and activities. MyMasjid was developed with the Adapted Waterfall Model, which involved a thorough and systematic approach encompassing requirement analysis, system design, implementation, and testing. Through the process of identifying and subsequently addressing the unique issues encountered by mosques, the application has successfully surmounted obstacles in the effective dissemination of information to the community. The rigorous test plan that was executed during the development phase ensured the application's reliability and performance. Moreover, the utilisation of the System Usability Scale (SUS) for user evaluation yielded significant insights on the user experience, facilitating ongoing enhancements to align with user expectations. The success of MyMasjid is attributed to its capacity to consolidate information and facilitate a streamlined method for users to remain up-to-date. The ongoing development of MyMasjid will contribute to its further growth as an essential resource for mosques, facilitating greater community bonds and enhancing the overall mosque experience.

Keywords: Mobile Notification System; Information Delivery; Communication; News and Information Distribution;

1. INTRODUCTION

In order to ascertain the prevailing method of disseminating news and information within the mosque community, a series of interviews were performed with mosque personnel, including the Imam, through phone calls and the messaging application WhatsApp. During this phase, the collection of user needs for the mobile app was conducted.

The mobile application underwent design and development processes that incorporated supplementary features and enhancements aimed at optimizing communication efficiency. Diagrams such as the Functional Hierarchy Diagram, Entity Relationship Diagram (ERD), Site Map, and Context Diagram were employed to ensure a coherent and well-defined flow of the system. The development process

adhered to the Adapted Waterfall Model, which facilitated the monitoring of progress and ensured the fulfilment of user requirements within the designated timeframe.

Following the completion of the development process, a series of tests were undertaken to validate the app's functioning and assess its usability. The study utilized a comprehensive test strategy to evaluate the complete operation of the application, wherein users were classified into two groups: worshippers and administrators (mosque management). In order to create a user experience that is intuitive, usability evaluations were also carried out.

The primary objective of the Mosque Centralized Information Mobile Application is to optimize communication channels, provide timely updates and information to worshippers, and cultivate a more cohesive and interconnected community among the congregation.

2. MATERIALS AND METHODS

Initially, a series of interviews were done with the personnel of the mosque, including the Imam, utilizing phone calls and the messaging application WhatsApp. The conducted interviews yielded significant insights pertaining to the prevailing information dissemination within the mosque, hence facilitating the identification of the encountered obstacles.

The user requirements for the mobile app were gathered over the course of these interviews. The aforementioned process played a pivotal role in comprehending the distinct requirements and expectations of the consumers, thereby guaranteeing the application's efficacy in meeting their needs.

The mobile application was developed with the integration of diverse computer science components in order to augment its usefulness. The aforementioned components encompassed geolocation and GPS capabilities, search and filter functionalities, file and media administration, invoicing features, push notifications, and alarms, so offering a full resolution.

The development approach adhered to the Adapted Waterfall Model, which facilitated methodical monitoring of progress and ensured timely fulfilment of all user requirements.

In order to ensure clarity and facilitate effective guidance for the development team, a range of diagrams including the Functional Hierarchy Diagram, Entity Relationship Diagram (ERD), Site Map, and Context Diagram were employed to visually represent the flow and structure of the system.

Following the completion of the development phase of the mobile application, comprehensive testing and evaluation procedures were conducted. The implementation of a comprehensive test strategy was undertaken to validate the functioning of the application, hence assuring its alignment with the planned performance objectives. Furthermore, usability evaluations were carried out in order to ensure an intuitive and user-friendly experience for individuals utilizing the program.

1. INTRODUCTION

3.1. Business Process

The Mosque Centralized Information Mobile Application was developed as a solution to address the existing cumbersome and ineffective method of disseminating information to worshippers. The implementation of this program is expected to enhance communication among worshippers by providing them with prompt access to news, updates, and announcements. This would effectively reduce response time delays and eliminate the necessity for human inquiries. Additionally, the implementation of this measure will enhance data security through the restriction of user access, hence mitigating concerns pertaining to unauthorized entry and breaches of privacy. The development process will be informed by the principles of the Ten Usability Heuristic theory, leading to the creation of a system that is both user-friendly and efficient. The use of this mobile application by the mosque aims to enhance communication, mitigate inconvenience, and effectively administer information, while enhancing the overall experience of worshippers.

3.2. User Acceptance

The Mosque Centralized Information Mobile Application obtained an average score of 72.25 on the System Usability Scale (SUS), indicating that users usually see the application as being usable. While several users have reported a really positive experience, achieving a maximum score of 100, others with a comparatively lower score of 55 have highlighted certain areas that require enhancement. In general, users express a positive sentiment towards the application's user-friendly interface and efficient provision of mosque-related information. It is recommended that developers give priority to the resolution of concerns pertaining to navigation, content presentation, accessibility, and the user interface in order to enhance the overall usability of a system or application. The consistent input from users and the implementation of iterative upgrades will enhance the usability of the application, fostering better connections within the mosque community and ensuring a more captivating experience for all individuals utilizing the program.

3.3. Application Interface

The application includes a feature called the "masjid list," which is a list of mosques that users can access through the mobile application. The masjid list provides information about different mosques, such as their location, contact details, and services offered. It allows users to easily find and connect with mosques in their area, enhancing their experience and facilitating their engagement with the mosque community. Figure 1 shows the screenshot of masjid list.

Figure 1: Application Interface

The news feed allows users to access updates about events, prayer schedules, and other important information related to the mosque. Users can view a stream of updates on the app, but currently, there is no option to customize the news feed based on individual preferences. Incorporating a personalized news feed would enhance the user experience by delivering content tailored to their specific interests. Figure 2 shows the screenshot of the news feed.

The "Save" feature allows regular users of the app to bookmark news posts that they find valuable for future reference. By saving news entries, users can easily access and revisit the content at a later time. The saved news entries are securely stored in the app's database, ensuring that users can retrieve them whenever needed. This feature enhances user convenience and allows them to keep track of important or interesting news articles.

4. CONCLUSION

The Mosque Centralized Information Mobile Application has been developed to improve communication and information dissemination within the mosque community. The project has successfully achieved its objectives, including identifying the current process of delivering news and information, addressing existing problems, and developing a mobile app to streamline communication. The app has been tested and evaluated for usability, and it has shown positive results in improving the mosque's daily business process. However, there are limitations to the current version of the app, and recommendations for future enhancements have been provided. Overall, the Mosque Centralized Information Mobile Application serves as a valuable tool for facilitating communication and engagement within the mosque community.

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TELEGRAM E-WALLET

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Abstract

Globally, online shopping has become extremely popular. Nowadays, there are numerous markets that accept online payments. Due to this circumstance, it would be a novel concept to integrate a messaging application with an e-wallet. In recent years, Telegram has gained immense popularity as a versatile messaging application with a user base exceeding 500 million worldwide. This research seeks to explore the untapped potential of Telegram as a platform for e-wallet payments, capitalizing on its extensive user reach, robust security features, and user-friendly interface. Telegram e-wallet enables people to make cashless purchases. Users can link their bank accounts, credit cards, and debit cards to Telegram e-wallets. For security purposes, passcode and face ID scan were needed. In addition, users can use Telegram e-wallet to send money directly from one bank to another, top up and pay tolls, parking and utilities payment can be made via Telegram e-wallet. Preliminary findings suggest that Telegram e-wallets have the potential to offer users a seamless, secure, and versatile payment experience. The integration of payment features directly within a widely-used messaging platform could significantly reduce transaction friction, fostering greater financial inclusivity and ease of use.

Keywords: E-wallet; Telegram; Online

1. INTRODUCTION

Online shopping behavior has forever changed due to the COVID-19 pandemic. It has accelerated the shift towards a more digital world. Due to this issue, many electronic wallets have been introduced. E-wallets are pre-paid accounts in which users can store their money for future online transactions. Akhila (2018) [1] stated that digital-wallet is are gaining popularity among the young lots such as students and employees. Chawla and Joshi (2019) [2] stated that an e-wallet is popular because it is a convenient transaction alternative for internet users to store and use information in online shopping. The use of an E-wallet allows you to pay for groceries, online purchases, flights, etc. Most e-wallets utilize biometrics as

well as passwords to ensure that no one else can use them to make payments. Karim et al. (2020) [3] studied the influencing factors for Malaysian young adults to use e-wallet as a payment method. This study reveals that perceived usefulness, perceived ease of use, and privacy and security have positive and significant relationships with behavioral intention to use e-wallet. The advantages on e-wallet can be assessed through Upadhayaya (2012) [4], Intarot et al. (2018) [5] and Alam et al. (2021) [6].

There are many messaging applications in this world such as WhatsApp, Kakao Talk and Line. Based on the survey published by AppMagic [7], Telegram is known as the second most popular messenger application worldwide in June 2023. Telegram is a free, cloud-based messaging application that can be used on both smartphones and computers. Basically, the data in cloud chats and groups in Telegram is encrypted between the client and server, so third parties cannot access them. Telegram by Iqbal et al. [8], telegram offers more functionalities and fewer potential drawbacks than many other applications. Due to this circumstance, it would be smart to set up Telegram-pay. Based on the case study by Atasie Esther [9], she imagined creating a wallet icon in the telegram app with send and request funds as core functionalities. Thus, it is a good idea to improve this e-wallet by having more features such as tolls, parking, and utilities payments. The research on messaging applications and e-wallets is conducted. Telegram is chosen because it allows more storage compared to other messaging apps. The interface of the Telegram e-wallet is designed. The interface of Telegram Wallet is shown in Figure 1.

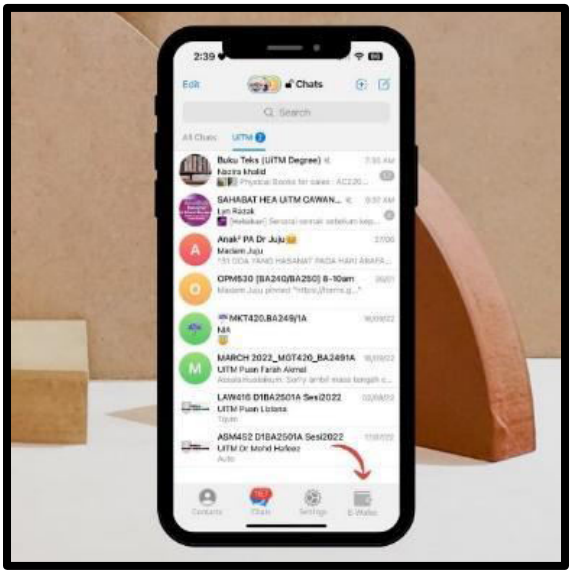
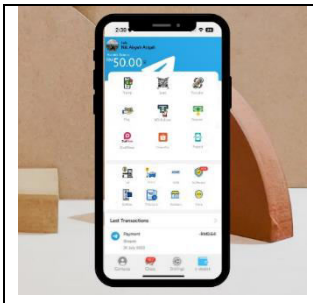
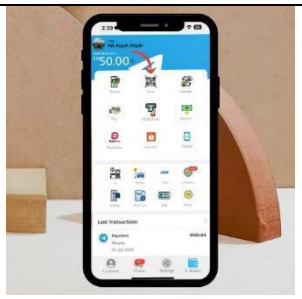
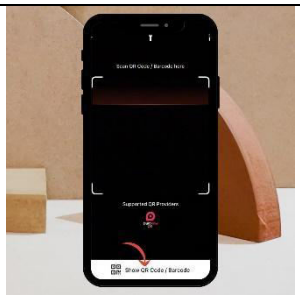
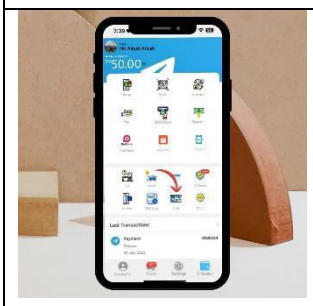
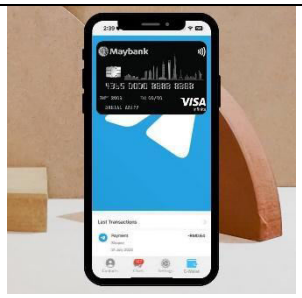
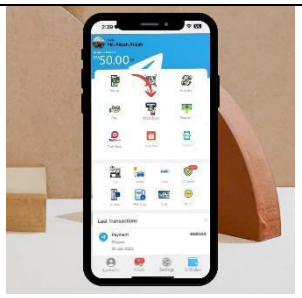
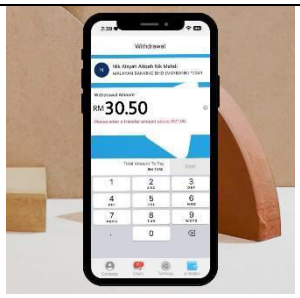


Figure 1. Telegram e-wallet interface

2. MATERIALS AND METHODS

The interphase on how to use Telegram e-wallet is discussed in Table 1.

Table 1. Process on how to use Telegram e-wallet.

			
There are few features are listed such as ASB, tolls, parking, utilities payments in the Telegram e-wallet.	For security, user need to insert passcode and face ID scan.	Tap QR code icon for scanning and accepting money.	"Show QR Code or Barcode" icon is to create a DuitNow QR code so that others can use to scan your barcode.
			
To add your visa card, you can tap the visa icon.	The card is displayed.	Tap withdrawal icon to withdraw topuped money.	After the amount is inserted, tap the next button and the money will be transferred into your bank account.

Then, a set of questionnaires were distributed to respondents from various background such as students and educators. The data is collected and analyzed. The flow of this research is illustrated as in Figure 2.

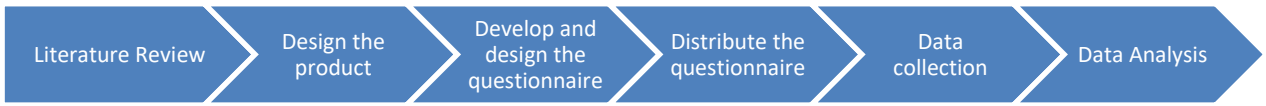


Figure 2. Research Flow

3. RESULTS AND DISCUSSION

The data are collected and discussed as in Figure 3,

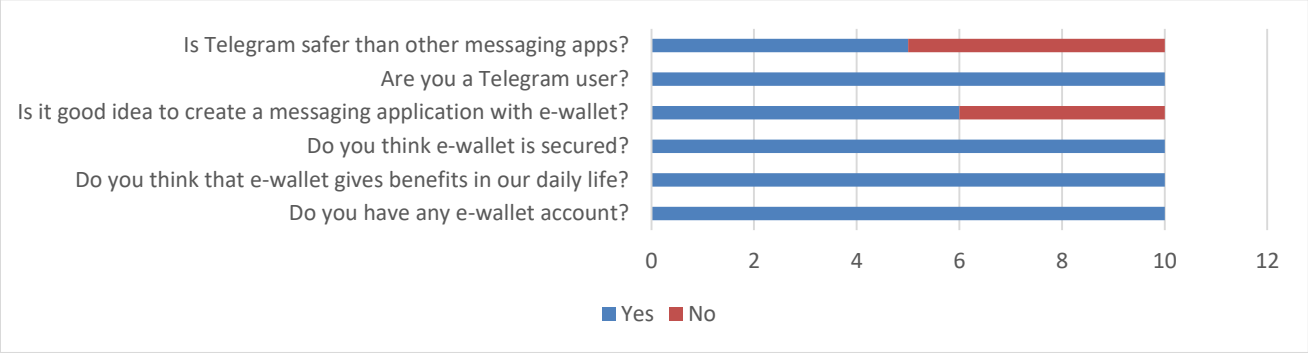


Figure 3. Telegram e-wallet interface

Figure 3 shows that all the respondents have Telegram and e-wallet accounts. All respondents have e-wallet account and believe e-wallet gives benefits in daily life. Meanwhile, all respondents also believe e-wallet is secure. On the other hand, 60% of the respondents agree it is a good idea to create a messaging application with e-wallet. Based on the survey, 50% respondents agreed Telegram is safe compare to other messaging apps but another 50% is still doubtful regarding telegram security. However, security concern will be upgraded and improved from time to time.

The overall respondents have Telegram and e-wallet accounts. All respondents believe e wallet gives benefits in their daily life. In addition, all respondents agreed e wallet is secure.

4. CONCLUSION

This innovation aims to shed light on the opportunities and challenges related with Telegram based on e-wallet offering insights that may inform future developments in the digital payment industry. With the massive trends of online messaging and online shopping, Telegram e-wallet is designed to make purchases without the use of cash. Users can seamlessly transition from messaging to making payments within the same app. This convenience reduces the need to switch between multiple applications for communication and financial transactions. Telegram e-wallets combine the convenience of a widely-used messaging app with the security and functionality required for modern digital payments, making them a compelling option for individuals and businesses looking to streamline their financial transactions. Ultimately, this study seeks to contribute to the ongoing dialogue on the evolution of digital payments in an increasingly connected world.

ACKNOWLEDGEMENT

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3A SMART WARM BLANKET

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Abstract

Neonatal death rates and very low birth weight (VLBW) infant mortality rates are both independently correlated with hypothermia during birth. These infants are unable to appropriately regulate their body's temperature. Newborn hypothermia, a severe issue in both developed and developing nations. Neonatal hypothermia during the first 30 minutes of life is mostly caused by heat loss and evaporation. There have been various studies on the usage of plastic wrap, which is thought to be able to lessen the need for metabolic heat production as well as heat loss through evaporation. When compared to normal thermoregulation therapies, laying premature or underweight newborns on plastic wrap at delivery can lower the possibility of hypothermia without causing it. It is also less expensive and does not require advanced equipment. Using plastic wrap to avoid hypothermia when doing neonatal resuscitation on neonates has been proven to be both safe and effective. In order to prevent evaporative heat loss in premature and very low birth weight newborns, **3A Smart Warm Blanket** will be utilized. The distinctive design makes it simple to attach any medical device when immediate care is needed. The 3A Smart Warm Blanket is another multipurpose blanket made to quickly and effectively help thermoregulate even the most delicate patients. Additionally, the 3A Smart Warm Blanket is also made for use in transferring infants to the NICU in a safe manner while maintaining core internal temperature and allowing for easy access to the torso or prop in case immediate treatment is needed.

Keywords: Cooling therapy, Hypothermia, Neonate, Neonatal unit, Thermoregulate

1. INTRODUCTION

3A Smart Blanket is an innovative and affordable product designed for premature and low-birth-weight babies in developing countries. It was designed around the specific needs and living conditions of these communities. Failure to maintain this condition would bring a grievous condition to patient's body that may go to an extent of multi organ failure. Hypothermia is another underlying condition where the body loses heat faster than it can produce, causing a dangerously lower temperature than normal (G. Lavanya,2021).

From previous study, the material used are medium density polyethylene with copper and carbon while for this new project it was used from protective garments which is from waste and environmentally friendly that can be recycled (G. Lavanya,2021). In addition, the material of warm blanket are thick and not tear easily to ensure the effectiveness of this product. Using this smart warm blanket, it can reduce the neonatal death rates that are closely correlated with hypothermia during birth.

2. MATERIALS AND METHODS

2.1. Product description

3A Smart Warm Blanket consists of two layer which is inner layer and outer layer. This layer is made from quality compliant which is fabric performance of protective garments. The inner layer has plastic wrap which for single used only and smart digital monitor in order to detect oxygen saturation and temperature of neonates. The outer layer can be wiped or washed, and it is water resistant.

3. RESULTS AND DISCUSSION

3.1. The effect of plastic cover and blanket on body temperature of preterm infants hospitalized in NICU

The results of Valizadeh *et al*., study showed that the body temperature of 28-30 weeks gestation infants hospitalized in NICU, for whom plastic cover was used, was within normal limits compared to those for whom the plush blanket was used. According to Table 1, there are 14 cases of hypothermia when the blanket was used that were observed in both groups and when the plastic cover was used, no cases of hypothermia were reported and there was only a single case of hyperthermia [4].

Table 1. Distribution of Body temperature in both groups, by the time of measurement and comparison between groups (N = 80)

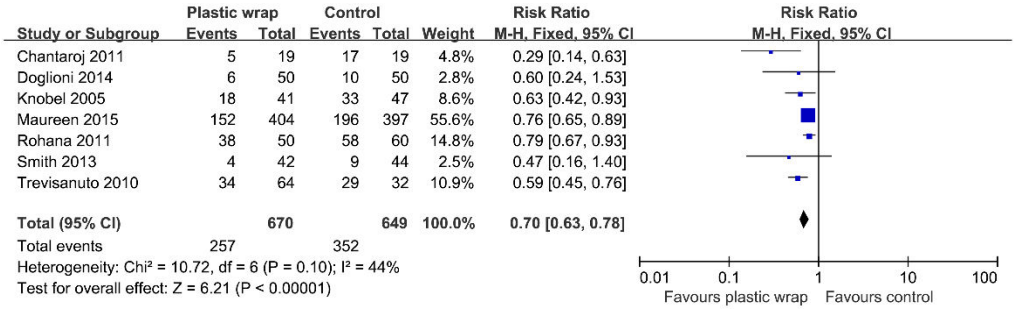
Group	Day Cover	Body Temperature (°C)	Times of Study					
			8:00 AM	9:00 AM	12:00 PM	3:00 PM	6:00 PM	9:00 PM
1	First plastic	Normal	40	40	40	40	40	40
	Second blanket	Hypothermia	0	0	2	2	1	0
		Normal	40	40	38	38	39	40
	First blanket	Hypothermia	0	0	2	5	2	0
		Normal	40	40	38	35	38	40
2	Second plastic	Normal	40	40	40	40	39	40
		Hyperthermia	0	0	0	0	1	0

Reference: Valizadeh *et al*., 2017

3.2. Efficacy and safety of plastic wrap for prevention of hypothermia after birth and during NICU in preterm infants

According to Li *et al*., study suggests that a high efficacy of plastic wrap in reducing heat loss preterm infants whether admission to NICU or during NICU. In addition, the use of plastic wrap was associated

with a lower incidence of hypothermia in the preterm infants born at less than 34 weeks of gestation as these results indicate that recommendations should be given to using plastic wrap in preterm infants in order to prevent hypothermia [2].



Reference: Li *et al*., 2016

Figure 1. Forest plot showing the effect of plastic wrap versus control intervention on hypothermia of preterm infants

3.3. Illustration of 3A Smart Warm Blanket

Figure 2. Illustration of 3A Smart Warm Blanket

4. CONCLUSION

In conclusion, 3A Smart Warm Blanket can be considered as an effective innovation which is safe for additional intervention in order to help prevent hypothermia in infants as well as able to help communities in developing countries as the price of this product is reasonable and affordable.

ACKNOWLEDGEMENT

Our deepest appreciation goes to our most beloved lecturer, Mrs. Fatimah Binti Sham, for all the guidance that was very constructive for us to complete this project. She was very helpful and motivated us to complete this project within the set time frame. We cannot repay all her good services and are preceded by a thank you. Not forgetting the members of this group who gave maximum cooperation and never tired of giving ideas in completing this project successfully. Thank you also to our comrades who are directly or indirectly involved in our project.

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STYLISH EISHA: MUSLIMAH TRAVEL-FRIENDLY SHAWL

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Abstract

Creativity and innovation are essential components for entrepreneurs to survive in their businesses. Entrepreneurs can produce unique products and bring new benefits to consumers through creativity. Innovation is changing opportunities into ideas in return for the expected profit. Thus, we have devised a business idea to propose a product package called Stylish Eisha. Stylish Eisha includes a combination of technology infusion and a Muslimah-friendly hijab. First, the consumer can use an app to try the hijab and to analyse the shape of their face and skin tones to match their selected hijab. Next, once the consumer has selected their preferred hijab, they can purchase an Eisha hijab set, which suits women who like a simple but beautiful style. The hijab is quick and saves time because consumers do not have to iron, and the awning does not fall off. The hijab fabric is made from Moss Crepe type. The fabric is soft, relaxed, pintless, and Muslimah, especially for Hajj and Umrah pilgrims. The hijab also has a mini pocket and does not attach to the body. Nowadays, everyone wants to get ready quickly. For women who do not have time to wear the hijab for a short period, the Eisha hijab may be your saviour. This latest collection is not only suitable for working women but also for girls who are always active with daily activities but at the same time still want to look fresh and trendy. Stylish Eisha also provides free hijab perfume mist and the fragrance of Rindu Raudah with agarwood essence, a soft and soothing smell just like the smell of the Raudah carpet in the Nabawi Mosque.

Keywords: Muslimah-friendly hijab, mini pocket, perfume mist, technology infusion.

1. INTRODUCTION

According to Henderson and Clark (1990), innovation is divided into three: product innovation, innovation in service, and process innovation [1]. Product innovation is creating and developing new ideas or improving existing products to increase added value, quality, functionality, or customer appeal [2]. This process involves introducing new features, new technology, design improvements, or changes in how products are used or manufactured. Therefore, our group has devised the idea of advancing and develop existing products with new features. Our product name is Stylish Eisha: Muslimah Travel-Friendly Shawl. This product innovation aims to meet customer needs and expectations, face market competition, and achieve a competitive advantage in business. Eisha Hijab Co. was established in 2020 and is based on online and offline (booth) platforms. The founder and co-founders are Puan Mastura Raus

and Cik Nur Shabrina Chong. The business sells various types of hijabs such as Tudung Bawal, various types of shawls, Bawal Chiffon Printed exclusive production created by Eisha Hijab, as well as accessories such as brooches, tudung rings, Malay shirt buttons, and dokoh.

The advent of the 21st century has seen the hijab become a hotly debated issue internationally from the West to the East and from Central Asia to Southeast Asia. In the West, unfair and prejudice against Muslim women who wear hijab is a debatable issue. The obligation to wear hijab has come from the verses of the Qur'an, which is clear. Wearing a hijab is half the perfection of covering a woman's private parts, which is the entire body except for the face and her wrists—the command to wear a headscarf by Allah Taala, which the Sharia orders. The hijab is one of the important things for women today. This is because women in modern times emphasize a classy, stylish, and, most importantly, trendy appearance. In changing times, hijab fashion constantly changes according to the current trends of modernity. Various materials are used for fabric, including cotton, Como crepe, satin, chiffon, corn skin, premium voile, and others. The shape of the face is essential in ensuring that women look elegant when wearing a hijab. This is because not all hijab materials available in the market are suitable for all faces. When talking about hijab, a little mistake in wearing hijab made users moody for a day. For example, some hijabs are not consumer-friendly, and the hood is often flappy/wavy/bubble, which causes the user to sit in front of the mirror for hours. Moreover, some hijab requires a pin, and some pins are expensive to buy. Often, the pin disappears and is lost. Most women are looking for a hijab that does not need to be ironed and a hijab that is comfortable to wear even for hours. Some women also want a hijab that is suitable to wear with glasses, and the face does not look plump.

2. METHODOLOGY

To define the problem faced by consumers, we have employed a design thinking approach. Design Thinking is an iterative process where we try to understand users, challenge assumptions, and redefine problems to identify alternative strategies and solutions that may not be immediately visible with our initial understanding. At the same time, Design Thinking provides a solution-based approach to solving problems. Design Thinking revolves around a deep interest in developing the understanding of the people who are the users of a product or service [3]. This helps us observe and develop empathy with target users. Design Thinking is beneficial in overcoming unclear or unknown problems by reframing problems in human-centered ways, creating many ideas, and adopting a direct approach in prototyping and testing. There are four main phases of design thinking: empathising, defining, imagining, and prototyping. This study defines the problem using an interview approach by selecting ten female respondents from diverse backgrounds. This study adopted a combined approach between structured and unstructured interviews, called formal and informal interviews. The data have been analyses using a thematic analysis where the researchers find the connection of patterns in a phenomenon and explain the extent to which a phenomenon occurs through the researcher's eyes [4].

3. RESULTS AND DISCUSSION

Based on the thematic analysis, we have categorise the problem into five main themes, namely, 1) made from low-quality material, 2) pricey, 3) need to iron, 4) need more pin, and 5)size of hijab does not fit. The summary of verbatim is shown in Table 1. Thus, based on these identified problems, we move to the next phase of design thinking: ideating the idea of Stylish Eisha: Muslimah Travel-Friendly Shawl. Therefore, our group has come up with an idea to introduce a hijab kit where the hijab is pinless and able to help consumers get ready in three seconds without pins, to solve issues such as allergic, to have an

easy-to-shape awning, to fit the hijab comfortably to your face size via Eisha face app, and to do less ironing. The hijab materials are made from Viscose or Lycra. Viscose is a type of fabric that is quite expensive and luxurious. It feels soft and cool on the skin, absorbs sweat, is quite shiny, and is not easily wrinkled.

On the other hand, Lycra is a light, soft, and smooth fabric. It stretches just like spandex. Our design hijab comes out with an industrial magnet with an exclusive box. The package also includes hijab with pockets, inner, and hijab performance. All our products are custom-made. Every product we provide will be useful for everyone. Perfumes that are unsuitable for hijab and hijab do need a stronger fragrance than clothes because the hijab is responsible for covering the head, which sometimes sweats a lot on hot days. The wrong choice of perfume will cause a musty smell from inside the hijab on a hot day. The mistake of choosing perfume can also leave a stain on the hijab. Thus, we have provided a suitable and beautiful fragrance for hijab in our package kit. Every woman has been through the struggle of imperfect measurements of hijab. When none of the hijab options fit, we realize the importance of knowing our body measurements. This is precisely why the Eisha Hijab app has amalgamated artificial intelligence with the hijab and textile industry. The Eisha app is a measurement app that accurately gives a clear idea of face measurements with just two pictures. This could empower businesses such as custom dressmakers to get their clients' accurate sizing and body measurements, just with the app installed on their smartphones. The measurement app scans the user's picture by simply holding your phone in a vertical position, with the back or front camera facing towards the person, showing his/her full face, and taking two pictures. The scanning app is a face scanning and measurement app that lets us serve our customers with accurate face measurements, with just two pictures.

Table 1. Identified Problem

Theme	**Verbatim Quotes**
1) Made from low-quality material	"Most hijabs are made of poor-quality fabric. For example, when washed, the color of hijab fades" (Mira, 21, Klang). "The cheap hijabs between RM10 and 20, are mostly not durable and easily rot after six months of use" (Shabrina, 24, Negeri Sembilan).
2) Pricey	"Most hijabs are very expensive and some cost hundreds and thousands. As a student, I could not afford it" (Lily, 19, Negeri Sembilan). "Hijabs are expensive and already symbolize a person's status. For example, Duck, Ariani, and so on, the B40 group cannot afford to buy" (Yana, 36, Shah Alam). "Most of these cheap hijabs are of low quality and easily broken" (Lina, 40, Kuala Lumpur).
3) Need to iron	"I do not like wearing a satin hijab because it needs to be ironed. Although it is beautiful and soft, it is not user-friendly" (Qistina, 27, Johor). "As a student, I must go to class quickly.. I do not want to waste time ironing the hijab. That is why I like to wear the crumpled hijab" (Nazihah, 21, Kedah). "As a working mother, I must move quickly to manage household life. Therefore, I need a hijab that can be put on immediately" (Marni, 44, Negeri Sembilan). "Even though there is a hijab that does not need to be ironed, it is very unattractive and looks like an aunt" (Nora, 32, Kuala Lumpur).
4) Need more pin	"My veil pins are always missing, and I buy many pins, and this is a waste of money" (Nazihah, 21, Kedah). "Cheap pins can damage expensive hijab like satin. Therefore, I replaced the pin with a magnetic pin. But most of the magnetic pins are not strong and without realizing, this pin will also disappear" (Mimi, 35, Petaling Jaya).
5) The size of the	"When I buy sarong hijabs, most of these hijabs do not fit my chubby face" (Nora,

hijab does not fit.	32, Kuala Lumpur). "Most sarong or instant hijabs do not fit my face. Therefore, I had to sew it myself" (Qistina, 27, Johor).

4. CONCLUSION

The benefit of our innovation is to solve problems. In this increasingly intense and challenging business environment, entrepreneurs with knowledge and skills are very much needed in the market because entrepreneurs need to make quick and accurate decisions [5]. However, many entrepreneurs need help managing their business in a challenging and ever-changing environment. In this discussion, the external environment is likely to affect the course of operation of a business. The external factors consist of competitors, consumers, the role of government, the role of financial institutions, and marketing opportunities. Therefore, to remain competitive, every business must pay attention to the changing business environment [6]. A quick response can help a business to move in line with competitors or even faster. Businesses operating in a dynamic environment require a rate of innovation to be competitive. Therefore, every entrepreneur needs to prepare themselves with education, knowledge, and skills to move quickly in business. Understanding customer needs and demand is significant for entrepreneurs to survive.

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SMART INSOLE SHOES

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Abstract

Mother health care is crucial during pregnancy to be given continuous attention and care to ensure optimum development of the fetus and maternal health. Two common problems maternal face during pregnancy are gestational hypertension and gestational diabetic mellitus. Hypertension during pregnancy can be divided into four categories: essential hypertension, gestational hypertension, pre-eclampsia and eclampsia. Hypertension during pregnancy may be chronic if predating pregnancy or diagnosed before 20 weeks of pregnancy. Chronic hypertension is associated with adverse maternal and fetal outcomes, and the best management is tightly controlling maternal blood pressure. Diabetes can be divided into two categories, which are insulin-dependent diabetes and gestational diabetes. Gestational diabetes or impaired glucose tolerance incidence between 3% – 12% of the pregnancy population. Overt diabetes will develop in 20-30% of sufferers within five years. Smart insole shoes are developed to help pregnant ladies alert about their blood pressure and take care of their feet, which are very suitable for working persons. Smart insole shoes can also monitor blood sugar levels continuously during maternal wearing this shoe. In addition, the design of these shoes can prevent diabetic mothers' feet from being injured. A GPS tracker was also implanted to increase the safety of the user. If smart insole shoes are a compulsory shoe for all pregnant ladies, the rate of mothers with hypertension and diabetes mellitus after pregnancy can be reduced. This can help Malaysian mother be healthier and thus can allow them to raise their child effectively. The most important fact is morbidity and mortality rates of mother and child can be reduced. Therefore, this can lead to an increasing economy in Malaysia.

Keywords: Mother Health Care, Pregnancy, Gestational Hypertension, Gestational Diabetes, Smart Insole Shoes.

1. INTRODUCTION

The birth rate for Malaysians in 2023 was 15.873 births per 1000 people in 2023. The Malaysian population will be 34308525 by 2023[2]. Mothers with diabetes during pregnancy in Malaysia rose from 13.5 per cent in 2016 to 27.1 per cent in 2022[3]. There was also an increase in women who exhibited high blood pressure during pregnancy from 5.8 per cent in 2016 to 6.5 per cent in 2022. Thus, project

innovation Smart Insole Shoes suits pregnant ladies with Gestational Hypertension and Diabetic Mellitus disease. The main purpose of this innovation is to help pregnant ladies to be alert about their blood pressure and at the same time take care of their feet. This shoe design is most suitable for working pregnant ladies.

2. MATERIALS AND METHODS

2.1. Product description

Smart insole shoes consist of 4 main functions: monitor continuous blood pressure, monitor glucose level, keep the user tracked all the time, and prevent low back pain. It also consists of extra features like step count and shock heel support. Smart insole shoes come with a blood pressure detector to measure blood pressure from the dorsalis pedis artery. The dorsalis pedis artery is located between the first and second toe. This feature will allow continuous monitoring of blood pressure. The blood pressure result will be linked with a phone connected to these smart insole shoes. A smart insulin detector will be placed just on the insole shoes. This feature allows the detection of continuous glucose levels. The glucose level result can be seen through the connected device with these smart insole shoes. GPS trackers are implanted at the heel of the smart insole to allow the user to be tracked constantly. This feature is built specially to increase the safety of users, especially pregnant mothers. Prevention of low back pain is worked by having arch support for the leg to give full support for pregnant users. The insole is made up of several combinations of high-quality materials. Firstly, the outer layer of the insole is memory foam. This memory foam is very suitable to support users for prolonged standing or walking without foot pain. Memory foam will mold according to the shape of the user's foot. It can be reversed if the user suffers from a foot injury or any other condition. The lower layer consists of a leather insole. The leather insole can provide strong arch support. Strong arch support will add extra padding, providing comfort and cushioning. This combination of two types of insoles is very significant to improve user satisfaction. To add to that, these smart insole shoes also have water-resistant and anti-bacterial insole to prevent bacteria from growing at the feet and forming uneasy odor.

2.2. Illustration of Smart Insole Shoes

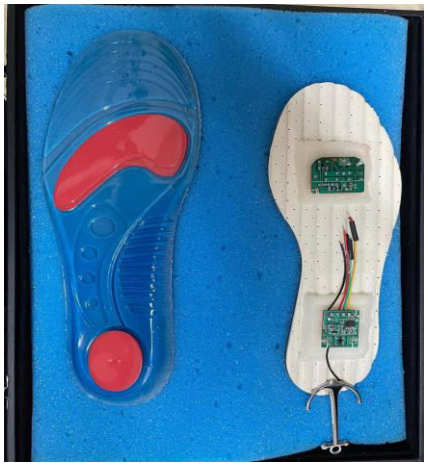

Figure 1. Illustration of Smart Insole Shoes. Contains blood pressure monitor, glucose monitor, electronic module, and the insole.

3. RESULTS AND DISCUSSION

3.1. Prevalence Preeclampsia

According to Sultan et al., 2022, the reported prevalence of preeclampsia was 1.6%. Pregnant women with preeclampsia had a higher risk of preterm delivery (67.7%), instrumental and cesarean delivery (74.7%), neonatal low birth weight (48.5%), and neonatal 5-min Apgar score. As stated here, pre-eclampsia will affect bad things happen to mothers during pregnancy and the labor process. If the innovation able to lower down the prevalence of pregnant women getting preeclampsia, the government can reduce patient treatment costs. The most important thing is the innovation will be able to save the life of the mother while also maintaining their quality of life.

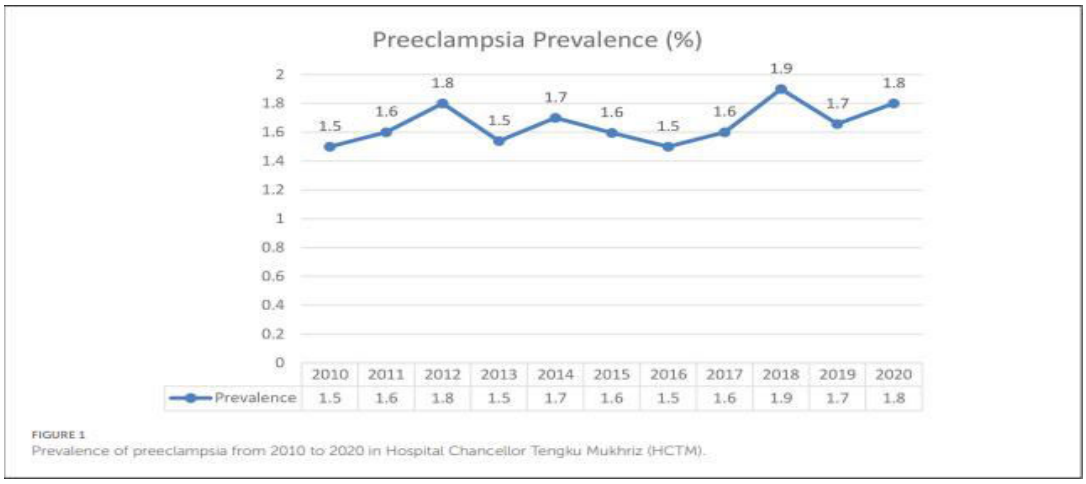

Figure 2. Preeclampsia prevalence
Sultan et al. 17.10.2022

4. CONCLUSION

In conclusion, the prevalence of gestational hypertension and diabetes mellitus are increasing year by year. This condition raised the issue of maternal safety and well-being to delivered safely a healthy child. Therefore, blood pressure and glucose monitoring become paramount in controlling hypertension and diabetes mellitus in pregnancy. So, ideally, the Smart Insole Shoes can be a very convenient innovation for all mothers who have the conditions.

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E-LEARNING TAJWID (E-TAJWID) MULTIMEDIA COURSEWARE AMONG ELDERLY WITH HEARING IMPAIRED

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Abstract

The E-Tajwid Multimedia Courseware (ETMC) is specifically designed for elderly individuals with hearing impairments to facilitate their learning process. The courseware's development is based on comprehensive preliminary and secondary studies, which identified the challenges faced by the elderly with hearing impairments in a learning environment. To address these issues, the courseware incorporates solutions to ensure its effectiveness. The main challenges identified were the difficulty in listening over distance due to their disabilities, leading to communication barriers during learning. Additionally, instructors faced challenges in tracking and obtaining feedback after learning activities, making it hard to gauge student understanding. Moreover, the search did not reveal any special elements in the study materials that could encourage their learning. To overcome these obstacles, the courseware was equipped with multimedia elements like text, graphics, audio, video, and animation, providing a more engaging and accessible learning experience for the users to grasp and deepen their understanding of tajwid. The courseware was meticulously developed using the ADDIE Model, which follows the stages of analysis, design, development, implementation, and evaluation. The utilization of the Multimedia Learning Theory served as a guiding principle throughout the project, ensuring the creation of an effective learning system. The courseware successfully fulfilled all the requirements outlined in the test plan, and usability evaluation was conducted to consider feedback for improvement. In the future, numerous enhancements are planned to further refine and enhance the ETMC, ensuring its continued effectiveness in aiding elderly individuals with hearing impairments in their tajwid learning journey.

Keywords: Research, E-Learning Tajwid, Multimedia Courseware, Multimedia Learning Theory, ADDIE Model

1. INTRODUCTION

Multimedia courseware is a revolutionary approach to education that uses a variety of media elements to enhance the learning experience. Unlike traditional text-based materials, multimedia courseware includes text, pictures, audio, video, and interactive animations. This media combination not only makes learning more exciting, but it also adapts to different learning styles and skills, improving understanding and retention. Multimedia courseware has grown in popularity in both traditional and online educational settings, allowing for dynamic, interactive, and accessible learning environments.

The E-Tajwid Multimedia Courseware (ETMC) is an excellent instance of how multimedia features may be utilized to address specific educational issues, particularly for elderly individuals with hearing impairments. The researcher discovered that people with hearing impairments have a variety of challenges as a result of traditional learning approaches, especially during sharing information and learning sessions. These issues arise mostly from communication boundaries, which make it difficult to adjust to the learning environment.

2. MATERIALS AND METHODS

The ADDIE model is a framework employed by instructional designers and training developers to design successful learning experiences. This approach encompasses stages such as analysis, planning, implementation, and evaluation.

2.1. ADDIE Model

The ADDIE model has been employed as the framework for developing the E-Learning Tajwid (E-Tajwid) Multimedia Courseware for elderly individuals with hearing impairments. This model is a structured, plan-driven approach that helps ensure that each phase of the project is properly scheduled to achieve the expected outcomes. The choice to use the ADDIE Model is primarily driven by the need to work within a specific time constraint for the development of this multimedia courseware. Figure 1 shows the ADDIE Model.

Figure 1 ADDIE Model

3. RESULTS AND DISCUSSION

3.1. User

This multimedia courseware is called E-learning Tajwid (E-Tajwid) Multimedia Courseware. E-Tajwid multimedia courseware delivered in Malay. This multimedia courseware contains several topics to be better understood by elderly with hearing impairment because there are various challenges due to its traditional learning methods, particularly when it comes to knowledge sharing and learning sessions. The implementation of the multimedia courseware also offers convenience to Tajwid instructors. They can access the courseware's syllabus contents anytime and anywhere during learning sessions, simplifying their teaching process. Table 1 shows the problem statement that has been faced by elderly with hearing impairments with effect and solution after applying multimedia elements.

Table 1. *Problem Statement*

Problem	Effect	Solution
Difficulties in listening over distance	Communication barrier in a learning environment.	Produce e-learning courseware that user-friendly for the hearing impaired among the elderly
Materials do not have special elements to encouraging learning.	Learning materials is boring, hard to read and understand	Produce e-learning with five elements of multimedia which are graphic, text, audio, video and animation with repeated function.
Difficult to know the level of Understanding.	Feedback after learning activities is hard to get	Produce e-learning that contain exercise or quizzes.

3.2. Navigation Map

The navigation map represents the route instructions, as it were, throughout the conceptual model. The conceptual navigation map shows the route that user can or required to take through the configuration to perform and conclude all the required steps for accomplishing a goal. It is for helping identify how the user might navigate and help identify how the information should flow.

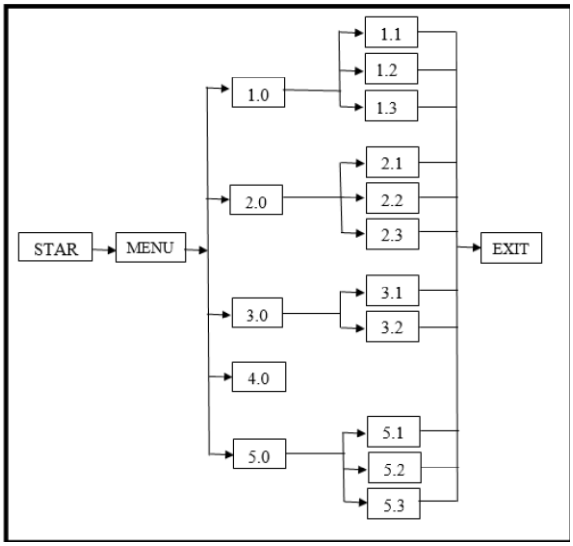

Figure 2 Navigation Map of ETMC

3.3. Storyboard

A storyboard is a written synopsis of text, graphics, videos, and animations shown, in the order, they will appear in the finished presentation. The storyboard can be used to plan, produce, and evaluate multimedia presentations or any instructional materials (Data, 2005). Its shape resembles a comic, in which there are sequential images that link the story that is a function to visualize the script or story.

Figure 3 Start Page and Main Menu Page of ETMC

Figure 4 Content Page and Quiz Page of ETMC

4. CONCLUSION

In conclusion, the development of E-tajwid Multimedia Courseware (ETMC) has been a success, meeting the set objectives in terms of content, design, and development. Through evaluation, it has proven to be an effective tool in enhancing the knowledge of elderly individuals with hearing impairments in the field of e-tajwid. ETMC incorporates a diverse range of multimedia elements, including text, images, sound, videos, and animations, which effectively engage and attract users. The courseware's interactive nature allows users to access information in an engaging manner and benefit from various activities. Although there are areas for potential improvement, these can be addressed over time. Presently, ETMC holds significant value for its intended target users.

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MODELLING THE PRODUCTION OF ELECTRICITY IN MALAYSIA USING AUTO REGRESSIVE INTEGRATED MOVING AVERAGE (ARIMA) MODEL

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Abstract

Electrical energy plays a key role in a nation's development, making future energy use planning remarkably crucial. This study attempts to apply Auto Regressive Integrated Moving Average (ARIMA) approach in modelling monthly rates of change in the production of electricity. The data used in this study were obtained from the Department of Statistics Malaysia (DOSM), consists of 120 observations starting from the period of January 2010 until December 2019. The analysis was conducted using Minitab software. The ARIMA method involves the process of identifying, estimating, and validating models to make predictions about future values of a time series based on its historical data. The development of ARIMA model requires the data to be stationary. To assess the stationarity of the data, autocorrelation and partial autocorrelation functions were constructed and the suggested ARIMA models were fitted. Three models were analyzed to find the best and most trustworthy model by employing Mean Square Error (MSE) and Box-Pierce statistics. The assessment results suggest that SARIMA$(1,1,1)(1,1,1)_{12}$ model has an outstanding precision, reliable forecasts, and is suitable for predicting electricity production. Forecasting electricity production is necessary due to the rising need for this energy. It can help the organization to prepare for future power consumption and balance the supply and demand of electricity. At the same time, a cost-effective and dependable energy supply can also be ensured. In conclusion, a good forecasting model can help organizations to comprehend the underlying causes of trends and develop the proper solutions to tackle the organization's difficulties.

Keywords: production of electricity, Autocorrelation Function, Partial Autocorrelation Function, ARIMA

1. INTRODUCTION

Electrical energy is a crucial element in boosting the development of a country. This is why careful planning for future energy demand is very important. Future energy demand could be influenced by

factors such as growth in population, economic situation, energy prices, and advancement in technology [1].

Due to the Covid-19 pandemic that affected the whole world in 2020, Malaysia faced a large decline in energy demand. This occurred following the shutdown of various sectors when lockdown was implemented, and everyone was instructed to stay at home. However, a recovery in demand for electricity was observed in 2021 due to an increase in utilization from manufacturing and commercial sectors. During this year, the government had motioned the National Recovery Plan (NRP) as an initiative to combat the pandemic.

As a result, the country was able to slowly get back on its feet with the economic reopening. According to Nurunnasihah [2], Malaysia's largest utility company, Tenaga Nasional Berhad (TNB) reported a growth of electricity demand at 0.6% compared to a contraction of 6.2% from the previous year. Since then, Malaysia has transitioned to the endemic phase on the 1st of April 2022. With this transition, it could be expected that the demand for electrical energy will continue to grow. Therefore, it is necessary to assist decision-makers in planning for future power consumption and balancing the supply and demand for electricity. Forecasting the electricity demand can also help to ensure an affordable and reliable energy supply.

Several studies had been carried out for predicting the electricity demand such as Haiges et al., [3] and Aurna et al.[4]. Time series is one of the models that can be used since it is accurate and suitable for energy prediction [5]. Predicting electrical demand using the Auto Regressive Integrated Moving Average (ARIMA) model involves time series analysis to forecast future values based on historical consumption data.

2. MATERIALS AND METHODS

The data series obtained from DOSM represents the monthly rates of change in the production of electricity in real terms over time. The production levels are denoted by index levels, or percentage change, relative to a base year. In the data series, the base year is 2010 for records of the years 2010 to 2015, and 2015 for the records from 2015 until April of 2020. The data used in this study consists of 120 observations starting from January 2010 until December 2019. The base year for the data of 2015 is 2010.

The data are fitted into the Auto Regressive Integrated Moving Average (ARIMA) model to forecast the future domestic electricity demand. Box-Jenkins methodology was employed in this study. The Box-Jenkins Model forecasts data with the application of three principles which are autoregression, differencing and moving average [6]. These three principles are known as p, d, and q, respectively. Each principle is used in the Box-Jenkins analysis; together, they are collectively shown as ARIMA (p, d, q). ARIMA model is formulated when the stationary assumption is met. To deal with series containing seasonal components, additional differencing is necessary to be performed in order to remove the seasonality effect and the model can be expressed as SARIMA$(p,d,q)(P,D,Q)_n$ where n refers to the number of time steps for a single seasonal period.

3. RESULTS AND DISCUSSION

3.1. Model Identification

According to the time series plot, it shows that the production of electricity increases over time. In addition, there is a seasonal component that exists in this time series due to the upwards and downwards pattern of the index level repeating for every 12 months. The data was investigated for stationarity by plotting its time series plot, Autocorrelation Function (ACF) and Partial Autocorrelation Function (PACF). Figures 1, 2 and 3 show that the data is not stationary. From Figure 1, there is an obvious trend pattern and seasonal component. Figure 2 shows a slow decay in ACF, and Figure 3 consists of several significant spikes in the PACF.

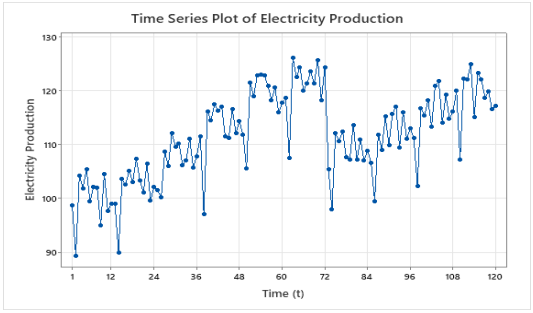

Figure 1. Time Series Plot

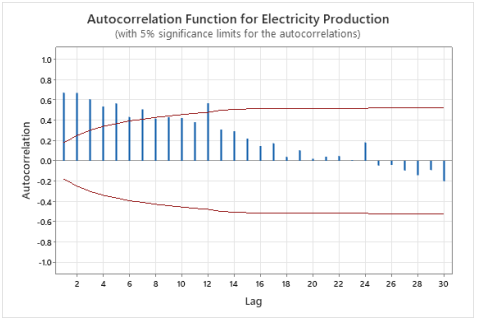

Figure 2. Autocorrelation Function

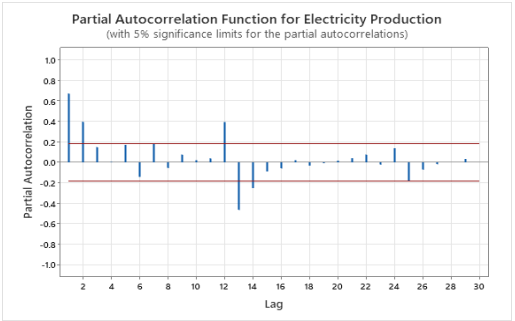

Figure 3. Partial Autocorrelation Function

Seasonal differencing was performed to eliminate the seasonal component from the original data series (D=1). However, the result still shows the non-stationarity of seasonal differencing data. Therefore, the first order of differencing for the seasonal differencing data is then performed (d=1). Figures 4 and 5 show that the data series is now stationary.

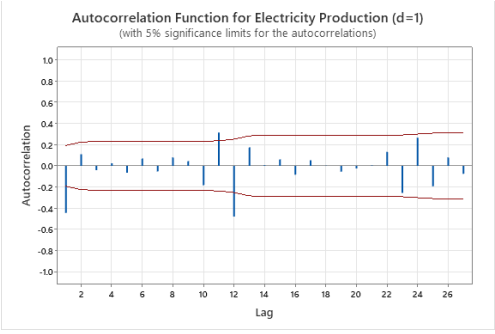

Figure 4. Autocorrelation Function of Seasonal & First Order Differencing

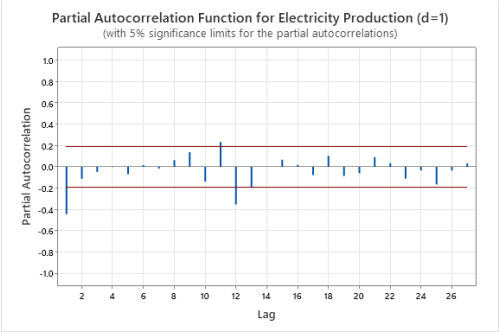

Figure 5. Partial Autocorrelation Function of Seasonal & First Order Differencing

The best model type for this data series is the form of SARIMA(p,d,q)(P,D,Q)$_{12}$. Referring to the ACF in Figure 4, there is 1 significant spike at lag 12, and 2 other significant spikes at lag 1 and 11 that determine the order for SMA (Q=1) and MA (q=2). Based on PACF in Figure 5, there is 1 significant spike at lag 12, and 2 others at lag 1 and 11 that determine the order of SAR (P=1) and AR (p=2). Therefore, the proposed model is SARIMA(2,1,2)(1,1,1)$_{12}$. For the purpose of comparison, the other two models suggested were SARIMA(2,1,1)(1,1,1)$_{12}$ and SARIMA(1,1,1)(1,1,1)$_{12}$.

3.2. Model Estimation and Validation

The parameters of proposed models were estimated, and the validity of each model was examined using mean square error and Box-Pierce statistics.

Table 1. Model Validation

Criteria	Model 1 SARIMA(2,1,2)(1,1,1)$_{12}$	Model 2 SARIMA(2,1,1)(1,1,1)$_{12}$	Model 3 SARIMA(1,1,1)(1,1,1)$_{12}$
Mean Square Error	14.2810	14.3746	13.7717
Box-Pierce statistics	p-value = 0.152 Residuals are white noise	p-value = 0.24 Residuals are white noise	p-value = 0.275 Residuals are white noise

Based on the insignificant p-value of the Box-Pierce statistics, the error terms for all models are white noise which indicates the models are well specified. However, due to the smallest mean square error, the best model chosen is SARIMA(1,1,1)(1,1,1)$_{12}$.

4. CONCLUSION

The main objective of this study is to identify the most suitable model that best represents the pattern of electricity index for forecasting purposes. Using the Box-Jenkins Methodology, it can be concluded that SARIMA(1,1,1)(1,1,1)$_{12}$ is the best model to forecast the value of electricity production for the upcoming year. In general, the production of electricity generated from natural sources increases over time. Since Malaysia is considering the implementation of renewable sources for electricity production, it could be predicted that the demand for electricity produced from natural sources would begin to slowly decline from the year 2030. The decline in the pattern would indicate that the implementation of renewable energy is achievable, thus, would eventually result in lower greenhouse gas emissions. To conclude, a good model is estimated for forecasting purposes as it helps organizations understand the underlying causes of trends, hence, identify the appropriate solutions to overcome the organizations' problems.

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MOBILE COMMERCE: REVOLUTIONIZING SHOPPING EXPERIENCES WITH PERSONALISED RECOMMENDATIONS IN AUGMENTED REALITY

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Abstract

Mobile commerce, augmented reality (AR) technology and personalized recommendation algorithms (PRA) offer a transformative mobile shopping experience. Users can make decisive purchases anytime and anywhere by virtually interacting with products in real-world environments. However, current mobile commerce platforms face several challenges. Inaccurate product information regarding size and dimensions can lead to improper purchase and returns. The proposed application named Furniture4U utilized context-based algorithms for PRA with Google Cloud Vision to receive personalized product recommendations based on room contexts, such as colour, type, and available space. Furniture4U utilised Sceneview for AR to enable users to view and place virtual furniture models which are recommended by the PRA with accurate measurements and dimensions. Furniture4U was assessed by two specialists using a functionality checklist and evaluated by thirty users using SUS. Furniture4U passed all functionality tests and scored 70.13 SUS. Major findings demonstrate that the use of PRA recommendations has effortlessly aided users to make appealing furnishing choices on their room and successfully solved inaccurate product information with visual representation in precise dimensions. In conclusion, integrating AR, PRA, and mobile commerce through the Furniture4U application can potentially revolutionize the shopping experience.

Keywords: augmented reality, mobile commerce, personalised recommendation algorithm, context-based algorithm

1. INTRODUCTION

Nowadays, with the help of smartphones and tablets, users can easily make online transactions with internet connections at the comfort of their home on mobile commerce. A survey conducted in Malaysia discovered that 88% of users owned a smartphone and 58% of mobile commerce transaction completed using mobile devices, proving that majority of smartphone users use mobile commerce to buy products in their daily life [1].

1.1. Problem Statements

One of the problems faced by current mobile commerce is incorrect product measurements. This is due to inaccurate information was displayed inside the mobile commerce when the user browsed for item's details. Research has proven that 25% of users worry about purchasing the wrong size and dimensions of a product, even when detailed information is displayed [2].

Next problem is cart abandonment as most users will abandon their cart after browsing items for quite time [2]. Reasons for this behaviour are limited payment method, slow checkout process and account requirement [2]. Due to this behavior, 70% of mobile commerce sales are lost [2] and this rate is expected to increase based on the cart abandonment rate trend significantly increase yearly.

Another problem is the lack of the user's decorative skills to decorate their own room. Some users lack creativity or are quite intimidated to furnish their home since it requires a lot of decision making such as in terms of colors, style, and function of the room. Even if users tried to decorate their room themselves, they tend to over or under decorate the room, making it uneasy and uncomfortable to look at.

1.2. Objectives

The objectives of this research are:
1. To identify the problem of current mobile commerce and the characteristics of PRA and AR.
2. To develop an AR assisted mobile commerce application that applies PRA.
3. To test and evaluate the functionality and usability of the developed mobile commerce.

2. MATERIALS AND METHODS

This study implements an adapted Waterfall model, created by Winston W. Royce in 1970 due to limited resources, clear schedule and easy to execute, consisting of planning, analysis, design, implementation, and testing phase. Table 1 shows the adapted Waterfall model implemented in this study,

Table 1. Adapted Waterfall Model

Objectives	Phase	Activities	Deliverables
To identify the problem of current mobile commerce and the characteristics of PRA and AR	Planning	1) Define study title and objectives 2) Identify project constraint 3) Determine suitable methodology	1) Title of study 2) 5 project constraint 3) Adapted Waterfall
	Analysis	1) Define functional and non-functional requirements 2) Research literature reviews to identify problem of mobile commerce 3) Observe other similar mobile commerce to determine characteristics of PRA and AR	1) 5 functional and non-functional requirements 2) 61 articles and conferences paper researched; 3 problems statement identified. 3) 3 similar mobile commerce observed (IKEA Kreativ, Shopee, Home Depot);

To develop an AR assisted mobile commerce application that applies PRA	Design	1) Create UML Diagrams 2) Sketch system architecture 3) Develop 3D models with Blender	1) UML Diagrams 2) System architecture 3) 14 3D models in .glTF format developed
	Implementation	1) Develop mobile commerce with android studio 2) Connect backend with Firebase and AWS 3) Integrate AR with Sceneview 4) Integrate PRA with Google Cloud Vision and trigonometry functions	1) Mobile commerce released in .apk format 2) Mobile commerce connected to backend 3) AR and PRA incorporated in mobile commerce
To test and evaluate the functionality and usability of the developed mobile commerce	Testing	1) Test mobile commerce functionality using checklist 2) Evaluate mobile commerce usability using System Usability Scale (SUS) 3) Report major findings and discuss about the results	1) Functionality checklist results 2) SUS Score 3) Limitation and future enhancements

3. RESULTS AND DISCUSSION

3.1. Functionality Result

Functionality testing was conducted using functionality checklists by two experts: one in the mobile computing and another in the AR field, and the other two random users. The test contains a list of functions used in Furniture4U. By this way, it allows the testers to check each component of the app, ensuring that it works as intended after development phase was completed. Table 2 shows the remarks of testers after they submitted the functionality checklist.

Table 2. Functionality Testing Remarks

Tester	Remarks
Mobile Expert	1) Some commerce functions are unstable. 2) PRA takes too long to execute. 3) AR is not elegant.
AR Expert	1) PRA is inaccurate, but works well 2) AR takes too long to load models.
User one	1) Commerce, AR, and PRA works well.
User two	1) All functionality works well.

After each remark, the functions were fixed to ensure that it works as intended. The last user has confirmed that all functions of the mobile application, including commerce, AR and PRA are able to function as well.

3.2. Usability Result

The SUS questionnaire was originally designed by John Brooke in 1986 to measure the quality of mobile applications. The usability evaluation was conducted using an adapted SUS questionnaire and distributed to thirty random users through Google Forms. Furniture4U achieved a result of 70.17 SUS score, placed in grade B, scoring more than average of SUS score which is sixty-eight. Figure 1 shows the results of the SUS based on the five quality components by Nielsen.

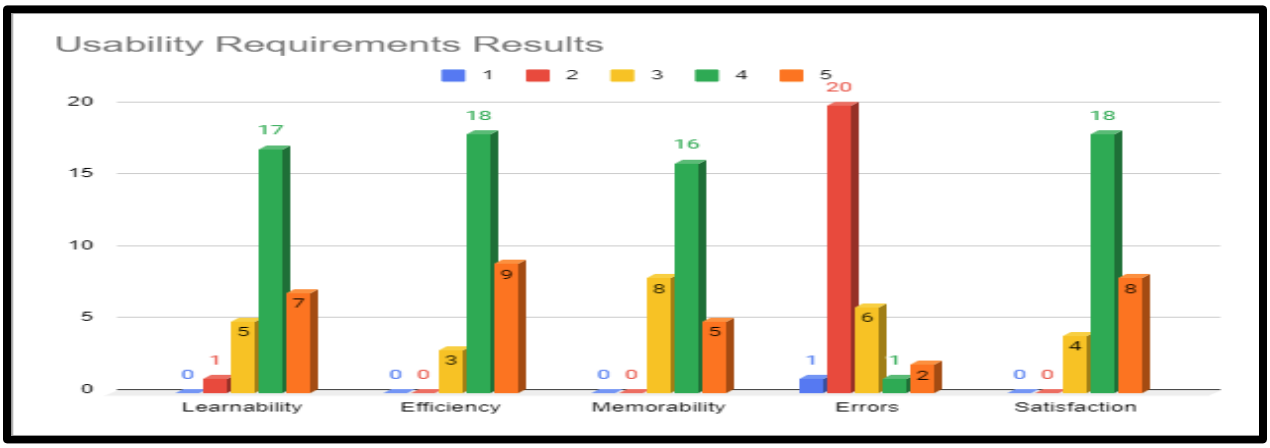

Figure 1. Number of people comfortable to use Furniture4U

The results score, ranging from 1(strongly disagree) to 5(strongly agree). In terms of learnability, most users agree that Furniture4U is easy to learn, as there will be instructions in from of toast and notifications that will guide users on how to use the app. In terms of efficiency, majority of users agree that they can quickly perform task as they learn about the functionality of the app due to the app requires less input by users and provide simples options to users, while the app itself makes complicated calculations without displaying it to users. In terms of memorability, most users mentioned that even though they stop using the app for a brief period, they can easily reuse it back effectively after awhile since the app uses simple layout and navigation. In terms of errors, most users disagree that the errors occurred during the use of the app are severe, although there are times where the app will eventually crash due to lack of memory. In terms of satisfaction, most users agree that they felt pleasant using the app since it is easy to use and navigate.

4. CONCLUSION

Based on the results of the functionality and usability tests, it was proven that Furniture4U works as intended and achieves higher than average score in usability. Users have mentioned that PRA has assisted them in deciding suitable furniture for their room and AR has aided them in deciding whenever the furniture fits on their room. For future enhancement, it will allow users to retrieve their previous furniture placement saved in cloud and view them based in the same room by using cloud anchors. Overall, Furniture4U can revolutionize the mobile shopping experiences by incorporating PRA and AR.

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CLOTH STORE LOCATOR BASED ON LOCATION BASED SERVICE

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Abstract

The "Cloth Store Locator Based on Location Based Service" is a website designed to help customers to easily locate cloth stores and services based on their current location. This website is designed especially for the visitors or tourists who come to visit Coimbatore. Coimbatore is the second largest city in the South Indian state of Tamil Nadu. The website uses advanced location-based technology to identify the user's location and provide relevant product and service recommendations. This system is a game-changer for businesses seeking to expand their reach and target customers in their local area. It offers a range of features to enhance the user experience and help customers to find what they need quickly and easily. Location Based Service (LBS) utilizes location data to provide users with relevant information based on their current location. By utilizing these technologies, the Cloth Store Locator based on LBS is able to accurately identify the user's location and provide personalized recommendations based on their search criteria. This enables customers to quickly find the products and services they need in their local area, enhancing the overall user experience. The development of the website system covers 5 main phases which were the planning phase, data collection and preparation, design phase, system development phase and finally the testing and evaluation phase. In this project, Hypertext Preprocessor (PHP) was used as the web development scripting language and MySQL was used as the database. The usability testing of the system had shown that the website was working efficiently. Most of the participants were satisfied with the website and their comments had been used to further improve the cloth store locator. Future work is to include personalized recommendations based on user preferences, detailed product information, and user reviews.

Keywords: Cloth Store Locator, LBS

1. INTRODUCTION

Our current era of mobile information is radically altering society and science. Location based services (LBS), which deliver information depending on the location of the device and user, play a key role in this mobile information era. Finding a store that offers the required products or services can be difficult in today's fast-paced world. However, advancements in location-based services and web technology have made it easier to locate nearby cloth stores quickly and efficiently. A store locator web application that makes use of location-based services can assist users in locating businesses in their area that provide the

product's they require [1]. Retailers use websites and social media to boost their visibility, but little consideration has been given to how they deliver information about the location and features of their businesses via the Internet. The purpose of this project is to gather evidence regarding the use of interactive web maps on retailer websites to provide information about the location of their stores. It was discovered that while most utilise interactive maps, some still use static maps or text format. In recent years, it has become challenging for customers to locate stores nearby [2]. Finding fashion or apparel stores that carry the desired item or one that is comparable may be challenging due to missing information, such as not knowing the brand name or the location of a store. In this project, a cloth store locator website has been developed using location-based services to enable customers to find the nearest cloth store to their current location, making it easier for them to shop for their favourite clothing items [3].

2. MATERIALS AND METHODS

The process for creating the location-based service cloth store locator involves 5 steps, which were planning phase, data collection and preparation, design phase, system development phase and finally the testing and validation phase. In the planning phase, the researcher established the system's goals and objectives, determined the technical and data needs and collected the information about the cloth store on the Internet. Next, during the data collection and preparation phase, the relevant information, such as store locations, operating times and other essential data had been gathered and prepared. The information had been gathered from a variety of resources, including open databases and information provided by the stores themselves. After the data gathering, the context diagram, the flow of the system and the Entity Relationship Diagram (ERD) had been designed in the design phase. The user interface of the application was also designed. The user interface should be intuitive, easy to use and allow users to search for stores by location and categories of clothes. In the system development phase, the website that locates clothing stores had been developed. The website provided options for filtering the retail brands or features, showing store information and location of store. In this project, the PHP programming and MySQL database were used for website development. During the testing and validation phase, the system was tested and validated to make sure it was performing as intended and meeting user needs. The usability and user experience of the system were further enhanced by adding user testing and feedback. Table 1 summarizes the key steps, and outcomes at each phase of the cloth store locator creation process.

Table 1. Key Phases and Outcomes

PHASES				
PLANNING	**DATA COLLECTION & PREPARATION**	**DESIGN**	**SYSTEM DEVELOPMENT**	**TESTING & VALIDATION**
OUTCOMES				
• Clearly defined system goals and objectives. • Identified technical and data requirements. • Gathered relevant information about cloth stores.	• Comprehensive data (e.g. store locations, operating times etc.) collected and prepared for use. • Data sourced from diverse and reliable resources.	• Context Diagram • System Flow Diagram • Entity Relationship Diagram • User interface design for easy store search	• Fully functional website to locate clothing stores. • Enhanced user experience with filtering capabilities. • Users can view relevant information and	• Verified that the system performs as intended. • Ensured that the system satisfies user requirements. • Improved system based on user testing and feedback.

			store locations.	

3. RESULTS AND DISCUSSION

The testing and validation were conducted using Google Form questionnaire which contained 13 questions. The website was evaluated for the UI/UX designs, user friendliness, rendering and lagging issues and lastly its usability. There were 33 respondents and for each question, the mean, median and mode have been taken based on their responses. Figure 1 shows the example results of the mean, median and mode for Questions 2,3,4,5 and 10. Based on the figure, all the means obtained for each of the questions were all above 4.00 and the modes were all 5.00. Based on these values, the enhancements have been made accordingly. In the collected responses, all functions were reported working more than expected, except for some loading issues. Based on the testing and validation, the design and functionality of the program could be improved by taking into consideration the user feedback to spot any usability problems.

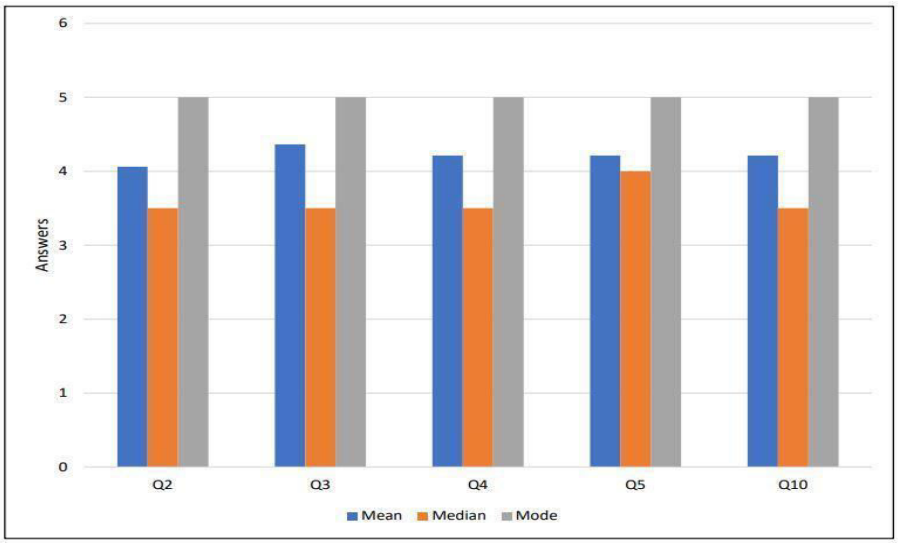

Figure 1. Results of Mean, Median and Mode

Figure 2 shows the page for searching the cloth stores on the website. It shows the categories of the clothes provided in the city. It is divided into categories in order to make it easier for customers to search and locate the exact clothes they are searching for. Customers can spend less time searching and looking for specific things by referring to the categories on the website. Customers may have a more positive shopping experience as a result, which may boost business and consumer loyalty.

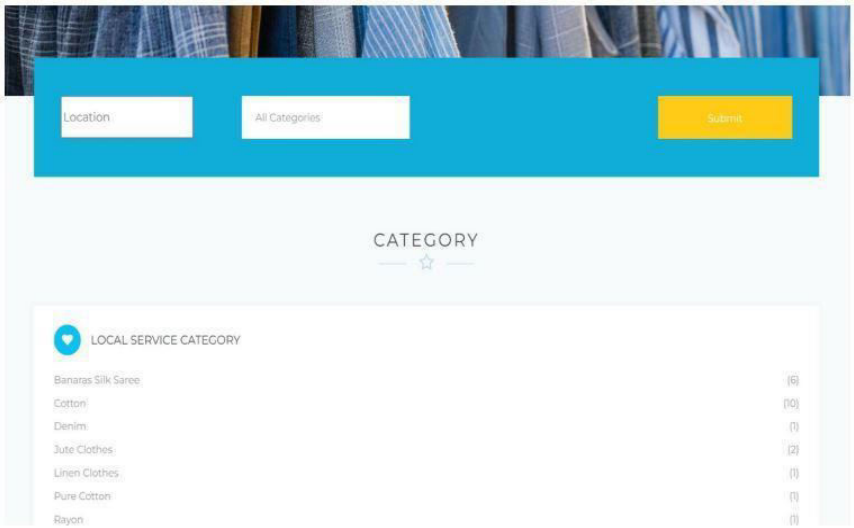

Figure 2. Cloth Store Categories

4. CONCLUSION

In conclusion, the web-based application that lists clothing stores is a crucial resource for today's shoppers who prioritize accessibility and convenience. The cloth store locator website could save time and effort by offering a complete directory of cloth businesses which could be quickly searched and sorted by location, product type and other criteria. Additionally, by having a presence on the Internet, business owners can gain better profit from more visibility and foot traffic. Numerous advantages exist for both customers and business owners when a location-based service is included in the cloth store website. Personalised product suggestions based on a user's browsing and purchasing history will be added in future improvements, which will improve the user experience by making focused and pertinent product recommendations. By doing so, it may be able to boost client lifetime value and the possibility of repeat purchases.

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THE DESIGN AND DEVELOPMENT OF BMC-FICATION SERIES FOR ENTREPRENEURSHIP COURSE

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Abstract

The Ministry of Education (MoE) has advised all higher education institutions, specifically public universities, to focus on entrepreneurship modules among the students in promoting entrepreneurship development in Malaysia. Therefore, Business Model Canvas (BMC) was designed to help entrepreneurs organise and strategize new business ventures that will enable all business ventures to be re-designed analytically. To date, the teaching and learning of BMC is relatively challenging as the students do not possess adequate knowledge or still new to the business, hence the students are not able to apply and reflect what business is all about. On top of that, educators must also play their roles to facilitate the students steps by steps in gauging their understandings of BMC before they are allowed to develop their own BMC. Hence, with the advent of the latest technology in education, the gamification approach for entrepreneurship subject (ENT300- Fundamentals of Entrepreneurship) was designed and developed to maximise the student's understanding of learning Business Model Canvas (BMC). This BMC-fication Series was designed and developed by using an open-source platform from Purposegame.com, and it comprises series of games for the students to play according to their level of understanding. BMC-fication Series addresses the common gamification elements: points, timers, badges, and leaderboards to promote collaborative and competitive activities among the students in a digital environment. In conclusion, BMC-fication Series is expected to help students learn, understand, and apply BMC in a meaningful way. It is also hoped that this BMC-fication Series will increase the students' motivation, interest, and understanding of Business Model Canvas (BMC).

Keywords: gamification, active learning, students' engagement, business, business model canvas

1. INTRODUCTION

Teaching the young generations nowadays need a lot of effort and determination from the educators to make the learning process more interactive and livelier. [1], "During tutorials and lectures, approximately 10–15 minutes of student attention will diminish", so, to address this issue, educators must be able to innovate their teaching skills in providing interactive teaching materials and active learning ambience for the students. Active learning promotes dynamic engagement among the students in the classroom. They

will stay focus for a more extended period of time and participate in each activity in the class. Involvement among students can be evaluated based on formative or summative assessment as this will contribute to their performance and achievement accordingly. [2] The chances of active students performing well is high as they gained more understanding and comprehension during learning activities. Therefore, the need for educators to enhance their teaching skills by reinforcing active learning activities in teaching materials is crucial to sustain the students' engagement. There are a lot of tools and freeware that available online for the educators to develop the teaching materials. By developing a gamification within the learning materials will further enhance the students' experience in learning as well as promoting a better learning performance. [3] For individual students to achieve specific learning outcomes, integration of educational games and curriculum goals must be synthesized with gameplay concept. Conventionally, the teaching and learning of Business Model Canvas (BMC) is via the use of colourful sticky notes and printed canvas in physical classroom. This method, however, has a washback effect on student's understanding due to several factors. Thus, the aim of this study is to explore the perceived effectiveness of gamification in enhancing student engagement for the effective learning in learning BMC.

1.1 Gamification

Gamification is defined as "the use of game design elements in non-game contexts" [4]. The fun learning promotes active participation from the students and therefore, enhance their learning performance. [5] [6] [7] The game components were helpful to increase student engagement in the classroom as this gamification concept is attractive and will stimulate students to be more active in the classroom. Thus, the needs for the educators to reinforce gamification in the learning materials are crucial to enhance the students' engagement in the class.

1.2 Students' Engagement

Fostering student engagement is crucial for enhancing their learning outcomes. Educators face a significant challenge in maintaining students' interest and participation due to the diverse learning styles they bring to the educational activities. Evidently, dynamic engagement among the active students is proven that they perform well as they are well-engaged with the lessons and able to retain more knowledge during the learning activities. According to the study by [2], students who actively participate are inclined to excel as they retain more knowledge during learning activities. Hence, it is crucial for educators to identify effective strategies that keep students engaged throughout the learning process.

1.3 Gamification Elements

Table 1 shows the interactive elements employed in gamification approach namely badges, points and levels, and leaderboard. Badges were used the most followed by leaderboard in gamification approach. Numerous studies have explored factors influencing student engagement, with previous research incorporating game elements such as leaderboards, badges, points, and levels [5][6][7][8][9]. This preference may stem from users' perception that badges enhance their social standing among peers [5].

Table 1. Interactive gamification elements used in previous studies

Elements/ Reference	Badges	Leader board	Challenges	Levels	Points	Online Activity	Incentive	XP

Hamari (2015)	√							
Hanus and Fox (2015)	√	√					√	
Sanmugam et al. (2016)	√	√			√			
Barata et al. (2013)	√	√	√	√				√
Kuo Chuang (2016)	√	√		√	√	√	√	

Source: (Ab. Rahman, 2018)

BMC-fication comprises four sequential levels namely Sort-it!, Know-it!, Connect-it! and Segment-it! as shown in Figure 1. The score from each student will be recorded on the leaderboard. Once the students have completed all of the BMC-fication levels, they will be asked to take part in answering the questionnaire to evaluate the usefulness and effectiveness of BMC-fication towards BMC learning.

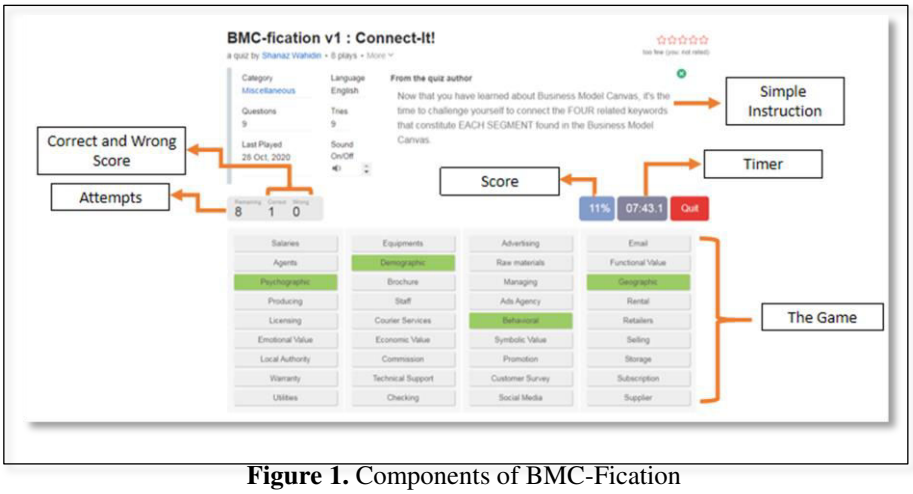

Figure 1. Components of BMC-Fication

2. MATERIALS AND METHODS

This quantitative study utilized a questionnaire featuring multiple Likert scale queries, employing a 1-5 scale (1: Strongly Disagree, 2: Disagree, 3: Neutral, 4: Agree, 5: Strongly Agree) as the response indicator. The questionnaire was then transformed into a Google Form and distributed to all participants involved in the study. The analysis focused on four aspects related to the perceived usefulness of gamification in learning Business Model Canvas, presented in terms of percentage and frequency. The study respondents consisted of 54 students who enrolled in the ENT300 – Fundamentals of Entrepreneurship course at Universiti Teknologi MARA Cawangan Perak, Tapah Campus. The outcomes of this study provided valuable insights for lecturers to enhance the development of more engaging and interactive gamification methods in teaching Business Model Canvas.

3. RESULTS AND DISCUSSION

Table 2. Responses by percentage

Statement	Strongly Disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly Agree (%)
BMC-fication improves my learning performance	-	-	3.7 (n=2)	61.1 (n=33)	35.2 (n=19)
BMC-fication increases my learning outcome	-	-	5.6 (n=3)	64.8 (n=35)	29.6 (n=16)
BMC-fication enhances my desire to produce the desired result in my learning	1.9 (n=1)	-	9.3 (n=5)	55.6 (n=30)	33.3 (n=18)
BMC-fication is useful in my learning	-	-	14.8 (n=8)	38.9 (n=21)	46.3 (n=25)

The majority of respondents expressed a positive inclination towards the use of BMC-fication in various aspects of their learning. Specifically, 61.1% agreed and 35.2% strongly agreed that gamification improves learning performance, indicating a progressive preference for its implementation. Additionally, 64.8% agreed and 29.6% strongly agreed that gamification increases learning outcomes significantly. In terms of usefulness, 55.6% agreed and 33.3% strongly agreed, with 9.3% being neutral. While there was one respondent (1.9%) who disagreed with the statement that gamification enhances the desire to produce desired results in learning, the majority (89.4%) expressed agreement or strong agreement. Overall, these findings suggest a holistic preference among respondents for incorporating BMC-fication in their learning environment.

4. CONCLUSION

In summary, the results of this study indicate a favourable influence of the gamification approach on student engagement and interest in studying Business Model Canvas (BMC), conducted through a digital platform. The incorporation of common gamification elements like points, timers, badges, and leaderboards is expected to stimulate collaborative and competitive activities among students in the digital realm. This, in turn, is anticipated to enhance the learning, comprehension, and practical application of BMC, thereby fostering a holistic improvement in students' motivation, interest, and understanding of Business Model Canvas (BMC).

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