GDIID2021

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Cawangan Terengganu
Kampus Kuala Terengganu

2ND GRADUATE DIGITAL INVENTION, INNOVATION & DESIGN

EMBRACING NEW NORMS TOWARDS DIGITALISATION

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Welcome Address

Dear all,

First and foremost, let us extend our sincere gratitude to Allah SWT for giving us an opportunity to publish in our 2nd volume of extended abstract for Graduate Digital Invention, Innovation and Design (GDIID) 2021. This is an international competition organized by Universiti Teknologi MARA (UiTM) Cawangan Terengganu Kampus Kuala Terengganu for local and international graduate inventors and researchers to present and publish their inventions, innovations, and designs of technology in various fields. Previously held in 2019, this biennial event has attracted graduate inventors from many universities.

As one of the pioneers in organizing virtual IID competitions since 2019, UiTMCTKKT is honoured to present GDIID 2021 with the theme of "Embracing New Norms Towards Digitalization". Despite this pandemic challenges, GDIID 2021 has witnessed the congregation of graduate inventors and researchers from all over the world to share ideas, exhibit and present creations, innovations and inventions. Having all these parties in the same platform will eventually create a conducive environment and creative ambience for future generations.

We would like to take this opportunity to thank our juries and reviewers for spending their valuable time to judge the projects and review the extended abstracts. We would also like to congratulate the GDIID 2021 organizing committee for organizing this event successfully. GDIID 2021 would not be possible without your professional service, hard work and dedication.

It is our hope that with this competition, participants and authors would have gained not only the intellectual benefits, but also the opportunities to promote their products and studies to the local community and entrepreneurs.

Finally, thank you for your participation and we wish to see you again in the next GDIID.

Thank you.

Sarah Yusoff
GDIID2021 Chairman

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GRADUATE DIGITAL INVENTION, INNOVATION & DESIGN 2021

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2nd GRADUATE DIGITAL INVENTION, INNOVATION & DESIGN
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VRNURSE: INFINITE LEARNING EXPERIENCE

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Abstract

The nursing institution has been attempting to adapt to the new norm since the Covid-19 outbreaks last year, which has caused a major shutdown to various industries in the country with the implementation of preventative intervention measures. The limitations for the educators to send the students for clinical and practical studies at the hospital and for the students to have a quality understanding of their education during the challenging period serve as the motivation for the birth of VRNurse. This project aims to help the academic institutes in transitioning from the traditional face-to-face study method to virtual teaching practice by creating a system, centring on the usage of virtual reality simulation. VRNurse will be designed to provide the opportunity for nursing students to train practically in total immersion of hundreds of different scenarios that can be risky or impossible to recreate with the usage of a nursing training doll. The time and space taken for the equipment in current practical teaching can be reduced immensely while keeping up with the updated teaching syllabus but in a better quality of learning experience for the students. It can assist the educators in evaluating and monitoring the students' task performances through the recordings saved while also improve the academic relations with the students in individual-focused sessions. Educators also can exploit the limitless ability of VRNurse to explain visually, along with audio for the complications and interventions in clinical settings such as assessing the degree of burns wounds and the pathophysiology for diseases. Therefore, for the current nursing institution to undergo a paradigm shift in educational levels, applicating a new evolving technology is a must and VRNurse can offer the chance for the transitions to occur in the near future.

Keywords: virtual reality, education, nursing, transitioning

1. INTRODUCTION

We are entering a new world of digitalization where technologies have been immensely evolving from the introduction of the internet in the early 1960s [1]. However, the author's experience of practicing the current nursing practical session in laboratories has been somewhat disenchanting. The usage of used, weary training dolls to replace human interactions, the large yet inadequate space for a group of students to engage together in a crucial learning experience and the current, decades-old syllabus are disappointing if the advance of the current technologies is being considered in mind. This is concerning as nursing students with other medical courses that need a lot of practice before engaging in clinical sessions in hospital are

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wasting their time, taking part in active yet ineffective educational training regimens. They need to learn as much as possible in lesser time and better quality so they can execute the procedures and follow the guidelines better with little to no mistakes. The authors believe the current study methods have been outdated and the act of not implementing the current technologies in the educational settings is a shocking squander to everyone in the industry. Now, what about the corollary on the students and educators? The large number of students training with a limited amount of equipment in a limited space can exhaust the educators as well as the students themselves thus reducing their learning and teaching experiences. Virtual reality somehow came into the author's mind as it negates the disadvantages that have been discussed. Therefore, the VRNurse project which is centering on the usage of virtual reality can be the most optimal option to eliminate the problems that emerged as virtual reality holds benefits such as distance learning, promoting engagements, stimulating spatial memory, and ability to be conducted in an inaccessible environment [2].

2. MATERIALS AND METHODS

2.1. Designing Components

Interviews with experts and professionals from both VR and medical industries were conducted. This phase helped to construct the flow of the project, to gain knowledge while exploring new paths to be taken and to build the images of the challenges throughout the project. The scenarios were visualized with their guidance on their experiences and knowledge. Model components for the menu interface and the scenarios models were sketched along with key features and minor models to be added into the virtual world. **Table 1** shows the features for the menu interface along with their rationales. They were arranged in a flow chart to help in understanding the relationship between components and the flow of the whole process. All the designed materials were referred to as real-world devices used in the scenarios to maintain the technicality and the realistic aspect of the system.

Table 1 Features for Interface Menu

VR interface	Rationale
• Scenario tab • Basic descriptions were added, along with a color indicator of each scenario. Green indicated availability, grey indicated the scenarios have been performed and red indicated unavailability. • Instructions, notes, and guide features for the scenarios were added.	• To collect all the scenarios customized in one tab for the user to choose and perform. • To help the user differentiate the status of the scenarios. • To help the educators to customize the scenarios, thus fitting the study syllabus. • To introduce key functions behind each component.
• Evaluation tab • Score charts, comments sections, and recordings were included. Recordings tabs were linked to another interface. History for the recordings last saved was shown in the interface.	• To provide the educators with a section for evaluating and monitoring the user's progress. • To collect the recorded videos in one section.
• Recordings tabs • Information for each of the recordings was placed next to the video with the links for other platforms share, to delete and download the recordings added.	• To navigate the user to find the recordings in the storage system with the descriptions. • To allow for collaborations with other developers and platforms.

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2.2. Modelling Components

SteamVR on Windows operating system was used as the platform software to project the virtual space built as well as the customization for 3D modeling and VR environment. Then, Unreal Engine functioned to provide support for importing the 3D models and modeling the 3D complex structures by creating meshes actors from basic shapes to the virtual world. It also helped in rendering the sketched images in real and blueprint textures that further optimized the VR system.

2.3. User Interactions

The user interactions needed to be natural and intuitive for a maximum immersive experience. For user's movement in the virtual world, HTC Vive was used as they featured infrared cameras, allowing the projection of user's physical movement into the virtual world. The HTC Vive controllers along with the headset enabled the user to interact on a room-scale by connecting with a tracking system. This solved the issue of restricting users' movements and interactions in the space. The VR Googles blocked any outside distractions to give the user complete focus during the simulation.

2.4. Usability Testing

Pilot tests were conducted with a few assigned users. The environment for testing was done in labs that werre common in many universities and training schools as they awere spacious and excluded for silent purposes which assisted in obtaining clear voices in communication and recordings. They were monitored throughout the tests to observe for live reactions. Feedbacks were obtained through evaluation session and filling out questionnaires. Issues raised were properly discussed before continuing the project; to release the system to the market. The projects were thoroughly looked into from the first phases if no is the answer from the discussion.

3. RESULTS AND DISCUSSION

3.1. Results

Evaluation of the system from assigned users had been carried out from 30 nursing students, asking them to rate from within 5 categories which are Accessibility, Confidence, Design, Skill Improvement, Education Quality and Time Management. **Figure 1** shows the analyzed data obtained from the students.

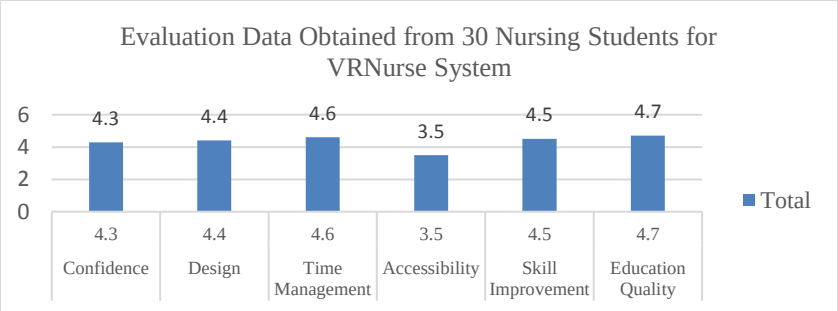

Figure 1 Figure Header

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3.2. Discussion

Based on data in **Figure 3.1**, it can be seen that the rate is high for each category, out of 5 for each category with the highest rate being 4.7 for Education Quality and the lowest is 3.5 for Accessibility. The data proves the system excels in terms of educating and improving the user's skills. Besides, the design for the system also is rated high for its functionalities and attractiveness. However, it is understandable that the accessibility rate is quite low as the project requires investors for the purchases of managing the equipment.

4. CONCLUSION

To conclude, this project is developed to build a system to help nursing institutions to shift from the old traditional ways of study. VRNurse has the opportunity to improve the quality of education standards in the medical field while exploiting the improvement of technologies in the current digital era. It also can potentially serve as the door to open new paths of educating in other fields as well as eliminating the limitation of studies for the next generation.

COPYRIGHT REGISTRATION

This project innovation has applied for IPR registration from IRMIs UiTM, with reference number CR003142 on 5th August 2021.

ACKNOWLEDGEMENT

Thanks to all the participants who were directly or indirectly involved for their contributions and supports. Special gratitude also to this project's advisor, Suzana Binti Yusof for her guidance and sponsor help to bring this project alive.

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i-ReChlo: AN INNOVATIVE LANDSCAPE DESIGN PRODUCTS FOR SUSTAINABLE ENVIRONMENT

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Abstract

Recent advances in green technologies and sciences have increased interest in the integrated landscape approach for a sustainable environment. This development of innovative landscape design products aims to improve recycling activities and create a sustainable landscape through further innovation and enhancement of existing materials. The recycle vending machine (RVM) is one of the novel machines that has been widely used to manage waste effectively. Enhancement versions of available RVM result in the proposed i-ReChlo vending machine, which featured an algae bioreactor and usage of solar panel as its sole power source. i-ReChlo uses a programmable hardware-based detection system consists of a cost-efficient capacitive proximity sensor, an infrared photoelectric sensor, and a strain gauge weight sensor readily available in the market. The design is straightforward, characterized by an LED display ideal for digital learning, platforms to operate rewards and redemption schemes. It takes one-way, non-refillable plastic bottles and cans, and in return, offers QR codes to redeemable points depending on the weight of the deposited bottles or cans. In addition, the machine's outer body provides space for wrapping advertisements and branding endorsement. Another feature attached to the machine is the flat plate algae bioreactor that would mimic the function of photosynthesis in plants, where it converts carbon dioxide into oxygen. The algae façade features also help the environment by reducing air pollution problems. The machine's upper part is equipped with solar panels, which can absorb the sun's rays to generate electricity to power the vending machine and charge the battery to work at night, on cloudy or rainy days. In conclusion, this product offers numerous advantages to the environment, particularly in sustaining the landscape area and raising awareness among the users through disseminating information and engaging in attractive recycling activities.

Keywords: Innovative design, landscape products, sustainable environment

1. INTRODUCTION

The 3Rs campaign in Malaysia was first launched in the late 1980s, focusing primarily on recycling activities. Unfortunately, the campaign still did not result in an improvement in the existing waste management practices. Thus, the development of recycling regulations, policies and programs with a long-term perspective could be guided by numerous examples from the outside world. For instance, in Japan, recycling programs through retailer trade-in, barter system activities, and community-based systems in the

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private and public sectors could be emulated. In Germany, they have regulations for a deposit-refund system, which combines a tax on product consumption with a rebate when the product or its packaging is returned for recycling [5]. According [2], despite the Malaysian government's funding for public information campaigns, the general public's awareness of the 3Rs is still low. The government has introduced The Action Plan for a Beautiful and Clean Malaysia (ABC Malaysia) in 1988 but received only a small amount of support from the public [1].

Malaysians should be aware of the importance of recycling, and they should take an active role in participating in recycling efforts. The public's participation is essential to the success of a recycling program, as the efficient recovery of large volumes of high-quality recyclable materials depends on effective public participation. One of the primary reasons for small involvement is a lack of incentives and ongoing motivation to engage in recycling activities. For example, a local study discovered that while householders are generally aware of the importance of recycling, their awareness does not always translate into widespread recycling practices [3]. This is because the fundamental motivation to recycle is extremely low.

More than 70% of Malaysians stated that they do not recycle because the available recycling facilities are insufficient, and a further 65% stated that recycling is inconvenient for them [2]. As a result, landfills receive more recyclable materials that enter the waste stream. Aside from raising awareness of the recycling concept, additional efforts are required to ensure that the percentage of people actively involved in recycling continues to rise. For example, the government has encouraged the private sector to invest in green technology to promote more environmentally sound waste management practices to adapt to the changing global environment.

In this way, innovative recycling that includes a refund or reward system is a viable alternative method of encouraging the public to participate in recycling activities. This development of innovative landscape design products aims to improve recycling activities and create a sustainable environment through innovation and enhancement of existing recycling materials. Notably, the recycle vending machine (RVM) is one of the novel machines that has been widely used to manage waste efficiently [4]. This enhancement versions of RVM result in the proposed of the i-ReChlo vending machine, which featured an algae bioreactor and usage of solar panel as its sole power source.

2. MATERIALS AND METHODS

Specifically, there are two main phases of this study which are the data collection from previous research and the design stages.

2.1. Data collection

As part of the development process, this design explored all material options and imagined the concept to create something completely new and different from what had previously been done. Data and information based on product-related documents were gathered to gain technical knowledge from scientists, technologists, and material suppliers. This information was compiled and discussed during the critique session prior to discovering the product's potential. The compilation process involves two main stages which are: i) Review on fundamental concepts of sustainable waste management, recycle products and landscape outdoor design; ii) Defining the scope of the product by considering the purpose of the product

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design, the scale and level of detail required, the time required to complete the task, the nature of the outputs required, and the judgement required to inform the relevant decision.

2.2. Design stages

This design stages process resulted in the identification of the final idea that was developed for the proposal of the landscape design products. It consists of three major procedures, which are: i) Draft of the product in the form of manual graphic sketches to serve as a medium of discussion for the development of ideas, ii) Making a preliminary drawing of the product in correct scale and dimensions using the AutoCAD design software, and iii) The development of the 3D model created with the SketchUp Pro software.

3. RESULTS AND DISCUSSION

3.1. Design layout

i-ReChlo uses a programmable hardware-based detection system consists of a cost-efficient capacitive proximity sensor, an infrared photoelectric sensor, and a strain gauge weight sensor readily available in the market. The design is straightforward, characterized by an LED display ideal for digital learning, platforms to operate rewards and redemption schemes. It takes one-way, non-refillable plastic bottles and cans, and in return, offers QR codes to redeemable points depending on the weight of the deposited bottles or cans. In addition, the machine's outer body provides space for wrapping advertisements and branding endorsement. Another feature attached to the machine is the flat plate algae bioreactor that would mimic the function of photosynthesis in plants, where it converts carbon dioxide into oxygen. The algae façade features also help the environment by reducing air pollution problems. The machine's upper part is equipped with solar panels, which can absorb the sun's rays to generate electricity to power the vending machine and charge the battery to work at night, on cloudy or rainy days.

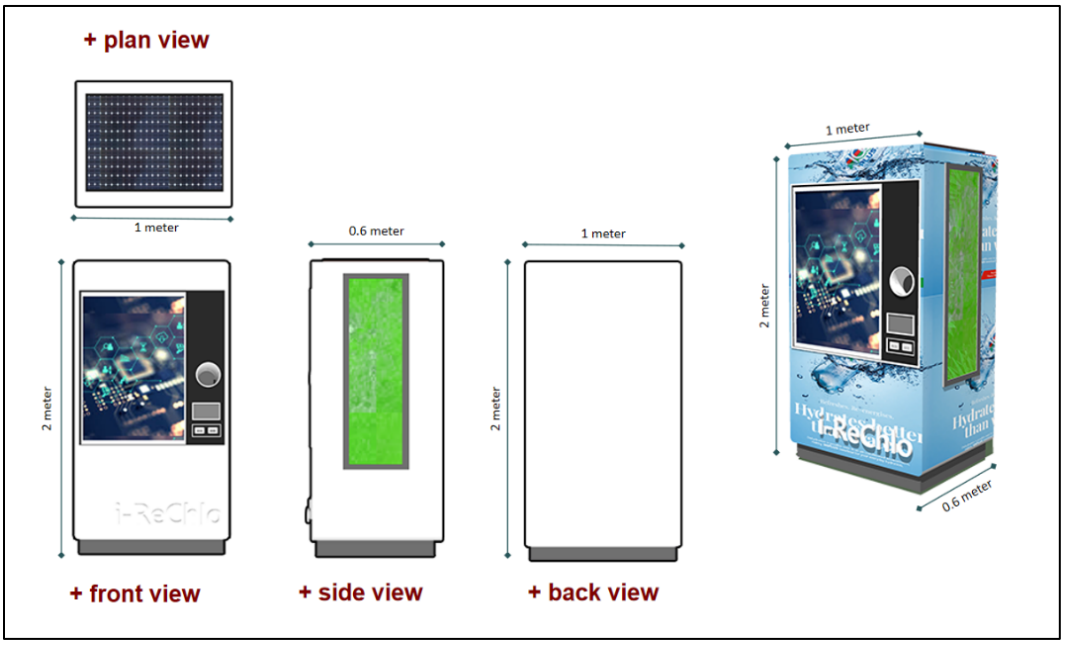

Figure 1. Layout design of i-ReChlo

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4. CONCLUSION

In conclusion, this product offers numerous advantages to the environment, particularly in sustaining the landscape area and raising awareness among the users through disseminating information and engaging in attractive recycling activities. This design project will also raise environmental awareness among students in the education system, resulting in more sustainable design idea development, especially among Malaysia's future landscape architects, engineers, and designers. Before recycling practices can be made mandatory, it is necessary to instill the recycling concept in the minds of future designers and engineers. Recycling products on the market should be commercialized to raise recycling awareness and translate that awareness into widespread recycling practices. Many people are unaware that recycling is critical to avoid a shortage of certain materials that they rely on in their daily lives. The knowledge should be built up in the society through this kind of product development. Ongoing government support should be incorporated into future studies, and a recycling product should be developed in collaboration with every stakeholder and policymaker to ensure that the idea is successful. A significant increase in the number of private, non-governmental organizations (NGOs) taking part in environmental protection efforts also plays an extremely important role in making a difference in the world and promoting respect to the environment. We should all be inspired by the natural cycle of the earth, in which every bit of waste is a resource for other users.

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FABRICATION OF LIE DETECTOR ARDUINO

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Abstract

The Lie Detector Arduino is a tool used to detect whether a person is telling the truth or lying. If a person is lying, this Lie Detector Arduino will work by detecting psychological changes in the body by seeing the presence of sweat. As is well known, a person will show slight changes in his face as well as limbs when he is in a state of nervousness or depression. This is because of the nervous system's response to emotions as a person interacts with others. Once the brain has given a signal about the emotion being experienced, the sweat glands will produce a spontaneous response. The objectives of the study will clearly state how the objectives of the study can be achieved. The objectives of this project are to identify the system used by the lie detector and the abnormal stimuli or reactions that pass from skin conductivity that depend on a person's state or emotions. Besides, this study to identify the principle of polygraph in real-time in Arduino graphics which serves to detect the skin reaction of the respondent. EDA is often used in Biofeedback therapy. Biofeedback is a mind-body technique that uses various forms of monitoring tools to establish conscious control over physical processes that are normally under the body's automatic control. Many biofeedback therapy tools use EDA as an indicator of a user's stress response. This is intended to help consumers control anxiety. Among its uses are to control blood pressure, heart rate, body temperature and even sweat.

Keywords: Lie detector, Arduino, psychology, temperature, blood pressure

1. INTRODUCTION

All industry around the world grow faster even lie detector industry already familiar about applying psychology with professional polygraphers with specific training [1]. There are many studies collected for the advance theory and methods of polygraphic. Skin conductivity is a psychological or physiological indication of a stimulus controlled by the autonomic nervous system [2]. If the sympathetic branch of the autonomic nervous system is strongly stimulated, then the activity of the sweat glands also increases, resulting in increased skin conductivity. There is a link between emotional arousal and sympathetic activity, although electrical changes alone cannot identify the specific emotion evoked. Autonomic sympathetic changes alter sweat and blood flow, and ultimately affect the Galvanic Skin Response (GSR). GSR is familiar to the project of "Lie Detectors", since GSR amplitude sensitively detect to emotional provocation, salient thoughts and attentional demand [3]. GSR is an old term that refers to the electrical resistance recorded between two electrodes when a very weak current continues to pass between them.

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The response of skin and muscle tissues to external and internal stimuli can cause altered conductivity. The main concept starts when skin conductivity and blood flow are measured and lie detection is detect through online interaction of the computer system that connect to the hardware [4]. Skin conductivity level known as Galvanic Skin Response is frequently used as a measure of emotion response and high levels are correlated with cognitive states such as high stress, excitement and attentiveness [1]. The combined change between electrodermal resistance and electrodermal potential gives rise to electrodermal activity.

Electrodermal Activity (EDA) refers to variations in electrical conductivity in the skin in response to sweat secretion controlled by the autonomic nervous system. EDA has been linked to temperature regulation in humans and studies have also shown that EDA exhibits strong signals and has a relationship with emotional stimuli. The signals generated by the sympathetic nervous system have given rise to changes to the Skin Conductivity Response (SRC) [5]. A person's emotional level changes due to the environmental conditions he faces. Changes in emotional responses will increase sweat gland activity and skin conductivity. Thus, the EDA signal does not represent the type of emotion, but its intensity [6].

2. MATERIALS AND METHODS

The Figure 1 shows the main components that will be used in the production of this Lie Detector Arduino project. The main components are Breadboard, Jumper Wire, Arduino, RGB LED, Potentiometer, Resistor, Buzzer and Thumb Tack.

Figure 1. The main components.

3. RESULTS AND DISCUSSION

At this stage, materials will be provided to assemble the project parts. The project that has been built will be tested to identify any errors or improvements during the project development process.

3.1.1 Evaluation RGB LED and GSR Sensor

Inside the RGB LED are three LEDs: red, green and blue. This project makes use of a multicolor LED that shows red to indicate a lie, blue to indicate the truth, and green to indicate that the potentiometer should be calibrated in order to adjust the lie detector. The RGB LED does not light up at the first assessment stage. Then, in the second assessment point, the RGB LED lights up but does not emit the

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color that the project expected. On the other hand, the RGB LED emits bright light in the third assessment stage.

After that, this project to compare voltages GSR Sensor (finger sensor) for A0 and A1 in the fourth assessment stage. If they are connected, the RGB LED will be set to green, as seen in Figure 2. If the voltage from the respondent finger sensor (A0) is significantly higher than A1, the RGB LED changes to red as seen in Figure 3. If A0 is slightly lower than A1, the RGB LED will turn blue as seen in Figure 4.

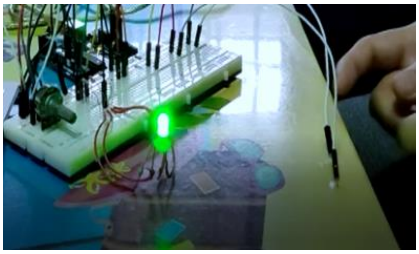

Figure 2. RGB LED for green color.

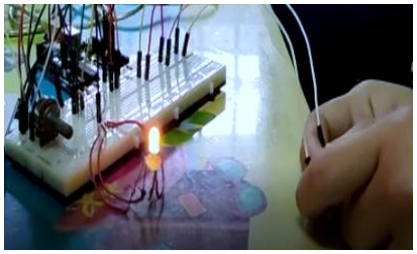

Figure 3. RGB LED for red color.

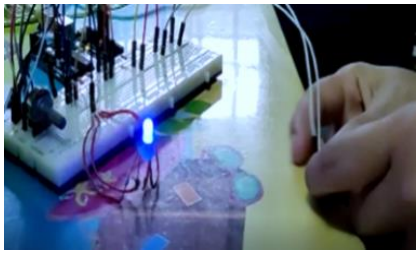

Figure 4. RGB LED for blue color.

3.1.2 Evaluation Polygraph

This project use GSR Sensor to analyze the various reactions that the body's skin goes through in this process, based on the circumstance, thoughts and feelings of a respondent to testing that will show all of these things happen in real time polygraph in an Arduino Serial Plotter.

Figure 5 shows the polygraph of the RGB LED for green color. A reference point centred on a loading stage will be defined as a point of comparison with the value obtained from the metal plate (GSR Sensor), the perturbations of which will depend on the reaction of the respondent to be investigated.

Figure 5. The polygraph - RGB LED for green color.

Figure 6 shows the polygraph of the RGB LED for red color. According to the graph, when the cutaneous resistance decreases, the respondent will be assumed to be lied, and therefore the Arduino's analogue input (A0) would tend to 5V, triggering a system output. The graph will sudden shift as change of skin resistance.

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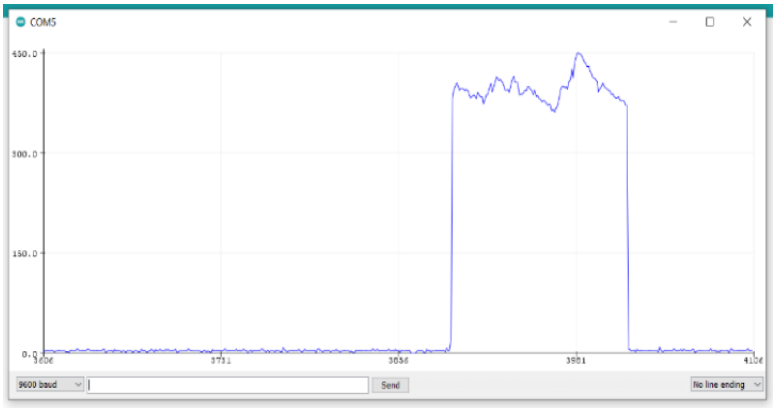

Figure 6. The polygraph - RGB LED for red color.

Figure 7 shows the polygraph of the RGB LED for blue color. According to the graph, the increases the cutaneous resistance, the more often the respondent is telling the truth, and therefore the Arduino's analogue input (A0) would tend to 0V, triggering a system output. The graph will change normal response.

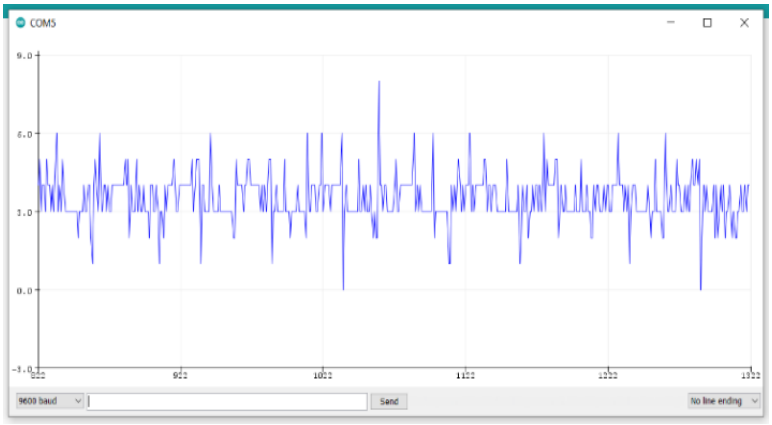

Figure 7. The polygraph - RGB LED for blue color.

4. CONCLUSION

Each project built will have its objectives, including this Lie Detector Arduino project. The objectives of this project have been achieved. Throughout the process of building this project, there were some problems encountered such as the RGB LED lights not function well and the Buzzer sound being too loud. But after several corrections and tests were done, the problems encountered were able to be fixed. There are also some improvements that have been made throughout the building process of this project. This Lie Detector Arduino is fully functional using a pre-programmed Arduino electronic kit. It simplifies the building process of this project which requires interacting with various other components. The product produced from this project can help and facilitate the school, especially school discipline teachers to identify students who often have disciplinary problems in school. It is also suitable to use by authorities such as PDRM and MACC to fight crime.

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GLOBAL ILMU TUITION CENTRE ADMINISTRATION AND TUTORING SYSTEM

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Abstract

GIATS is a system built for Global Ilmu. Global Ilmu is a private educational institution that provides tutoring services for primary and secondary school's students. These systems have a combination of two systems which are management information system and learning management system. Studies have been made to learn deeper into the current business flow of the organization and developed systems will focus on improving the business flow. Nowadays, a business organization needs to have a management system to ensure the business run smoothly. With a computerized working environment, workers could save a lot of time and business processes would be done quicker. As for the tutoring system, usually all private educational institutions would only hold physical classes for the students to attend. However, at this time of the year, it is important for students, to practice learning in both ways which are face to face and online. GIATS enable students to communicate with their tutors from anywhere and at any time. There are four types of users for the system which are the administrator, employee, students and tutors of Global Ilmu. Administrator and employee will be using the administration system, while the students and tutors will be using the tutoring system. This system has been built using PHP programming language and MySQL databases. GIATS has been completed and deployed to the hosting. All the users that were intended to use the system have completely been able to use the system during the User Acceptance Testing that was being held in the testing phase. The result of the developed system has been tested with 15 users and has gained excellent feedback from the users.

Keywords: Online tutoring, web application system, PHP, MySQL

1. INTRODUCTION

GIATS is a combination of two systems that includes a management information system and an online tutoring platform. This web application has been developed for a private educational institution named Global Ilmu. The management information system was used for decision-making, take control over data organization and visualization of data in an organization. An online tutoring platform is where students learn and communicate with their teachers and enables students to communicate with their private tutors [2]. Starting this year, it is important to have a backup digitally education platform to enable students to keep on learning during the worst-case scenario that may cause them unable to learn face to face at school. Nowadays, most organizations that do businesses are no longer managing their business using a paper-based system but instead, they are using a system-based to manage their data efficiently [1]. GIATS could

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avoid the loss of important data and save time on managing information collected from the organization. As for a company that do businesses such as private educational institutions, it is important to have a management information system to speed up business performance and completing their tasks. Another reason why it is important to have a system is that it has features to generate a monthly report so that the organization can keep track of their business revenues.

2. LITERATURE REVIEW

2.1 Management Information System (MIS)

A Management Information System or MIS collects data from many different sources, processes and organizes data to ease businesses making decisions. The aim of MIS is to help individuals and organizations access, process and use information efficiently and effectively. MIS also could give businesses a competitive advantage because of how efficiently it organizes thousand data into helpful and information that can be use as the organization's strategy.

MIS collects many different types of data. With the stored data, MIS will able to process the data and generates a user-friendly report that allow the organizations to make decisions easily. This method helps organizations business operations to run smoothly.

To use MIS technique, computer involvements are very important because it helps to process large amounts of data quickly instead of paper-based. There are several roles of computer that implement MIS. Computer are used to capturing the data. Data must be entered into the computer by workers. Calculating, sorting and searching also one of the roles of computer in MIS. It able to summarize the captured data accurately. This process does not require a lot of time unlike summarizing business data by hands. By using computer, organizations may use Database Management System to organize, process and protect the data from outsiders. It acts as data warehouse, storing raw data and cataloging it. With MIS, it can deliver information to managers in the form of reports. The report includes records listing or summary figures that shows totals or averages of a company. The reason on using MIS on a computer, it's because of the computer storage working with big data. A computer storage can be upgraded or extended, this helps to store enormous amounts of data easily and cheaply due to falling prices of hard drives every year.

2.2 Methods and Qualities of a Good User Interface Design

User interface is the main representation of a software to user. It consists of pictures, sounds, colors and text. UI act as a communication between the user and the system. One way to design a good interface design, it is important to work with intended user through the designing process. With this method, the design will be made according to the user expectations. A goof design of UI is expected with an error-free design, and in order to have an error-free UI, it is important to have a good error handling strategy. Another way to maintain a good user interface design, is to run the UI on various platforms as to validate how users will be seeing the UI. However, a good design user interface does not define a good software quality.
Software qualities is when we define how great the software design in relation to the client's requirements and how good the software with the user interface design. There are several factors involves in software quality such as reliability, efficiency, conciseness, portability, consistency, maintainability and understandability. Software quality is important because with a software that implements the software quality factors can ensure for the success of the system delivered in the market. This is because in the

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market, there are many same kinds of software but the differences are the qualities of each product, most users take a deep look into the software qualities before they had it.

For a better software, there are few features that will help to build a better user experience. Firstly, the system must consistent as in the choice of colors and the UI should use the same theme throughout the whole system so that the user able to communicate easily with the system. Next, a good UI, it should have an error handling features where UI could serve any possible forms of input from the user. In addition, it is also important for a software that has a feedback system, as this will help the developer to build a more user-friendly system design. With the feedback received from the users, the organization may use it as a reference to improve the system. Lastly, user involvement during the design stage is important, in order to know what users, expect from the design. This is because the software should always be as user's expectations.

3. TECHNOLOGY AND METHODS

3.1. Methodology

GIATS applied iterative model for its development. An iterative model is an implementation of a software development life cycle (SDLC). The iterative model works as a cyclical process. After the initial phase, the following phases will be repeated over and over and because of the incremental phases, enhancement of the software will be easily recognized and implemented throughout each iteration [5]. The number of iterations in this iterative model depends on the results from the review phase. If problems or errors were found in the reviewing phase, then only the iteration will start. According to Java Point [4], this methodology is the best to use when the requirements are easy to understand and has been defined clearly, and if there are future changes in the requirement. Figure 1 shows the web application framework used in GIAT [3].

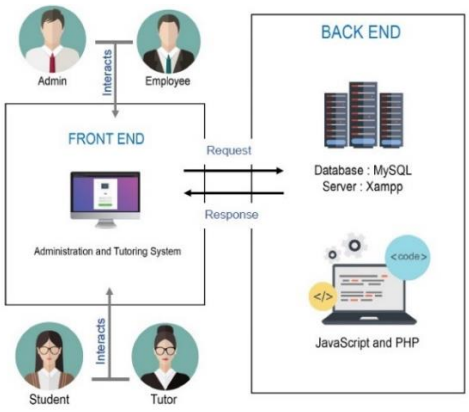

Figure 1. GIATS Framework

3.2. Software/Hardware Used

This project is a web application project which was built using a programming language called PHP and to complete this project, a combination of hardware and software was used for this project. As for the hardware, it only requires a laptop and as for the software, a code editor that supports writing PHP and

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HTML code, XAMPP as the temporary server and MySQL as the database to store all data collected from the system [6].

4. RESULTS AND DISCUSSION

4.1. Result

The development of this project has been completed with highlighted features included as below:

i. Login Page

The system provides the same login page for all users. Every user needs to enter their credentials which is username and password to access the system.

ii. Record Student's Attendance

This feature provides two options for recording student's attendance. The user of the employee can record the student's attendance manually through the 'Attendance' page on the system or provide a QR code to the students as they can scan it and record their attendance automatically.

iii. Graph Analysis Page (Administration System)

Graph analysis is included on the dashboard page of the user of Administrator. On that page, graphs that have been included are the number of students in each year level, the number of students enrolled in the current month, the number of students enrolled in each class's subjects and student's performance based on their submission on given task by the tutor. There is also included widgets that display the total amount of payments collected within that current month and the total number of students registered in GIATS.

iv. Student's Payment Page (Administration System)

This feature gave the ability for the employee to update the student's payments process. Once the payment has been completed, the system will automatically generate a receipt in PDF file format and stored it in the database. Furthermore, the system will automatically trace the students who have an outstanding payment record and notify them through the system.

v. Materials and Submission Page (Tutoring System)

This feature allows the students to submit their task to their tutors and tutors can retrieve it through the system. Other than that, tutors are also able to share additional learning materials with their students. Students able to retrieve it and downloaded it from the system. Each subject has its page and did not interfere with one another making it easy to access by the students. As for the submission, students can submit their task when the submission is open and within the dateline of submission given.

vi. Class Page (Tutoring System)

On the Class Page, it has been included features such as messaging and video calls for tutors and students to communicate with one another. Tutors can create virtual classes to complete the teaching and learning process.

4.2. Discussion

At the end of the project, the system was tested to get feedback from the stakeholder. User acceptance testing has been made by deploying the system to a temporary hosting and has been tested by the end user's representative from the organization. There are three groups of users involves in this UAT session, which

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are the employees, tutors, and students. The total number of testers are group into 3 users in the role of employees, 6 users for the tutors and 6 users for the students, which lead to a total of 15 users.

After the testing has been made, a questionnaire was distributed to the testers to gather feedback from the testers regarding the system performance and the usability of the system. Below is the table of testers feedback upon certain subjects from the system:

Table 1. Results

Features	Results
System navigation	All testers agree on being able to navigate through pages easily.
Page speed load	All testers had no experience loading pages for a very long time.
UI system design	80% of testers were satisfied with the UI design.
Choices of devices	73.3% of testers used computers and laptops while the others using mobile devices to access the system.
Overall experience with the system	All testers were satisfied with the system.

5. CONCLUSION

Throughout the end, it can be concluded that the Global Ilmu Tuition Centre Administration and Tutoring System (GIATS) has been completed and deployed to the hosting. All the users that were intended to use the system have completely been able to use the system during the User Acceptance Testing that was being held previously. The result of the developed system has been tested with 15 users and has gained excellent feedback from the users.

ACKNOWLEDGEMENT

I would like to give my appreciation to my supervisor, Nurdatillah Binti Hasim for guiding me throughout this Final Year Project. The comments and guidance that I received have helped me a lot in completing this project at ease. I would also like to thank my close friends and family, who gave me unconditional support throughout the journey on completing this project.

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THE DEVELOPMENT OF FACE MASK REMINDER BOX TECHNOLOGY

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Abstract

The World Health Organization (WHO) has declared COVID-19 as a pandemic on 12th March 2020 due to the growth in the number of cases around the world. WHO advises to wear a face mask and practice social distancing that has played a crucial role in prevention and control measures that can prevent the spread of COVID-19. This is because, this virus can spread by air and also through droplets from nose or mouth when someone infected coughs or sneezes. To prevent the spreading of COVID-19 in our community, we must stay safe by taking the simple precautions which are by applying new norms in our life such as physical distancing, wearing the mask, keeping room well ventilated, avoiding crowds, cleaning hands, and coughing into a bent elbow or tissue. But there are some people still not familiar with the new norm that we must always wear the face mask whenever they leave the house or are in a crowded place. For this project, the problem focuses on the attitude and habits of wearing face masks. Thus, to solve the problems stated, this project developed a face mask reminder in order to give awareness toward the importance of face masks. Through the project, a person will be alerted with a voice reminder to wear a face mask before going outside.

Keywords: Face mask, COVID-19, Voice Reminder, Arduino, New Norm

1. INTRODUCTION

The World Health Organization (WHO) has declared COVID-19 as a pandemic on 12th March 2020 due to the growth in the number of cases around the world [1]. The COVID-19 pandemic has a negative impact on health, education, economy, finance, and others, resulting in the introduction of the Movement Control Order for many countries. People are advised to stay at home, Work from Home (WFH), limit their movement outside the house, wear a mask to cover their nose and mouth, regularly wash their hands, establish social imprisonment, and so on as precautions to stop this pandemic [2]. So, all the people need to carry and adapt to daily life with the new norm. As a prevention and control measure to limit the spread of COVID-19, WHO advises to wear a face mask and practice social distancing [1]. Mask has played a crucial role in prevention and control measures that can prevent the spread of some respiratory diseases and COVID-19. The use of masks as well as frequent hand hygiene, social distancing and other Infection Prevention and Control (IPC) measures should be followed to prevent spread of COVID-19 [2]. Wearing masks is an extremely important habit that every one of us should be applying since this simple step could

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significantly reduce the risk of transmission. The Face Mask Reminder box design to give awareness toward the importance of face masks. Through the project, a person will be alerted with a voice reminder to wear a face mask before going outside. In this design of face mask box is for the user to put the face mask in the box up to 100 pieces of face mask. The IR sensor function will detect a person hand that take out the face mask and the number display on the LCD will be reduce. Then, PIR sensor will detect a person movement that go through the box and will play a voice reminder which is "Please wear a face mask before going out" using speaker. So people will more alert during going out. Figure 1 below shows the Face Mask Reminder Box.

Figure 1. Face Mask Reminder Box

2. MATERIALS AND METHODS

The face mask reminder is designed based on alerting the person to wear a face mask before going out. In order to assure the project runs smoothly, the systematic action for every component is taken to analyze the performance of the face mask reminder.

2.1 Selection of Components

The hardware and software components used to develop the Face Mask Reminder system for successful and smooth application are illustrated in Figure 2. The system design consists of one main part, which is hardware. The hardware components are Arduino UNO, PIR and IR sensor, 16x2 LCD display with I2C, 4x4 membrane keypad, SD card module and speaker.

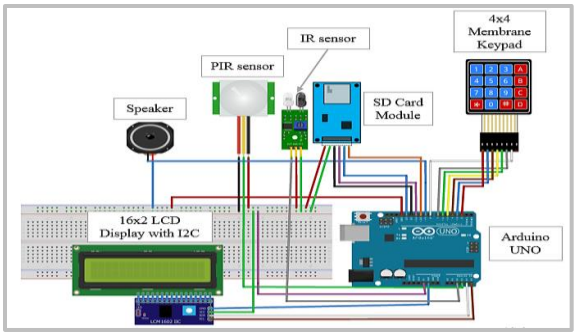

Figure 2. Component of Face Mask Reminder Box

Firstly, Arduino UNO that acts as a microcontroller integrates with PIR sensor to detect any motion within the range [3]. When the sensor detects a person's motion, a speaker will alert with a voice reminder from the SD card module. It will be a warning for a person to wear a face mask before going outside. Secondly, Arduino UNO acts as a microcontroller that integrates with IR sensor to detect a hand motion of someone taking out a face mask from the box [4]. When the sensor detects a hand motion, the number displayed on the LCD display will be decreased. Lastly, the keypad used to enter the number of face masks in the box.

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2.2. Face Mask Reminder Box Design

The prototype design includes space for hardware and face mask box. Figure 3 shows the face mask reminder box design using SketchUp software. There are tools for selection, drawing, component, view and sharing the drawing designs. The sketching shows the sides to be used to place all the hardware with each part labelling. For the front side, the 4x4 keypad membrane, PIR sensor and 16x2 LCD display is placed side by side. For the right side, the speaker, and IR sensor are also placed side to side. Hardware space is for placing the Arduino UNO and power supply which is the suggested power supply to be used is power bank.

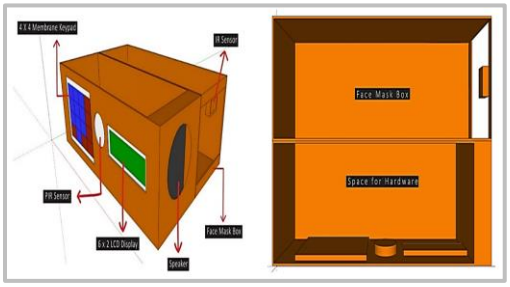

Figure 3. Face Mask Reminder Box Design

2.3. Face Mask Reminder Box Fabrication

The face mask reminder is designed based on alerting the person to wear a face mask before going out. As shown in Figure 3, the design of face mask reminder box divided into two parts. The first part for hardware connection space where all the hardware will be placed in this space. This box comes with a small hole for power supply purpose. The second part for face mask box where a user can store up to 100 pieces of face mask in this space. The material used for the box is Acrylic or Perspex. Acrylic also a material with its properties such as transparency and durability because of which it is now being used in wide range of applications such as lenses of glasses, tail lights and various other instruments in a vehicle to reduce cost and productivity [5]. Thus, it is useful in outdoor application as well. The box has a lid that can be open and close easily to check on the hardware connection and to fill in the face mask.

Figure 4 shows the face mask reminder box. On the front side, the 4x4 membrane keypad and 16x2 LCD keypad with I2C are placed side to side. The keypad is used to key in the quantity of face mask in the box. The LCD display is used to present the actual number of face mask in the box. On the display, it will show the actual number of mask and maximum number of masks that can be entered. The maximum number of face mask that can be placed in the box is 100 pieces. On the right side, there is only a small cutout of acrylic sheet for connecting the hardware to the power supply. While on the left side, the speakers, PIR and IR sensor are places side to side. In addition, on the right there is a face mask box where the user can place face mask in there. The speaker is used to give alert "Please wear a face mask before going out" to anyone pass through the box. PIR sensor is used to detect a person motion. When it detects a motion, the speaker will sound an alert. While, IR sensor is used to detect a hand motion of a person. If a person takes out a face mask from the box, the number displayed on the LCD display will be reduced.

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Figure 4. Face Mask Reminder Box

3. RESULTS AND DISCUSSION

3.1. Overall System Architecture

The flowchart application shown in Figure 6 starts with the face mask reminder box attached next to the door or somewhere close to the door. A user can fill in the face mask in the box and key in the quantity of face mask using the keypad membrane. The actual number of face masks in a box is shown in LCD display.

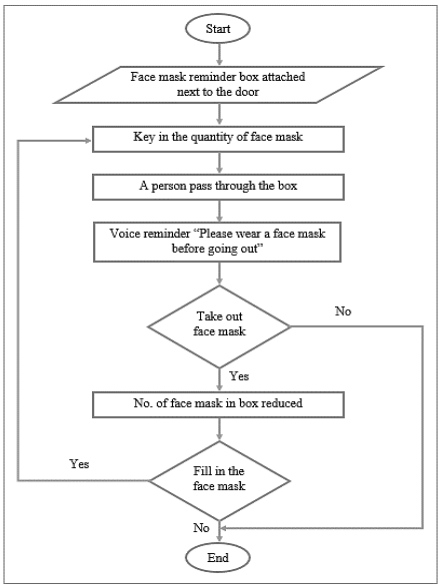

Figure 6. Flowchart of face mask reminder box application

When a person passes through the box, the PIR sensor detects a motion and sends a signal to the speaker [4]. A voice reminder alerts the person with a warning "Please wear a face mask before going out". If a person takes a face mask from the box, the IR sensor senses a hand motion into the face mask box [4]. Then, the number of face masks in the box reduced. Thus, if a user fills in the face mask in the box, they must key in the quantity and the actual number appears in the LCD display.

3.2. Result

In this part, the face mask reminder box was tested to get its functionality. The test was done in a living room, which is near to a door. A hardware component is connected to the 20000mAH power bank that acts as a power supply to keep the box stay active through the testing. The audio of different voice alert is stored

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in SD card in waveform audio file (WAV) format. A person passed through the box and the speaker sent an alert with a voice reminder "Please wear a face mask before going out". The box reminds the person to wear a face mask before going outside to prevent exposure of virus COVID-19. Then, the person takes out a face mask from the box and the number of face masks shown on the LCD display decreases. On the other hand, the person refills the face mask in the box. After that, he keyed in the actual amount of face mask that was added using the keypad. Thus, the actual number of face masks in a box appeared on the LCD display. The result proved on this project obtained is by analyzed all the component functioning. It is proved that face mask reminder box work systematically according to the work principle and based on the testing phase. The face mask reminder is successfully implemented.

4. CONCLUSION

In conclusion, the capabilities of the Face Mask Reminder box provide a voice reminder as an alert or warning for a person to wear a face mask before going outside. To reduce the problem of people who recently forgot to wear a face mask, the box comes with a space to place a face mask up to 100pcs. The sensors used resulted in higher accuracy to detect a person's motion when it passed through the box and take a face mask out of the box. The performance of the box is tested in the living room and it shows a worthy result that can be used for a face mask reminder.

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IRIDOLOGY IN HEART DISEASE DETECTION USING ARTIFICIAL NEURAL NETWORK

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Abstract

Apart from Covid-19, heart disease is also one of the deadliest diseases in today's world as the number of deaths caused by heart disease continues to grow day by day. Therefore, people need to maintain a healthy lifestyle and do regular heart check-ups as early prevention of this disease. Traditionally, to detect heart disease, heart condition checking is a must but this method is costly, inconvenient, and takes some time. An alternative and a simpler method to be used as an early examination must be found to solve this problem. The suggested method is the iridology method which will overcome this problem. Iridology is a study of the human iris to determine any abnormalities that happened in the organ's functions. This project presents an implementation of computerized iridology in detecting heart disease. The system is designed with several stages such as pre-processing, segmentation region of interest, feature extraction, and classification using an Artificial Neural Network. Gray Level Co-Occurrence Matrix (GLCM) is used in feature extraction to extract the features from the segmented image while the Artificial Neural Network algorithm will be used as a classifier to create the prediction model for the system. The prediction model will be evaluated using the 10-Fold Cross-Validation method. 50 patient data with 27 patients of a normal heart condition and another 23 patients of abnormal heart condition is used and this data will be divided into 45 training data (90%) and 5 testing data (10%). The training and testing accuracy obtained from this project is 80%.

Keywords: Iridology, Heart Disease, Image Processing, Artificial Neural Network, GLCM

1. INTRODUCTION

Heart disease is a state in which the heart is disrupted by any factors that contribute to the disease itself. This disease also can be triggered by an unhealthy diet, tobacco usage, alcohol consumption, and lack of exercise [1] and these factors make the heart organ is often being a medical problem experienced by most humans [2]. According to World Health Organization, heart disease is one of the deadliest diseases. Some people do not check their health sooner and figure out only when the heart problems are in a worse state. To certain people, heart condition checking is assumed as something complicated, inconvenient, and

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requires a lot of time. Therefore, early signs of heart disease must be detected more conveniently and cheaply [1].

Iridology is a non-invasive medical diagnosis that has gained attention in recent years as a complementary medical approach with a growing variety of applications. Iridology will be used to classify and predict the state of a particular organ that is representing and mapped on the human iris [3]. The goal of this study is thus to develop a system using iridology, by creating a detection machine of heart disease to determine the health condition [4]. This system also can be assumed as a health screening test as this system allows the user to detect heart disease in early condition even when there have been no symptoms or signs of the disease. If the user is detected with minor or major heart disease, they can get the full and right treatment at the hospital.

In today's technology, predicting heart disease using a machine learning method has been widely used and important as its capabilities are useful to assist doctors in decision making. Although the doctor can do the diagnosis on a patient on their own, it is a time-consuming yet difficult job to handle. Thus, by having a computer-aided system, the doctor can make a reliable decision. Table 1 shows a similar application.

Table 1. Similar application

No	Problem	Objective	Technique/ Algorithm	Result	Reference
1.	Many cases of diabetes are not diagnosed early because it is a condition with an undetectable initial symptom and delays in the diagnosis of diabetes could lead to significant injury.	To predict diabetes based on iridology by using iris image	Support Vector Machine, k Nearest Neighbor	The accuracy is 85.6% by using Support Vector Machine and k Nearest Neighbor as a classifier.	Ratna Aminah (2019) and Adhi Harmoko Saputro (2019)
2.	Detecting neuronal diseases such as Alzheimer's is a really hard procedure and this disease has a lower chance to detect in the early stage.	To detect neuronal disease using image processing through iridology method	Naïve Bayes	Naïve Bayes has produced a prediction model for the system with 61.96% of accurate diagnoses.	F. Hernandez (2019), R. Vega (2019), F. Tapia (2019), D. Morocho (2019) and W. Fuertes (2019)
3.	The heart is an organ that has the most works where it pumps blood throughout the human body, and it tends to always have complications.	To recognize heart problems by observation of iris	Backpropagation Neural Network	The success rate of Backpropagation Neural Network using Principal Component Analysis is 90%	Leonardus Sandy Ade Putra (2018), R. Rizal Isnanto (2018) and Aris Triwiyatno (2018)

Based on the previous research done as the table above, conclusively iridology in the medical diagnosis system is a subject in need were determining the status health of an individual is important nowadays. It is proven by the previous research, where the iridology method can be used to predict diseases suffered from a patient such as heart disease, diabetes disease as well as Alzheimer's disease.

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2. MATERIALS AND METHODS

The process begins with image acquisition, where eye images will be used to detect any potentials of heart disease. Next, the image will undergo pre-processing where it consists of five stages, which are image filtering, edge detection, iris localization, iris normalization, and contrast enhancement. Then, the result from pre-processing will undergo segmentation of the region of interest (ROI) and followed by feature extraction. The system framework is shown in Figure 1 and the processes involved in pre-processing are shown in Figure 2.

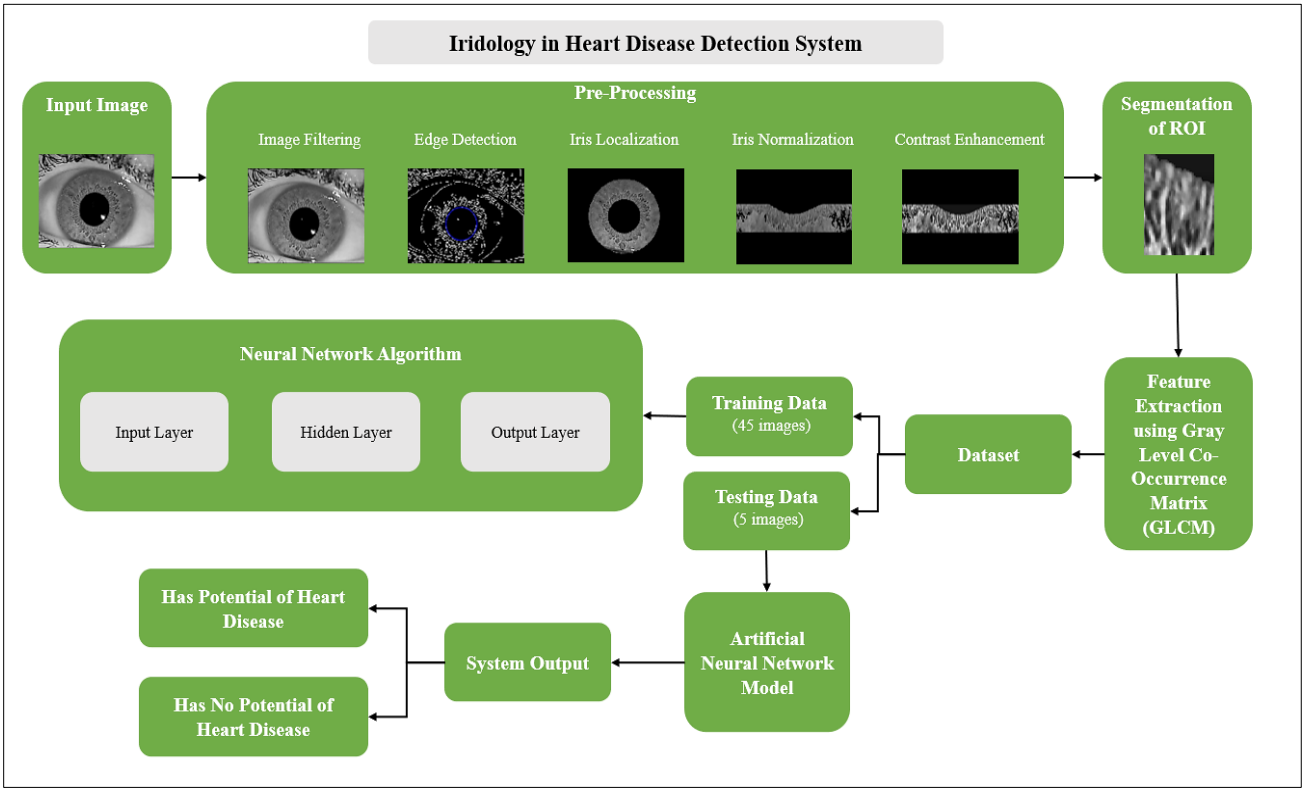

Figure 1. System Framework

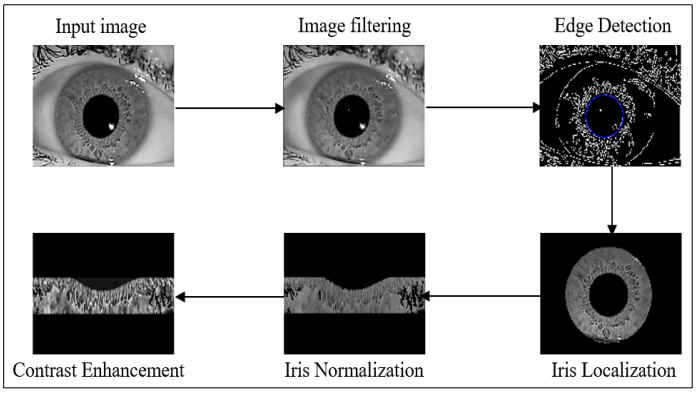

Figure 2. Steps in Pre-processing

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2.1. Image Acquisition

The dataset is obtained from the Indian Institute Delhi Database (IITD Database) where it consists of 50 eye images. From 50 eye images, 27 images are normal data, where the subjects have no potentials for heart disease and another 23 images are abnormal data, where the subjects have potentials for heart disease. Only left eye images will be used for this project with a resolution of 320 x 210 pixels.

2.2. Image Pre-Processing

Pre-processing is the first and essential phase in this project to get more enhance the quality of the image as well as isolate the region of interest in the eye image. Firstly, the image will undergo image filtering and this step is done using a Gaussian Filter to get a less noisy image. Then, edge detection will be performed by using the Canny Edge Detection method to detect edges on the eye images and locate the boundary of an iris. The next step is to find an iris between an image's external and inner boundaries, which is called iris localization by using the MATLAB method called Masking. Iris normalization is a process to change the shape of the iris from the circular shape into the rectangular shape to make the process of locating the region of interest easier. Next, to improve the contrast of the iris image in the normalized form, contrast enhancement will be done by using Contrast Limited Adaptive Histogram Equalization (CLAHE) to resolve low contrast and different lighting problems. Figure 2 shows the steps involve in pre-processing.

2.3. Segmentation of ROI

Region of Interest (ROI) is an area that contains features that will be used to recognize the condition of the heart. Based on the information of iridologists, the ROI area of the heart in the iris image is in a clockwise direction at 2 to 3.20 o'clock for the left eye. The system will take that part only as the input of this process.

2.4. Feature Extraction

The method that will be used to do the feature extraction would be the Gray-Level Co-Occurrence Matrix (GLCM). GLCM is the extraction method for checking the texture of the image and considering its spatial relations between pixels. GLCM works by picking up the relation between two pixels at a time, called the reference and the neighbor pixel. The features extracted in GLCM are contrast, correlation, energy, and homogeneity.

2.5. Classification using Artificial Neural Network

Artificial Neural Network will be used as a classifier in this system. In the neural network architecture, it consists of three layers which are the input layer, hidden layer, and output layer. In this project, the data will be divided into two categories which are training data and testing data. For training data, 90% of the 50 eye images will be used, making the training data have 45 images. As for testing data, only 10% of the total data will be used which is equivalent to 5 images. Next, after the data has been separated, the training process will take place where all the training data will be trained by using a multilayer neural network and backpropagation to reduce error, get the actual weight for testing data as well as compute the value of the training accuracy. 50 hidden neurons will be used with the 'tansig' and 'logsig' activation functions. The parameters used in the neural network are shown in Table 2.

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Table 2. Parameter of Neural Network

Parameters	
Number of Neurons	50
Maximum Epoch	1000
Learning Rate	0.1

3. RESULTS AND DISCUSSION

The neural network model uses the same number of hidden neurons and learning rate for each experiment.

3.1. Result comparison for different numbers of maximum epoch and learning rate

Table 3 shows the neural network performance with different maximum epoch and learning rates. As seen in Table 3, the highest accuracy obtained is at 1000 maximum epoch and 0.1 value of learning rate. Hence, this system will use these parameters to get a better prediction model.

Table 3. Network performance with different maximum epoch and learning rate

Maximum Epoch	Learning Rate	Classification Accuracy (%)	Mean Square Error (MSE)	Percentage Error (%)
500	0.001	77.7778	0.177749	22.2222
	0.01	93.3333	0.0760232	6.6667
	0.1	91.1111	0.0516609	8.8889
1000	0.001	88.8889	0.1059974	11.1111
	0.01	93.3333	0.0574039	6.6667
	0.1	95.5556	0.0391241	4.4444

3.2. Result for testing data

Table 4 shows the result for the testing data using an Artificial Neural Network with GLCM. From Table 4, we can see only one sample has been wrongly predicted which is from sample 47.bmp. The output for this sample has been wrongly predicted, where the system output produced the abnormal data when it is normal data. This proves that classification using Artificial Neural Network in detecting any potentials of heart disease is highly representative.

Table 4. Test result with GLCM

Sample	Expected Output	System Output	Classification Result
46.bmp	Normal	Normal	0.2010
47.bmp	Normal	Abnormal	0.7914
48.bmp	Abnormal	Abnormal	0.9999
49.bmp	Abnormal	Abnormal	0.0478
50.bmp	Normal	Normal	0.0384

4. CONCLUSION

In this project, Artificial Neural Network have been used as a classifier to find the result of heart disease. The backpropagation algorithm has been used as a machine learning model that has produced predictions

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from iris images. The data was divided into two which one being training data and the other one is for testing data. 50 images were used at the training and testing phase. In the testing phase, the images have been classified by using the proposed algorithm and produced a result regarding the heart's condition, whether the patient has heart abnormalities or not. The result for both training and testing data using an Artificial Neural Network algorithm as a classifier is 80%. The objectives have been successfully achieved throughout the development of this project.

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COVID-19'S SYMPTOMS DETECTION SYSTEM BY USING ARTIFICIAL NEURAL NETWORK

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Abstract

In the beginning of 2020, the COVID-19 has cause as a global pandemic and it is been declare by the World Health Organization (WHO) in the beginning of 2020. The number of positive COVID-19 patient increasing and cause an early response to diagnose and prevent this rapid spread of the disease. As the COVID-19 becoming a global pandemic, the demand on health workers and facilities is high. It is important for the hospital to provide a system that may reduce the task burden among the health workers for diagnostic. Therefore, it is necessary to implement an automatic detection system that can help detect COVID-19. A model been proposed to help to detect the COVID-19. The proposed method consists of pre-processing and feature extraction stages. The chest x-ray image will be resizing and convert into a greyscale image in the pre-processing step. The model will be developed by using Artificial Neural Network (ANN) classifier by using MatLab Software. To detect it, the image of chest x-ray of patient will be used as a dataset. 63 images been used for training and another 7 images for testing. GLCM been used in feature extraction step. This system then will help the community to detect the patient with COVID-19 by using the patient chest CT and classify either the patient positive or negative. The highest accuracy obtained from the system is 95.16% with the mean square error of 0.046.

Keywords: Covid19, Chest x-ray, Image Processing, Artificial Neural Network, GLCM

1. INTRODUCTION

In the end of 2019, a new infectious disease has been discovered in China was defined as Coronavirus disease (COVID-19) or also known as the severe acute respiratory syndrome corona virus 2 (SARS-CoV-2) [1]. The first case of COVID-19 has been reported at Hubei, China in December, 2019. Most of the initial cases that are recorded has an exposure to the seafood market in that city [3]. The cases started increased in January 2020. There viruses that started to transmitted to the people in the others country when the local China people travelled to another country. The viruses also can be transmitted from the animal to the human (Tuncer et al., 2020). Healthy people should avoid the close contact with the infected or suspected COVID-19's patients. It is important to wear mask every time they going out as a precaution action. This is because the COVID19 can be spread through the air [3]. The patient with COVID19 will also has an effect to their lungs. To prevent this from happens, an Xray and CT scan must be done to the suspected patient [2].

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A neural network is to understand on how the neuron of the artificial working by using the dendrite as the input to the neuron, cell body and axon as the output. There are several advantages of Artificial Neural Network (ANN) compared to the other technique. Artificial neural networks are built of fundamental processing units called neurons (McCulloch & Pitts, 1943) arranged according to diverse topologies. In this project, Artificial Neural Network will be used as a classifier and Back Propagation Network will do the classification process. The advantages of Artificial Neural Network (ANN) that ANNs could adapt and model non-linear and sophisticated interactions, which is significant because some of the relationships between inputs and outputs in real life are both non-linear and intricate

2. MATERIALS AND METHODS

The process begins with image acquisition, where chest x-ray images will be used to detect any potentials of Covid-19 viruses. Next, the image will undergo pre-processing where it consists of two stages, which are conversion to greyscale and image filtering. Then, the result from pre-processing will undergo feature extraction using GLCM technique. The system framework is shown as in Figure 1.

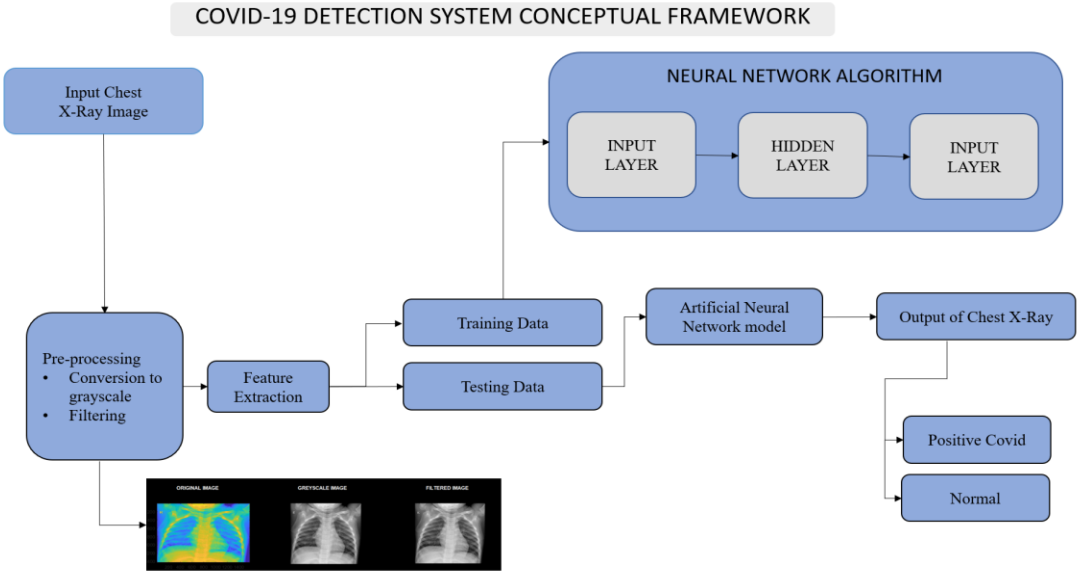

Figure 1. System Framework

2.1. Image Acquisition

The dataset is obtained from Kaggle website where it consists of 70 chest x-ray images. From 70 chest x-ray images, 35 images are normal data, where the subjects have no potentials of Covid-19 viruses and another 35 images are abnormal data, where the subjects have potentials of Covid-19 viruses. The resolution of the chest x-ray images are 1000 x 1000 pixels. Figure 2 shows the sample of input image.

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2.2. Image Pre-Processing

First of all, the images will undergo the conversion to greyscale. The greyscale image then will be used to filtering to remove the noise. The images will be filtered using gaussian filtering technique with the standard deviation of 15%. The noise will be removed, and the images will be more clear and ready to be analyzed. Figure 3 shows the steps in pre-processing that being used for this paper.

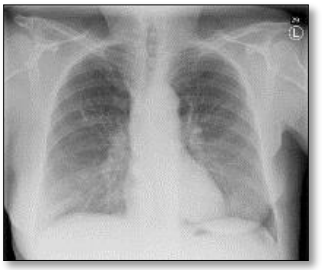

Figure 2. Sample input

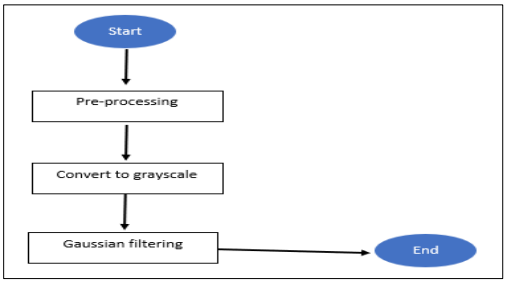

Figure 3. Steps in Pre-processing

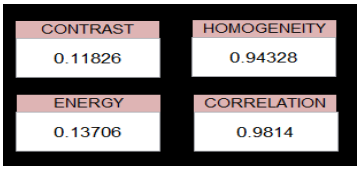

Figure 4. Example value of GLCM

2.4. Feature Extraction

Feature extraction where the processed image will be extract. There are several methods that can be used to perform feature extraction and for this project the method that will be used is Gray-Level Co-occurrence Matrices (GLCM) as per example given in Figure 4. GLCM is the common linear method that can be used to do feature extraction. The result of feature extraction than will be used for classification process. The output of GLCM is contrast, energy, homogeneity and correlation.

2.5. Classification using Artificial Neural Network

Artificial Neural Network will be used as a classifier in this system. In the neural network architecture, it consists of three layers which are input layer, hidden layer and output layer. There must be connection between those three layers. In a simple word, the input layer will take the data from the network and then the hidden layer will receive it as a raw information and process them. The value that been obtained then will be sent to the output layer and then will process and produced an output. In this project, the data will be divided into two categories which are training data and testing data. For training data, 90% of the 70 chest x-ray images will be used, which makes the training data have 63 images to be trained. As for testing data, only 10% of the total data will be used which is equivalent to 7 images. After that, the training phase will begin, in which all of the training data will be trained using a multilayer neural network and backpropagation to reduce error, obtain the true weight for testing data, and compute the training accuracy value. There are 50 hidden neurons will be used with 'tansig' and 'logsig' activation function. The parameters used in the neural network is shown as in Table 1.

Table 1. Parameter of Neural Network

Parameters	
Number of Neurons	50
Maximum Epoch	1000
Learning Rate	0.1

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3. RESULTS AND DISCUSSION

The neural network model uses the same number of hidden neurons and learning rate for each experiment.

3.1. Result comparison for different number of maximum epoch and learning rate

Table 2 shows the neural network performance with different maximum epoch and learning rate. As seen in Table 2, the highest accuracy obtained is at 1000 maximum epoch and 0.1 value of learning rate. Hence, this system will use these parameters to get a better prediction model.

Table 2. Network performance with different maximum epoch and learning rate

MAX EPOCH	INITIAL LEARNING RATE	ACCURACY RATE (%)	MEAN SQUARE ERROR	PERCENTAGE ERROR (%)
10	0.1	67.7419	0.219	32.2581
	0.01	69.3548	0.202	30.6452
	0.001	58.0645	0.375	41.9355
50	0.1	61.2903	0.193	38.7097
	0.01	70.9677	0.200	29.0323
	0.001	69.3548	0.210	30.6452
100	0.1	82.2581	0.128	17.7419
	0.01	91.9355	0.139	8.0645
	0.001	54.8387	0.241	45.1613
500	0.1	90.3226	0.073	9.6774
	0.01	90.3226	0.121	9.6774
	0.001	82.2581	0.180	17.7419
1000	0.1	95.1613	0.046	4.8387
	0.01	93.5484	0.065	6.4516
	0.001	91.9355	0.143	8.0645

4. CONCLUSION

Classification is a process of grouping the data based to the data class and the information that have been obtained. In this project, Artificial Neural Network is used as a classifier to find the result of the heart disease. The backpropagation algorithm will be used as a machine learning model that will produce predictions from chest x-ray images. The data is divided into two which one is training data and the other one is for testing data. 50 will be used at the training and testing phase. In the testing phase, the images will be classified by using the proposed algorithm and produce a result regarding the lung's condition, either the patient has heart abnormalities or not. The result for both training and testing data using Artificial Neural Network algorithm as a classifier is 80%.

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PRIVATE BODY SAFETY EDUCATION COURSEWARE

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Abstract

Private Body Safety Education courseware is an educational material for students and teachers in subject Pendidikan Jasmani dan Pendidikan Kesihatan (PJPK) Tahun 3. Currently, there were lack of learning materials and we have identified the most students are using incorrect words in pronouncing their private body part. Besides that, the current practice of text book learning leads to problems such as lack of focus as students easily get bored during lessons. To solve the problems, Private Body Safety Education courseware has been developed. The courseware consist of three lessons which are: Kenali Tubuh Peribadi that will help the students pronouncing the correct private body parts especially during self-learning, Sentuhan Selamat dan Tidak Selamat which teach about safe and unsafe scenario and Tips Keselamatan that consist of safety tips during dangerous situations. These lessons have been implemented using text, videos, audios, animations and also activities. This courseware was developed using ADDIE Model development method and adapted four elements (linguistic, spatial, musical and bodily-kinesthetic) from Multiple Intelligence Theory by Howard Gardner. Functionality testing was conducted to ensure the navigation, functionality and acceptance of users. Based on the results, The Private Body Safety Education courseware has encouraged students in learning and improved the teaching and delivering lessons in and outside of the classroom.

Keywords: Private Body Safety education courseware, Multiple Intelligence Theory, ADDIE Model.

1. INTRODUCTION

According to research, 15,504 child sexual abuse cases in Malaysia have been recorded between 2018 until September 2020 [1]. Based on the facts, a serious attention must be made towards educating students about private body safety. The students must be exposed to their rights as a child, learn about safe and unsafe situations and how to protect themselves. Therefore, Malaysian Ministry of Education started to include private safety education lesson for Year 3 primary school students. However, the current practice of text book were unable to attract students' attention during lessons. Limited teaching source from textbook also lead to inability to provide an interactive lesson for these primary school students. As for self-learning, students often use incorrect word when pronouncing the private body parts as there was no teachers to guide them during that period.

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Due to this, there is a need for an interactive courseware that focus on delivering private body safety education for Year 3 primary school students. The courseware aims to help the primary student understand body safety and learn to protect themselves from sexual abuse. It also act as teaching aid to in delivering interesting and interactive lessons in class as the courseware combines the use of text, graphic, sound, animation and videos in the lessons [2]. These elements will help the teachers to improve their teaching efficiency and the class interaction compared to textbooks.

2. METHODOLOGY

2.1 Courseware Organization and Development

ADDIE Model was used to organize and develop the courseware. ADDIE Model is a technique in instructional design that helps to arrange and standardize the development of this courseware [3]. ADDIE stand for Analysis, Design, Development, Implementation, and Evaluation. 'Analysis' is a preliminary stage before starting to develop the contents of a project [4]. During this phase, problem will be defined and potential solutions were identified. In the 'Design' stage, storyboard or prototype are developed to identify the necessary output or input in the contents. 'Development' is the process of creating the instruction materials that will be included in the courseware. The 'Implementation' stage is the stage to deliver the courseware which is using CD-ROM. Lastly, 'Evaluation' is the stage to test the courseware using test cases. Test cases will help the developer testing the effectiveness and functionality of the courseware Private Body Safety Education.

2.2 Application of Multiple Intelligence Theory

The Multiple Intelligence Theory established by Howard Gardner, from Harvard University, was used in this study. There were eight elements of intelligence are included in the Multiple Intelligence Theory [6 however, the developer only use four of them for the courseware project which are: linguistic, spatial, musical, and bodily-kinesthetic intelligence.

The application of Multiple Intelligence Theory could aid the developer in resolving issues such as a lack of focus and an easy tendency to become bored during learning sessions, as well as a lack of learning resources. This problem utilizes linguistic, spatial, and bodily-kinesthetic factors to aid visual learning through the use of video, pictures, and appropriate words. Another problem that students have is that they frequently mispronounce the term for private areas of the body. This issue was solved by using the musical intelligence approached where by the music and sound will attract students to remember the correct words to be used for the private body parts. The Multiple Intelligence Theory's applicability is shown in Table 1.

Table 1. Application of Multiple Intelligence Theory

Elements	Description	How/Where to Implement
Linguistic	Allows people to use words accurately, whether verbally or in writing style.	The courseware is using Malay language to deliver the information.
Spatial	Allow creating the visual image, express the imagination with picture and enhance understanding between images and meanings.	The image is used in the lesson to deliver information about *Kenali Tubuh Peribadi, Sentuhan Selamat dan Tidak Selamat* and *Tips Keselamatan.*
Musical	Allow to interpret, convert, communicate and differentiate through music.	This element will incorporate music with the sound of text about *Kenali Tubuh Peribadi,*

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		as well as a video song.
Bodily-kinesthetic	Allow people skilful at body movements, performing actions and physical ability control.	The video that will used in the courseware will introduce the information using body movement. The contents of *Koleksi Video*.

Reference: (Amstrong, 2018)

3. RESULT AND DISCUSSION

3.1 Courseware Development and Testing

The Private Body Safety Education courseware has been developed and evaluated based on the courseware testing. The testing is conducted by the developer and the evaluation approached is by using the test case. The evaluations are divided into six test cases. The test cases are the home page, lesson one: *Kenali Tubuh Peribadi Diri*, lesson two: *Sentuhan Selamat dan Tidak Selamat*, and lesson three: *Tips Keselamatan*, *Koleksi Video* and also *Aktiviti*. The purpose of conducting the test case is to evaluate the functionality of the courseware and to ensure the courseware contains no errors and make sure the courseware will run smoothly. The result of the testing, whether pass or fail in terms of functionality, is also derived from the test case. Figure 1 shows an example of the test case – the lesson two: *Sentuhan Selamat dan Tidak Selamat*. Overall, all of the actual results were compromised with the expected results and the testing done was described as 'Pass'.

Table 4.5 Test case for lesson two *Sentuhan Selamat dan Tidak Selamat*

Developer	Norazian binti Ahmad			
Date	3/1/2021			
Test case description	Test for the *Sentuhan Selamat dan Tidak Selamat* page to navigate the user in each element in the content			
Pre - requisite	The user need to click at "*Sentuhan Selamat dan Tidak Selamat*" button at menu page			
No	**Activity**	**Expected Results**	**Actual Results**	**Pass/Fail**
1	Navigate to *Sentuhan Selamat dan Tak Selamat* page of the courseware	It should display the button of home, exit and *Sentuhan Selamat* and *Tidak Selamat.*	Expected	Pass
2	Click on *Sentuhan Selamat* button	It will navigate into *Sentuhan selamat* page include animation, picture, text and sound	Expected	Pass
3	Click on *Sentuhan Tidak Selamat* button	It will navigate into *Sentuhan Tidak Selamat* page include animation, picture, text and sound	Expected	Pass
4	Click on Home button	It will navigate into menu page	Expected	Pass
5	Click on *Kembali* button	It will navigate into *Sentuhan Selamat dan Tidak Selamat* page	Expected	Pass
6	Click on X button	It will navigate into exit (*Keluar*) page	Expected	Pass

Figure 1. Test Case for Lesson Two: *Sentuhan Selamat dan Tidak Selamat*

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In whole, the elements of Multiple Intelligence enhance the improvement in delivering the contents of the courseware. The Multiple Intelligence approaches give an impact on learning which reach all of the students and encourages them to be able to think about the subjects from various perspectives, enhancing their understanding of the subject. Furthermore, the functionality evaluation is based on the developer's testing, which is designed to demonstrate the courseware's functionality. The test case is to test the functionality and the result of testing appear at the end of the test. It will tells either it is a failure or a success courseware. Overall, the functionality of the Private Body Safety Education courseware meets all of the objectives. This ensures that the courseware can have a positive impact on the learning and efficiency of teachers and students.

4. CONCLUSION

In conclusion, Private Body Safety Education courseware has been successfully developed using ADDIE Model development method and adapted four elements of intelligence (linguistics, spatial, musical and bodily-kinesthetic) from Multiple Intelligence Theory. However, due to time limits and the conditions of the Covid-19 pandemic, the courseware has several limitations during the development process. For better outcomes and future development, the courseware should be improved to include additional animation, sound, and quizzes. On the other hand, real testing with a group of target users should be carried out in order to obtain accurate results.

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ESTIMATION OF CATTLE LIVESTOCK POPULATION BY USING NUMERICAL METHODS

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Abstract

Cattle breeding is a common occupation and familiar to farmers and ranchers in peninsular Malaysia. The rate of increase and decrease in the number of cattle livestock population every year is not much different and the number always remains high. The population can be seen through the actual data collected by the Ministry of Agriculture and Food Industries (MAFI) which was shared in open data at the Malaysian Administrative Modernisation and Management Planning Unit (MAMPU). By using the data, estimation of the cattle livestock population for the next year can be implemented. For this project, numerical methods were used to estimate the data on the number of cattle livestock population in peninsular Malaysia. Among the numerical methods used are Least Square method and Runge-Kutta method. Both of these methods were used to estimate the data and were compared by analysing the method's error to determine which method is the best. Based on this study, it was found that the Cubic Least Square method is the best method because it has high accuracy. Subsequently, the total of cattle livestock population in peninsular Malaysia for year 2020 until 2025 could be estimated using the best method. Hence, the Cubic Least Square method is one of the other methods that can be used by any organization, especially the Ministry of Agriculture and Food Industry (MAFI) for the purpose of estimating data in the following year.

Keywords: Population; Numerical methods; Least Square method; Runge-Kutta method; Estimation

1. INTRODUCTION

Numerical methods are among the methods in mathematical modelling that are often used to solve any computation problems easily and accurately [1]. The Least Square method is widely used in data processing and error estimation. The mathematical method has become an important technique for estimating parameters, processing data, evaluating regression and fitting experimental data, and also has become a criterion tool for statistical inference. The application of complex rules in measurement data analysis is usually based on the Least Square principle such as using matrix form to solve the final approximation and increase its precision [2, 3]. In numerical analysis, the Runge-Kutta methods are a family of implicit and explicit iterative methods, this method used in temporal discretization for the approximate solutions of ordinary differential equations [4, 5]. This method is fewer computational requirements and has high accuracy. Besides, it is one of the most widely used and most successful of all one-step formulas.

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Moreover, cattle are one of the animals that are in great demand not only in Malaysia but also in foreign countries because they are livestock animals that provide many benefits and uses to everyone in daily life especially food sources. In Peninsular Malaysia, many cattle were raised and the production of this livestock such as milk and meat were sold throughout Malaysia and abroad as well. Based on the data collected, the number of cattle livestock population in Peninsular Malaysia for each year was inconsistent and it comes in large numbers. However, the amount was still sufficient to meet the current needs of the population and always remains high. But in this case, it was a little difficult to calculate an accurate data estimation for a particular year. Therefore, the numerical methods would be applied in this project as an alternative method to estimate the data easily and accurately [6]. In this paper, the research was conducted to estimate the number of cattle livestock population by using Least Square method and Runge-Kutta method. Furthermore, the total relative error was analyzed to determine the most accurate method. Then, that method used to predict the number of cattle livestock population in year 2020 until 2025.

2. METHODOLOGY

Least Square method and Runge-Kutta method were applied to estimate the data of cattle livestock population in Peninsular Malaysia from year 2007 to 2019 that obtained from the open data at The Malaysian Administrative Modernisation and Management Planning Unit (MAMPU) [6]. The relative error was computed and analyzed to identify the most accurate method. The method was then use to predict the number of cattle livestock population in Peninsular Malaysia from year 2020 to 2025.

2.1 Least Square Method

Least Square method is a form of mathematical regression analysis used to determine the line of best fit for a set of data, providing a visual demonstration of the relationship between the data points. The general function for Least Square method is $f(x) = a_0 + a_1 x + ... + a_n x^n$, where, f is an approximate function, $a_0, a_1, ..., a_n$ are the coefficient of variable, n is number of data point and x is an actual value. The coefficients of $a_0, a_1, ..., a_n$ were calculated in the normal equation in matrix in the form $Ax = b$, [2]. This paper was presented the linear, quadratic and cubic least square methods.

2.2 Runge-Kutta Method

Runge-Kutta method can be used to construct high order accurate numerical method by functions self without needing the high order derivatives of functions. The Runge-Kutta method used are the Classical Second-Order Runge-Kutta (RK2) method and Classical Fourth-Order Runge-Kutta (RK4) method [4]. The derivative equation for Runge-Kutta method was defined from trend line scatter charts in Microsoft Excel. Then, the equation to the first-order differential equation with the initial condition is define in (1) and the general Classical Second-Order Runge-Kutta (RK2) method and Classical Fourth-Order Runge-Kutta (RK4) are presented in (2) and (3), [4];

$$\frac{dy}{dx} = f(x,y) = 76.494x^2 - 358.88x - 18760, \quad y(1) = 772323, \quad \text{for } x_i \le x \le x_{i+1} \tag{1}$$

The RK2 formula: $y_{i+1} = y_i + \frac{1}{2}(K_1 + K_2)$ (2)

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The RK4 formula: $y_{i+1} = y_i + \frac{1}{6}(K_1 + 2K_2 + 2K_3 + K_4)$ (3)

2.3 Error Analysis

Error calculations are necessary to test, evaluate and analyze the imprecision and inaccuracy of a particular method. Therefore, in this paper, the error for each method would be calculated by using Relative Error formula.

$$Relative\ Error = \left| \frac{Actual\ Value - Estimation\ Value}{Actual\ Value} \right| \quad (4)$$

3. RESULTS AND DISCUSSION

3.1. Estimations Results

Based on the implementation of Least Square method and Runge-Kutta method, the result for estimation values was arranged in the table below.

Table 1: Estimation Results of Least Square Method and Runge-Kutta Method.

Year	Actual Value	Estimation Value				
		Least Square Method			Runge-Kutta Method	
		Linear	Quadratic	Cubic	Classical Second-Order	Classical Fourth-Order
2007	772323	786273.3407	794105.6814	792422.8159	753215.915	753203.166
2008	779877	769387.1813	773303.3517	773303.3517	734055.926	734030.428
2009	786317	752501.0220	753213.0530	754130.9795	714996.021	714957.774
2010	761796	735614.8626	733834.7853	735058.6874	696189.188	696138.192
2011	691049	718728.7033	715168.5485	716239.4627	677788.415	677724.670
2012	663563	701842.5440	697214.3427	697826.2936	659946.690	659870.196
2013	667869	684956.3846	679972.1679	679972.1678	642817.001	642727.758
2014	662818	668070.2253	663442.0240	662830.0729	626552.336	626450.344
2015	661005	651184.0659	647623.9111	646552.9967	611305.683	611190.942
2016	654602	634297.9066	632517.8292	631293.9271	597230.030	597102.540
2017	621223	617411.7473	618123.7783	617205.8516	584478.365	584338.126
2018	589113	600525.5879	604441.7584	604441.7582	573203.676	573050.688
2019	592878	583639.4286	591471.7693	593154.6345	563558.951	563393.214

Table 1 shows the actual values for the number of cattle livestock population from 2007 to 2019 along with the estimation results for the Least Square method and Runge-Kutta method. The values for Linear, Quadratic and Cubic are very close to each other, similar to the values for RK2 and RK4. However, the value for Cubic is very close to the actual value.

3.2. Analysis of Error

The error was computed for each method, then, the total of relative error was collected as in Table 3.2. The errors were analyzed to identify the best method which has the lowest of total relative error.

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Table 2: Total of Relative Error

Method		Relative Error
Least Square	Linear	0.327103333
	Quadratic	0.307478164
	Cubic	0.307136034
Runge-Kutta	Classical Second-Order	0.675619470
	Classical Fourth-Order	0.677412605

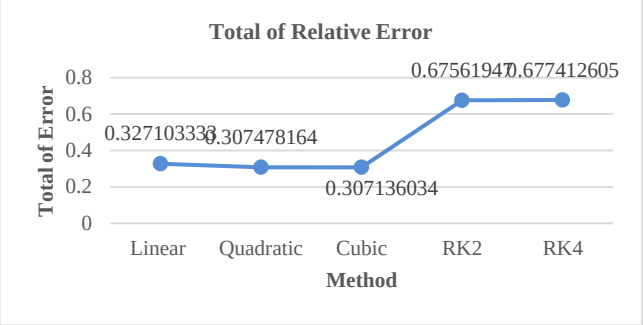

Figure 1: Total of Relative Error Between Least Square Method and Runge-Kutta Method.

Table 2 and figure 1 were presented the total of relative error for both methods, it was found the Cubic Least Square method obtained the least error. Hence, this method was defining as the best method and it will be used to predict the number of cattle livestock population in Peninsular Malaysia from 2020 to 2025.

3.3. Prediction The Number of Cattle Livestock Population

The number of cattle livestock population in Peninsular Malaysia for year 2020 to 2025 was predicted by using the Cubic Least Square method.

Table 3: Prediction of Cattle Livestock Population for Year 2020 to 2025.

Year	Prediction of Cattle Livestock Population Number
2020	583497.4686 ≈ 583497
2021	575623.2478 ≈ 575623
2022	569684.9600 ≈ 569685
2023	565835.5931 ≈ 565836
2024	564228.1348 ≈ 564228
2025	565015.5729 ≈ 565016

Table 3 shows the number of cattle livestock populations that has been predicted and found that it declining. The prediction data obtained can give an additional information to The Malaysian Administrative Modernisation and Management Planning Unit (MAMPU) in taking the action to ensure the number of cattle livestock population is sufficient and meet the demands and needs this country.

4. CONCLUSION

The number of cattle livestock population can be estimated by using numerical methods as the Least Square method and Runge-Kutta method. Based on the error analysis, the best method is Cubic Least Square method. Thus, the number of cattle livestock population in Peninsular Malaysia from year 2020 to 2025 could be predicted by using Cubic Least Square method easily and accurately.

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COMPARISON STUDY OF LAMR METHOD UNDER DIFFERENT LINE SEARCHES

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Abstract

Nowadays, optimization is becoming an interest in many areas since most of the people are relying on the technology such as Internet of Things (IoT). Optimization problems can be classified into two which are constrained and unconstrained. Optimization problems can be solved by any iterative method such as Newton's, Steepest Descent and Conjugate Gradient (CG) methods. In this research, a modified CG method, LAMR is chosen and tested under different line searches to solve the unconstrained optimization problems. Based on the previous study, LAMR method has a good performance compared to some other CG methods. This method is tested with ten sets of test functions using MATLAB software. Different variables with four initial points are chosen randomly for testing. The iteration number and CPU time are recorded for numerical analysis. The data are evaluated to determine the best line search for LAMR method. As a conclusion, the LAMR method using strong Wolfe line search is the best as it requires lesser iteration number and CPU time to converge to its solution points.

Keywords: LAMR method, conjugate gradient method, strong Wolfe line search, exact line search

1. INTRODUCTION

Optimization is used to maximize or minimize some mathematical functions that often representing a range of choice available in certain situation. Optimization are divided into two types which are constrained and unconstrained optimization problems. The general unconstrained optimization problem is defined as:

$$\min_{x \in R^n} f(x)$$

where, $f : R^n \to R$ is continuously differentiable and R^n is denotes an n-dimensional Euclidean space while $x \in R^n$ is a decision variable and a constraint set. This problem can be solved by any iterative method such as Steepest Descent (SD), Newton's, Quasi-Newton (QN) and conjugate gradient (CG) methods. This iterative method is written as:

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$$x_{k+1} = x_k + a_k d_k \qquad k = 1, 2, ...$$

Noted that x_k is the current iteration point, $\alpha_k > 0$ is the step size and d_k is assume to be direction search at each iteration that plays importance role in solving the unconstrained optimization problems. Line search is needed in order to compute the α_k of the iterative method. The line searches are divided into exact and inexact line searches. There are few types of inexact line searches such as strong Wolfe, Armijo and Goldstein. The d_k for CG method is

$$d_k = -g_k + \beta_k d_{k-1} \text{ where } g_k \text{ is known as gradient.}$$

The conjugate gradient method is one of the most popular methods for solving large-scale unconstrained optimization problems. These CG methods can be classified into classical, modified, hybrid, parametric and spectral. There are various well-known CG methods by earlier researchers such as Hestenes and Steifel [1], Fletcher and Reeves [2] and Dai and Yuan [3]. Nowadays, there are many improvement that have been made by the researchers including Rivaie et al. [4] who proposed RMIL method,

$$\beta_k^{RMIL} = \frac{g_k^T (g_k - g_{k-1})}{\|d_{k-1}\|^2}.$$

This particular method has been widely used by current researchers such as Zull et al. [5-7], Ibrahim et al. [8], Sulaiman et al. [9] and Koorapetse et al. [10].

2. METHODOLOGY

This paper is focusing on the LAMR method from Zull et al. [7] which is formulated as:

$$\beta_k^{LAMR} = \frac{g_k^T \left(\frac{\|d_{k-1}\|}{\|d_{k-1} - g_k\|} g_k - g_{k-1} \right)}{\frac{\|d_{k-1}\|}{\|d_{k-1} - g_k\|} \|d_{k-1}\|^2}.$$

This method is tested under three different line searches which are exact, strong Wolfe and Armijo line searches. The algorithm from Rivaie et al. [4] is used to calculate the numerical result. Ten test functions with four random initial points and different ranges of variables are chosen for testing purpose are listed in Table 1.

Table 1. Test functions

No	Test Functions	Variables	Initial Points
1	Extended Freudenstein & Roth	2,4,10,100,500	(4,4), (8,8), (14,14), (22,22)
2	Extended Rosenbrock	2,4,10,100,500	(4,4), (8,8), (18,18), (33,33)
3	White & Holst	2,4,10,100,500	(2,2), (4,4), (9,9), (11,11)
4	Perturbed Quadratic	2,4,10,100,500	(2,2), (8,8), (14,14), (22,22)

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5	Extended DENSCHNB	2,4,10,100,500	(4,4), (12,12), (18,18), (24,24)
6	Diagonal 4	2,4,10,100,500	(4,4), (6,6), (15,15), (30,30)
7	Raydan 1	2,4,10	(3,3), (30,30), (33,33), (40,40)
8	Dixon and Price	2,10	(8,8), (12,12), (16,16), (20,20)
9	Zett1	2	(4,4), (9,9), (16,16), (20,20)
10	Six Hump	2	(4,4), (12,12), (20,20), (24,24)

3. RESULTS AND DISCUSSION

The performance of the LAMR method in terms of iteration numbers and CPU time can be analyzed by referring to the performance profile by Dolan and More [11]. Based on the Figure 1 and Figure 2, the effectiveness and robustness of LAMR method with each line search can be interpreted easily. As stated by Aini et al. [12], the left side of the graph shows the efficiency of the method while the right side of the graph shows the robustness of the method.

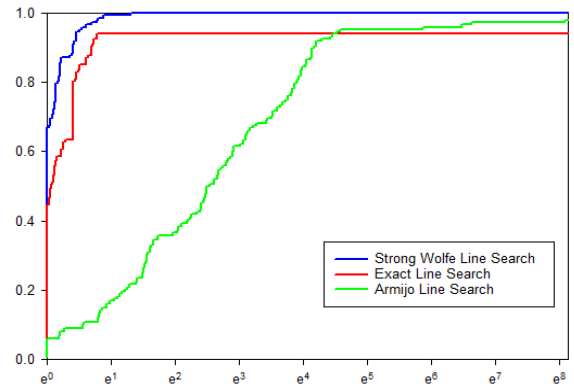

Figure 1. Performance profile based on iteration number

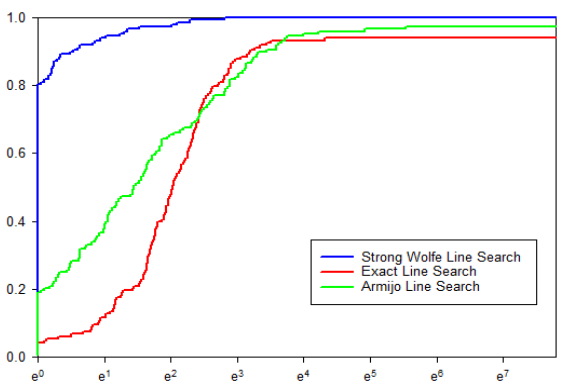

Figure 2. Performance profile based on CPU time

The efficiency of a line search can be verified through its convergence rate. Both figures clearly show that strong Wolfe line search is the fastest method because it requires lesser time to reach its solution points. Based on Figure 1, LAMR with exact line search has better number of iterations compared to Armijo line search. However, LAMR with Armijo line search is better in term of CPU time compared to exact line search. LAMR with strong Wolfe line search is the most robust method as it is at the top of the graph of the right side. It means that LAMR method with strong Wolfe line search is able to solve all the test problems while Armijo and exact line searches are able to solve 97% and 93% respectively.

4. CONCLUSION

As a conclusion, LAMR method under strong Wolfe line search is the fastest method in order to converge to the solution points compared to the exact and Armijo line searches. In both figures, the strong Wolfe line search shows that it has the highest convergence rate by having the least number of iterations and CPU time. Thus, this method can be hybridized with another CG method for future research.

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MHD STAGNATION POINT FLOW IN FERROFLUID OVER A FLAT PLATE

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Abstract

In recent times, a new type of heat transfer equipment equipped with superior effect has been requested by many industries to boost the multidisciplinary growth of miniaturization technology, for instance microelectromechanical system (MEMS), nanoelectromechanical system (NEMS) and nanotechnology. A major effort to develop the advanced fluid and the concept of microchannel cooling technology has been carried out. The development of the advanced fluid has led to the invention of nanofluid that helps the equipment to transfer heat as well as increase the thermal conductivity of fluid. Nanofluid comprises tiny volumetric amounts of nanometer-sized particles, namely nanoparticles. Nanoparticles are highly useful in heat transfer applications due to their convective properties and thermal conductivity performance over the base fluid. Therefore, this study aims to focus on the convective heat transfer of MHD stagnation point flow in ferrofluid over a flat plate. Formulation of the mathematical models includes the transformation of non-linear partial differential equations to ordinary differential equations by using the appropriate similarity transformation variables. The resulting ordinary differential equations are then solved by using the Runge-Kutta-Fehlberg Fourth-Fifth method encoded in Maple software. The behaviour of fluid flow and heat transfer are discussed over solid volume fraction parameter. The results have shown that the velocity profile increases due to increasing magnetic parameter and decreases due to volume fraction parameter.

Keywords: MHD, stagnation point flow, ferrofluid, nanoparticles, flat plate

1. INTRODUCTION

Fluid will help the equipment to transfer heat and prevent the equipment from overheating (cooling system) when the thermal conductivity of the fluid increases. A poor heat transfer process has been reported when the fluids such as water and oil are used. Therefore, numerous theoretical and experimental

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studies on heat transfer enhancement to improve the cooling capabilities as well as thermal conductivity have been conducted. Magnetite (Fe_3O_4) water-based nanofluid is termed as ferrofluid. Ferrofluid is a material that acts like a magnetic solid and also liquid. It is made up of tiny nanometer-sized particles of coated magnetite that are dispersed in the liquid. Ferrofluid is strongly and permanently magnetized in the presence of a magnetic field. It consists of a stable colloidal dispersion of subdomain magnetic particles in a base fluid (water, oil, ethylene glycol, etc.) due to the thermal Brownian motion of suspended particles [2]. The features and benefits of ferrofluid have attracted many researchers to investigate the fluid interaction [3-5].

Motivated by the above-mentioned literature, this study aims to examine the MHD stagnation point flow of ferrofluid over a flat plate. The Newtonian heating condition is also considered where the heat transfer from the surface is taken to be proportional to the local surface temperature.

2. PROBLEM FORMULATION

A steady incompressible ferrofluid on a stagnation point over a flat plate with an ambient temperature, T_∞ is considered. It is assumed that the free stream velocity, $U_\infty = bx$ where b and x represent the constant and uniform magnetic field of strength, B_o is applied in the positive y-direction normal to the flat plate. The governing equations as well as its related boundary conditions can be expressed as follows:

$$\frac{\partial u}{\partial x}+\frac{\partial v}{\partial y}=0 \tag{1}$$

$$u\frac{\partial u}{\partial x}+v\frac{\partial u}{\partial y}=U_\infty\frac{dU_\infty}{dx}+v_{nf}\frac{\partial^2 u}{\partial y^2}-\sigma\frac{{B_0}^2(x)}{\rho_{nf}}(u-U_\infty) \tag{2}$$

$$u\frac{\partial T}{\partial x}+v\frac{\partial T}{\partial y}=\frac{k_{nf}}{(\rho C_p)_{nf}}\frac{\partial^2 T}{\partial y^2}-\frac{1}{\left(\rho C_p\right)_{nf}}\frac{\partial q_r}{\partial y} \tag{3}$$

$$u=v=0,\frac{\partial T}{\partial y}=-h_s T \quad \text{at} \quad y=0 \tag{4}$$

$$U\to U_\infty, T\to T_\infty \text{ as } y\to\infty$$

where u and v are the velocity components along the x and y directions, respectively. Further, T is the ferrofluid temperature in the boundary layer, σ is the electrical conductivity, h_s is the heat transfer coefficient, $\left(\rho C_p\right)_{nf}$ is the heat capacity of ferrofluid, ρ_{nf} is the ferrofluid density, v_{nf} is the kinematic viscosity of ferrofluid, α_{nf} is the thermal diffusivity of ferrofluid and μ_{nf} is the dynamic viscosity of ferrofluid. They can be expressed in terms of the properties of base fluid, ferroparticles and solid volume fraction ϕ as follows:

$$v_{nf}=\frac{\mu_{nf}}{\rho_{nf}}, \rho_{nf}=(1-\phi)\rho_f+\phi\rho_s, \alpha_{nf}=\frac{k_{nf}}{\rho_{nf}\left(C_p\right)_{nf}}, \mu_{nf}=\frac{\mu_f}{(1-\phi)^{2.5}},$$

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$$(\rho C_p)_{nf} = (1-\phi)(\rho C_p)_f + \phi(\rho C_p)_s \, , \frac{k_{nf}}{k_f} = \frac{k_s + 2k_f - 2\phi(k_f - k_s)}{k_s + 2k_f + \phi(k_f - k_s)} \tag{5}$$

Note that k_{nf}, k_f and k_s are the thermal conductivity of ferrofluid, base fluid and ferroparticles, respectively. The following similarity transformation variables are introduced

$$\eta = \left(\frac{b}{v_f}\right)^{1/2} y, \qquad \psi = \left(bv_f\right)^{1/2} x f(\eta), \qquad \theta(\eta) = \frac{T - T_\infty}{T_\infty} \tag{6}$$

By applying equations (5) and (6) and the radiative heat flux $q_r = -\frac{4\sigma^*}{3k^*}\frac{\partial T^4}{\partial y}$, the governing equations (1) to (4) are transformed to the following ordinary differential equations (ODEs)

$$\frac{1}{(1-\phi)^{2.5}\left[(1-\phi) + \phi\frac{\rho_s}{\rho_f}\right]} f''' + ff'' - f'^2 + 1 - M(f' - 1) = 0 \tag{7}$$

$$\frac{\frac{k_{nf}}{k_f}}{\left[(1-\phi) + \phi\frac{(\rho C_p)_s}{(\rho C_p)_f}\right]}\left(1 + \frac{4N_R}{3}\right)\theta'' + Prf\theta' = 0 \tag{8}$$

$$f(0) = 0, f'(0) = 0, \theta'(0) = -\gamma(1 + \theta(0))$$

$$f'(\eta) \ \to 1, \ \theta(\eta) \to 0 \ \ as \ \ y \to \infty \tag{9}$$

where $M = \sigma {B_o}^2(x)/b\rho_{nf}$ is the magnetic parameter, $Pr = v_f(\rho C_p)_f/k_f$ is the Prandtl number, $\gamma = h_s\left(\frac{v_f}{b}\right)^{1/2}$ is the conjugate parameter and $N_R = \frac{4\sigma^* {T^3}_\infty}{k_{nf}k^*}$ is the radiation parameter.

3. RESULTS AND DISCUSSION

The resulting ODEs (7) to (9) are then solved using the Runge-Kutta-Fehlberg Fourth-Fifth method encoded in Maple software. The obtained results are first validated through comparison where the present values of $\theta(0)$ and $-\theta'(0)$ are compared with Mohamed et al. [6] for various values of Pr. It is evident from Table 1 that the comparison values are in good agreement.

Table 1. Comparison Values of $\theta(0)$ and $-\theta'(0)$ for Various Values of Pr

	Mohamed et al. [6]		Present results	
Pr	$\theta(0)$	$-\theta'(0)$	$\theta(0)$	$-\theta'(0)$
5	1.2753	2.2753	1.2726	2.2726
7	0.9001	1.9001	0.9000	1.9000
10	0.6565	1.6565	0.6565	1.6565

Reference: Mohamed et al. [6]

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From Figure 1, the graph shows that the velocity profile $f'(\eta)$ decreases and the temperature profile $\theta(\eta)$ increases with increasing solid volume fraction ϕ. This is because increasing the volume fraction of nanoparticles has increased the thermal conductivity and viscosity of the nanofluid, thereby decreased the velocity. Meanwhile, the increasing temperature profile is due to an increase in the volume of magnetite nanoparticles where the increase of ferrofluid's thermal conductivity has resulted from the added magnetite nanoparticles to the water-based fluid.

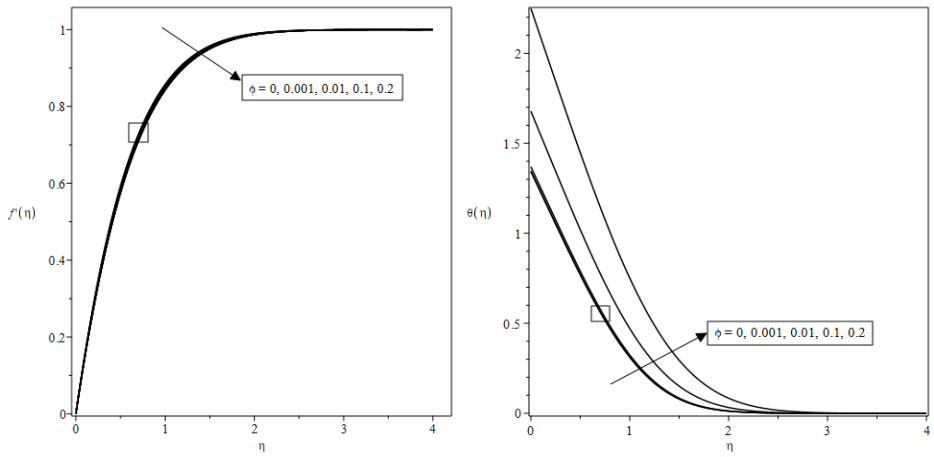

Figure 1. Velocity Profile and Temperature Profile for Increasing of Volume Fraction ϕ for $Pr = 6.2$, $M = N_R = 1$ and $\gamma = 0.5$

4. CONCLUSION

This study has discussed the stagnation point flow of magnetite ferrofluid over a flat plate with Newtonian heating. It was found that the velocity is decreased while the temperature is increased due to increasing solid volume fraction parameter.

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2nd GRADUATE DIGITAL INVENTION, INNOVATION & DESIGN GIDID2021

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STRESS MANAGEMENT COURSEWARE (SMC)

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Abstract

The COVID-19 pandemic has impact many sectors in Malaysia including education. Early literature has documented negative impacts of pandemics on students' psychological well-being. Ministry of Health has made initial preparations for stress management skills by providing a module for Program Healthy Minds to Handling Stress among school students to identify signs and symptoms of stress, anxiety and depression that can used by school teachers. The Ministry of Education also take part in this issue by providing stress management module in syllabus for the subject of Pendidikan Kesihatan on topic of Mental, Emotional and Social Health. However, current practice of learning this topic is less interactive as teacher relies on textbook and the time constraint allocated for the subject is only for one hour. The aim of this project is to develop Stress Management Courseware (SMC) for student in primary school targeted for the ages ten (10) to twelve (12) years old. The ADDIE model was implemented as an instructional design model and persuasive design strategy has been implemented to support the user interface of SMC. There are four (4) topics in this courseware such as stress introduction, symptoms of stress, tips to overcome the stress and the techniques to reduce stress. All topics are presented in interactive ways combining text, images, videos, animation and sound. There are five (5) fun quizzes provided in SMC including two (2) types of multiple choice questions, two (2) of drag and drop puzzle quizzes and a crossword puzzle. This courseware has been tested by developer in term of its functionalities. In the future, it is hope that this courseware can improve stress management skills among the student and the usage of this courseware can be extended to other group of users including the worker.

Keywords: Courseware, Stress Management, ADDIE model, Persuasive Design Strategy

1. INTRODUCTION

Stress is a feeling of emotional or physical tension. It can come from any event or thought that makes you feel frustrated, angry, or nervous. According to the National Health and Morbidity Survey in 2019 [1], nearly half a million Malaysians experience symptoms of depression and 424,000 children were found to have mental health problems in Malaysia. It was estimated that 9.25 percent of them are those whoage10 to15 years old. There are many factors that contribute to mental health problems such as peer problem, conduct problem, emotional problem and hyperactive problem [1]. Ministry of Health has made initial preparations to improve stress management skills among students by providing a module for Program Healthy Minds to handle stress [2]. This program helps to identify signs and symptoms of stress, anxiety

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and depression that can be used by the school teachers as a measurement to handle stress among students. On the other hand, Ministry of Education also takes part with this issue by introducing the stress management module in syllabus of subject *Pendidikan Kesihatan* on topic of '*Mental, Emotional and Social Health'*. Taking the inspiration of this issue, this project aims to develop the stress management courseware (SMC) for those aged ten to twelve years old of primary school students. The objectives of this project consist of identifying the current learning approach used by the teacher for stress management among primary school students, to design and develop the courseware for stress management and to evaluate the functionalities of the courseware. The SMC courseware was developed by implementing multimedia elements and adapting the seven of persuasive design principles for its interface design.

2. METHODOLOGY

This project consists of seven phases where the ADDIE model was implemented as an instructional design model and seven principles of persuasive design strategies [3] have been implemented to support the user interface design of SMC. The project starts with the initial study phase and followed by phases of analysis, design, development, implementation and evaluation from ADDIE model and lastly the reporting phase. During the initial study, an interview session has been conducted with teachers who have experienced in teaching related subject. Requirements for developing the courseware later was captured and analyzed to assist the development of the courseware. In designing and development phase, seven persuasive design principles have been implemented to guide to exploits cognitive biases to guide and influence the user behavior. There are reduction, tunneling, tailoring, personalization, self-monitoring, rehearsal and simulation [3]. In the implementation phase, the courseware was published as a standalone application and evaluated based upon its functionalities. The functionalities were tested based on normal, alternative and exception scenario. Figure 1 shows the design model of the courseware content.

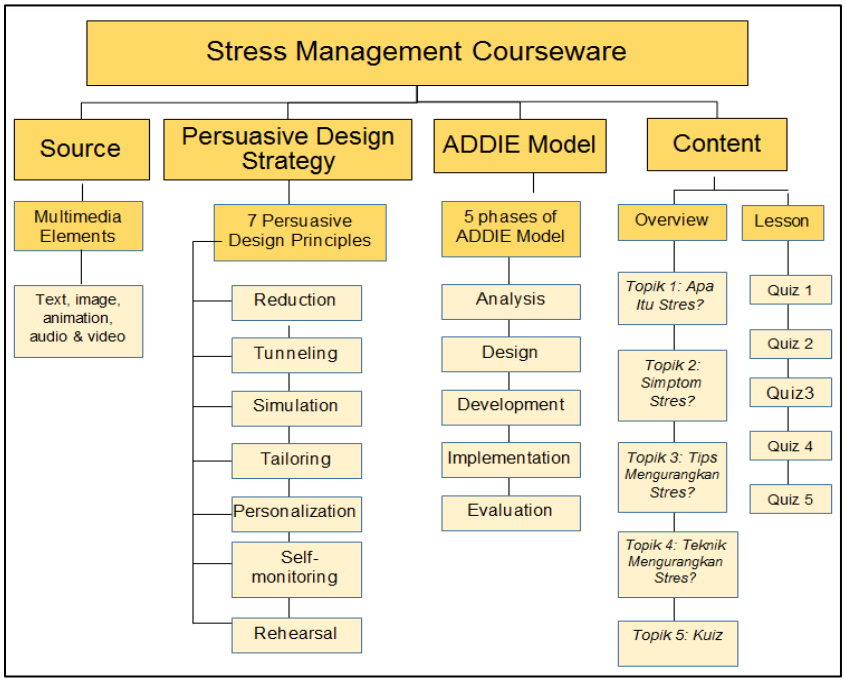

Figure 1. Design model for SMC

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3. FINDING AND DISCUSSION

Based on persuasive design strategy, the first principle which is reduction means the system should reduce the complex behavior into simple tasks helps user to perform the target behavior[3]. Example implementation in SMC can be seen in the *home* page where user can understand the button "*Masuk*" as there is animation on the button that redirect user to click on the button to enter the courseware and in the *menu* page where user has freedom to choose any topics from the menu choices. Figure 2 and Figure 3 show the home page and menu page of SMC.

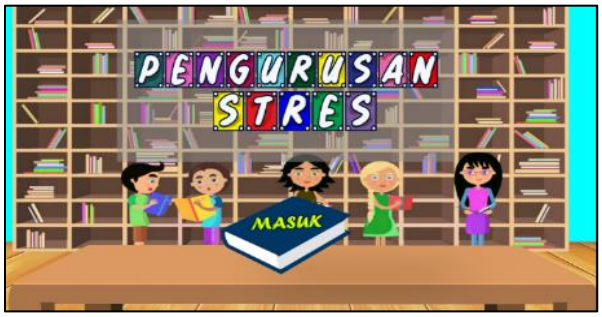

Figure 2. Screenshot of *Home* page in SMC

Figure 3. Screenshot of *Menu* page in SMC

Tunneling refer to the system that can guide users in the attitude change process by means for action that brings them closer to the target behavior[3]. For example implementation in SMC, user can get the information regarding the techniques of handling stress and practice by themselves from the video provided in the courseware (see Figure 4). In tailoring principle, the system should provide information for its user group[3]. As for the SMC, the whole contents are associated with the primary schools students aged ten to twelve years old, thus the interface design are tailored with their preferences. The next principle which is rehearsal refers to the system which can provide for rehearsing a target behavior [3]. In the SMC, after user reviewing the information, the users can test their understanding by answering the questions in *Quiz* page. Personalization offer personalized content and services for its users [3]. This can be seen in SMC when the related buttons are used to associate with the content and flow of the information. Repetitive and similar buttons such as *Home*, *Next, Previous, Cancel and Exit* button are implemented in SMC so user can understand and follow the instruction clearly. Self-monitoring refer to the system that allow users to track their performance or status[3]. For example, in the *Quiz* page, user is required to complete the question and can view the result. Lastly, simulation refers to the system that provide for observing the link between the cause and effect with regard to users' behavior [3]. In SMC, icon happy and sad smiley will appear based on the result from the questions.

Figure 4. Screenshot of *Video* content in SMC

Figure 5. Screenshot of *Quiz* page in SMC

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SMC courseware has been evaluated by the tester to validate its functionalities. Example test case for *Quiz* page can be seen in Table 1. Majority of the functionalities get the positive feedbacks. Some functions required improvement.

Table 1. Test Case for *Quiz* page

Date		5/1/2021		
Test Case description		Testing for the quiz for each an element in the content page		
Pre-requisite		The user needs to click on "Kuiz: Topik 1 -Topik 4" button at the menu page		
No	**Activity**	**Expected Result**	**Actual Results**	**Result**
1	Click on *Kuiz 1* button	It will navigate into activity selected page	*Kuiz 1* page is displayed	Pass
2	Click on *Kuiz 2* button	It will navigate into activity selected page	*Kuiz 2* page is displayed	Pass
3	Click on *Kuiz 3* button	It will navigate into activity selected page	*Kuiz 3* page is displayed	Pass
4	Click on *Kuiz 4* button	It will navigate into activity selected page	*Kuiz 4* page is displayed	Pass
5	Click on *Kuiz 5* button	It will navigate into activity selected page	*Kuiz 5* page is displayed	Pass
6	Click on Home button	It will navigate into main menu page	Main menu page is displayed	Pass
7	Click on *Kembali* button for each *aktiviti*	It will navigate into *Topik 4* page	*Topik 4* page is displayed	Pass
8	Click on X button	It will navigate into *Keluar* page	*Keluar* page is displayed	Pass

4. CONCLUSION

As a conclusion, the current learning approach in primary school has been enhanced and improved through the development of this courseware. SMC has been developed with applying all multimedia elements such as graphic, text, video, audio and animation. SMC offers interactive platform for students to learn and understand on stress management topics. Persuasive design strategy has been implemented in SMC supporting seven of its principles. These principles assist on predicting the user acceptance towards the courseware. Future enhancement of this research may consider on the evaluation in terms of usability of the courseware.

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IO2TX: (IO DOUBLE TX) AN ALARM FOR EQUIPMENT IN TREATMENT CUPBOARD USING INTERNET OF THINGS (IOT)

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Abstract

Hospital conditions are synonym as a busy environment where there are many patients that nurses should need to give attention to. The busy schedule makes the nurses not aware to refill the items in the treatment cupboard. Besides, the items in the treatment cupboards are always out of stock when nurses need to use them and have to find the items first. This situation will delay the treatment time and the patients will wait for a long time for the nurses to prepare the equipment that needs for the procedure. In the meantime, research conducted by Katya, shown that nursing workload lead to harm for patient including rate of fall and medication error [4]. In addition, nursing workload also reduce the quality of care for patient [3]. Our project has been named IO2TX has been invented to solve this problem. IO2TX stand for Internet of Thing in Treatment Cupboard. IO2TX is using sensors to detect the quantity of theitems such as syringes, needles, and other clinical items in the treatment cupboard. IO2TX also used the internet of things (IOT) to transmit the information via the cloud using BLYNK apps that help display items that are out of stock from the treatment cupboard. IO2TX acts as a reminder for the nurses by the action oflight-emitting diode (LED) light will blink and display items that are out of stock in the form of the liquid crystal display (LCD) at the cupboard door and transmitted data to mobile phone and computer at nurse counter. Therefore, the innovation that we were created can help nurses to become more aware before the items in the treatment room are out of stock. In addition, this will facilitate the work of nurses while having a systematic and manageable system in the hospital. The cost for the development of the product is RM 100.

Keywords: IO2TX, LED light, LCD, items

1. INTRODUCTION

IO2TX (pronounce as IO Double TX) is a special type of product with the ability to detect items through sensors. The software that we use to conduct this project is Arduino and BLYNK. Arduino usage is for coding and BLYNK's purpose isto send the notification to mobile phone and computer. Hardware items that we use are LCD, LED, nodeMCU ESP8266, breadboard, and IR sensor. LCD function is to visualize the notification when the item is running out of stock while LED will blink if the item is near out of stock.

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Next, a breadboard is used to connect all the wire through it and an IR sensor will detect the number of items in the box. IO2TX continues to connect to the IOT cloud and transmit data to the cloud. Using the BLYNK application allows users to visualize data (number of items) and provide notifications when the items such as syringes are running out. In addition, the LED will blink and the cupboard will display the current items using the LCD when the items are near to run out. The main objective of the project is to help nurses and other health care providers to solve problems in keeping track of items in the treatment room. With the help of this product, nurses will notice if the items ran out in the treatment cupboard as the BLYNK application will send a notification to them via mobile phone and computer.

2. PROBLEM STATEMENTS

The problem that influenced us to design this innovation called IO2TX is because when we went to the hospital for practical, the problem that we face is items in the treatment room were always out of stock. The nurses were not alerted to refill the items as they have a busy schedule, especially during this pandemic COVID 19. The case rises day by day, making the nurses must deal with hectic days and difficult to be aware of this condition without any reminder. The items that are always out of stock during this pandemic are usually personal protective equipment (PPE). When this condition happens then we have to delay the treatment and make the patient wait for a long time to finish the procedure. During the practical, we have one case where we have to delay the procedure because the alcohol swab in the treatment room is out of stock. So, we make the patient wait for us to find the items in other wards to perform the procedure. This is where we get an idea to develop this kind of innovation. The target group of this product is the nurses and other health care providers. The creation of this product will also influence the hospital management system and further improve the quality of services of nurses and other healthcare providers. Besides, it also can improve nurse's work and provide better services to the patients. Therefore, this innovation can help in reminding the nurses to be more alert in refilling the items in the treatment room before they are out of stock.

2.1. Explanation about the product

The IR sensor usage depends on how many types of items to detect. For example, we use 3 IR sensors to detect three different types of items such as syringes, needles, and alcohol swabs. When one of the items runs out as an example of syringes runs out, the BLYNK application will send a notification that the syringe runs out. In addition, the LED will blink and the LCD, mobile phone and computer will display an ascending count to calculate the time of the absence of the item. We have come out with this idea using this kind of components inspired by [1].

3. RESULTS AND DISCUSSION

3.1. Benefits of the product and commercial price

The significance of the product is for nurses and other health care providers especially during this hectic condition which is pandemic to COVID 19. This product will make it easier for nurses to be more alert to the items available in the treatment room. Therefore, the case for refilling items that are out of stock will not be disrupted and not delayed any more. This will make the procedure for the patient can be done quickly and do not hesitate. The estimated price for commercialization is about RM 100 for each product. This estimated commercial price is based on the capital price we have used for us to prepare this product. Even the product is under prototype but the quality to be commercial is highly recommended as the product can be

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a reminder for nurses and the need in the ward.

3.2. Components in IO2TX

Blink when the items less than 5.

Figure 1. Light-emitting diode (LED)

Display the items counter.

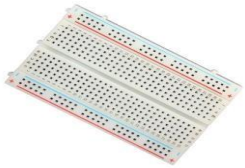
Figure 2. Liquid crystal display (LCD)

Restrict current for LED.

Figure 3. Resistor

Connect hardware.

Figure 4. Jumper wires



Placement for hardware.

Figure 5. Breadboard

Sensor to count the items.

Figure 6. IR sensor

4. CONCLUSION

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This is how our final project looks like. Last but not least, this innovation is really helpful to prevent from nurses being unaware of the items that run out of stock due to IO2TX act as a reminder for nurses. Therefore, we hope that this product will be commercialized to provide benefits for health care institutions.

ACKNOWLEDGEMENT

The project members would like to precise our special thanks of gratitude to the Centre for Nursing Studies, Faculty of Health Sciences, UiTM Puncak Alam, also as our project advisor, Ts Dr. Sharifah Shafinaz Sh Abdullah who gave us the golden opportunity to plan this excellent project and participate in Graduate Digital Invention, Innovation & Design (GDIID) 2021. The IO2TX, our revolutionary design will help healthcare or nurses to always be alert with the items in the treatment room and always get ready to fill the items before it's out of stock. We also want to thank our project members themselves who helped one another in doing tons of research and that we came to understand numerous new things. We are thankful to everyone. Secondly, we might also wish to thank anybody who helped us tons in finalizing this project within the limited time frame from the start until the top. They have made valuable comment suggestions on this project which inspired us to enhance our design. We thank all the people for their help directly and indirectly to complete our IO2TX project.

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GTNLARM21

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Abstract

The name of the project is GTNLARM21. Based on the name, it is a combination of Glyceryl Trinitrate (GTN) medication and alarm technologies. GTN is a common medication used to relieve pain from a heart attack. The project employed some technologies that consist of ESP32 TTGO Microcontroller, buzzer, resistor, jumper wires, breadboard, LED, HC-05 Bluetooth module, and LILYGO®TTGO T-Watch-2020 ESP32. These technologies will be set up on GTN bottles and will deliver a beep sound when it detects a spike of the heartbeat (more than 100 beats per minute) which indicates a heart attack to be happening. This product is a combination of the latest technologies has the ability in reducing the mortality and morbidity rate resulted from heart disease. This product targets people who are on GTN medication, especially elderly or disable patients with a history of heart attacks where they must always bring their GTN medication no matter where they are going because heart attacks can happen anytime and anywhere. Failure to consume the GTN in time and correctly will cause a patient to become unconscious and can lead to serious complications including death. The main purpose of this project is to provide early precaution of heart attack as the beeping alarm would alert the user or person nearby and immediately help the user to take the medication. This action could decrease the risks of the user getting a cardiac arrest or sudden death. Therefore, the GTNLARM21 is considered as one of the solutions that could prevent the incident from occurring. The cost of our project is in the range of RM350.

Keywords: GTNLARM21, Glyceryl Trinitrate, heart attack, ESP32 TTGO Microcontroller, LILYGO®TTGO T-Watch-2020 ESP32

1. INTRODUCTION

According to the World Health Organization (WHO), In 2016 an estimated 17.9 million people died from Chronic Vascular Disease (CVD) which represents 31% of all global deaths with 85% caused by heart attack and stroke. This shows that a heart attack is very dangerous due to its unexpected occurrences where the coronary arteries were blocked by the plaque and eventually ruptured cause the lumen of the coronary arteries to become fully occluded resulting to poor blood supply to the affected myocardium (heart muscle).

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At this stage, the patient will then develop a severe pain as the myocardium would suffer from ischemia and necrosis of the surrounding tissues (death tissues) [3].

Glyceryl Trinitrate or GTN is the common medication that helps to relieve pain from a heart attack. If the GTN is taken late or not taken at all during a heart attack, the patient will potentially develop a cardiac arrest and if left untreated would contribute to death. The GTNLARM21 is a product that helps patient receives medication faster and timely as it produces an alarm (beeping sound) that could detect a patient's abnormal heart rate (more than 100 beats per minute) when link with the smartwatch. The smartwatch will then be able to detect the abnormal heart rate and send a signal to the sensor located at the bottom of the GTN cap bottle allowing it to beep. This alarm will then alert the patient or the people nearby of the reminder to consume the GTN tablet. This product significantly impacts medical health industry as it has the potential to improve patients' heart conditions and their quality of life.

2. PROBLEM STATEMENT

WHO (2021) stated that many people died due to chronic vascular disease (CVD). One of the common Chronic Vascular Disease is heart attack. One of the treatments or management of heart attack is by taking Glyceryl Trinitrate (GTN). However, when a heart attack happens, the patient may be in a very painful and panic situation which can cause slow action for the patient which may collapse without even getting the needed medication. Thus, the team is called to design the product called GTNLARM21 that could provide early precaution when a heart attack is about to happen that can alert the patient and people nearby at that time. This product is a combination of the latest technologies which has the ability to reduce the mortality and morbidity rate resulting from heart disease. This product targets people who rely on GTN medication, especially elderly or disable patients with a history of heart attacks.

2.1. ABOUT THE PRODUCT

This product consists of a combination of Glyceryl Trinitrate (GTN) and an alarm with the purpose of alerting people when heart attack strikes. The alarm connected to the smartwatch by Bluetooth and whenever the smartwatch would detect an abnormal heart rate which trigger, the GTN bottle to sound an alarm. Failure to consume the GTN will cause a patient to be unconscious and could seriously lead to complications including death. Elderly or disabled persons with a history of heart attack might have the possibility to delay or forget to take their GTN medication hence increase the risks. Therefore, GTNLARM21 is designed to alert the patient and those nearby, be more resilient with time to take the GTN tablet.

The technologies used in this product are ESP32 TTGO Microcontroller, buzzer, resistor, jumper wires, breadboard, LED, HC-05 Bluetooth module, and LILYGO®TTGO T-Watch-2020 ESP32 [1] Firstly, a patient is required to acquire the LILYGO smartwatch ready (need to set up the smartwatch and GTN bottle to make sure they are connected). The smartwatch will detect the abnormal heart rate (more than 100 beats per minute) and send a signal to the sensor located at the bottom of the GTN cap bottle to beep.

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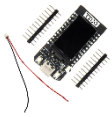 Figure 1.1 ESP32 TTGO Microcontroller	 Figure 1.2 Buzzer	 Figure 1.3 Resistor	 Figure 1.4 Jumper Wires
 Figure 1.5 Breadboard	 Figure 1.6 LED	 Figure 1.7 HC-05 Bluetooth Module	 Figure 1.8 LILYGO®TTGO T-Watch-2020 ESP32

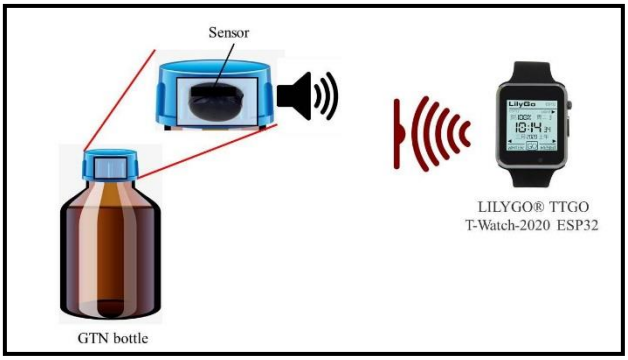

Figure 1.9

3. RESULTS AND DISCUSSION

3.1. Benefits of the product and commercial prize

The benefit of our product is to alert those who are diagnosed with a heart attack. With the product serves as important reminder, the patient will be able to consume the GTN medication right away thus preventing a heart attack. This can avoid any harm to themselves such as an incident of dying on the scene immediately. We do not know whether if we call the ambulance, they will arrive right away. Sometimes it will take more time because of other factors such as traffic jams or something else. Therefore, our group created this state-of-the-art innovation aptly name as GTNLARM21. The cost for the development of this product is about RM 350 which includes the cost of total items or components in GTNLARM21, the cost of electrics, and the cost for commercial purposes. The proposed commercialized price is RM45 per item and the price is subject to change and require careful consideration in many aspects.

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3.2. Component in GTNLARM21 and the costs

- LED - Jumper Wire - Resistor - Buzzer - Breadboard	RM 10.10
Bluetooth Module	RM 14.00
Smartwatch (LILYGO®TTGO T-Watch-2020 ESP32)	RM 191.60
Total Cost	RM 281.60

4. CONCLUSION

In conclusion, with GTNLARM21, we can provide early precautions to the patient with a heart attack so they can consume their medication on time. Other than that, people around the patient also will be alert if anything happens to the patient, such as unconscious or collapses on the spot. Moreover, we hope that this product can save many lives.

ACKNOWLEDGEMENT

The members of the project would like to express our special thanks to the Centre of Nursing Studies, Faculty of Health Science, UiTM Kampus Puncak Alam and to our project advisor, Ts. Dr. Sharifah Shafinaz Sh Abdullah and who gave us this opportunity to join and participate in Graduate Digital Invention, Innovation & Design (GDIID) 2021. We are also thankful to Assoc. Prof. Ts. Dr. Zulkifli bin Mohamed from UiTM Kampus Shah Alam for guiding us through this project. The GTNLARM21, our innovative design will help the elderly and disable person with heart problems especially in detecting their spike of heartbeat anywhere. Next, we would like to thank our members group for accepting each other as one group and keep helping each other during the research and making the innovation. Lastly, we thank all people for their help directly or indirectly during the phase of making our innovative design, GTNLARM21 come true.

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CAPCUTT: MEDICINE CUTTER

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Abstract

Capcutt refers to a medicine cutter at the cap of the medication bottle. The Capcutt has been designed to split a medication into tablets or pills as easily as possible and without needing another device because this cutter is placed in the cap of the medication bottle. For example, if the pill cutter is missing or used by another person, the nurse must use a sharp object to cut the medicine such as a knife. This action can lead to injury. To avoid this accident from happening, we get inspired to upgrade the pill cutter into Capcutt, which is the cutter attached to the cap of the medication bottle. Basically, at the hospital, the nurse will use a device called a pill-cutter to cut the tablet or pills to provide a lower dose to the patient as prescribed by the doctor. The pill cutter will be placed on a flat surface. A medication which is a pill or tablet will be put between the guides. Then, the nurses will bring the bladed section filly down to divide the medication. The fingers should stay away from the blade all the time as a precaution. The pill-cutter consists of a V-shaped pill positioner, blade at the right of center, and usually a compartment in which to store the unused part. Usually, nurses and people can buy the pill cutter at the pharmacy. Patients that have to consume a lower dose of the medicine or have to crush the pill will buy this pill cutter at the pharmacy because the hospital did not provide the cutter to the patient. So, the Capcutt is very important to the nurses and patients to cut the pill appropriately without using another device.

Keywords: Capcutt, pill-cutter, medication

1. INTRODUCTION

Capcutt or also knows as medication cutter is a great product that will be useful and essential for all health care providers especially nurses and also bring benefits to the patient. This is because they will cut the medication in tablets and pills easily without using another device such as a pill cutter. Furthermore, the purpose of this innovation is to lower the incidence of missing pill cutters in the ward as based on our experience during practical in hospital, the pill cutter always went missing.

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2. PROBLEM STATEMENTS

This innovation, Capcutt, is produced because of some weaknesses of the current pill cutter. Based on our experience in the hospital, there is a limited number of pill cutters in the ward, and it is always missing because the nurses will use the pill cutter to cut the medications, and sometimes, they have forgotten where they put the cutter after used. It is because the current pill cutter is a mobile and can be carried everywhere by the nurses and is not placed at the medication bottle, this always can lead to missing places. So, it is quite hard for other nurses on the next shift to do their duty if the pill cutter is missing. Besides, other nurses have to buy another pill cutter at the pharmacy repeatedly if the pill cutter keeps missing. If a student nurse is having a practice in a hospital, they also have to buy their pill cutter to make their practice easily without borrowing the cutter from the staff nurses. So, the Capcutt is one of the innovations that can solve this problem. Furthermore, our Capcutt was designed as an individual cutter that was placed in the individual medication bottle which serves as another function that is the prevention of cross-transmission of the infection.

2.1. Explanation about the product

The Capcutt component will be placed in the cap of the medication bottle. The items that we used in the Capcutt product are stainless steel blade, hot glue, acrylic sheet, acrylic sheet cutter, and lid of a plastic container. The Capcutt will be placed in the cap of the medication bottle which will be covered with another cap or lid that will be attached with a stainless-steel blade to act as a cutter of medication. The acrylic sheet will be used as a V-shaped pill positioner before we cut the medication with a stainless-steel blade. The acrylic sheet will be cut by the acrylic sheet cutter to make a V-shaped. So, this innovation will be helpful to all health care providers to cut the medication easily and can prevent from cross-transmission of infection because it is an individual cutter that placed in an individual medication bottle.

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3. RESULTS AND DISCUSSION

3.1. Benefits of the product and commercial price

This Capcutt is extremely crucial for all the health care providers especially nurses and also to the patient. The main benefit of this innovation is the cutter of the tablet and pills medication will not be missing because it was placed in the cap of the medication bottle. The nurses that have to give medication to the patient in the ward during their shift did not have to find another device to cut the medication and can cut the medication easily. This innovation also is a safe product to use for all nurses and patients. In the making of this product, we calculated the amounts of component's price are around RM30. While the estimated price for commercialization is about RM10. The component's price for one Capcutt will be low than RM30 if we buy bundle of component instead of component for one Capcutt. Thus, we can commercialize the Capcutt only for RM10 per Capcutt. This commercial price is very affordable, and this product is highly suggested to all health care providers especially nurses.

3.2. Components in Capcutt

		
Figure 1: Medication bottle	Figure 2: Stainless steel blade	Figure 3: Lid of plastic container

		
Figure 4: Hot Glue	Figure 5: Acrylic sheet	Figure 6: Acrylic sheet cutter

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4. CONCLUSION

In conclusion, by creating this innovation, we can lower the incidence of missing pill cutters in the ward as the product Capcutt will be placed in the cap of the medication bottle and also make it easier for the patient to use it. The capcutt also can be reusable which is the empty medication bottle can be used for others medication. Moreover, we hope that this product will bring benefits to healthcare providers especially nurses.

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SOLVING SHORTEST PATH PROBLEM IN NEUTROSOPHIC ENVIRONMENT

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Abstract

In this study, Dijkstra's algorithm has been redesigned to handle the case in which most of the parameters of a network are uncertain and given in terms of interval-valued bipolar neutrosophic numbers (IVBNN). The proposed algorithm gives the shortest path length using the score function from the source node to the destination node and each of the arc lengths is attributed to an IVBNN. Moreover, for the validation of the proposed algorithm, a numerical example has been offered.

Keywords: Dijkstra's algorithm, neutrosophic set, shortest path problem

1. INTRODUCTION

The shortest path problem (SPP) is one of the most fundamental combinatorial problems that appear in various disciplines such as road networks, transportation, scheduling problems, and other application. One of the well-known algorithms in solving SPP is Dijkstra's algorithm. The main objective of the SPP is to find the minimum length between any pair of vertices. In a classical SPP, the distance of the edge between different nodes of a network is assumed to be certain. However, when the information about the path is undetermined, uncertain, and unreliable, the neutrosophic concept has been implemented and obtained the solution for the neutrosophic shortest path problem (NSPP) in the literature.

To do best with our knowledge, few research papers deal with SPP in neutrosophic environments such as solving SPP in a single-valued neutrosophic set (SVNS) [1], interval-valued neutrosophic set (IVNS) [2], and bipolar-valued neutrosophic set (BVNS) [3]. Till now, there are only a few journals that use interval-valued bipolar neutrosophic set (IVBNS) in their studies such as IVBNS and their application in pattern recognition [4], interval-valued bipolar fuzzy weighted neutrosophic sets and their application [5], and computing minimum spanning tree in the interval-valued bipolar neutrosophic environment [6]. Therefore, it is important to establish an interval-valued bipolar neutrosophic version of Dijkstra's algorithm for the neutrosophic shortest path problem (NSPP). The novelty of our work arises from the fact that, while there has been some work on the use of Dijkstra's algorithm in the neutrosophic set, none of the existing work has provided a theoretical study on IVBNN Dijkstra's algorithm.

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Therefore, the objectives of the study are to propose a new version of Dijkstra's algorithm for solving the SPP where the edge weights are characterized by IVBNN. Moreover, this study intends to find the optimum route for solving network problems by using Dijkstra's algorithm with IVBNN. To handle the IVBN-SPP, two considerations should be taken. The first one is determining the sum of two edges and the other one is how to compare the lengths of two different pathways, as each edge's length is represented by neutrosophic numbers.

2. PROPOSED METHODOLOGY

Step 1: Assume d_i = ([0,0],[1,1],[1,1],[−1,−1],[0,0],[0,0]) and assign the first vertex / source vertex as the permanent label (d_i = ([0,0],[1,1],[1,1],[−1,−1],[0,0],[0,0]),−). Making a vertex permanent means that it has been included in shortest path.

Step 2: Set i = 1.

Step 3: Check the value of j from i, if the minimum occurs for more values of j from i go to step 4. Otherwise, skip step 4 and go through step 5.

Step 4: Use the following score function [6] to get j for which d_{ij} minimum.

$$S(\tilde{a}) = \frac{1}{12}(T_L^p + T_U^p + 1 - I_L^p + 1 - I_U^p + 1 - F_L^p + 1 - F_U^p + 1 + T_L^n + 1 + T_U^n - I_L^n - I_U^n - F_L^n - F_U^n)$$

Step 5: Determine the temporary neutrosophic label $[u_i \oplus d_{ij}, i]$ for each node j that can be arrived from i, provided j is not permanently labeled.

Step 6: If node j is previously labeled as $[u_j, k]$ through another node K, and if $S[u_i \oplus d_{ij}, i] < S(u_j)$ change $[u_j, k]$ with $[u_i \oplus d_{ij}, i]$.

Step 7: If all the vertices are permanently labeled, the algorithm terminates. Otherwise, choose the label $[u_r, s]$ with the shortest distance (u_r) from the list of temporary labels. Set $i = r$ and repeat Step 3.

Step 8: Determine the shortest path between vertex 1 and the destination vertex j by tracing backward through the network using the label's information.

3. ILLUSTRATIVE EXAMPLE

Table 1: Details of edge information in terms of IVBNN

Edges	End vertices	Weight of The Edges
E_1	V_1V_2	$([0.6,0.8],[0.5,0.7],[0.4,0.6],[-0.2,-0.1],[-0.3,-0.2],[-0.4,-0.3])$
E_2	V_2V_4	$([0.2,0.4],[0.3,0.6],[0.4,0.8],[-0.3,-0.2],[-0.6,-0.4],[-0.4,-0.3])$
E_3	V_2V_3	$([0.4,0.5],[0.2,0.4],[0.3,0.7],[-0.4,-0.3],[-0.6,-0.5],[-0.8,-0.7])$

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E_4	V_3V_4	$([0.1,0.3],[0.3,0.4],[0.5,0.7],[-0.5,-0.4],[-0.6,-0.3],[-0.6,-0.5])$
E_5	V_4V_5	$([0.3,0.6],[0.2,0.4],[0.5,0.6],[-0.3,-0.1],[-0.4,-0.3],[-0.7,-0.5])$
E_6	V_5V_6	$([0.3,0.4],[0.2,0.4],[0.4,0.6],[-0.4,-0.3],[-0.7,-0.6],[-0.8,-0.7])$
E_7	V_4V_6	$([0.2,0.3],[0.3,0.5],[0.1,0.3],[-0.5,-0.4],[-0.4,-0.2],[-0.7,-0.6])$
E_8	V_3V_5	$([0.5,0.6],[0.6,0.8],[0.3,0.4],[-0.5,-0.4],[-0.6,-0.5],[-0.9,-0.7])$
E_9	V_1V_3	$([0.3,0.4],[0.2,0.5],[0.1,0.2],[-0.4,-0.3],[-0.6,-0.4],[-0.8,-0.6])$

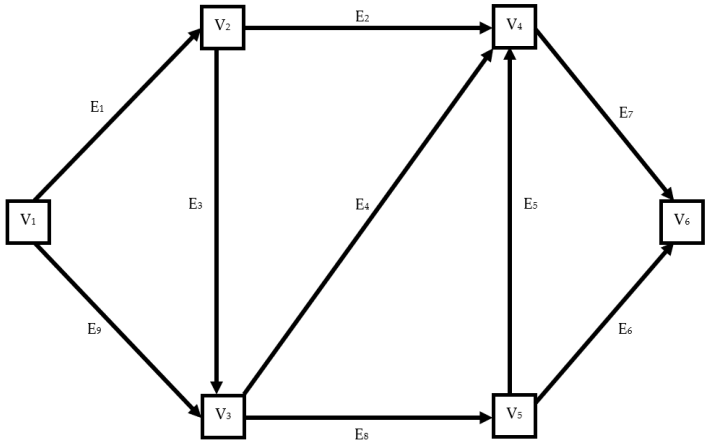

Figure 1: Interval-valued bipolar neutrosophic network graph

Step 1: Assign the permanent label $\langle[0,0],[1,1],[1,1],[-1,-1],[0,0],[0,0]\rangle$ to vertex 1 (source vertex).

Vertex	Weight	Status
1	$\langle[0,0],[1,1],[1,1],[-1,-1],[0,0],[0,0],-\rangle$	P

Step 2: Set $i=1$. Assume $\hat{d}_1=\langle[0,0],[1,1],[1,1],[-1,-1],[0,0],[0,0],-\rangle$, then the value of $\hat{d}_j; j=2,3,4,5,6$ can be obtained as follows:

Step 3: Compute the temporary label for each vertex $j=2,3$ that incident from $i=1$. (Vertex 2 and vertex 3 are incident from (the last permanently labeled) vertex 1). Then, the value of $\hat{d}_2$ and $\hat{d}_3$ as follows:

$$\hat{d}_2=\langle\hat{d}_1\oplus\hat{d}_{12}\rangle$$
$$=\langle[0.6,0.8],[0.5,0.7],[0.4,0.6],[-0.2,-0.1],[-0.3,-0.2],[-0.4,-0.3]\rangle$$
$$\hat{d}_3=\langle\hat{d}_1\oplus\hat{d}_{13}\rangle$$
$$=\langle[0.3,0.4],[0.2,0.5],[0.1,0.2],[-0.4,-0.3],[-0.6,-0.4],[-0.8,-0.6]\rangle$$

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Since minimum occurs corresponding to vertex 1, thus, the list of labeled vertices (temporary and permanent) becomes:

Vertices	Weight	Status
1	$\langle[0,0],[1,1],[1,1],[-1,-1],[0,0],[0,0],-\rangle$	P
2	$\langle[0.6,0.8],[0.5,0.7],[0.4,0.6],[-0.2,-0.1],[-0.3,-0.2],[-0.4,-0.3],1\rangle$	T
3	$\langle[0.3,0.4],[0.2,0.5],[0.1,0.2],[-0.4,-0.3],[-0.6,-0.4],[-0.8,-0.6],1\rangle$	T

Step 4: To compare the weight for each vertex (among temporary labels), calculate the score function:

$$S_{2,1}\left\langle \begin{matrix}[0.6,0.8],[0.5,0.7],[0.4,0.6],\\ [-0.2,-0.1],[-0.3,-0.2],[-0.4,-0.3]\end{matrix}\right\rangle = \frac{1}{12}\left(\begin{matrix}0.6+0.8+1-0.5+1-0.7+1-0.4+1-0.6+1+\\ (-0.2)+1+(-0.1)-(-0.3)-(-0.2)-(-0.4)-(-0.3)\end{matrix}\right)$$

$$= 0.5083$$

$$S_{3,1}\left\langle \begin{matrix}[0.3,0.4],[0.2,0.5],[0.1,0.2],\\ [-0.4,-0.3],[-0.6,-0.4],[-0.8,-0.6]\end{matrix}\right\rangle = \frac{1}{12}\left(\begin{matrix}0.3+0.4+1-0.2+1-0.5+1-0.1+1-0.2+1+\\ (-0.4)+1+(-0.3)-(-0.6)-(-0.4)-(-0.8)-(-0.6)\end{matrix}\right)$$

$$= 0.6167$$

Step 5: Since the weight of $S_{2,1} < S_{3,1}$, thus, the status of vertex 2 is changed to permanent.

Step 6 and 7: If all vertices are permanently labeled, the algorithm terminates. Otherwise, repeat Step 3. Table 2 shows the required shortest path from the source vertex, V_1 to the destination vertex, V_6.

Table 2. IVBN-SPP Dijkstra's algorithm

Vertices	d_i	The shortest path from vertex 1 to j^{th} vertex
2	$\langle[0.6,0.8],[0.5,0.7],[0.4,0.6],[-0.2,-0.1],[-0.3,-0.2],[-0.4,-0.3]\rangle$	$1\rightarrow 2$
3	$\langle[0.3,0.4],[0.2,0.5],[0.1,0.2],[-0.4,-0.3],[-0.6,-0.4],[-0.8,-0.6]\rangle$	$1\rightarrow 3$
4	$\langle[0.68,0.88],[0.15,0.42],[0.16,0.64],[-0.06,-0.02],[-0.72,-0.52],[-0.64,-0.51]\rangle$	$1\rightarrow 2\rightarrow 4$
5	$\langle[0.65,0.76],[0.12,0.4],[0.03,0.08],[-0.2,-0.12],[-0.84,-0.7],[-0.98,-0.88]\rangle$	$1\rightarrow 3\rightarrow 5$
6	$\langle[0.744,0.916],[0.045,0.21],[0.016,0.192],[-0.03,-0.008],[-0.832,-0.616],[-0.892,-0.804]\rangle$	$1\rightarrow 2\rightarrow 4\rightarrow 6$

5. CONCLUSION

The use of IVBNN as weights in Dijkstra's algorithm expresses more precision and reliability than the existing algorithm. This study will be very helpful to the new researchers to propose novel concepts to solve the shortest path problem. Based on this present study, new algorithms and frameworks will be designed to find the shortest path for a given network under various types of sets environments.

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INTANGIBLE ASSET CALCULATOR: THE MODIFIED VAIC MODEL

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Abstract

Modified Value Added Intellectual Capital Calculator or MVAIC calculator calculates the efficiency level of firms' resources. The MVAIC model is the modified model of VAIC. It is based on the assumption that both, intellectual capital and physical capital, are a function of production and mathematically computed as MVAIC = ICE + CEE. Intellectual capital efficiency (ICE) is the sum of human capital efficiency (HCE), structural capital efficiency (SCE), and relational capital efficiency (RCE), which are proxies for intellectual capital, and capital employed efficiency (CEE) represents physical capital. To use this calculator, three steps are to be considered; step 1 is the input level by keying in operating profit (OP), employee costs (EC), depreciation (D), and amortization (A) to generate value-added (VA) via this equation: VA = OP + EC + D + A and total assets (CE), step 2 is the output level whereby the calculator will generate efficiency scores of HCE through HCE = VA/HC, SCE through SCE = VA – HC/VA, RCE through Relational Capital/VA, and CEE through CEE = VA/CE and finally in step 3, the calculator will compute the value of MVAIC by combining the total value of all the efficiency (HCE, SCE, RCE, and CEE). This paper has two objectives, to illustrate the use of the calculator and to discuss the contribution of the calculator. The MVAIC calculator is an innovative product because it is unique, easy to operate, user-friendly, and can be used anywhere and anytime without hassle. The MVAIC calculator will assist and guide company managers and decision-makers to effectively allocate company resources. The novelty of this calculator is primarily created for calculating intangible assets; this is the first handy calculator to measure intangible that will be a valuable tool for the companies in the Knowledge-Based Economy.

Keywords: Intangible Asset, Firm's Financial Performance, MVAIC Calculator, Knowledge-Based Economy, Intellectual Capital.

1. INTRODUCTION

Business nowadays has been more complex than before. The world becomes distinctive each second, so does the business condition. Previously, in the old economy, the effectiveness of developing economy depended on the employments of traditional production factors like land, labour, capital, and entrepreneur in making a value-added to the well-being [1]. Traditional accounting strategies look backward into the past and measure physical assets only. However, in the twenty-first century, new techniques in value

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creation have contemplated intangible assets (intellectual capital) for a thriving competitive market [3]. Though intellectual capital is connected to a company's significant value-added and growth, intellectual capital is not easy to identify, capture, and report in financial statements. This is primarily due to the content analysis used to extract the information manually from the firms' annual reports.

Moreover, Malaysia is adopting specific accounting standards such as Malaysian Financial Reporting Standard 138 (MFRS 138). The particular act states that the MFRS 138 on intangible assets prohibits the recognition of internally generated assets in financial statements, such as goodwill, customer-related, and technology-related. This means that the identification and measurement of the intellectual capital of intangible assets do not conform to traditional accounting practices [7]. Since the importance of intellectual capital is undeniable [9], thus this paper is introducing a web-based application product named MVAIC calculator to compute intellectual capital. This paper has two purposes: one is to explain the purpose of calculators. The other is to discuss the contribution of calculators to calculating the level of resource efficiency of enterprises. The rest of this article is divided into methodology, discussion, and conclusion.

2. MATERIALS AND METHODS

Below is the data for Maybank from 2015-2020; the banking sector has been chosen as a study sample because it is categorized in the knowledge-intensive sectors, and most of the studies on intellectual capital are related closely to the banking industry [1]. In calculating the intellectual capital, there are several steps to be followed: Step 1 is to establish the Value Added (VA). VA is derived from the equation: VA = OP + EC + D + A, where OP is operating profit, EC is employee costs, D is depreciation, and A is amortization. In step 2, the calculator will generate efficiency scores of HCE, RCE, SCE, and CEE. Finally, in step 3, the calculator will compute the value of MVAIC by combining the total value of all the efficiency (HCE, SCE, RCE, and CEE).

3. RESULTS AND DISCUSSION

To use the calculator, three simple steps are taken. Step 1 requires data extraction from the firm's annual report, such as operating profit, employee costs, depreciation, amortization, and total assets. To illustrate the use of the MVAIC calculator, data from the audited annual report of Maybank from 2015-2020 is employed as follows:

Table 1: Items for intangible assets calculation from Maybank annual report.

YEAR	OP	EC	D	A	VA
2015	9,151,548,000	5,765,147,000	374,649,000	222,665,000	15,514,009,000
2016	8,844,450,000	5,638,874,000	379,135,000	254,089,000	15,116,548,000
2017	10,098,096,000	6,128,012,000	418,917,000	245,360,000	16,890,385,000
2018	10,901,346,000	6,449,524,000	400,991,000	220,814,000	17,972,675,000
2019	11,013,880,000	6,625,037,000	297,231,000	247,363,000	18,183,511,000
2020	8,656,956,000	6,563,189,000	311,984,000	283,348,000	15,815,477,000

Source: www.maybank.com.my/annual-report

The data from step 1 will be used to calculate the efficiency and total MVAIC values. Each of the data has to be keyed in into the calculator to generate step 2 and step 3 values as below.

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Step 2: calculate the efficiency level

Table 2: Items for efficiency level calculation.

YEAR	HCE	SCE	RCE	CEE
2015	3.570	0.720	0.039	5.829
2016	3.530	0.717	0.035	5.824
2017	3.605	0.723	0.030	6.410
2018	3.639	0.725	0.030	7.201
2019	3.631	0.725	0.033	7.785
2020	3.163	0.684	0.024	7.167

Step 3: Calculate the total MVAIC of Maybank from 2015-2020

Table 3: Items for MVAIC calculation.

YEAR	HCE	SCE	RCE	CEE	Total MVAIC
2015	3.570	0.720	0.039	5.829	10.158
2016	3.530	0.717	0.035	5.824	10.106
2017	3.605	0.723	0.030	6.410	10.768
2018	3.639	0.725	0.030	7.201	11.596
2019	3.631	0.725	0.033	7.785	12.173
2020	3.163	0.684	0.024	7.167	11.037

The MVAIC results above showing the Maybank's efficiency level from investment in HCE, RCE, SCE, and CEE is at upwards movement from 2015-2019. However, a decreasing trend in 2020. This might be due to the pandemic across the globe; thus, the economies have been hit hard and fast by COVID-19. The table above concluded that Maybank's CEE is at the highest level then followed by HCE. Practically, a higher return on CEE signposts more efficient companies as it is one of the components of the intellectual capital model that combines capital productivity [6]. Since Maybank is the performing bank in Malaysia, hence this is also theoretically supporting the finding.

4. CONCLUSION

In conclusion, the MVAIC calculator contributes to measuring intellectual capital for all the firms from all over the sectors and industries. It has benefits that are unique, handy, user-friendly, and reliable tools for calculating intangible assets that can be used anywhere and anytime without hassle. Since this calculator is easy to use; thus it is encouraging in intangible asset disclosure and helps in the country's knowledge-based economy and economic growth.

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MORINGA OLEIFERA BARK – SILICONE BIOCOMPOSITE (MOBSIL): A NOVEL SOFT COMPOSITE MATERIAL FOR CUSHIONING APPLICATIONS

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Abstract

Moringa Oleifera Bark - Silicone Biocomposite, commercially introduced and copyrighted as MOBSil, is a biocomposite material by reinforcing moringa oleifera bark fibres with silicone rubber. To this day, the development of silicone rubber that reinforced with Moringa Oleifera (MO) bark is still lack. MO bark contains medical properties which can give benefit to the development of silicone composite. Therefore, reinforcing MO Bark fibres could potentially embed all these superior qualities into silicone rubber. The fabrication of MOBSil samples includes harvesting MO bark to produce fibres. Various compositions of fibre were mixed with Ecoflex 00-30 silicone matrix, moulded and cured accordingly. The early stage includes quantifying the mechanical properties of MOBSil to suit cushioning applications. Preliminary results prove that the MOB fibre – silicone reinforcement has improved the modulus of elasticity. This newly developed biocomposite a.k.a green material supports the United Nation Sustainable Development Goals (UN-SDG Number 13 and 9) as this new biomaterial could contribute towards sustaining climate; as well as innovative invention towards industrial applications. In terms of sustainable supply, the plant belongs to the Moringaceae family, has drought-tolerant properties as it can grow in Ethiopia, Pacific Islands including Malaysia. Therefore, the research and development of Moringa Oleifera Bark - Silicone Biocomposite (MOBSil) has great potential and could be a significant contribution to Malaysian economy.

Keywords: Moringa Oleifera, Silicone rubber, Biocomposite, Mechanical properties, Cushioning Application.

1. INTRODUCTION

Silicone rubber is a soft substance with hyperelastic characteristics that belongs to the elastomer group. Its structure is made up of an "inorganic" repeating unit by oxygen (O) and silicon (Si) atoms[1]. Due to their soft characteristics, it is used in the development of soft robotic and custom wearable assistive devices[2]. However, silicone rubber has weak intermolecular interactions among polymer chains, resulting in poor mechanical strength. Thus, it usually can be improved by reinforced with some filler[3][4]. The development of silicone composites has become attention for many applications, for instance, LED

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encapsulants[5], sensor and actuator[6], and insulation[7]. Composite materials made from natural, renewable sources have attracted a lot of attention in recent years, due to growing awareness and push for environmentally sustainable technologies [8]. Besides, due to easy availability and renewability, natural fibre can be used as an alternative resource for synthetic fibre as a reinforcing material. Jute, hemp, sisal, kenaf, coir, banana, bamboo, sugarcane, and flax, have superior mechanical characteristics and are less expensive than man-made fibres. Furthermore, natural fibres also can reduce energy consumption, less health risk and are nonabrasive to the equipment, and non-irritation material to the skin[9]. However, research incorporating natural fibre into silicone rubber are still less in number.

Thus, this study introduced moringa oleifera plant, also known as 'Miracle Tree'. In conjunction to improve the mechanical strength of the silicone rubber, the bark of the tree was used as the reinforcing material for the silicone rubber. Nevertheless, there is no such evidence reported in reinforcing moringa oleifera bark(MOB) into silicone rubber and being tested under the uniaxial tensile test. Based on the literature, MOB contains alkaloids (moringine and moringinine) and minerals as it can provide medicinal advantages[10]. According to Zaffer et al.[11], MOB can act as a potential treatment for different infections caused by microbes as it can break down microorganisms or bacteria. Besides, George et al [12] also reported that the bark of moringa oleifera can act as a sorbent agent for the contaminated water which can remove the presence of metal ions such as lead, nickel and zinc. Despite its unique properties, limited study has reported on reinforcing the MOB into silicone rubber.

Therefore, this study aims to assess the mechanical properties of Moringa oleifera barks – silicone biocomposite under uniaxial tensile test and, quantify its mechanical constants via hyperelastic constitutive model; Neo Hookean model. This research collaborates with GV Medhini Sdn Bhd, which aims towards producing and commercialising industrial-grade cushioning products. This could contribute to the national agenda, namely Shared Prosperity Vision 2030 (WKB KEGA-4).

2. MATERIALS AND METHODS

2.1. Material preparation and specimen fabricating

Moringa oleifera stems were retrieved at Kota Kemuning, Selangor, Malaysia. This study used EcoFlex 00-30 Platinum Cure Silicone rubber from Castmech as the matrix. The barks were peeled off from moringa oleifera stem and cleaned with tap water to eliminate any contaminants before being dried for 24 hours at 100 °C using a drying oven. To transform the bark into powder, it was crushed into small chip particles with a crusher machine and milled at 270 rpm for 30 seconds four times in a planetary mono mill and sieved at 150 μm in size. There 0wt%, 4wt%, 8wt%, 10wt%, 12wt% and 16wt% of MO bark fibre content compositions were fabricated in this study. The fibre was mixed with silicone rubber matrix in a cup and the mixture was stirred using a wooden stick. The mixture was poured and cured for 4 hours at room temperature.

2.2 Uniaxial Tensile Test

Tensile tests were performed using an Instron 3382 97 universal testing machine (Norwood, MA, USA) in accordance with ASTM D412. The specimen was subjected to a uniaxial load at a rate of 500 mm/min until a failure state was reached.

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2.3 Determining the Hyperelastic Material Constant

The composites in this study were presumed as hyperelastic material, since they possessed soft characteristics, and extremely elastic which acted like rubbery materials. Due to this, the stress-stretch relation has adapted via hyperelastic constitutive model to illustrate their deformation behaviour. The equation below represents the Neo Hookean model in terms of stress-stretch relation. The material constant of composite is determined through these mathematical equations using Solver Tool in Microsoft Excel.

$$\sigma_E = (2\,C_1)\left(\lambda - \frac{1}{\lambda^2}\right) \quad (1)$$

$$\lambda = \varepsilon + 1 \quad (2)$$

where, σ_E is the engineering stress (MPa), C_1 is material constant (MPa), λ is stretch, and ε is Strain (m/m).

3. RESULTS AND DISCUSSION

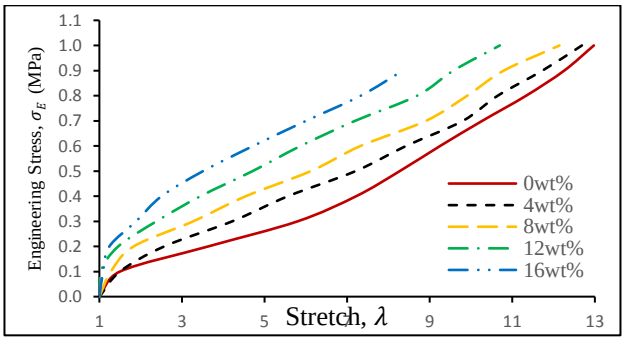

Figure 1. Average tensile propoerties of pure silicone and moringa oleifera barks – silicone biocomposite

Table 1. Material constant for pure silicone and moringa oleifera barks – silicone biocomposite

Weightage (%)	Material constant, C_1 (MPa)	Maximum Stretch, λ
0	0.03619	11.07 ± 1.08
4	0.03738	11.99 ± 0.83
8	0.04096	10.93 ± 0.84
12	0.04846	10.14 ± 0.75
16	0.05880	8.01 0.62

The stress-strain curves of MOBSil biocomposite were observed to deviate distinctly compared to pure silicone as seen in Figure 1. Pure silicone rubber (0wt%) exhibits a highly nonlinear elastic curve with the largest stretch value of 11.07. Pure silicone rubber demonstrated a significant rate of stretch with only a little stress load, allowing it to elongate more than the MOBSil specimen. In comparison to the MOBSil specimen, the curve trend of pure silicone specimens tends to bend in a concave tendency during 0.1MPa to 0.6MPa stress load. Besides, the nonlinearity of the trend curve in Figure 1 has decreased gradually as MOB fibre content increases. This can be explained because the presence of MOB fibre have resistance in deformation when the load is applied, which similar with previous studies [13], [14]. This is due to the silicone rubber with MOB fibre added has a higher resistance to deformation when the stress load was applied. Table 1 shows that the material constant obtained from the equation 1 and 2 were rises in parallel with the increment of MOB fibre content. The material constant defines the resistance of the material to the elastic deformation under stress. It may be inferred that the 16wt% of MOB fibre content in silicone rubber, has better resistance to the stress load as it has the highest value of material constant, C1 which is 0.0588MPa. This proved that the reinforcement of MOB fibre has improved the mechanical strength of silicone rubber.

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4. POTENTIAL APPLICATION OF PRODUCT

Due to its improved elasticity and excellent cushioning effect, moringa oleifera bark - silicone biocomposite (MOBSil) may be utilised in applications that need low load, such as shoe insoles. Besides, MOBSil also possessed lightweight and anti-slip properties which can be used as innovative grip material like racket grip and anti-slip mat. Other potential applications are drink coaster and cool grip silicone pot holder. These products may be vast in the current market, however producing these cushioning products using MOBSil, is more environmentally friendly and support sustainable life.

5. CONCLUSION

A novel type of silicone biocomposite material has been produced using natural fibre (moringa oleifera barks) as the reinforcement filler to support environmental and sustainability development. MOBSil has improved the mechanical properties of silicone rubber based on the stress-stretch curve that behave less nonlinear compared to pure silicone. This study supports the United Nations Sustainable Development Goals (UN-SDG Number 13 and 9) and Shared Prosperity Vision 2030 (WKB KEGA-4). This will promote other researcher to develop material using bio-based material as reinforcement material instead of using synthetic fibre. Synthetic fibres like glass fibres, carbon fibres, Kevlar and nylon are not safe to the environment which can lead to climate change due to the carbon dioxide(CO2) emission in the atmosphere during production process. Therefore, this study will increase the awareness among researcher about the sustainability of earth in developing new material.

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APPLICATION OF AGRICULTURAL WASTE AS AN ABSORBING MATERIAL IN THE PRODUCTION OF ANTI-MICROWAVE BRICK WALLS

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Abstract

Microwave absorbing materials have received great attention over the years for various applications such as radar, stealth technology, and an anechoic chamber. The growth of wireless devices, networks and the increase in the base station number has raised radiation. This radiation adversely affects human health and interferes the electronic systems. Therefore, the effective elimination of this radiation is essential for human health and the proper working of electronic equipment. This project aims to develop anti-microwave brick walls with the composition mixture of agricultural wastes and to optimize the absorption performance of anti-microwave brick walls with different percentages of agricultural waste. In this project, a solid brick wall design with a standard commercial size is proposed. Agricultural waste material, which is coconut husk, is used in bricks production. The study also includes a comparison of the absorption performance of anti-microwave bricks with commercial concrete bricks. The performance of the bricks was measured by using Naval Research Laboratory (NRL) arch-free space method. A frequency range from 1GHz to 12GHz is used. The measurement results of anti-microwave and commercial concrete bricks were compared and analyzed. The study shows that the anti-microwave brick walls have an excellent absorption performance compared to the commercial concrete bricks, and anti-microwave brick walls with a higher percentage of coconut husk have the best absorption performance -15.35dB at the frequency 10GHz.

Keywords: Anti-microwave bricks walls, agricultural waste absorbing materials, coconut husk

1. INTRODUCTION

Anti microwave materials or electromagnetic radiation absorbing materials have received great attention over the years for various applications such as electromagnetic compatibility (EMC), communication, stealth technology, and anechoic chamber [1-3]. Anti-microwave materials were used to eliminate the electromagnetic radiations. The application of these materials is essential to protect the electronic and communication equipment from external electromagnetic interferences and protect humans from the adverse health effect of exposure to electromagnetic radiation [4,5]. This unwanted radiation is mostly generated from wireless communication devices such as mobile phones and wireless networks [3,6]. The rapid increase of wireless technologies used in our daily life has increased the amount of radiation spread

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around that causes electromagnetic pollution. In this project, brick walls were fabricated as anti-microwave materials, and the agricultural waste mixture was used in the brick manufacturing. Bricks are the fundamental materials used in building construction, especially for building walls. Nowadays, there are many designs and sizes of bricks available in the market [7,8]. Solid brick with standard commercial size, which are 225mm length, 125mm depth and 75mm height was designed. Coconut husk ash is obtained from the burning dried coconut husk. The husk is regarded as agricultural waste material or crop waste produced from the plants (coconut) [9,10].

2. MATERIALS AND METHODS

In this project, the coconut husk ash mixture was used in anti-microwave brick manufacturing. The resistivity and permittivity test was done on the chosen materials to obtain conductivity and permittivity values of the materials. The flowchart shown in Figure 1 shows the manufacturing process of the anti-microwave bricks. The process is divided into five stages; materials preparation, proportioning, mixing, molding, and drying and curing. The proportion of the materials for anti-microwave bricks is divided into four sets with different percentages of coconut husk ash; 10%, 20%, 30%, and 40%. Table 1 shows the coconut husk ash and cement composition ratio. The mixture of the materials was poured into a mold, and the molded bricks cannot be remove from the mold immediately, as they may get damaged. Therefore, the bricks should be dried and cured for about seven to 14 days.

Table 1. Composition mixture ratio of materials

Set	Coconut Husk Ash	Cement
A	10	90
B	20	80
C	30	70
D	40	60

Reference: Nur Hashira Narudin, 2021

NRL Arch free space method is used to measure the performance of the anti-microwave bricks. The result of the absorption level of the bricks was displayed on the graph of magnitude (dB) versus frequency (GHz). Figure 2 shows the setup of the NRL Arch free space measurement method.

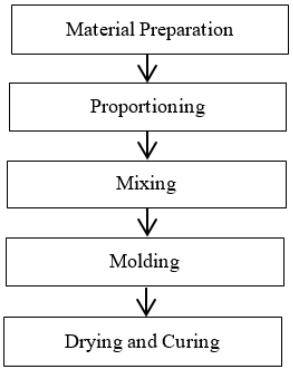
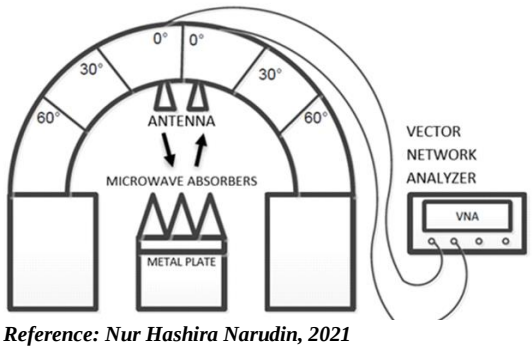


Figure 1. Manufacturing Process of Anti-Microwave Bricks



Reference: Nur Hashira Narudin, 2021

Figure 2. Setup of NRL Arch Free Space Method

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3. RESULTS AND DISCUSSION

The measurement results were generated in a graph of Frequency (GHz) versus absorption (dB), and divided into four frequency bands; L-band (1-2GHz), S-band (2-4GHz), C-band (4GHz-8GHz), and X-band (8-12GHz).

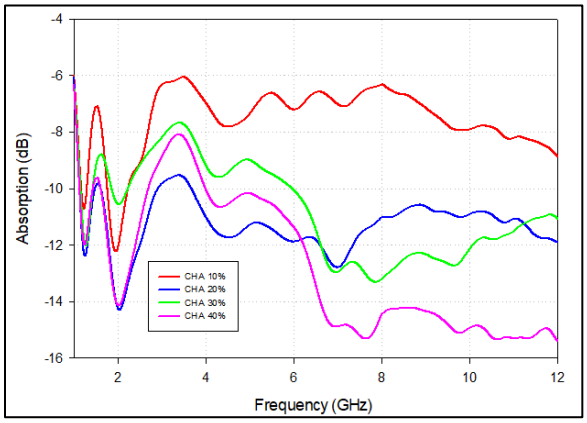

Figure 3. Absorption Performance Graph of Anti-Microwave Bricks

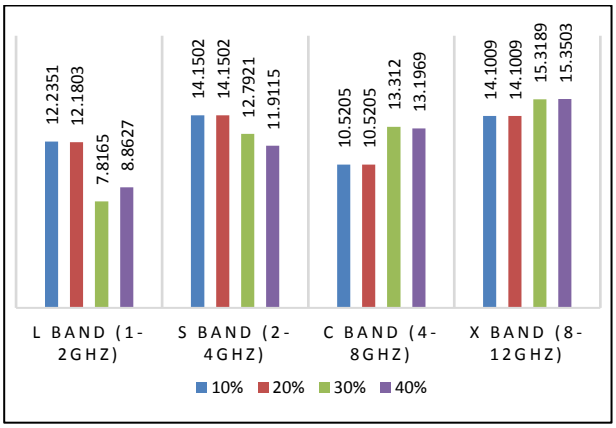

Figure 4. Bar Graph of Absorption Performance Data (Maximum)

Table 2. Absorption Performance Data of Anti-Microwave Bricks

Frequency	Absorption (dB)			
	10%	20%	30%	40%
L band (1-2GHz)	-12.2351	-14.1502	-10.5205	-14.1009
S band (2-4GHz)	-12.1803	-14.1502	-10.5205	-14.1009
C band (4-8GHz)	-7.8165	-12.7921	-13.3120	-15.3189
X band (8-12GHz)	-8.8627	-11.9115	-13.1969	-15.3503

Reference: Hashira Narudin, 2021

Figure 3 shows the NRL Arch free space measurement result at 0° of the anti microwave brick walls made with different percentages of coconut husk ash (CHA), which are 10%, 20%, 30%, and 40%. Figure 4 shows the bar graph of the maximum absorption performance data of anti-microwave bricks and the Table 2 shows all the maximum absorption data for each frequency band. For L and S band, brick containing 20% of CHA has the best performance with the absorption -14.15dB at 2GHz, followed by 40% CHA with the absorption -14.10dB at frequency 2GHz, 10% CHA with the absorption -12.23dB at frequency 2GHz, and 30% CHA has the least performance with the absorption -10.52dB at 2GHz. For C band, brick containing 40% has the best performance with the absorption -15.31dB at 7.65GHz, followed by 30% CHA with the absorption -13.31dB at frequency 7.86GHz, 20% CHA with the absorption -12.79dB at frequency 6.98GHz and 10% CHA has the least performance with the absorption -7.81dB at frequency 4.46GHz. For X band, brick containing 40% CHA has the best performance with the absorption -15.35dB at frequency 10.62GHz, followed by 30% CHA with the absorption -13.19dB at frequency 8GHz, 20% CHA with the absorption -11.91dB at frequency 12GHz, and 10% CHA has the least performance with the absorption -8.86dB at frequency 12GHz. From the overall observation, the absorption performance of the anti-microwave bricks contains a low percentage of coconut husk ash (20%) shows good absorption at the low-frequency band (1GHz to 6GHz), while anti-microwave bricks contain a high percentage of coconut husk ash (40%) shows good absorption at the high-frequency band

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(6GHz to 12GHz). Based on previous study, microwave absorber with size of 22.86mm length, 10.16mm depth and 2mm height produce reflection loss with an average of -51.18dB in frequency range of 8-12GHz (X band)[11]. Therefore, for this study, more analysis and improvement in term of design or size need to be done to increase the absorption performance of the anti-microwave bricks.

4. CONCLUSION

The result of the anti-microwave brick walls containing the highest percentage of coconut husk ash produced the best absorption performance result, with -15.35dB at the frequency 10GHz (X band). The improvement of anti-microwave brick with better absorption performance can be designed through further study and using other materials as an absorbing materials.

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FILE ENCRYPTION SYSTEM USING FLASH DRIVE AUTHENTICATION (FESFA)

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Abstract

Nowadays, applying security to personal documents is a must. Most of the people keep their personal files in their personal laptop or hard drive. Documents in the computer are not secured and can be accessed by anyone because of the rising number of hackers and cyber threats. To mitigate such threats, this project is focusing on developing an application that can encrypt important files and documents while using flash drive as authenticator. The application deployed SHA256 encryption to generate user's credentials into hash format and stored inside the flash drive that acts as authenticator. The selected document was encrypted using AES encryption algorithm to secure the access. Only authorized user who hold the flash drive with the user's credentials has the right to encrypt or decrypt the document(s). The combination of SHA256 and AES algorithms is believed to increase the security of the files and documents. The system was developed using Visual Basic and C#, and prototyping has been used as the development methodology. Even though there is room for improvement, generally the project has been successfully developed and tested, and it is hoped that the application can be used by the user.

Keywords: Encryption, Decryption, AES encryption, SHA256 encryption, Authenticator

1. INTRODUCTION

Computer security is the way toward forestalling and identifying unauthorized utilization of the computer. Therefore, prevention measures may assist users with halting unauthorized users or in other words hackers from getting other people's document and also accessing people's computer. Even though sometimes users feel safe when they stored their personal documents, confidential documents and any other documents that are not supposed to be leaked or shared with public, hackers may still get into their computer system and steal it. The growing number of hacking and cyber threats is what makes personal files and confidential data at risk as seconds goes by [1].

Encryption is one of the solutions to overcome network security issue for users to protect sensitive or confidential data from unauthorized users [2]. Thus, this project is focusing on encrypting files or

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documents that are classified as sensitive and confidential with additional security added using authentication key.

SHA256 was designed to be used as cryptographic hash function but it is now known to be used as checksum to verify data integrity. One technique to secure data or confidential file is cryptography [3]. It is the process of changing information in such way to make it unreadable by unauthorized user using cryptography algorithm and encryption key [4].

In this project, SHA256 is used to encrypt user's credentials and act as authentication key to run the software before encrypting or decrypting the user's files. After that, AES encryption algorithm is used to encrypt or decrypt user's desired files. The AES algorithm is well known for its simplicity and high efficiency than other algorithms [5].

2. MATERIALS AND METHODS

The user interface of this application and hashing the user credentials are designed and coded using Visual Basic Code (VB) in Microsoft Visual Studio. Whereas, C-Sharp (C#) is used to perform the programming function for AES encryption and decryption.

Figure 1 illustrates the logical diagram of this application. A flash drive is connected to the computer and user enter his / her credentials. The credentials are then rooted into the flash drive before users can perform encryption or decryption on the filer or documents.

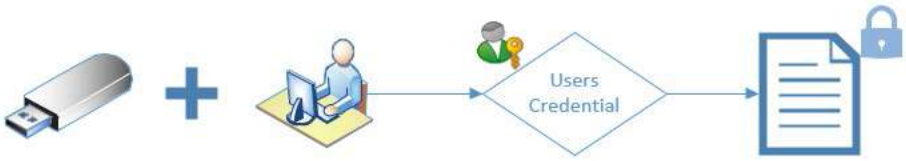

Figure 1. The logical diagram

The following diagram shows the flowchart to portray the whole process of creating the credential and performing the encryption or decryption on a file or document.

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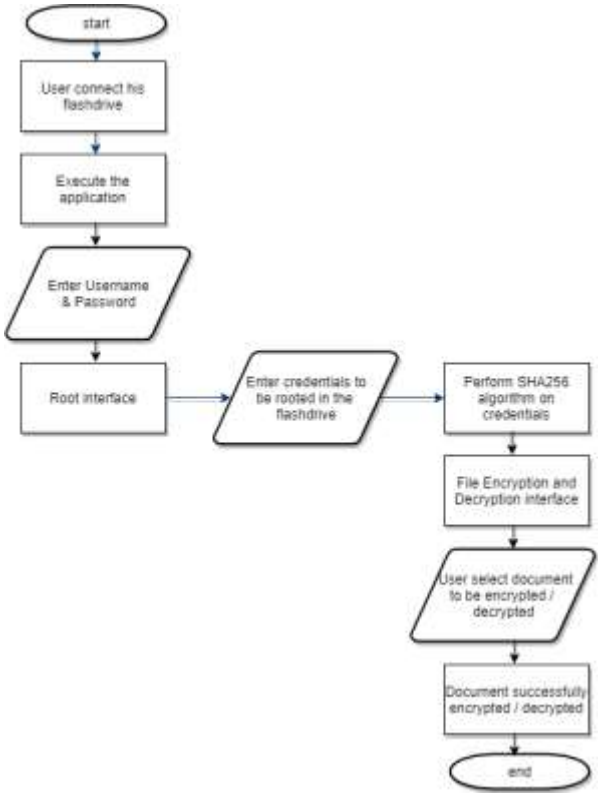

Figure 2. The process flow of the application

3. RESULTS AND DISCUSSION

The File Encryption System using Flash Drive Authentication managed to secure the access to the documents. When documents are in encryption state, user must keep the flash drive because it is the authentication key. The only way to decrypt the documents to its normal state, user has to run the application, plug in the flash drive and only then user have access to the encrypted or decrypted page in the application. Furthermore, user also have to memorize the password that they set when documents are being encrypted. The following section briefly explain how the application works.

3.1. The Home Page

Figure 3 shows The Home Page that will be prompted once the correct username and password are entered by the user in the login page. Home page displays information regarding the flash drive status, ownership and version of the application. Furthermore, if the user presses the start button without rooting the flash drive beforehand an error message will be displayed. Once the flash drive is rooted with the user's credentials, a message "*You can now begin encrypt/decrypt file*" will appear, replacing the message "*Flash Drive is not yet root!*", as shown in figure 3. Afterwards, user can press the start button to go to the next page and begin the encryption or decryption. The next page will be the root page, shown in Figure 4. Here, the user will need to enter username, company and access code to be rooted inside the flash drive as authenticator. Once successful, a pop up will appear to indicate that the file has already

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rooted. At this phase, SHA256 was generated. The user will need to restart the application by pressing the restart button at the Home Page to proceed.

Figure 3. The Main Page

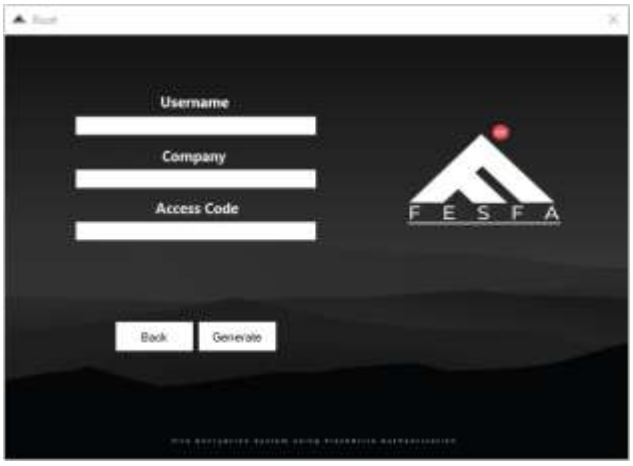

Figure 4. The Root Page

3.2. Encrypt or Decrypt Page

Figure 5 shows the final page which is the encrypt or decrypt page. In this page, the user will only need to drag and drop their selected files into the box which are stated to lock or unlock their desired files or documents. Figure 6 shows the password box for the user to enter. It is an additional security to apply to the encrypted file. The same password box also will appear when the user wants to decrypt back their encrypted file.

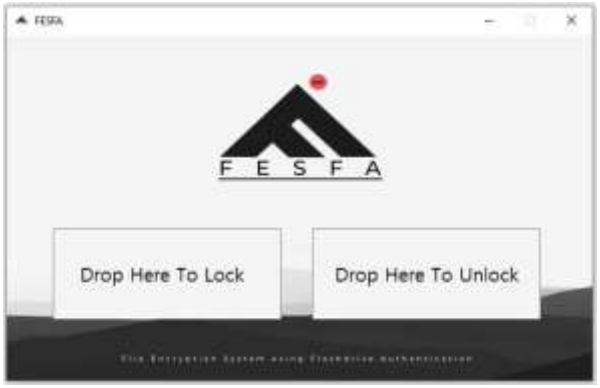

Figure 5. Encrypt or Decrypt Page

Figure 6. Password Box

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Different type of files has been tested using FESFA, which include text file (.txt), MS Word file (.doc), audio file (.mp3) and image file (.png). All files were successfully encrypted and decrypted.

4. CONCLUSION

As a conclusion, FESFA aims to ease users to secure documents that are confidential and sensitive to the eyes of public. Although it can also be used to secure personal files that are not meant to be shared or viewed by unauthorized users. Thus, by using the application that provides multi-layered security, documents are secured and inaccessible without its readable form. From login interface, to encrypt the user's credentials and lastly to encrypt desired documents are all to provide the security to secure desired files.

In a nutshell, the application cannot erase the existing user's credential that is meant as the key to start encrypting or decrypting the document. Due to this limitation, the user needs to simply format his / her flash drive by using the format functions in the OS itself if he / she cannot retrieve the credentials of the authenticator.

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Thank you to those who have given a lot of guidance and assistance on doing this project. A special gratitude to all lecturers, whose contributed in stimulating suggestions and encouragement, helped to coordinate this report from the very start. Equally important, a special thanks to my supervisor, Puan Zarina Zainol who assisted in giving suggestions and guidance about this project and report until the very end of this project development.

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SECURING WEB BROWSER: MALICIOUS ADVERTISEMENT BLOCKER (ADVBLOCKER)

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Abstract

Malware advertising is an attack that occurs when an attacker injects malicious code into an advertisement network and redirect users to malicious websites. The development of this project help users especially users who are not proficient in using computers when browsing the website safely from any malicious advertisements. Advertisement blocker (ADVBlocker) eliminate online advertisement while browsing the internet and this program reduce the opportunity for malvertising attacks. This program targeted malware advertisements such as pop-ups, banner advertisement and other common forms of online advertisement. In developing this project, we used python and javascript languages to create a browser extension for ADVBlocker. The scope of this study is blocking the malicious activity of advertisements on users' websites while using the internet. Results from the development of this project, an extension has been developed names Advertisement Blocker (ADVBlocker) where blocked the pop-up advertisement while users' browse the requested website. In this project, web browser extension filtered out any unwanted element especially the malicious advertisement automatically for the user. User can also filter the advertisement manually by having their own whitelist. In conclusion, ADVBlocker can help users by blocking malicious advertising activities on websites. ADVBlocker can also count the number of malicious advertisement that have been blocked.

Keywords: Advertisement blocker, malware advertising, malicious code, network security, cyber threat

1. INTRODUCTION

Malware advertising is an attack in which perpetrators inject malicious code into legitimate online advertising networks. The code typically redirects users to malicious websites. Attackers use a number of ways to insert the malicious code into the advertisement. The most notable one is injecting it within a flash video. The videos can be injected with malware even without having the user click on the video. Flash files might also load a pre-roll banner which a static image that the user can view while the file is loading. Attackers can inject malicious code into the pre-roll banner, and it can run even without the user clicking on the video. When a website displays a page that contains an advertisement, it pushed the advertisement to the user via third parties servers. One of these third party servers may be compromised by an attacker, who can add malicious code to the web advertisement payload. This phenomenon known

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as malware advertisement. By viewing the malware advertisement it usually can cause such as a *drive-by download*. This means installation of malware or adware to the computer not noticed by the user after user viewing the advertisement where later is redirected the user browser to a malicious site and display unwanted advertising, malicious content and pop-ups windows. Nowadays, most of the websites are catered with a many advertisements displayed on the webpages. This is happen because advertisement is the main source of income for the websites owner. In the case of Facebook, they use targeted advertising based on personal data processing and it is a source of revenue for data controllers [1]. However, there are unethical individual who decided to abuse the weakness and perform illegal practices such as malware advertising. Such illegal practices unknowingly computer users are likely to download malware files that will eventually cause problems to their computers. Reports in 2017 estimated the economic loss caused by malicious advertising to the online advertising sector [2]. Malicious advertisement happened in flash file where it allowed users to embed custom business logic which gave benefit to the attackers. The files look like an ordinary flash type file somehow it might have an encrypted redirect function to execute the custom business logic embedded into the effected ads once it is published [3]. To reduce damaged to the computer, the use of advertisement blocker is recommended to be placed on the user's browser. In this study, a proposed extension of advertisement blocker is developed and implemented to users' browser. In another study stated how adblock filter lists can provide a solution for users to know the origin, evolution, and effectiveness of filter lists [4]. In discussing about malicious advertising, web browsers cannot avoid that there are many malicious code where vulnerable to damage to the user's computer. Past studies have mention how researcher detect malicious advertisement using VirusTotal. What exactly happened is that the system extracts the detection ratio after loading the page and analyzes it. If the detection ratio is greater than one, the advertising is labeled as malicious, the URL is saved in the file *VirusTotaIResults.txt* and the malicious counter is incremented by one. Otherwise, the benign counter would be augmented by one. In the end, as classified by VirusTotal, researcher get the number of malicious ads and the number of benign ads [5]. This study is the main reference in developing this project.

2. RESEARCH METHODOLOGY

In this topic, the discussion explained on the research methodology in developing this project. To describe in more depth the activities, summarized table is shown in Table 1.0. The reference research method used in this study is SDLC which is divided into several phases. This research method began by conducting an information gathering from literature study to analysis past research on malware advertisement attacks and study the behavior of those malware advertisement. Next, this study also looked at the current malware advertisement detection and prevention algorithms and selected the appropriate algorithms based on quarantined log criteria. In the second phase, explained a flow design of malicious advertisement detection and defense algorithms to detect and defense Ad-syndication, Dynamic Delivery of Ads, Flash Ads and pop-up advertisement and propose a quarantines log to log specific information about the possible infected URL and ads. In the next phase, the proposed algorithms is implemented. In The fourth phase, we tested the proposed algorithms in terms of intelligent detection, detection efficiency and compatibility of defense. The last phase in our research study, where the experimental result is applied to the web browser.

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Table 1. Research Activities

Phases	Activities	Deliverables
Information Gathering	Study the behavior of malicious advertisement threat.	Observe and understanding types of malicious advertisement threat works.
Design	Explain contributions of research study, which are malicious advertisement detection and defense algorithms and report of attack mechanism.	Proposed the design of malicious advertisement detection and defense algorithms to detect and defense ad-syndication, dynamic delivery of advertisement, flash advertisement and pop-up advertisement.
Implementation	Develop the ADVBlocker using the proposed criteria.	Proposed a quarantined log as follows: 1. Infected URL 2. Infected advertisement Implement the proposed algorithms.
Testing	Execute the proposed algorithms to ad-syndication, dynamic delivery of advertisement, flash advertisement and pop-up advertisement.	Test and measure the proposed algorithms in terms of ability to detect and block malicious advertisement.
Evaluation and Validation	The results of experiment is compared in terms of intelligent detection, detection efficiency and compatibility of defense.	Present the results of the proposed algorithm to the web browser.

In describing the whole process of this study, the flow chart in Figure 1 describes the whole process for this study. Malicious advertisement detection is important an organization to detect malicious advertisement attacks because as it can result in damage to the organizational infrastructure. In our study as well, we developed the defensive criteria where it is used to blocks and mitigate malicious advertisement attack before it reaches to the user system. Later, we produced a report of attacks that can be identified by ADVBlocker by counting the number of advertisements that can be detected.

3. RESULTS AND DISCUSSION

The discussion in this subtopic looked at the accomplishments in developing ADVBlocker as we have proposed in this study. JavaScript and the Python language are used in developing this innovation,. The objective of this study is to block malicious advertisement activity in chrome browser. The construction of a browser extension that is a credential available in the basic web browser Chromium. From this extension, the development of ADVBlocker continues by calling various Chrome APIs to do various things that are useful for users. A useful feature of this ADVBlocker project is that a *popup style* menu is created to allow users to easily access advanced menus to turn on or off a specified webpage. The number of blocked advertisement is also displayed in this menu. The development of this ADVBlocker project can be obtained and it is an innovation that can have an impact on the security of internet users when browsing using a browser. After running an API as in Figure 2, users can get the number of advertisement that have been blocked. This research study has been successfully developed as shown in Figure 3.

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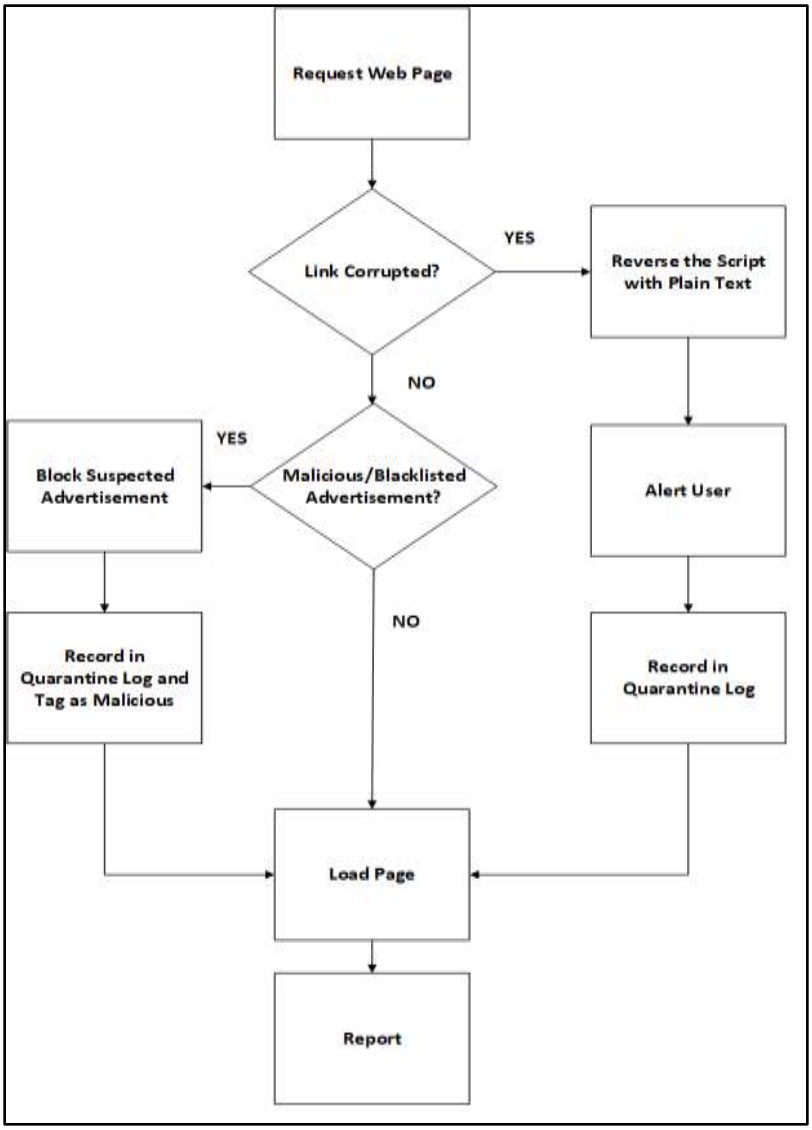

Figure 1. ADVBlocker Development Process Flow

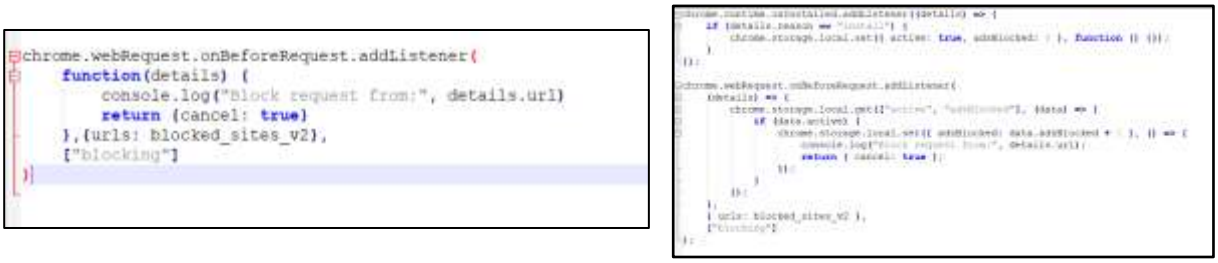

Figure 2. ADVBlocker Extension Development using JavaScript

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Figure 3. Web Browser Before and After Add In ADVBlocker

In conclusion, this study developed a browser extensions in blocking malicious ad activity on websites called ADVBlocker. ADVBlocker can also count the number of advertisement that have been blocked when displayed on the browser. Finally, the project has provided new knowledge to application developers on internet security in developing browser extensions.

4. CONCLUSION

To make the internet a safer place, we have suggested the development of the ADVBlocker. With this innovation, it is able to check and scan internet browser and successively block malicious advertising activities on websites. In addition, this innovation can also provide reports to internet users by counting the number of ads that have been successfully blocked. Although there is opportunities to improve for this study. There are several recommendations from this research project to overcome its limitations. This study did not look at Video-type advertisement. In the future, researchers can look into this type of advertisement. Researchers can also look into the blacklisting of URLs by users. This suggestion allows the user to add the current URL to the log. This will help the user by avoiding manual entry into the source code.

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DEVELOPMENT OF A CONCEPTUAL FRAMEWORK FOR PROJECT GOVERNANCE PRACTICES IN POVERTY ALLEVIATION PROGRAM IN MALAYSIA: AN EXPLORATORY STUDY

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Abstract

An exploratory study was conducted to determine the current state of project governance practices in the national poverty alleviation program and to serve as an input for the conceptual framework development. Survey questionnaires were used to obtain stakeholders' perspectives on governance practices in poverty alleviation programs. The stakeholders are public officials attached to the government ministries/agencies involved in the whole cycle of project management, such as planning, implementation, monitoring, operation, and evaluation. They were selected as a survey sample due to their involvement and familiarity in managing public projects related to the poverty alleviation program. The survey results have been integrated with the project governance elements and components found in the literature review. It was found that the officials working in poverty alleviation programs and projects understand the importance of project governance towards better programs and project delivery. However, there are also misunderstandings about the differences between project governance and project management among the respondents, leading to confusion, mainly when addressing the project governance issues. Finally, a conceptual framework was established supported by the project governance elements found in the review of literature as well as the exploratory study results. While the conceptual framework is rudimentary, it can be improved in a future study to make it more precise and reflect the phenomenon's reality.

Keywords: Project governance, Poverty alleviation, Public officials, Framework, Malaysia

1. INTRODUCTION

Poverty alleviation projects are instrumental in charting a country's socio-economic development and is considered unique since it encompasses transforming social structure and community realignment, which might require a specific governance system. The successful planning and execution of poverty alleviation projects are vital to ensure that the poor people receive maximum benefits and lift their quality of life. Hence, this is where the project governance term is utilized to improve project delivery. Essentially, project governance in poverty alleviation projects is defined as a management system that comprises a set

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of values and structure in delivering the right project to the right target groups through effective and efficient possible ways with the ultimate aim to propel the quality of life of the poor people and bring them out of poverty [1]. While there is no research available in the literature that could determine the project governance practices in the context of public poverty alleviation projects, there are pressing needs to address the better understanding of project governance at the organization and project level since there is evidence that project governance could lead to the project success [2] and at the same time minimize the risk of project failure [3]. Project governance elements that could be derived from the exploratory study will be the basis for the development of a conceptual framework. Therefore, the current study has been conducted with the objective to determine the current project governance practices in the national poverty alleviation program, which is significant in establishing the conceptual framework.

2. DATA COLLECTION METHOD

The exploratory study was conducted through online questionnaires survey forms distributed to the officers from government ministries/agencies involved in the whole cycle of project management in the poverty alleviation program. They were selected as a survey sample due to their involvement and familiarity in managing public projects related to the poverty alleviation program.

2.1. Instrument, Respondents and Analysis

The instrument for the questionnaire was designed in tandem with the objectives of the exploratory study. Part A is used to obtain the respondents' background, while Part B is used to test the respondents' understanding of the project governance elements and obtain information on how important the project governance elements are in the context of the poverty alleviation program. Next, Part C is used to assess project governance issues in the poverty alleviation program, and Part D is open-ended questions for the respondents to add to the whole questionnaire.

The invitation to participate in the survey was emailed to 73 public officials, and 24 respondents took part in the survey, representing 32.88% of the samples. The response rate is acceptable since responses through online surveys are always very much lower than those obtained when using on-paper surveys [4]. Fundamentally, the sampling method used was non-probability purposive homogeneous sampling, which focuses on one particular subgroup with similar characteristics. All the data were analyzed by using MS Excel prior to the development of the conceptual framework.

3. RESULTS AND DISCUSSION

3.1. Demography

In terms of demography, almost half of the respondents (41.7%) have 5 – 10 years of working experience, 29.2% have 11– 15 years of working experience, while only 8.3% have less than five years' experience. This ratio can be considered reasonable since it is essential to have experience public officials as the respondents for this exploratory study, while there is a fair distribution of public officials' classification from ministry and agencies. There are 31.8% of respondents from the Ministry of Woman, Family and Community Development, Ministry of Housing and Local Government, and Ministry of Rural Development. However, a small percentage of respondents (13.6%) from the central agency is expected

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since the central agency functions as a coordinator for all programs and projects rather than implementing ministry.

3.2. The Understanding and Importance of Project Governance Elements

In total, 11 elements have been listed to test the understanding level of the respondents and measure the importance of project governance in the context of poverty alleviation programs and projects carried out by the respondents' organization specifically and the government in general. The results are tabulated in a bar chart in the form of a mean score for each element, as depicted in Figure 1.

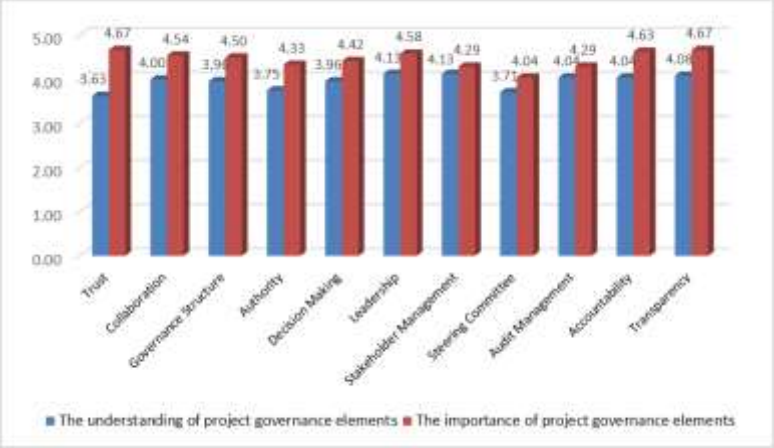

Figure 1. The Understanding and Importance of Project Governance Elements

In terms of understanding of project governance elements, five elements recorded a mean score below '4' while another six elements recorded a mean score of '4' and above. The project governance element of trust scores the lowest mean, '3.68', while stakeholder management scores the highest mean, '4.14'. On top of that, another two elements, which are steering committee and authority score '3.73' and '3.77' respectively, which is considered low compared to other project governance elements tested in the survey. It should be noted that the clear understanding of public officials about project governance elements in the context of poverty alleviation programs and projects in their respective ministry/department/ agency is crucial; hence, the low score for the understanding of trust, steering committee, and authority is something that could be investigated in further study. The low scores could be because of the lack of understanding of the definition of the elements or no clear understanding of the context of the project governance elements. Therefore, public administration as a field can undoubtedly enhance the current understanding of project governance [5] as poverty alleviation is one of the areas under public administration.

On the other hand, all listed project governance elements are considered important, with a mean score above '4' for all the elements. The highest score is trust and transparency elements, which is '4.68', while the lowest score is '4.05', which is the steering committee. The results show that the listed project governance elements are essential in the planning, implementing, and operation of poverty alleviation programs and projects from the perspective of public officials. To be more specific, project governance mechanisms are essential for the project actors to set the vision, set the priority right, configure and coordinate the planning, decision making, and define the roles and responsibilities of each actor [6]. Also, government financial constraint is the issue faced by all government machinery systems. Therefore,

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related organizations need to ensure that the right projects are selected and implemented correctly. Bureaucracy is the obstacle that blocks the projects from progressing. A good project governance structure and clearly defined authority could reduce bureaucracy and contribute significantly to the project outcome.

3.3. Conceptual Framework of Project Governance in Poverty Alleviation Program

The conceptual framework is shown in Figure 2. Principally, the conceptual framework starts with trust and collaboration as intrinsic motivation that drives project governance in the poverty alleviation program. The motivation influences the project governance element as listed in the framework. This framework is conceptualized in poverty alleviation programs and projects setting. It is imperative to have an effective project governance framework specifically for poverty alleviation projects since it greatly depends on the operating environment and cannot be determined in isolation [7]. Therefore, these settings are rational as a basis in delivering the right project to the right target groups with the ultimate aim to drive the quality of life of the poor people and bring them out of poverty.

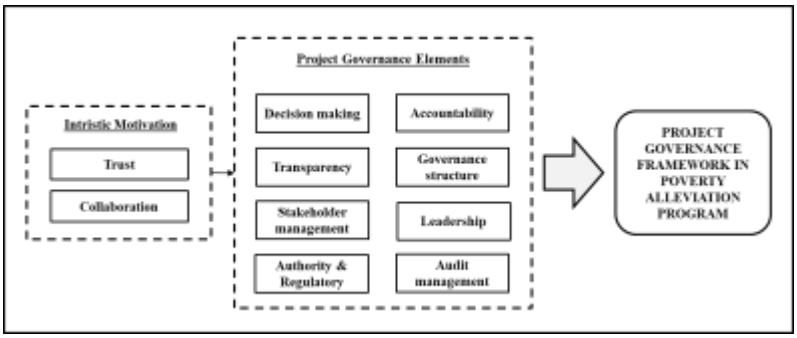

Figure 2. Conceptual Framework of Project Governance in Poverty Alleviation Program

4. CONCLUSION

In conclusion, the officials working in poverty alleviation programs and projects understand the importance of project governance towards better programs and project delivery. Several issues and barriers are also identified. The conceptual framework has been developed to reflect project governance in the poverty alleviation program while it can be improved in future studies and reflects the reality of the phenomenon.

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AQUAVINE:
AUTOMATED SMART GREEN PLANT WATERING SYSTEM

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Abstract

Covid-19 pandemic has been hit around the world including Malaysia which causes people to stay home. Because of this pandemic, people in Malaysia who usually worked in the office, or any places must quarantine themselves at their home. Staying at home for months and as Covid-19 restrictions continue to keep people to work from home (WFH), they may be looking for a way to brighten up their space or need something to do such as doing DIY stuffs to water the plant on their daily routine. In response to this issue, this project will be developing a technology on handling the watering plant issue which is called ***AquaVine: Automated Smart Green Plant Watering System***. This project helps people to handle the process of watering plant in an easy way. This system also can solve the problem of people who always forgot about their watering routine using an innovative concept of "Do It Yourself" (DIY). This DIY project uses an Arduino IoT board with Wi-Fi connectivity, a capacitive soil moisture sensor, and your own water pump. This project exploring how to create an automatic indoor watering system using with Arduino components and integrate together with mobile application. The device is also installed with your own toilet flush where it helps to generate the water so that the water supply will not be less. This system can help people doing the watering process automatically with the DIY device and they able to control it with mobile application. With this system, they can set their watering schedule, set clock and timer, and receive notifications from the mobile application while the device will follow the order and do the watering process. As a conclusion, this innovative application is an affordable product, save times and easy to use.

Keywords: Watering plan system, IoT technology, mobile application, Arduino technology

1. INTRODUCTION

Healthy environment encourages people to have plants in their home. People must, however, be concerned about monitoring and watering their plants on a regular basis in order to maintain them alive. People in cities are usually busy with their jobs or other responsibilities, and they sometimes forget to water their plants. [1] People can extend their idea to develop a nice application to handle according to a routine watering the plant using recycle things such as your own water tank by discovering IOT technology and their ability to "Do It Yourself" (DIY) on the goods they have at home.

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2. MATERIALS AND METHODS

Home gardening, combined with current technology capable of producing plant watering activities, can be made more entertaining and unique by integrating an embedded system with a mobile application. AquaVine: Automated Smart Green Plant Watering System was created as a result of this to automate the process of watering plants on a daily basis when you are away from home. This smartphone application can create a decent schedule to monitor and control the plant's usage and watering time, as well as send a notification message to the user.

2.1. Domain of technology

2.1.1. Arduino tool system

The Arduino tool system is a software-oriented open-source platform for embedded systems. In this project, When the plants become dry, the Arduino tool system will water them automatically. There is a moisture sensor that detects soil moisture, so that when the device is watering the plant and the soil begins to get damp, the sensor will notice it and cause the device to cease watering the plant. Water will be used, and the container will be filled with it. The consumers will receive the notification via the mobile application as well. They will receive notifications when the reminder is activated, the plant has been watered, and the water container is empty. Users may also specify the time when the gadget will water the plant, in addition to receiving notifications.

2.1.2. Mobile Application and Internet of Things (IoT)

The mobile application technology able to provide many services such as web application, social media such as Facebook, Twitter and Instagram [2]. IoT technology used embedded system to retrieve and send the information from their environment. In this application, it was possible to create a good novel application such as a plant watering system by combining Wi-Fi connectivity with an Arduino IoT board that was integrated with certain sensors [3].

2.1.3. Comparison between existing system

This chapter delves into the investigation of application aspects related to the AquaVine system in great detail. In order to build this system, it is necessary to understand each function that is linked to understanding based on previous case studies. All of the components are critical to the development of this system. The objective is to compare and contrast the present application in order to enhance and build a better solution for more systematic use. The comparison between existing technologies and the suggested solution was shown in Table 1.

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Table 1. Comparison between existing system proposed solution

Features	Water Sprinklers	Greenhouse Irrigation System	Existing Automatic Watering Plant System	Proposed Solution
Automatic watering	✓	✓	✓	✓
Set clock for schedule process	✓	x	✓	✓
Set timer for schedule process	x	x	✓	✓
Soil moistures detect	x	x	✓	✓
Water supply	✓	✓	✓	✓
Power supply	✓	✓	✓	✓
Mobile application support	x	x	x	✓
Wireless control	x	x	x	✓
Waters multiple plant	✓	✓	✓	✓
Automatic re-fill water into water container	x	x	x	✓
Manage schedule	x	x	x	✓
Guidelines for beginner	x	x	x	✓
Log activity of the process (Database)	x	x	x	✓

2.2. Methodology

For the development of the project, the author has decided the implementation of the Rational Unified Process (RUP) as the methodology that will be used. RUP was chosen for various reasons, the first of which is that it enables for iterative system development. The second reason is that, as RUP emphasis on component-based architecture, which of course supports system reuse. The third and final reason for the selection of RUP is that it gives the developer the ability to control changes in the system, in term of ensuring that the possible change is necessary and the ability to track and monitor the changes. [4]

3. RESULTS AND DISCUSSION

3.1. Testing

Because the inconsistencies of one component may impact the outcomes generated by the system as a whole, this system significantly relies on all of its components to effectively interact and support one another. Users participated in user acceptance testing, and they were pleased with the results. All functions are working well as all test cases pass. However, there are some comments for future improvement during the first user acceptance test(UAT). These system feature modules will be tested in order to ensure that they are successfully integrated with Arduino and mobile application (Android). In usability testing, by using the given evaluation form for 20 respondents consists of Universiti Kuala Lumpur Malaysian Institute of Information Technology (UniKL MIIT) students have tested the system individually and in groups. They need to evaluate the system right after the developer explains about the system to them. The followings are the questions that include in the open evaluation form focusing on how system is attractive and well designed, the system is easy to understand, the system flow is clear and system functions perfectly. This section discussed the findings according to constructs presented. The implementation for evaluation process, researcher using the Likert Scale evaluation (1-5) point. Based on figure 1, almost 95% strongly agree with Q1, 100% strongly agree with Q2, 95% strongly agree with Q3, 95% strongly agree with Q4, 95% strongly agree with Q5, 95% strongly agree with Q6, and 95% strongly agree with Q7. Total percentage for all the open evaluation question is 97.71%. Based on this result we can conclude that AquaVine system is acceptable by end user. This open evaluation test

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is being distribute in UniKL MIIT.This measurement also included for perspective of user interface which are easy to understand, system flow is clear, system functions perfectly and the system is attractive and well designed. Evaluation also focusing to the ability of the researcher is willing to answer questions related to this project, has adequate knowledge about the project and overall performance of the project.

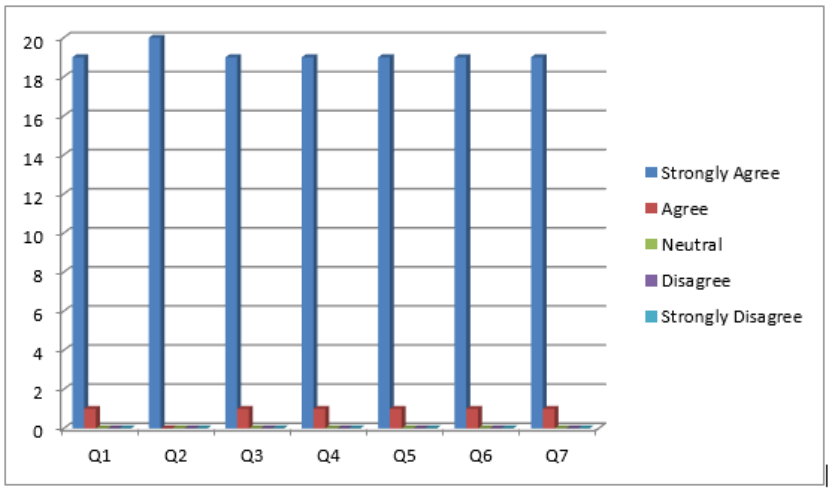

Figure 1. Overall evaluation of the system using UAT testing

4. CONCLUSION

In conclusion, AquaVine: Automated Smart Green Plant Watering System is developed to help the people who want to keep plants healthier in home. The system also has an automatic watering system and several features that allow customers to maintain their plants alive without having to manually water them. It is hoped that this system would provide various advantages to the user and will be regarded as worthwhile.

ACKNOWLEDGEMENT

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IOT BASED WATER LEAKAGE MONITORING SYSTEM

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Abstract

Nowadays, water leakage has become one of the major issues in the water distribution system and it can cause a lot of water loss through water pipelines. Hence, it will give a financial loss if it cannot be identified at an early stage. The concept of real-time water leakage monitoring using the Internet of Things is presented in this project. The internet of things (IoT) is a key component of smart tracking, which uses wireless sensor technologies to link people and systems. The parameter used to analyse the water leakage in the pipeline is the water flow sensor. The proposed system would concentrate on common housing pipes and would display collected data through a smartphone. As a result, it shows that the system can function stably and give water flow rate readings with 98% accuracy. The system can also send real-time data to smartphones via the Blynk application and alert the users when leaks are identified using threshold data.

Keywords: IoT, water leakage, flowrate, Blynk, flow sensor

1. INTRODUCTION

In recent years, Malaysia's water industry is plagued with ineffective water management. According to the World Bank, water management inefficiency has resulted in water losses of up to 50% in Pahang due to pipe leaks, while the national average is now at 35%, nearly three times that of developing nations. Additionally, the government intends to cut non-revenue water (NRW) to 25% by 2020 [1]. This illustrates that pipe leakage is a significant concern in the water management system. Leaks that have remained undetected for a long period are one of the causes leading to the high NRW. This illustrates that pipe leakage is a significant concern in the water management system. A variety of factors may cause pipeline leakage. Among the common causes are due to imperfect connections, corrosion of the pipes, or even mechanical damage [2][3]. According to N. Abd Rahman et al. [4], the water leakage situation will worsen if the water pressure is high throughout the pipe at night.

Recently, the development of IoT water leakage systems has been extensively studied by researchers. M. S. Mehta et al.[5] presented a Leak Monitoring Device in 2019 that builds a nodal network of systems that continuously monitor the flow of water and may deliver timely alerts. The study used two water flow sensors to monitor the water flow rate and it will be located at both ends of the pipe. According to the research, if there is a change in flow rate at the pipe's ends, this might indicate that the pipe is leaking.

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Also, Arya Vijayan et al.[6] created a system that can detect pipe leakage by obtaining the inflow and outflow values. The study shows that If the differential between the two sensors exceeds 60 L/hr, a leak in the pipe has occurred. However, none of these researches discusses the degree to which their various systems are accurate.

In this study, the proposed system will be monitoring the flow rate of water using TTGO Lora Esp32 as the microcontroller and Wi-Fi as the communication protocol in the Internet of things (IoT). Therefore, it is predicted that this improvement will save time, cost and most importantly it can monitor the flow rate at any places through the Blynk application on the smartphone [7]. The sensor used in this system is the water flow sensor and the overall system will be powered by a rechargeable battery and USB charging module. By focusing on the problem of water in the house, the system will be applied to standard housing PVC pipes ½ inches in diameter. Besides, all components will be placed in a compact casing that will be easy to install on-site.

2. MATERIALS AND METHODS

2.1. System Configuration

Before configuring the system, the sensor's wire must be appropriately connected to the TTGO Lora board's pins. The pins connection for the sensor and microcontroller can be shown in Figure 1. The flow sensors' VCC (Red Wire) and GND (Black Wire) pins are linked to the TTGO Lora's 5V and GND pins, respectively, while the Signal pin (Yellow Wire) is attached to pin 32.

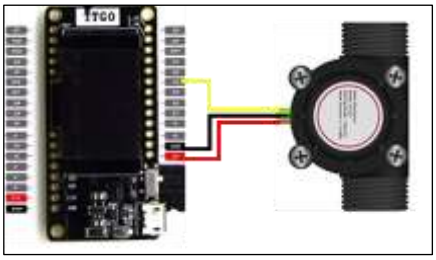

Figure 1. Pins connection for TTGO Lora and Sensor

In this proposed system, Arduino IDE was used as a programming software to communicate with the microcontroller, sensor and IoT platform. In order to communicate the board, some libraries are required to be installed, such as ESP-32 and Adafruit SSD1306 library. The Adafruit SSD1306 library will enable the board to connect with the integrated 0.96-inch OLED screen for site monitoring purposes. Apart from that, the code for the water flow sensor will use an external interrupt function on signal pin 32. This is used to read the flow sensor's pulses. When the TTGO board detects a pulse, the pulse counter function is triggered to count the number of pulses. The water flow rates will be calculated using the equation, where the flow rate is pulse per minute divided by the calibration factor.
Then, the same flow rate will be delivered in real-time to the Blynk Server utilising the Wi-Fi protocol that has in the TTGO Lora board. A database will be established synchronously in the Blynk application for the purpose of monitoring the water flow rate on a smartphone. Lastly, when a leak is detected, the system will notify the user by sending a notification to their smartphone. The possible water leakage for this option is obtained through the threshold method. The method classifies anything under a certain level of threshold flow rate as possible water leakage.

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The process flowchart of the system begins with a reading of the sensor data that measures the water flow rate passing through the pipe. The value of flow rate will be display on the OLED screen and at the same time, the data will be sent to the Blynk application. In the Blynk application, the system will provide information in the form of water flow status, water flow rate level, and leakage notification. The system flowchart can be seen in Figure 2.

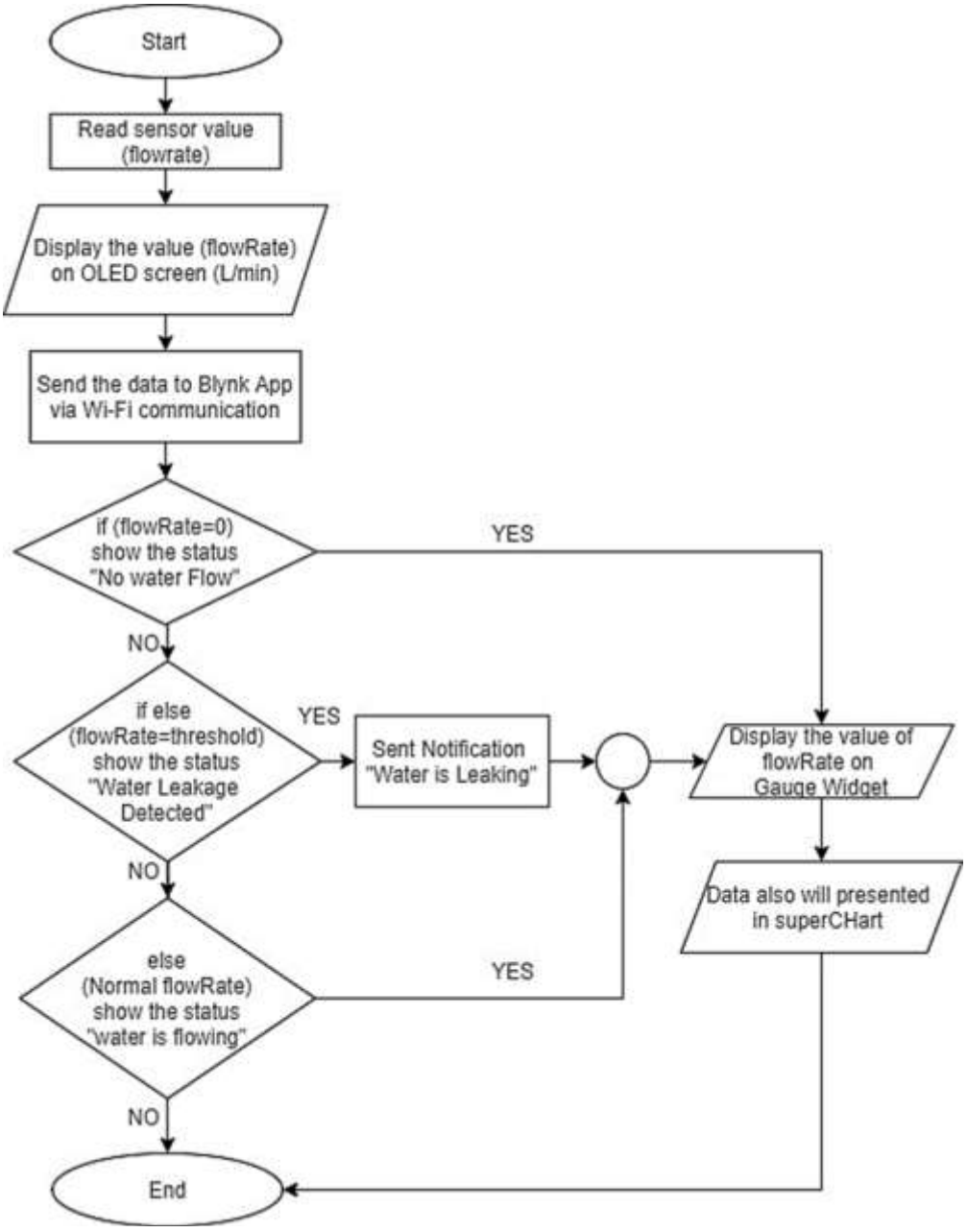

Figure 2. A schematic design for hardware

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2.2. System Integration

After the IoT components were programmed, all components were integrated into one complete circuit to secure the connection during field testing. The schematic design of the hardware is illustrated in Figure 3.

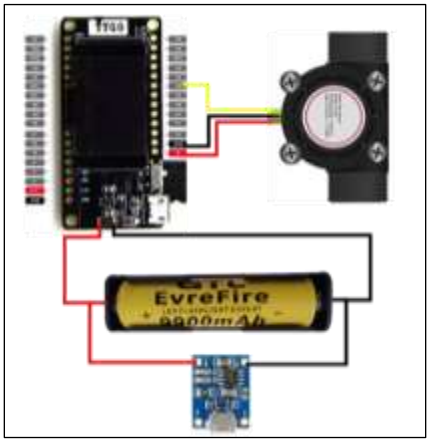

Figure 3. A schematic design for hardware

Next, the IoT-WLMS case was developed to integrate all components used as one compact device by using Autodesk Fusion 360. This ensures that all electrical components were shielded from any possible water spills and easy to install for site monitoring. Finally, the casing will fabricate by using 3D printing technology.

2.3. Experimental Setup

System performance testing is conducted to determine the performance in monitoring the water flow rate in the pipeline. A prototype is designed to test the system performance by using PVC pipe ½" and connected to the existing pipe with 4 faucets. In this test, the developed system will monitor various water flow rates in order to determine the present condition of water flow at the site. Furthermore, the system's reliability will be validated via data transmission between the hardware and the IoT platform. Finally, leakage simulations will be conducted to determine the values for the threshold data that will be included in the final coding. The design of the prototype is shown in Figure 4.

Figure 4. Water Flow Monitoring

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3. RESULTS AND DISCUSSION

3.1. System Performance Testing

Next, the prototype is tested at various conditions of water flow. Figure 5 shows the graph for flow rate conditions during a given interval.

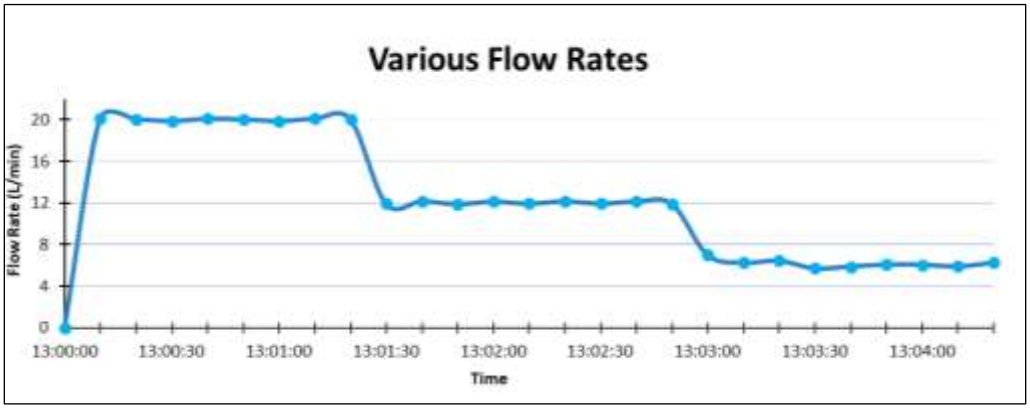

Figure 5. Graph of water flow rate at various conditions

The figure above shows that when no water is flowing, the flow rate is zero, and when the water is free to flow, the flow rate steadily rises to a constant value. The maximum flow rate during the testing is about 20.99 L/min, and at this stage, only one faucet was open. Then, the flow rate starts to decrease about half of the maximum point when two faucets were opened simultaneously. Meanwhile, when the opening faucets were increased to 3-4, the minimum flow rate was between 6.5 to 5.5 L/min. This shows that when the opening faucets are increasing, water pressure starts to drop. Hence the flow rate also will be decreasing.

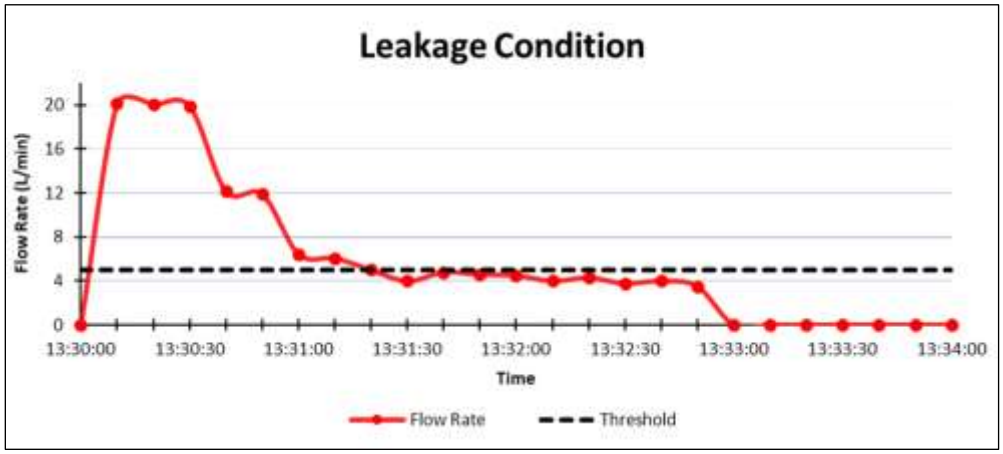

Figure 6. Graph of the leakage condition

From the minimum value of the flowrate, a 2 mm hole was made to consider that the pipe was leaking. As a result, the threshold data were obtained between $0 < Q \leq 5$ L/min. Figure 7 shows a sudden drop of flow

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rate after 45 seconds to below 5 L/min. After 90 seconds, it shows that the pipe is fully closed after the user detects the leakage. The possible water leakage only shows a pulse when the flow rate is between threshold values for more than 5 seconds. The system will alert the users by sending a notification when leakage is detected. The possible leakage value of 5 L/min is acceptable, as the research from [8] stated that the average flow rate for one water fixture in low-income households is about 6 L/min.

Next, testing is done by placing the transmitters (device) and receivers (Blynk apps) at a certain distance. The experimental results show that transmitting data from transmitter to receiver rarely experience delays in the range of 0.1km to 14km. This indicates that the sensor data was successfully sent to the receiver so that the Blynk dashboard could display it in real-time.

Figure 7. Results from the receiver (Blynk apps) and transmitters (device)

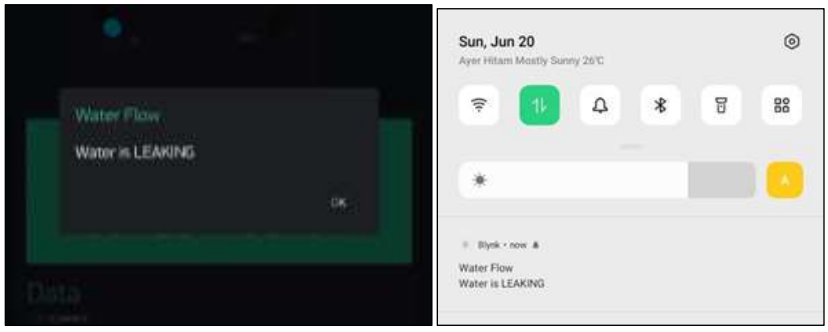

Figure 8. Leakage notification from the Blynk apps

Figure 9. Charging Mode

4. CONCLUSION

In this study, the development of IoT Based Water Leakage Monitoring System was conducted and investigated at ½ inch PVC pipe. As a result, the system can communicate successfully between microcontroller, sensor and IoT Platform that utilising the Arduino IDE software and the Blynk application. The results also show that the developed system is very reliable in real-time monitoring, since the data transmission between receiver and transmitter does not show any delay during the testing session. In addition, the findings show that the pipeline's possible water leakage might occur if the flow rate is below 5 L/min. Finally, the implementation of the Internet of things (IoT) is necessary as water flow through pipelines can be observed at anytime from anywhere, which can save money and time.

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IOT MUSCLE FATIGUE MONITORING SYSTEM IN WEIGHTLIFTING

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Abstract

In this project, an Internet of Things-based muscle fatigue monitoring system technology will be presented. This system is mainly will be used for muscle fatigue detection by using IoT devices and allows the monitoring purposed to be controlled and sensed across the existing network infrastructure. This project aims to develop a muscle monitoring system to detect muscle fatigue in weightlifting activity and create a user interface (UI) that is easy to monitor muscle fatigue and user friendly. This system will use Esp32 as microcontroller and electromyography sensor to detect muscle activity from muscle movement while practicing sports activity. Thus, the user can monitor the muscle activity through Blynk mobile application. In this paper, the response of muscle under observation is monitored with a load of 5kg. The reaction from dynamic contraction of bicep brachii after repetitive loading is observed. The response observed during the experiment showed that as the muscle progresses to fatigue, its amplitude begins to decrease. The muscle responses of a healthy person differ from that of a person with some muscular disorder. All subjects show different responses according to their respective muscle strength.

Keywords: Internet of Things, Muscle Fatigue, Electromyography sensor, real-time monitoring, Blynk

1. INTRODUCTION

Essentially, any physical activity involves injuries. Muscle injuries are prevalent among athletes and have a significant effect on an athlete's performance [1]. With proper stretching and warming, muscle injuries can be avoided. However, muscle fatigue may also occur. The physical condition of individuals, in particular sportspeople, is challenging to track. Compliance with the physical condition of a sportsman during practicing is necessary if the injury is to be prevented or mitigated.

In recent technologies, the development of muscle fatigue monitoring systems has been applied. Widasari [2] researched and developed a sEMG monitoring system using smartphone and maintain biceps from getting muscle fatigue. They developed the system by computed sEMG signal to MATLAB and calculated and analyzed muscle fatigue then sent the result back to the android smartphone to be

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displayed. The system has been proved that that it is helpful to maintain biceps and avoid muscle fatigue during training and exercises. Besides, by using wireless technology, which is Hypertext Transfer Protocol (HTTP), the android smartphone can easily record and transfer sEMG signal to Personal Computer (PC). In addition, Eclipse IDE has been used for developing monitoring systems for android platform.

In this study, a design based on the ESP32 is proposed and used as the main controller and communicator, with adaptive muscle fatigue detection and recovery. Electromyography signals can detect muscle fatigues and track them on a wireless network in real-time. In this project, muscle fatigue can be monitor using the internet through a mobile application. Blynk application will be used to develop a new IoT (Internet of Things) system. The complete system is composed of a power supply, EMG transducer, ESP32 Wi-Fi module, and microcontroller. This technology is comfortable for monitoring fatigue conditions which is used for real-time monitoring of fatigue for sportspeople [3]. The system's primary function is to monitor and prevent muscle fatigue through the adoption of adaptive technology.

2. MATERIALS AND METHODS

2.1. System Hardware and Software Configuration

The hardware that needs to be used consists of two main parts which is microcontroller or Wi-Fi module and sensor. The microcontroller will perform as a data processing tool and can unloading Wi-Fi networking functions from another application processor or hosting an application. While the sensor is used to provide proximity measurement. The LED indicates the condition of muscle during exercise. As the user conducting some exercise, muscle will be in contraction and yellow LED will turn on. Furthermore, LCD display will display "Contraction" to inform the user their muscle condition. Red LED will light up when the user will be experiencing muscle fatigue and LCD will display "Fatigue" to the user. The LED indicator and LCD display ensure the user can track their muscle condition during exercise easily. The LCD Figure 3 will show on how the monitoring system works.

This project requires to install libraries for Blynk and ESP32 in order to develop to system coding. The algorithm is configured so that ESP32 can connect with Wi-Fi and work together with smartphone via Blynk Application.

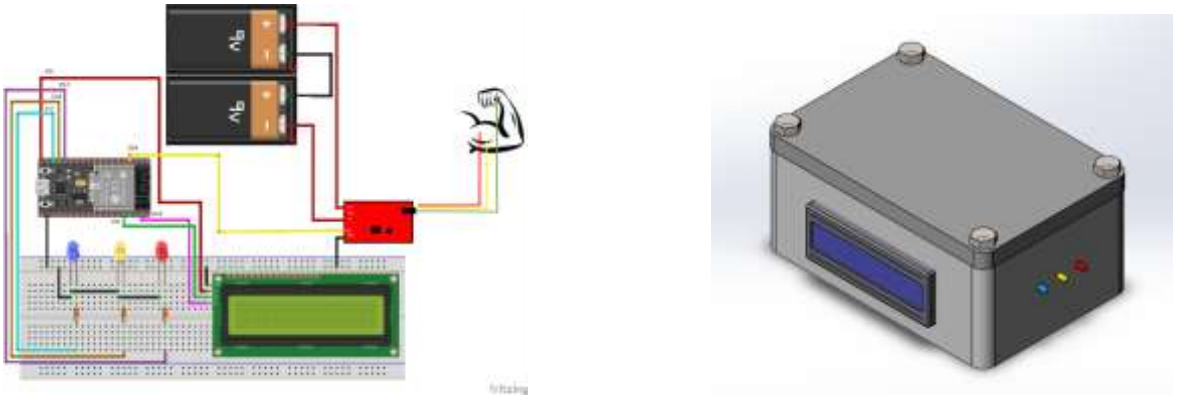

Figure 1. Illustration of circuit diagram and 3D model for IoT Based Muscle Fatigue Monitoring System

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2.2. Experiment Setup

A group of 3 individuals male with ages 21-35 years were selected. The chosen subjects are from different range of status such as gym person, sportsperson, and inactive (sedentary) person. The subjects were assigned to lift and curl 5kg weights of dumbbell using their dominant hand until exhaustion. The subjects need to perform 5 sets of dumbbell weightlifting curl and each set consist of 5 repetitious and 10 seconds of rest interval between set. All subject were advised to perform the exercise in comfortable tempo with Surface Electromyography Non-Invasive Assessment of Muscles (SENIAM) norms for EMG acquisition. The muscle condition which are muscle contraction, rest and fatigue were recorded by the muscle activity monitoring system developed. Table 1 shows the physical characteristics of all subjects.

Table 1. Physical Characteristics of Subjects

Subject	Gender	Age	Weight (Kg)	Height (cm)	Status
1	Male	35	80	175	Sports Person
2	Male	23	55	182	Sports Person
3	Male	21	105	180	Inactive Person

3. RESULTS AND DISCUSSION

3.1. System Operation and Data Visualization

The monitoring system operate when the subject starts curling, the muscle amplitude (mV) and time (second) are shown in Arduino IDE through serial plotter and Blynk application through superchart widget. The system will display muscle status on the LCD display to notify the user their muscle condition. Furthermore, every muscle condition displayed, LED will light up with different colors. Muscle fatigue will be displayed when the subject is in relaxed state. The system will notify the user their muscle is on muscle fatigue state if voltage value (mV) during relaxed state is lower than relaxed voltage value from initial state. Figure 2 shows the LCD display and LED light when weightlifting activity is conducted.

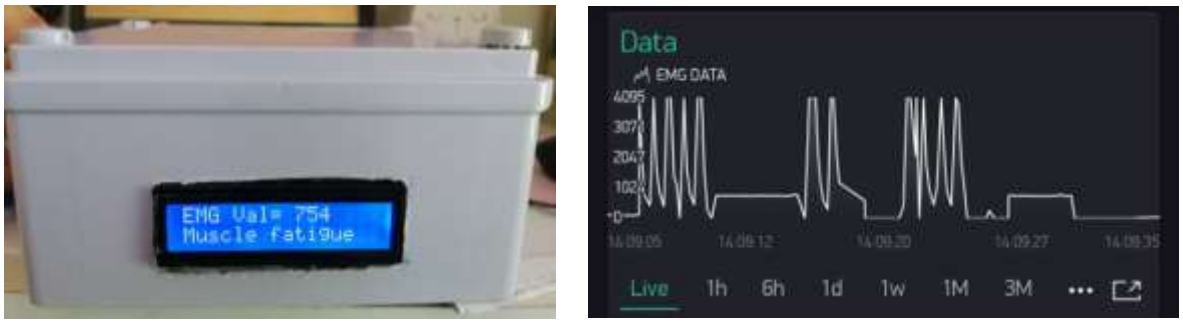

Figure 2. LCD Display muscle condition of the subjects and LED indicator

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3.2. Electromyography Sensor Data Analysis

Data from serial plotter in Arduino IDE shown the muscle activity during subject 1 conducting weightlifting activity in phase 5 as in Figure 3. Muscle fibres generate electric activity whenever muscles are active [4]. During muscle contraction, the peak value of the amplitude is more than 4000mV when lifting dumbbell with 5kg load. Muscle amplitude throughout muscle rest is observed in the range of 1000mV to 1500mV. The amplitude value during muscle rest is throughout every phase is lower than muscle contraction due to a lesser amount of muscle activity [5]. However, muscle fatigue amplitude observed is lower than normal muscle rest amplitude which is less than 1000mV. It is important to monitor the amplitude changes. The amplitude (mV) was different for each subject [1][6][5].

The parameters of the signals depend on the number of MUA (Motor Unit Action potentials) [6]. When bicep brachii is in rest condition while holding the load, small amount of motor units is recruited, hence producing a small signal. This signal gives small amplitude [7]. When voluntary contraction of bicep brachii is done with load of 5kg, the increase in voltage was noted which meant that the number of activated motor units had also increased as bicep brachii required more strength for contraction. The results for different individuals were different according to the muscle strength and force required for the muscle contraction.

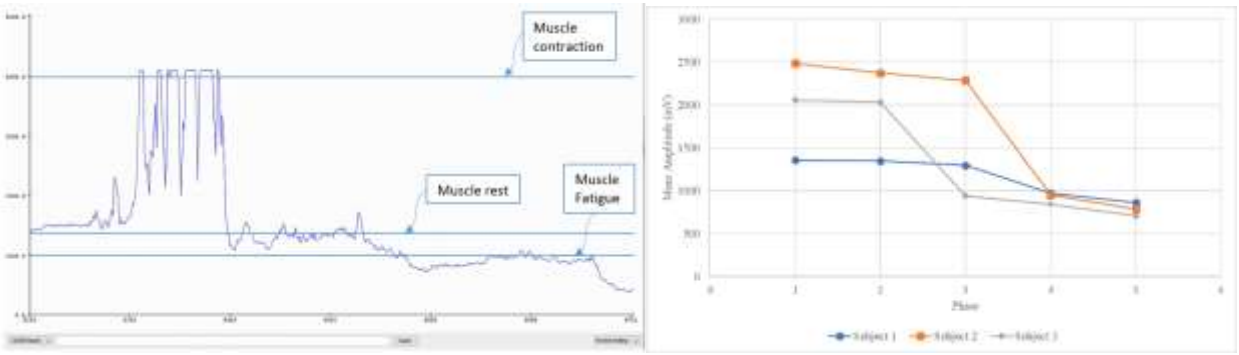

Figure 3. Muscle Activity in Phase 5 from Serial Monitor and Mean Amplitude (mV) during Relaxed/Rest Position Graph VS Weightlifting Phase

4. CONCLUSION

This study concludes that right biceps branchi faces muscle fatigue condition as the weight load applied was 5kg. This study concludes that muscle fatigue starts to occur when muscle rest in initial state is higher than in final phase during weightlifting. Same goes to flexed position state, the mean voltage will slowly decrease as the subject felt tiredness and nearly unable to do any lifting anymore. The continuous manual lifting task will leads to low productivity and low performance in their work. Also, this system can be used as IoT monitoring system for recording EMG data and send data wirelessly via Blynk applications. The objective of this project is achieved when the sensor is well functioning with NodeMcu and the mobile phone application can get the data from the sensor and manage to monitor muscle activity from anywhere as long as the system is connected to the internet.

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IOT BASED WATER QUALITY MONITORING SYSTEM AND TEST FOR SWIMMING POOL WATER PHYSICOCHEMICAL QUALITY

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Abstract

Water quality in a swimming pool has always been neglected due to time-consuming and costly methods. This encourages people to ignore the water quality aspect while permitting negative impacts such as pool infection outbreaks. Hence, the research project aims to develop an Internet of Things (IoT) based water quality monitoring system specifically to monitor water physicochemical quality in swimming pool applications. The system utilizes IoT to display the output in a real-time manner for both on-site and off-site monitoring using mobile phone, visualize through Blynk Application. The parameters to analyse water quality are pH and Total Dissolved Solid (TDS). Both parameter's sensors have successfully undergone calibration process to ensure the validity and credibility of the system. As a result, pH sensor have error as low as 0.25% and TDS sensor error of only as low as 0.34%. The main reason both sensor selection in the integration of the system is due to its viability in monitoring and achieving intended swimming pool water quality. The system is very significant as having a reliable quality monitoring system, corrective procedure can be conduct accordingly.

Keywords: Internet of Things, Water Quality Monitoring, Ph, Total Dissolved Solid, Swimming Pool,

1. INTRODUCTION

Beside hydration purpose, water is important for other usage like recreational activities. Water usages demand a clean and safe water, signify the important to control and maintain water quality. Nowadays, monitoring water quality in swimming pools application can be divided into several approached such as laboratory analysis [1] while some used cheaper testing kits with lower accuracy. Even though this laboratory analysis work, it is time-consuming. This comes to the introduction of IoT device. IoT is an innovation that merge immense variety of intelligent devices, smart systems, wireless network as well as sensors [2]. Currently, IoT have been applied in numerous application due to its minimal cost. In recent decade, the evolution of water quality monitoring system can be seen from the conventional manual lab-based approach to manual on-site based monitoring and recently to the WSN (Wireless sensor network) based approach [3]. Swimming pool water quality rely heavily on how effective the chemical properties of the liquid inside the pools [4]. Swimming pool water quality is monitor in two different form or condition which are physicochemical and microbiological parameters. [5]. However, analysis of

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microbiological parameters need to undergo procedure like membrane filtration and incubation process. Hence, almost unpracticable being monitor on-site and in real-time based.

According to Saba and Tekpor [6], pH and TDS are two of many physicochemical parameters monitor in the study. WHO in their Guidelines for Safe Recreational Water [7] also include both parameter in evaluate pools water quality. This justification has shaped the scope and objective of the project in development of an easily accessible IoT based water quality monitoring system with two parameter which are pH and Total Dissolved Solid (TDS. As such, this project aim in having a system that has been calibrated in ensuring the validation of the data being monitored. Validation done by comparing data before and after the calibration before the system tested for real swimming pool monitoring. Another objective is to test run the developed project prototype with the actual swimming pool application.

2. MATERIALS AND METHODS

2.1. Design and Integration of System Prototype

The development of the system integrates the used of TTGO Lora ESP32 microcontroller, Gravity Analog pH sensor V2 from DF Robot and KS0429 TDS Meter V1.0 from Keyestudio as the hardware component. Microcontroller board with utilization of Wi-Fi module is compulsory to gain input data, fetched by the sensor in the system being transmitted before the data can be display to the user of the system. The microcontroller used have a 0.96-inch OLED build-in display which significant for on-site monitoring. pH sensor used have measurement range of 0 to 14 pH value while TDS sensor have measurement range of 0 to 1000 ppm. The sensor works in converting physical change detected or being measured into voltage electrical equivalent before convert to a signal. Data transfer as TDS sensor and pH sensor directly connected to pin 34 and pin 35 of the microcontroller as illustrated in Figure 1.

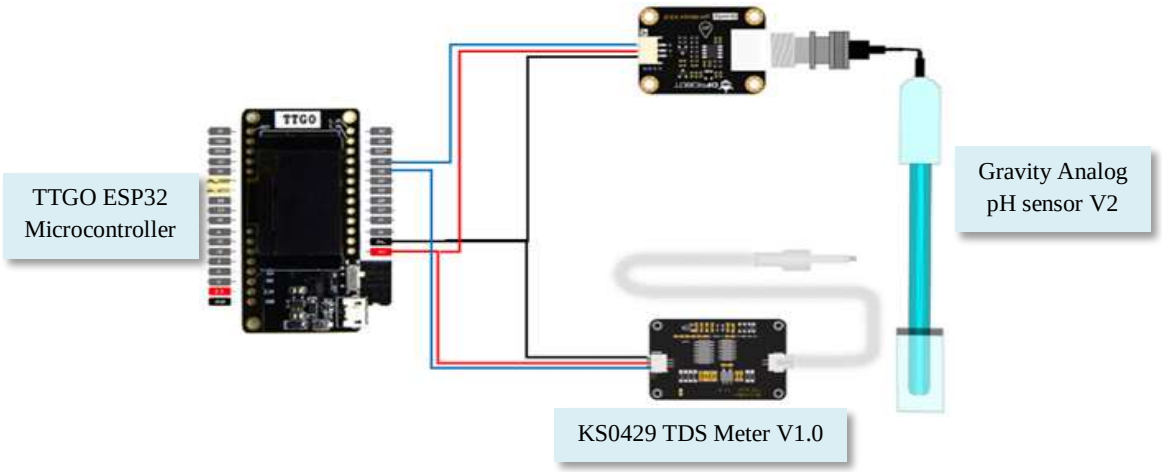

Figure 1. Complete circuit diagram of the developed IoT based water monitoring system

Sensor holder was also design in computer-aided design (CAD) software, CATIA before the holder was 3D-printed. The holder secure both sensors are firmly attached and ease user during system monitoring. In communicating between the hardware and the software of the system, Arduino Integrated Development Environment (IDE) was used by construct the system's algorithm and coding. For each component and function, Arduino IDE required installation of designated library. For this system, Blynk application facilitate the interchange of input from user or output from the system with appropriate features in its

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graphical user interface (GUI). Blynk application aid in the creation of a clear and comprehensive interface with various existing widgets. SuperChart is used to visualize pH value and Gauge Meter is used for representing TDS value. The change in the water quality can easily being monitored through the Blynk data visualization.

2.2. Experiment Setup

Each sensor in system was calibrated to ensure the credibility of data produced. It is also one of the research objectives to calibrate the system before its performance testing using real swimming pool water. pH sensor underwent two-point calibration process which require the submersion of sensor probe in two different standard buffers with a known pH value of 4.00 and 7.00. The sensor will automatically identify and distinguish between two standard buffer solutions, resulting in a very convenient yet precise method. The appropriate parameter value from the calibration process is then saved in the main control board's EEPROM. While for the TDS sensor, the calibration procedure requires submersion of sensor into a predetermined-TDS value solution. For this specific research, a solution with a known concentration value of 590 ppm was used. The value was entered in serial monitor during calibration step. Calibration process is crucial to increase overall accuracy by lowering the percentage error. System performance testing using real swimming pool water was done due to the succession of the system calibration. Figure 2 show the developed system utilize both Arduino IDE and Blynk. Efficiency and performance of the system will be validated as a whole including the data visualization and transmission through mobile phone.

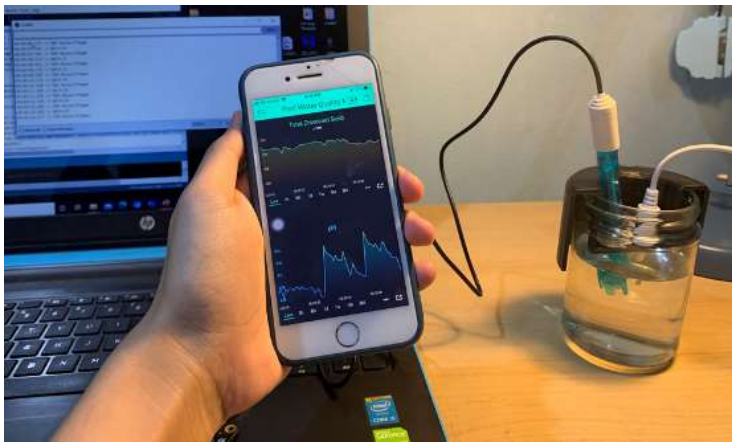

Figure 2. Developed system monitoring actual swimming pool water

3. RESULTS AND DISCUSSION

3.1. System Calibration and Performance Testing

Data during the calibration process was recorded to compare the difference between the measurement before and after the sensor has been calibrated. All 5 reading were taken after the sensor has produced stabilized reading. Reading was taken consecutively for five (5) seconds. Table 1 and Table 2 show the percentage error range for both sensor after successful calibration.

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Table 1. pH sensor calibration

Type of calibration	pH buffer solution	Total reading	Calibration status	pH measured range	Percentage error range (%)
First-point	7.0	5	Before	8.42 – 8.44	20.29 – 20.57
			After	6.99 – 7.01	0 – 0.14
Second-point	4.0	5	Before	4.70 – 4.72	17.50 – 18.00
			After	3.99 – 4.00	0 – 0.25

Table 2. TDS sensor calibration

Predetermined total dissolved solid value (ppm)	Total reading	Total dissolved solid measured range (ppm)	Percentage error range (%)
590	5	590-592	0 – 0.34

PH sensor percentage error ranges from 20.29% to 20.57% before any calibration process, remarkably drop after first-point calibration to only 0% to 0.14%. However, performing first-point calibration using only pH 7.0 buffer solution meaning that the sensor has only reliable accuracy within that value. This can be seen as before the second-point calibrations using pH buffer solution 4.0, the percentage error still high between 17.50% to 18.00%. After second-point calibration, percentage error drop significantly between 0% to 0.25%. Besides, for TDS sensor, after effective calibration, percentage error ranging from 0% to 0.34% which is considerably very low. As for the system performance testing using actual swimming pool water, the data have successfully display both on the TTGO microcontroller OLED and mobile phone through Blynk application. The swimming pool water does not satisfy the guideline (WHO,2006) [7] which clearly stated that a swimming pool should have pH value of 7.2 to 7.8 with chlorine disinfectant used. This happen potentially due to lack of maintenance as the pool close during Covid-19 pandemic restriction. Proper correction need to be done before it is open for public usage. Figure 3 show an example of result display by the developed system.

Figure 3. Data visualization both OLED display and Blynk application

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4. CONCLUSION

In this research, an easily accessible IoT based water quality monitoring system has successfully being developed and tested with actual swimming pool applications. As a result of calibration, percentage error of the system has been minimal. This is crucial as it determines the validation of the system to monitor the parameter intended. IoT implementation has outstandingly ease water quality monitoring as it can also be done remotely. For future, IoT based water quality controlling system can be develop. This research system can incorporate to fully monitor and then control water quality by addition of any disinfectant or chemical additives according to different circumstances to achieve desired condition.

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DESIGNING A WALKTHROUGH CONTENT SHARING MOBILE APPLICATION FOR ELDERLY USERS

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Abstract

A walkthrough is a comprehensive collection of instructions for completing a task. Throughout the century, the most popular means of transferring information is through written language. Since then, the delivery of information has been digitalized. Early on in the digitalization era, information was delivered through CDROM and quickly transformed into blogs, online articles, and many other formats when the internet arrived. In today's social media era, people utilize every social media to deliver such information. With so many websites and mobile applications (apps), the target audience is limited to those who are already familiar with them. The elderly are mostly overlooked, and the majority of apps aimed at the elderly are health-related. Since they are the group that is always left behind, they require a walkthrough of any new technology. We, as young people, can instruct them, but they are not always by our side, and our movement is restricted during the Covid-19 pandemic. This paper will discuss designing an app for sharing walkthroughs about a mobile app that is compatible with elderly users. The content creators are free to design their walkthroughs, and templates are available for easy usage. The program's interface may be easily customized to meet the needs of the elderly user, including adjusting the brightness, text size, and interface arrangement, to mention a few options. This app will have a feature that allows users to group with family members, allowing for a more dynamic approach to content sharing. To summarize, this content-sharing mobile app would be especially beneficial to the elderly or those who struggle to understand how to use a mobile app. Furthermore, it would be extremely beneficial to the children to assist the elderly in giving instructions when they are not present.

Keywords: walkthrough, content sharing, mobile application, elderly

1. INTRODUCTION

According to the Handphone User Survey [1] performed by the Malaysian Communication and Multimedia Commission, the percentage of smartphone users has risen from 75.9 percent in 2017 to 78.0 percent in 2018. In terms of elderly people or senior citizens (those aged 65 and up), the adoption rate of smartphone users among the elderly is 30.6 percent.

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With the Covid-19 pandemic, almost all regions have implemented lockdowns, shutting down any activities that focus on human gathering and interactions. Because of the lockdown, most people have turned to the internet to communicate, connect, and continue their jobs from home. This shift has resulted in an unavoidable increase in digital usage. People all over the world have had to adapt to new lifestyles. As for the elderly, mobile phone use is no longer limited to communicating with children and friends.

The mobile phone function appears to be making rapid progress in development. They are not just used for communication but also as a platform to get information, socialize, entertainment, and perform banking activities. In today's era, people utilize every social media to deliver such information. With so many websites and mobile applications (apps), the target audience is limited to those who are already familiar with them. The elderly are mostly overlooked, and the majority of apps aimed at the elderly are health-related [2] and remote monitoring of the elderly [3]. Since they are the group that is always left behind, they require a walkthrough of any new technology. Walkthrough by definition is a comprehensive collection of instructions for completing a task.

Throughout the century, the most popular means of transferring information from one person to another is through written language. As for step-by-step learning, we can see in the manual booklet that comes together with the product we purchased, or books "For Dummies" series are the most recognized instructional/reference books that are intended to provide non-intimidating guides to readers who are unfamiliar with the various topics covered. Since then, the delivery of information has been digitalized. Early on in the digitalization era, information was delivered through CD-ROM and quickly transformed into blogs, online articles, websites, and many other formats when the internet arrived. Websites such as WikiHow, Quora, and Yahoo! Answer are the best places to look for a walkthrough. Since the advent of the social media era, people have been using social media such as Instagram, Facebook, Vine, and Tiktok to deliver such information. However certain platforms have fixed format usage, only the author's creativity will make it interesting to deliver the information. The main issue is the elderly are not familiar with all these platforms. Young people can instruct them, but some elderlies do not stay with their children, and their movement is restricted during the Covid-19 pandemic. There are limited studies that focus on teaching technology skills to the elderly and assisting them. [4] identified the existing online tutorial; website to develop the social media skills among senior citizens. Although it is found that most of the websites help them in learning technologies despite their cognitive and physical declination, however, there is a limitation in using those websites which is to understand the navigation of a webpage, and certain knowledge and skill support should be considered. Meanwhile, some researchers have identified the problem raised by older adults while using mobile phones [5]. These findings gave insight and guidance to develop mobile apps that are friendly to the elderly. Therefore, this research will discuss the design of an application for sharing walkthroughs on mobile gadgets that is compatible with a wide range of users regardless of age.

2. DESIGN AND IMPLEMENTATION

Many apps are launched with a tutorial of simple instructions on how to use the apps for first-time usage. Since the tutorial will disappear once they have completed the tour and they will have to explore on their own, this will raise concerns about the ability of new users, especially the elderly, to remember all of the instructions. This would not be a problem for the majority of young people because they are tech-savvy; however, the elderly and those who are slow to adopt technology found it difficult to find and use functions available in the apps. Furthermore, the interfaces of the apps are not always user-friendly for the

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elderly. As for this research, we will discuss designing an app for sharing walkthroughs that is compatible for a wide range of users' age and has an elderly-friendly characteristic interface.

This app will be a social media type of apps where the user will have an account to interact with others. In general, the user has to create an account to use the apps since the apps require the user to upload content, which is a walkthrough of anything created by the user in an article text format. The text format is essential because it can be customized based on the viewer's preferences. Users can interact with one another through content sharing, content commenting, content rating, and private messaging. Almost identical to video-sharing platforms such as YouTube, except that the videos are replaced with content in article text-like format.

The content that will be shared by this app is a walkthrough of anything the user can think of. The formats are text-based, with images added as needed. The content will then be made public in the app's library, allowing other users to share it. To improve the user's experience when accessing the content in the app's library, a search system with features such as tags, keywords, and advanced search for specific detail searches such as centered on the date, authors, or field is included.

A common issue on elderly user based on previous research is the physiology and psychology of the elderly differs significantly from that of young people, as shown by declines in vision, hearing, touch, response time, hand strength, text, and graphical memory, and other areas. Thus, when the elderly use a mobile phone, they face several inconveniences and special requirements, and their user experience differs significantly from that of other age groups [6]. Other research indicates that the requirements in Table 1 should be incorporated for the convenience of elderly users. Since everyone has their preferences, these features will be customizable by each user [7-9].

Table 1. Design Requirement for Elderly

Characteristic	Feature
Look and Feel	Three-dimensional appearance button.
	Separate keypads typing for numbers and letters.
	Good spacing between buttons.
	Larger font for the text, and labeled icons
	Labeled button instead of menu navigation.
Interaction	Easy zoom in and out.
	Tapping rather than drag and drop actions.
	Avoid slide-out keyboard.
	The screen should not turn off when being idle too soon.
Functionality	Main navigation should be placed identically on all pages.
	The critical feature should never disappear.

A special feature is being introduced to assist the elderly's experience with the apps. This feature allows the user to a group or even create a sub-user account, allowing for much more private communication. This will provide the user the authority to operate the apps for their elderly or even their child from a different device. This also allows the user to customize the app's interface based on the preferences of the sub-users. When it comes to walkthrough sharing, the elderly just open the apps that the user had previously prepared remotely for them, and the user may even see what is happening on the sub-user screen for real-time session supervision. This function must only be used with both parties' approval for safety reasons.

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3. CONCLUSION

Smartphone applications are rapidly evolving, and not everything created is suitable for people of all ages, particularly the elderly. As a result, this walkthrough sharing platform gathers all information from users and shares it with others to assist those in need, with the option of customizing the interface according to personal preferences, which may also be done remotely by other users such as family members. With movement restrictions during the Covid-19 pandemic, it is clear that avoiding digitalization is not an option. Instead, developers should think about making their products considerably more age friendly.

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B-GREEN: A GREEN DIGITAL ECOSYSTEM

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Abstract

The awareness of the green environment and its link with better mental health may lead to investments in green infrastructure along with preservation and enhancement of biodiversity, both within the macro and micro scale. For a landscape project, many stakeholders are involved; from developers, designers, plant nurseries, managers and those proposing such projects. Those who provide such needs today are on separate entities, in a way, gaining those goals are less inefficient. There exists a need for a digital ecosystem platform that will help connect these stakeholders within the supply chain of creating a landscape project. Currently, there are websites for finding plants to buy owned by respective plant nurseries, another website exists that serves to provide information of local garden designers or landscape architects and another website serves to provide a wealth of knowledge regarding plants, gardening, and landscape design. Within the proposed digital ecosystem platform in the form of a web-based application, the data will be integrated resulting in easier accessibility. The members of the web-based application will be aided with the way information regarding building a green landscape project are presented holistically in the platform along with the feature of a recommender system. In addition to this, the website will present mapped data that will be useful for landscape design, including soil map, local vegetation and more. This green digital ecosystem targets usage from amateurs of garden design, one time plant purchasers, plant enthusiasts, plant collectors to designers, plant nursery owners, business owners, developers, NGOs, and governments.

Keywords: digital business, green ecosystem, gardening, landscaping, plants.

1. INTRODUCTION

The public is increasingly aware of climate change impacts and how the design of a city may either worsen or slow down the consequences [1]. Investments in green infrastructure as a complimentary solution for responding to climate change are increasing in the last couple of years in major cities. For example, in Surabaya, 13 gas stations are converted into public parks garnering positive response for the public and less pollution in the city [2]. This is also in relation to the public understanding of green infrastructure to the betterment in health of the people, biodiversity, and the climate [3]. Alongside this, increased interest in gardening have occurred during the pandemic [4].

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With this increasing green investment and green-related activities, b-green aims to connect stakeholders providing landscape design and related products and services to each other. These stakeholders may include developers, designers, plant nurseries, and managers and more. Currently, these stakeholders perform on separate entities. A digital business ecosystem is an environment that allows for collaboration consisting of different operations co-creating value through information and communication technologies (ICTs) [4]. Digital Business Ecosystem does not merely increase efficiency both from the perspectives of consumers and business owners, but also a brand's competitive advantage by the digital presence of networks [5] of businesses alike and related. The purpose of B-Green is to unify different entities operating under the umbrella of landscape design and related into one landscape digital business ecosystem to better cater to the consumers' needs and provide value of networks and market access to the different entities. A recommender system attempts to solve the problem with information overload [6]. With the numerous information available online, a recommender system improves the visitors' decision-making process through personalization by a generation of visitors' preferences, item preferences among others [7]. With the combination of the Digital Business Ecosystem and the recommender system, users can experience online personalization in landscape design and related projects through one dependable platform.

2. MATERIALS AND METHODS

To present B-Green as an idea, a prototyping platform called figma.com is used. The idea proposed also stems from literature review on existing problems and possible solutions. As mentioned prior, the growing interest in landscape design from a micro household level to the macro governmental level is high. Therefore, we conclude that there may be large interests in assembling the different stakeholders for easier contact in one digital business ecosystem. We first conducted a stakeholder and market research along with a competitor analysis to figure out the operations necessary in the DBE and to formulate the competitive advantage of B-Green.

2.1 The stakeholders involved

We mapped the different stakeholders (also potential customers) that may be affected positively by the platform:

a. Individuals
   There has been an increase in interest into gardening activities during the pandemic. Individuals who are new to take up this hobby or are long-time hobbyist may be advantageous by the presence of B-Green as they can find various plants from different nurseries, consult professionals on how to care for a certain plant and designers for the best ways to design their outdoor spaces or with plants.
b. Plant nurseries, outdoor accessories or furniture providers
   Small businesses that offer materials to designing landscape are at an advantaged as they can reach a wider online market.
c. Landscape designers/architects
   Provide their contacts in the platform and design portfolio to receive exposure from people in the field and those who are looking into designing with plants. Additionally, they can retrieve data in relation to landscape planning - such as contour lines, native plants - in the platform.
d. Developers
   Those who are interested in developing a landscape for commercial purposes can also use the B-Green platform to reach out to different landscape designers/architects.

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2.2. Competitor Analysis

The possible competitors for B-Green and how each competitor stands in comparison to B-Green are as followed:

a. **General Online Marketplace** (e.g. Tokopedia/Shopee/Facebook Marketplace)
   Compared to B-Green, the online marketplace provides products not services. Its strength lies in providing access to different products across industries. The market for B-Green may purchase here because they sell plants and landscape design related accessories. B-Green may be more attractive as its focus is solely on landscape design, plants and related.
b. **Online Plant Nurseries** (e.g. bibitbunga.com)
   Similar to b-green, online plant nurseries provide plants available that they sell and are growing. Alongside that, bibitbunga.com also provides planting and gardening accessories. The difference is that B-Green provides plants and accessories available for sale across different plant nurseries.
c. **Landscape Designers/Architects Platform** (e.g. arsitag, balilandscapecompany.com)
   Arsitag is an online directory for the design and build ranging from residential to commercial projects. Balilandscapecompany.com is an online website for a landscape design business. Similar to B-Green they provide information on what kind of projects have been done and their specialties. The difference is that within b-green, the designers and builders are limited to the landscape design and related industry.

3. RESULTS AND DISCUSSION

3.1. Product and Service Offerings from Different Businesses into One Platform – Competitive Advantage of B-green

The platform will allow users to shop plants and landscape design accessories, find designers, consult plant, or landscape care experts and retrieve mapping data for personal or commercial purposes. With the recommender system, each visitor has a personalized experience within the site. For example, a visitor may be intent only on looking into buying a certain plant for their backyard also acknowledging there are different services provided in B-Green, when the visitor is ready to purchase the site would also recommend a list of landscape designers who expertise in residential projects along with a list of possible consultations with plant or care experts who are well-versed in the management of residential landscape projects. When the user activates the geospatial tagging, B-Green will also present her a trivia of native plants of the users' region, a sample of the offerings provided in the mapped data. This may ease the visitor in knowing that b-green provides relevant information in regards to landscape design and rely on b-green for future landscape design projects.

4. CONCLUSION

Existing landscape design services and related works have been either allowing for one to two specific functions (see bibitbunga, betalandscapeindonesia) or too general on what they are providing (see Tokopedia, Shopee). B-Green attempts to invite all entities of the landscape design business into an online platform with the purpose of catering the consumers' landscape design or plants' needs in one location. In the future, it would be a viable option to conduct an in-depth insight into the market size of the Indonesian landscape design and related industry for business sustainability purposes.

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RFID HOME GATE

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Abstract

There are many low-cost options for securing your home, particularly the gate. When the owner of the house is not there, the simplest approach to safeguard the house is to lock the gates, doors, and windows. However, technology has altered our environment and daily lives over time. To improve house security, we developed RFID Home Gate, a technology with a high security system for the home. Our product is a multi-function gate that assists homeowners deal with security issues and prevent thief cases in the home, which can result in several negative results such as theft, murder, and property loss. RFID Home Gate is a new innovative product with unique functionalities, more precise security features, and better monitoring. RFID Home Gate provides innovative features, such as an RFID chip that recognizes the number plate of the owner's car and allows them to enter the parking lot of their homes. As a result, the consumer will no longer have to manually open the gate as this will open automatically when RFID is detected. The RFID Home Gate features a concealed camera, also known as closed-circuit television, on the gate, which allows fingerprints to access the fence for people to enter, as well as an alarm that emits a loud sound. This feature can assist to solve problems such as burglars climbing the gate to gain access. Furthermore, the RFID Home Gate's target user is anyone concerned about their home's security using technology. Consumers play a significant role in the advancement of new technology. That is, the more consumers who want to use new technologies, the more technologies will be generated in response to demand and how soon the technologies can fix the issues which they have experienced in the past.

Keywords: CCTV, home's security, technology, radio frequency identification

1. INTRODUCTION

New Product Development (NPD) can be classified by two group that is completely new product and improvements on existing products. The first group consist of two categories that is new to the world products and new to the firm (new product lines). Next, the second group is consisting of four categories that is addition to existing lines, improvements and revisions to existing products, cost reductions and repositioning. Addition to existing lines is the subsets to the new product lines. This will perhaps a company targeted to different market segments. The term "improvement and revision" refers to the process of making current products better than their predecessors, such as the iPhone 12. Repositioning is considered as a new product because the products were retargeted for a new use or applications such aspirins repositioned as a safeguard against heart attack or Arm & Hammer baking soda repositioned into

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a drain or refrigerator deodorant. Finally, a cost reduction refers to a new product that essentially replaces an existing product in the line, offering similar value at a lower cost to the consumer.

For this project, RFID Home Gate were classified in the second group which is improvement on existing products. Standard and electrical gate has long been in the market, RFID Home Gate was improved the current existing gate product to a multi-function electrical gate. RFID Home Gate have several advanced features and function that is different from current electrical and standard gate in the market. RFID Home Gate had including Radio Frequency Identification (RFID), closed-circuit television (CCTV), alarm system, and fingerprint scanning technology. People will undoubtedly want to improve their protection as the number of break-ins and robberies increases. One of the things that any housing resident demands is a pleasant and secure living environment [1]. As a result, RFID Home Gate will be a hit with users looking for reassurance about their safety.

This product is useful for resolving security issues in the workplace and in personal privacy. This system can also ensure the protection of companies and private residences, as it performs a variety of security functions. This product gives users extra security that is impenetrable and unavailable to others. The end consumers or target markets for this product are private residences. RFID Home Gate is an electrical multi -function gateway [2]. These gates enhance the versions of ordinary gates or electronic gates commonly used nowadays. The RFID Home Gate has many functions such as detect if there is a thief who wants to pass the gate. When a thief climbs the gate higher than the limit set by the homeowner to enter the house, the function of this hidden camera detects the thief, and this hidden camera can be used as evidence to be brought to the authorities. In addition, the alarm will also sound if a thief has entered the gate beyond the supposed fence limit that has been set. Fingerprint scanning system also has on RFID Home Gate function, this feature is useful for the owner once they forget to bring key of the gate. With all these features and functions, this gate will undoubtedly succeed in replacing an existing gate on the market.

2. MATERIALS AND METHODS

2.1. Concept Testing

The first test of a new product is concept testing, which ensures that it is attentive to the needs of the target market. Design research is an important phase in recognizing the product's desires, wants, and requirements when companies and organizations are looking to launch a product or invest in the development of a concept. New product concept virtual prototypes are replaced with physical prototypes in the design testing process. All approaches include having a group of potential customers rate one or more concept statements, each of which is provided with a particular emphasis on the needs or benefits of the customer. Figure 1 shows the sketch of the gate.

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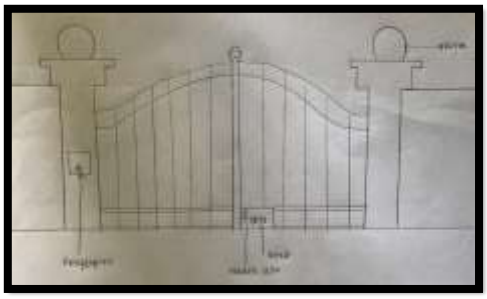

Figure 1. Sketch of the gate

2.2 Build Prototype (2D and 3D)

Figure 2 to 5 below shows the prototype of RFID Home Gate that come up with RFID devices features, fingerprint, hidden camera or CCTV, and Alarm.

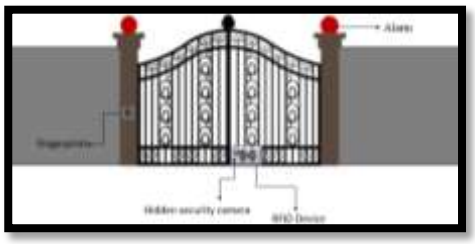

Figure 2. Two dimension (2D) from front view for RFID Home Gate

Figure 3. Two dimension (2D) from back view for RFID Home Gate

Figure 4. Two dimension (2D) from back view for RFID Home gate

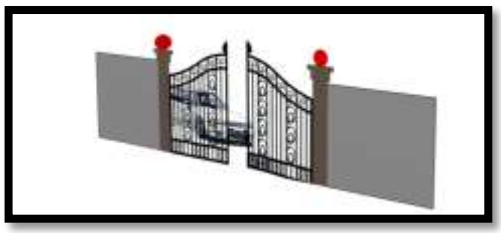

Figure 5. Two dimension (3D) from back for RFID Home Gate

3. RESULTS AND DISCUSSION

Test marketing concept to ensure the high quality of the new gate technology product on the market, starting with the marketing campaign and continuing until it is widely available. We begin with consumer market research, which is the process of providing additional information about a product through marketing and advertising.

3.1. Market Survey

Market survey has been conducted to get feedback from the potential buyers or respondents on RFID Home Gate innovations. Online surveys were also distributed to 50 respondents at random. The

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questionnaires consist of three sections. Section A is the background of respondents, Section B is issues regarding the home security and Section C is the consumer's view or support for the proposed product innovation. The table below shows the results of the online survey that has been conducted.

Table 1. Descriptive Statistics

Items	Category	Frequency	Percent
Gender	Female	29	58.0
	Male	21	42.0
Age	18-25	19	38.0
	26-33	19	38.0
	34 and above	12	24.0
Do you think you will lose your property if the thieves or robbers intrude your house?	No	1	2.0
	Yes	49	98.0
Do you think house that does not install CCTV will have less evidence to show to the authorities regarding the intruders?	Yes	50	100.0
Do you think the RFID Home Gate that provides barcode to be detected by the gate is convenience to use by the owner of the house in terms of security?	Yes	50	100.0
Do you think the alarm system that has on RFID Home Gate that emits a loud sound is suitable to use to notify the owner of the house regarding the robbers, thieves, and intruders?	Yes	50	100.0
Do you think that RFID Home Gate that provides fingertips is facilitating the residents to get inside the house?	Yes	50	100.0
Do you agree if more people are installing RFID Home Gate in their house?	Yes	50	100.0

Table 1 shows the descriptive statistics in percentage for market survey conducted. Fifty respondents consist of 58% female and the remaining, 42% are male respondents. There are 38% of the respondents with age range 18 to 25 years old, and 26 to 33 years old. While 24% of them are 34 years old and above. The issues regarding about the home security shows that 98% of the respondents agree that they will lose their property if the thieves or robbers intrude the house. Interestingly, they 100% agree about the statement of does not install CCTV will have less evidence to show to the authorities regarding the intruders. The feedback from the respondents shows that most of them agree the alarm system that has on RFID Home Gate that emits a loud sound is suitable to use to notify the owner of the house regarding the robbers, thieves, and intruders. In addition, they also agree to install RFID Home Gate in their house.

4. CONCLUSION

As a conclusion, after completing the market survey, most of the consumer are interested in RFID Home Gate. The combination of new features and technology in RFID Home Gate is what making it more interesting. RFID Home Gate has new features such as an RFID chip that detects the number plate of the owner's car to allow them to enter the parking lot of their homes. Only recognized plate can pass the gate. Other than that, the RFID Home Gate also has a hidden camera or called as Closed-Circuit Television (CCTV) on the gate. RFID Home Gate facilitates the owner to get inside the house in two ways which is using a barcode that have install on the number plate of the car and by using the fingerprints. Therefore, by developing RFID Home Gate we hope that it can help consumer in many ways.

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CALEFACTION HANGER

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Abstract

Calefaction hanger is a product that quickly dries the garments that are hung on it. It also allows for the removal of creases from clothing. This device works by converting electrical energy into heat energy. The clothing will be dried using the heat energy. The air that is produced by the fan will circulate through the air output and the dry cloth. This device also offers unique features, such as the ability to emit disinfection liquid. This happens as a preventative measure to keep contagious diseases from spreading. Consequently, it can better educate consumers about the importance of excellent hygiene. Depending on the use, the air produced can also be varied from hot to cold. Next, we sought to make this calefaction hanger as light as possible by using high-quality materials such as polypropylene, a form of plastic. These kind of materials are ideal for any type of fabric. The power status of the calefaction hanger is also indicated by a button and this power button can be used to control the product. As a result, this power button may be used to operate the device, and these kinds of features can help consumers solve their problems with drying clothes, which can be a source of aggravation, especially during the rainy season. Furthermore, for everyday use, this hanger is fairly sturdy.

Keywords: Calefaction, Hanger, Drying, Cloths

1. INTRODUCTION

Hanging clothing in the sun, rather drying using a hanger, or hanging them on a string that is essentially connected to the walls or any iron structure, is a very simple and traditional technique to dry them. People nowadays are so preoccupied with their jobs that they don't have time to care for their own clothes. When people talk about time, it's always in the context of labor. So, in an urgent case where the user requires those specific clothing, they are always in the wash bag, and the only option to get them dry is to hang them in the sun, keep them near a fan, or go to the self-service laundry, which takes a long time [1]. Another option for the user is to purchase a personal dryer and install it in their home, but this will cost a lot of money. Aside from that, the weather in most parts of Malaysia can be unexpected and inconsistent at times [2]. This paper was presented an innovation of hanger, ironing and disinfection products by introducing calefaction hanger.

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Electrical energy will be transformed to heat energy to able the Calefaction Hanger dries the clothes. The heating process will allow the molecule in the fiber materials stretched thus maintaining the new shape when cool [3]. The product, Calefaction Hanger is made to serve purposes of drying clothes and remove wrinkles. This hanger has additional features which is automatic disinfectant liquid released after the clothes is dried. This feature was innovated to adapt with the global health issues faced now, COVID-19. Moreover, the design of the hanger is practical and safe to be use by children. Material of the hanger is the polypropylene [4] where it is commonly used plastic for industrial appliances and it is a good electrical resistance. Thus, the product will lessen the probability from electrical shock. The Calefaction Hanger is a reimagining of a previously available product. Although a drying hanger or rack already exists on the market, the calefaction hanger has additional benefits, including the ability to dry garments and the release of disinfecting liquid. These additional characteristics distinguish the calefaction hanger from other hangers. Furthermore, the market's desire has sparked the development of this technology.

The main factors that influenced the design of a new innovative product were a busy lifestyle, uncertain weather, unsanitary indoor drying, and an expensive dryer. By conducting research and surveys, feedback from respondents is used to improve existing products and solve drying, ironing, and hygiene issues.

2. METHODOLOGY

The development of Calefaction Hanger was categorising as New Product Development (NPD) that involved a process that presented in the Figure 1 below.

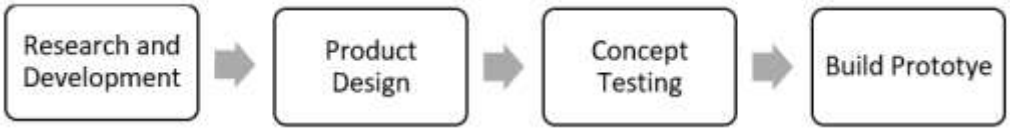

Figure 1. The flow chart of New Product Development (NPD)

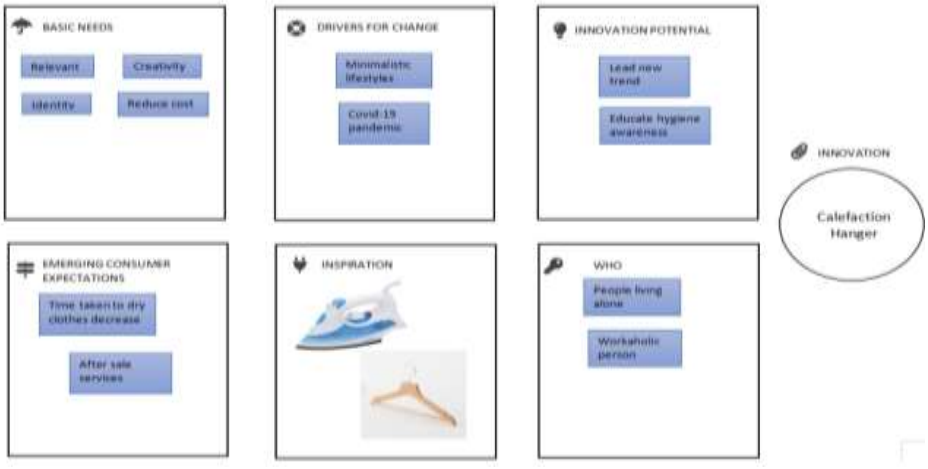

Figure 2. The components considered in introducing Calefaction Hanger

Figure 1 depicts the NPD flow chart used in gathering information and developing the concept for Calefaction Hanger. All of the information was gathered from research on current products as well as a

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consumer survey. The product was designed based on gathered information, the concept was tested to determine the safety of usage and special features, and the prototype was built as the final phase. While, Figure 2 presented six components which are the basic needs, driver for change, emerging consumer expectations, innovation potential, inspiration and who are necessary to consider in producing an innovation product. The gathered information is used to develop an innovative concept to fulfil the needs and wants of consumers.

3. RESULTS AND DISCUSSION

A market study was carried out in order to get information about this new product that people were interested in. This survey was carried out to assemble data based on user needs, price range expectations, and the ability of this product's innovation to replace an existing product. There have been about 100 people who have completed the survey. According to the results of the poll in Figure 3, the majority of respondents (about 57) wish to replace their current hanger with the Calefaction Hanger since it has many appealing features and is a new product on the market. From the market survey analysis, more than 50% respond the calefaction hanger is a brilliant idea and most respondents want to replace their current hanger with the calefaction hanger and most of them are willing to purchase the calefaction hanger if the product price were below RM100 as presented in Figure 4. The respondents also willingly recommended the products towards their friends and relatives due to its value. The positive results from the market survey analysis become the main factor in introducing this innovation of the calefaction hanger.

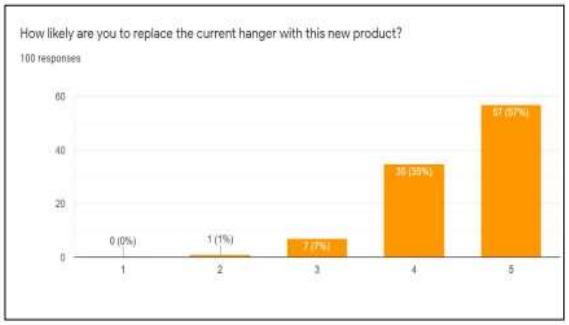

Figure 3. The number of respondents of introducing Calefaction Hanger

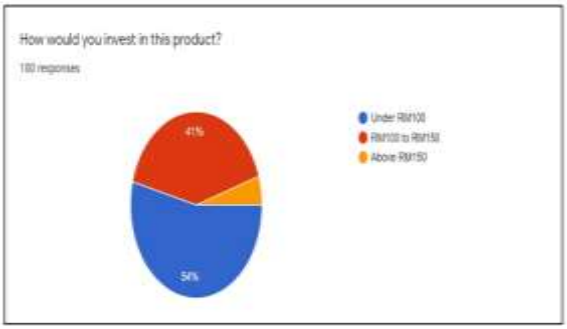

Figure 4. The Price Range of Calefaction Hanger

Figure 5 was illustrated the innovation prototype of the calefaction hanger in 3- dimensional. This idea is innovation of combination the product of hanger and iron in order to help the consumer to dry and ironing process in one time.

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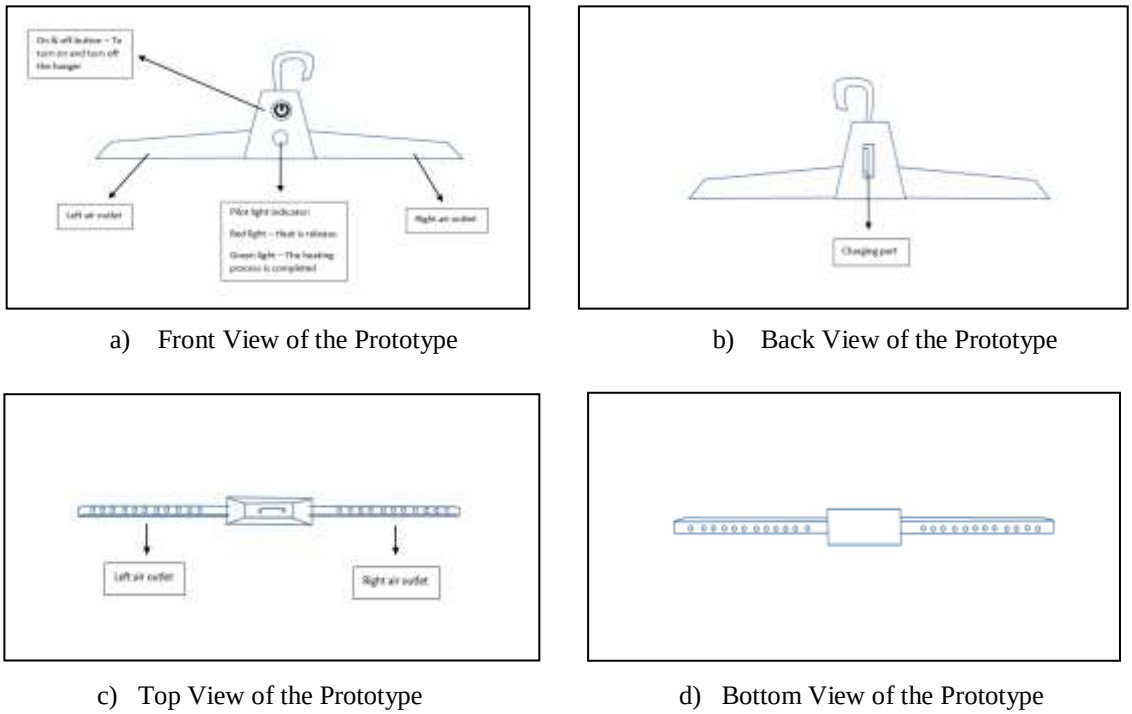

a) Front View of the Prototype

b) Back View of the Prototype

c) Top View of the Prototype

d) Bottom View of the Prototype

Figure 5. Prototype of the calefaction hanger

This cutting-edge hanger had a charging plug, a fan, and an air outlet. The hanger's charging connector would employ Type-C charging, which supports 30W of charge and has been proved to carry more power. The fans attached would provide the dry air required to dry the clothes, producing energy of 5-9 V at 30.0 watts, allowing wet garments to be dried in 20-30 minutes for medium thickness materials. The air outlet, on the other hand, would direct the air produced towards the garments. This hanger is also equipped with a sensor that sprays disinfectant liquid onto the garments, making them more sanitary. This concept will be realized utilizing polypropylene, a lightweight and high-quality material [4]. The combination of features will solve the problem of wrinkle removal during the drying process while also disinfecting all viruses and germs that cause health problems.

4. CONCLUSION

In a nutshell, the Calefaction Hanger will convert electrical energy into heat energy, allowing the hanger to perform its functions of drying garments and removing wrinkles. The objective will be served by the extra features of a fan and an air outlet. The product's design and materials are suitable for both youngsters and adults. The calefaction hanger's material, polypropylene, has a high electrical resistance, which is important for the hanger's use. Busy schedules, inclement weather, unsanitary indoor drying, and the high cost of a dryer are just a few of the issues that users face today. The calefaction hanger, on the other hand, could solve these issues. The calefaction hanger offers a number of tempting features that will entice new customers to purchase and use the product.

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AUTOMATED FOOT MEASURER

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Abstract

Product innovation is vital as it develops new products or improves existing products. In this era of modernization, the development of new products in terms of the design, materials and components are going through major changes. Since 2019, the world has been hit by the deadly Corona virus resulting in massive deaths. This pandemic has affected millions of people around the world. The nature of business has changed where the trend for e-commerce business is given top priority. People prefer to shop online in this time of difficulty as the government introduces the slogan "stay safe, stay home". However, online purchases especially from the overseas might result in a dissatisfaction. As an example, people would accidentally buy wrong sizes of shoes and that would be such a waste. Thus, a new product, Automated Foot Measurer (AFM) is created in order to help people to choose the correct sizes. This AFM is designed by improving a weighing scale with built-in sensors which can measure 3 different sizes, UK, US and EU. Basically, it can be concluded that these smart sensors turn mundane processes into smart through real-time data collection, processing and transmission.

Keywords: AFM, sensor, foot size, business, online store

1. INTRODUCTION

The novel severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) pandemic outbreak emerged in Wuhan City, Hubei Province, China, named Covid-19. Since the cases keep increasing, the first Movement Control Order (MCO) is implemented on 18th March 2020 in order to reduce the cases in Malaysia. As stated by Elengoe [1], the government has issued 6 restrictions including the closure of government and private premises. Since that everything seems to change. Technology plays a crucial role in everyday life where classes are being conducted online and meetings are done virtually. People have been exposed to the importance of technology. Besides, technology give a huge positive impact in online businesses particularly since most of the business premises are not able to be operated thus leading them to online platforms such as Shopee and Lazada. Top ten retail international e-commerce website can be referred from Andrienko [2] and listed in Table 1.

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Table 1. Top retail e-commerce websites in pandemic

Retail Websites	Millions
Amazon.com	4059M
Ebay.com	1227M
Rakuten.co.jp	804M
Samsung.com	648M
Walmart.com	614M
Apple.com	562M
Aliexpress.com	532M
Etsy.com	395M
Homedepot.com	292M
Allegro.pl	272M

With the help of advance technology, the sale of e-commerce increases because of this virus [3]. However, buying things without looking at them physically might have some disadvantage. For example, when buying shoes online, some buyers and new sellers might get confused with the different shoe sizes. The standard shoe sizing system based on anthropometric measurements of Malaysian women's foot sizes and shapes has been studied by Shariff et al. [4]. Foot dimension information on different user groups is important for footwear design and clinical applications [5]. Wu et al. [6] proposed an automatic foot scanning and measurement based on multiple RGB-depth cameras. Zheng et al. [7] proposed an automatic foot arch index measurement method based on a flexible membrane pressure sensor. The foot arch index is an important index to evaluate the health of human feet and the biomechanics line, aiming at addressing the shortcomings of the low efficiency and slow speed of manual foot arch index measurement. As mentioned by Vetelino and Reghu [8] , the need for sensors is more critical due to complex technologies. The use of sensor is beneficial in term of its range, precision, sensitivity, error, environmental and cost. The sensor is well known in monitoring processes accurately, reliably and continuously. Besides, it collects process and asset data in real time which could save more time.

2. METHODOLOGY

Introducing the Automated Foot Measurement is good where buyers and sellers may own their individual AFM. The idea of this AFM is taken from body mass & fats scale. The summary of the methodology process is shown below,

Step 1: The problem is identified.
Step 2: The articles on foot sizing are studied.
Step 3: The AFM is proposed and it is drawn manually as in Figure 1.

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Figure 1. A sketch of AFM

Step 4: The materials for AFM are suggested.
Step 5: The AFM prototype is developed and demonstrated.
Step 6: The benefits of the AFM are discussed.

3. RESULTS AND DISCUSSION

A simple and useful tool which is easy to use is relevant for a shoe's customer. AFM is developed to assist people who are willing to buy online shoes or people who do not know their actual foot size. Besides that, the new technology that is implanted in AFM is a high technology sensor to obtain accurate foot measurement. It senses a physical change in some characteristic that changes in response to some excitation. The heat or force from the user's foot and bodyweight is converted that into an electrical signal. This AFM offers various types of the foot size. The screen can appear in three types of foot sizing that are the UK, EU, and the US. This feature can help the user to know their foot size in various types of measurement, so that they do no need to convert their shoe sizes using the conversion chart when buying online shoes. Other than that, AFM provides sound features to help the user know when their foot size has been completely measured by the device. Figure 2 shows the design of AFM with built in sensors.

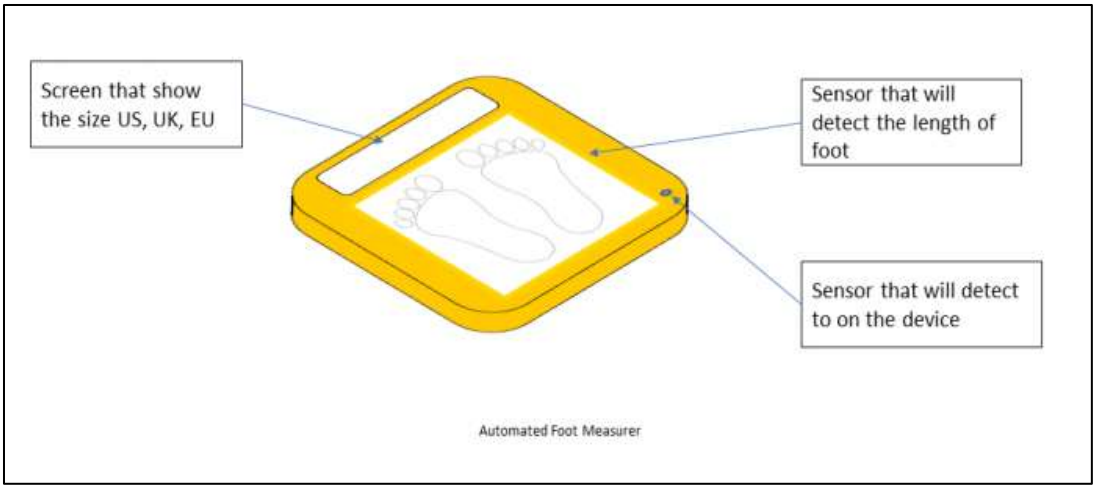

Figure 2. Automated Foot Measurer (AFM)

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4. CONCLUSION

As a conclusion, the Automated Foot Measurer is designed to assist people in foot measurement of different foot sizing. It is beneficial to be used when people need to buy shoes online. This could avoid a lot of frustration and could also be money-saving to online shoes buyers.

ACKNOWLEDGEMENT

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SOAPAG+: SOAP IMPREGNATED GREEN SILVER NANO

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Abstract

SOAPAg+ is the novel disposable hand washer paper soap impregnated with green silver nanoparticles(AgNPs+) produce from combination of pineapples and mangosteen peels extracts. This novel product emphasizes the use of green Ag+ enriched with a bundles of powerful bioactive compounds from both plants offer a promise to sanitize our hand/skin by killing off microorganisms and viruses during this COVID-19 pandemic. It's can encourage hygiene practice among people during this pandemic. This product suitable for all skin type consumers. Soap is one of the most effective ways to get rid of COVID-19 by breakdown the fatty layer that coats coronaviruses. It's meant for people who are concern of healthy skin care product and looking for alternative hygiene product from AgNPs+ produce from natural sources. From the scientific finding, the ingredients that made up the SOAPAg+ shown antiviral antibacterial, antifungal properties, no allergic to skin, and at the same time, it is estimated to be stable at room temperature for a long term storage. It is believed that SOAPAg+: SOAP IMPREGNATED GREEN SILVER NANO promoting potential marketable hygiene product in purpose of able to give highly hygiene to hand/skin emphasis the use of green silver nanoparticles.

Keywords: soap, silver nanoparticles, pineapple peel, mangosteen extract, COVID-19

1. INTRODUCTION

The coronavirus was first identified during an outbreak of respiratory illness cases in Wuhan City, Hubei Province, China and cause the pandemic Coronavirus disease 2019 (COVID-19) spread drastically in every part of the world [1]. On December 31, 2019 COVID-19 was initially reported and on January 30, 2020, consequently declared the COVID-19 outbreak as a global health emergency and a global pandemic [2]. The problem become ubiquitous issues because the virus COVID-19 virus is transmitted through droplets generated when an infected person coughs, sneezes, or exhales. Scientifically, these droplets are too heavy to hang in the air, and quickly fall on floors or surfaces makes it spread from touching surfaces is not thought to be a common way that COVID- 19 spread.

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Consequent from these problem, SOAPAg+ which consist of silver nanoparticles coated by bioactive compounds from pineapple and mangosteen peel extract was impregnated in paper soap to create good atmosphere in hygiene practice among people as well as able to reduce the infection of COVID-19 and another microorganism. At the same time SOAPAg+ can be alternative to liquid hand sanitizer as some people may be sensitive to alcohol and this is best practice to maintain our daily routine of hygiene and using soap is actually more efficient in removing bacteria or virus especially during this COVID-19 pandemic. Uniqueness and novelty of SOAPAg+ due to its thin structure and light weight without the problems of leaking or dripping like the other usual soap. As well as this novel soap introduce the benefit of silver nanoparticles synthesis using green method as they enrichment with antiviral, antibacterial and antioxidant potentials.

Pineapple which is belongs to the family Bromeliaceae enrich with phytochemical compounds such as saponin, terpenoid, flavonoid, amino acid, protein, phytosterol, carbohydrate, alkaloid and cardiac glycosides that can contribute to protect the cells from destruction that can lead to various diseases [3]. These bioactive compounds also used as capping and reducing agent for the bio-synthesis of silver nanoparticles because of their reducing properties available in the plant extract [4]. Alkaloids, tannins, flavonoids, steroids, and other natural compounds derived from various plant components such as leaves, flowers, seeds, bark and roots, are useful for synthesizing metallic nanoparticles as a bio-reduction reaction reducer and stabilizer [5].

Mangosteen is a native tropical plant that can be found in Southeast Asia and belongs to the family Guttiferae [6]. There are one active compounds found, xanthones in the mangosteen extract that been attracted special attention of many researches have ability on treating tuberculosis, demonstrated strong antibacterial activity, antioxidant and anti-inflamantory [7]. Pharmacological activities such as antibacterial, antifungal, antimalarial, anti-carcinogenic, and antiatherogenic activities are some of those demonstrated by mangosteens. The pericarp of mangosteen contain phenolic compounds thus it can be a good source of natural anti- oxidants [8].

Hence, invention of SOAPAg+ create a novel soap with green silver nanoparticle and in direct capable to reduce the accumulation of solid waste in our biosphere that can give huge bad impact to environment and human health.

2. MATERIALS AND METHODS

Pineapple and mangosteen were collected and the peel of both fruits were separated from its flesh. Weighed and dried in the oven at 50° C for 2 days. The dried peels are grounded and extracted using a water. The solution of extracts was mixed with silver nitrate for the synthesis of silver nanoparticle(AgNPs). The present of AgNPs fabricated with Pineapple and mangosteen peel extracts was characterized using UV-Vis Spectrophotometer and visual observation. The mixture was impregnated into dissolvable paper. The formulation of $SOAPAg^{+}$ started and undergoes several testing including allergic test, stability and antibacterial assay.

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3. RESULTS AND DISCUSSION

3.1. Characterization of AgNPs using UV-Vis Spectrophotometer

The samples of AgNPs displayed an absorbance band peak at around 420 nm which is the typical absorbance reading for silver nanoparticles after 72 hours [9].

Table 2. Wavelength Reading of AgNPs using UV-vis spectra

AgNPs/72 hours
Wavelength
424

3.2. Characterization of AgNPs using Visual Observation

The colour of the mixtures pineapples and mangosteen peels extracts gradually changed to dark brown from the original colour was recorded after 24 hours of incubation. The primary indication of silver nanoparticles(AgNPs) formation is signified by a reaction solution colour change to dark brown [10]. The synthesis of silver nanoparticles(AgNPs) from the mixtures was progressive as the colour of the reaction showed changes from colourless to reddish brown [11].

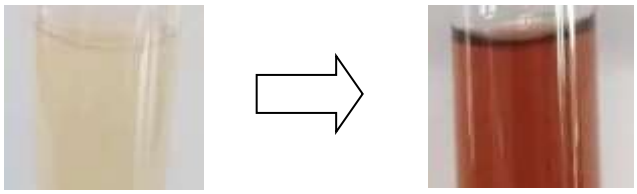

Figure 2. After 24 hours incubation time, colour changes occur in the mixture of pineapple and mangosteen peel extracts to indicate the synthesis of AgNPs

4. CONCLUSION

As a conclusion, SOAPAg+: soap impregnated green silver nano is a new invention of soap formulated from silver nanoparticles synthesized through the combination of pineapple and mangosteen peel extracts was showed positive inhibition against bacterial organism. This novel product has a potential to reduce microorganisms especially microorganisms that landed on our skin surface.

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2nd GRADUATE DIGITAL INVENTION, INNOVATION & DESIGN GIDID2021

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MILLENNIUM FACE SHIELD

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Abstract

The usage of face shield has been broadly implement by many people as to protect their face from viral infections. Face shield are worn to protect face that are not covered by face masks such as the eyes and upper face. Although, the face shield is a supplementary protective tool to prevent the spread of covid-19 outbreak, it remains risky especially if we are in a public area because the existing face shield still exposed with some weaknesses. The existing face shield in the market is not suitable to be used solely as the main self-defence. To prevent the virus more effectively it should be worn in conjunction with the face mask. The best solution to overcome this problem is by implementing the smart technology through their protection system in enhancing not only the main function of the product but also able in providing multiple function that can ease the user. Thus, the problem faced by existing user can be solve or reduce and manufacturer or company will have more competitive advantage in delivering their products. Millennium Face Shields (MFS) is a multi-function innovation and improved version of existing face shields. It has several advanced functions that may vary from existing face shield. It has three (3) ports that has multi-function. The ports can be used for charging, connect to earphone and communicate. All these functions were more user friendly where user not have to pull out their mask to pick up the call and listening to the song. It also come with mini fan to give user comfortable feeling when they wear the face shield for extended duration. It also has anti dust surface technology and magnetic cover. This will provide user more option either to use together with the shield or not. It also come with UV light steriliser features. By activating the ultraviolet light steriliser button, users can disinfect their face shields and eradicate germs. Users no longer have to manually sanitise their face shields.

Keywords: face shield, smart technology, multifunction

1. INTRODUCTION

Face shield is one of the additional protective tool to prevent the transmission of covid-19 outbreak. Face shield is also broadly used in the medical and non-medical sectors (Nania, 2021). Nowadays many people choose to use face shield while doing their outdoor activities to defend themselves against the infections of the virus. Face shield are worn to protect face that are not covered by face masks such as the eyes and

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upper face. Although, the face shield is an additional tool to protect against Covid-19 outbreaks, it remains at risk with the virus especially if we are in a public area because the existing face shield still has open space at the bottom and edges of the face. Other than that, face shield also not seemly be used alone as the main protection, to prevent the virus more effectively it should be worn together with the face mask. Thus, the user need to apply two (2) different protection tools which may lead to uncomfortable feeling and time consuming. The best solution to overcome this problem is by improving the existing face shield by executing the technology through their protection systems. By having a technology implemented through protection systems, the major problem that face by user can be solved and also can attract more user to take part in face shield application for better safety against this outbreak.

2. MATERIALS AND METHODS

The research and data collection have been conducted by focusing on the people in Malaysia as our sample. We used Google Form as our questionnaires method to conducting the survey. It consists of Section A (respondents demographic), Section B (application of existing face shield) and Section C (innovation/ implementation of Millennium Face Shield (MFS)) in collecting the data and determining the market survey acceptance among our respondents. The questionnaires were distributed by providing the link through WhatsApp, Telegram and other social media platform likes Facebook, Twitter and Instagram. The questionnaire has been distributed using random sampling technique to 60 numbers of respondents in Malaysia.

2.1. Findings

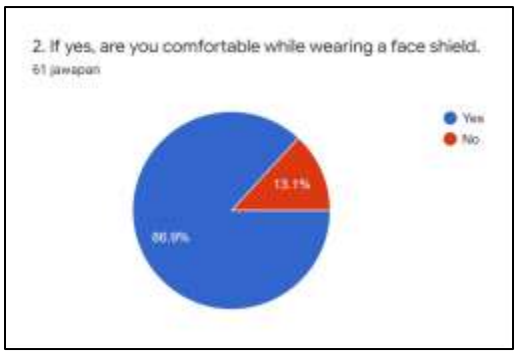

Figure 1. Result from the survey through questionnaire

From the survey, we found out that 86.9% respondents said that they feel safe, comfortable and have more prevention action while wearing a face shields and the remaining of 13.1% respondents are not prefer to wear the face shield and not comfortable wearing it considering to the certain factors such as need to have double application of prevention. From the survey we found out that they felt they need to spend more time, effort and money since they not only to wear the face shield solely but also need to put on the face mask.

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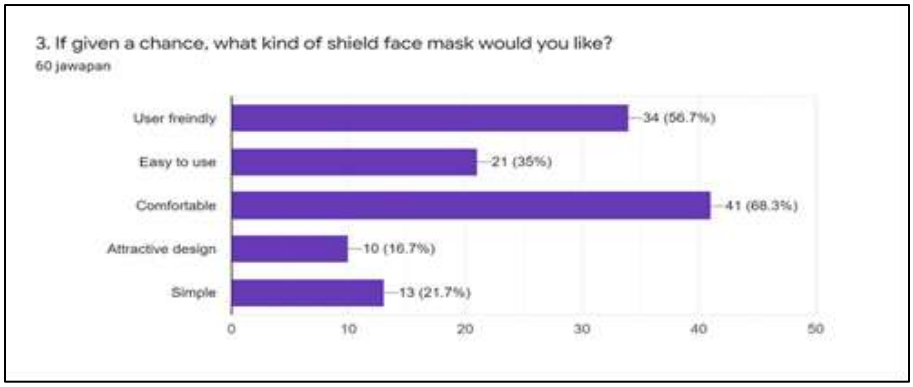

Figure 2. Market preference on face shield

Figure 2 shows the responds to the question; If given the opportunity, what type of face shield do you want/ prefer in the market? The results of the study showed that, most respondents prefer to choose comfortable face shield with 68.3% representing 41 respondents. While 56.7% (34 respondents) prefer face shield that is more user friendly, 35% (21 respondents) prefer face shield that is applicable and easy to be use, 21.7% (13 respondents) choose for simple application and design and the rest of 16.7% (10 respondents) prefer for more attractive design of face shield.

3. RESULTS AND DISCUSSION

3.1. Improvement on existing products

From the data gathered through our survey, we believed that the improvement on the existing face shield 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 (Hart, 2012). Millennium Face Shield (MFS) were classified in the second group which is improving an existing product. It was a multi-functions face shield attached with the mask which were an improved version of existing face shields in the market. The several advance function include of three (3) ports that has multi-function. The ports can be used for charging, connect to earphone and communicate. All these functions were more user friendly where user not have to pull out their mask to pick up the call and listening to the audio. It also come with mini fan to give user comfortable feeling when they wear the face shield for extended duration. It also has anti dust surface technology and magnetic cover. This will provide user more option either to use together with the shield or not. It also come with UV light sterilizer features. By activating the ultraviolet light sterilizer button, users can disinfect their face shields and eradicate germs. Users no longer have to manually sanitize their face shields (Corsillo, 2019). This will provide more benefit to user since it has multifunction that able to meet user requirement again it.

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3.2. Prototype

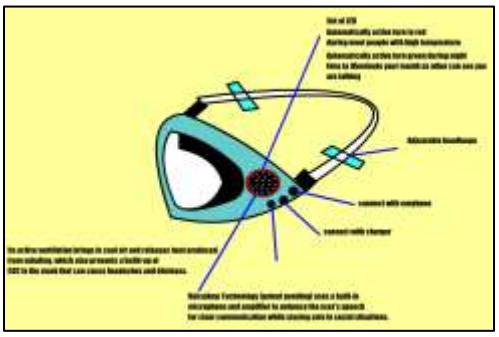

Figure 3. Side View Millennium Face Shield

Millennium Face Shield (MFS) provide a set of LED that will automatically turn to red if the environment is surrounded by people who has a basic symptom such as high temperature, cough and flu. It will change to green if the surrounding is safe (Elverum et al., 2016). Other than that, it has ventilation that will brings in cool air and releases heat produced from exhaling which also prevents a build-up of CO^2 in the mask that can cause a headaches and dizziness. Last but not least, it also come with Voice Amp Technology (VAT) that assigned in the microphone and amplifier to enhance the user's speech for clear communication while staying safe in social situations. It also come with adjustable loop that's give the Muslim people easy to wear it.

4. CONCLUSION

As a conclusion, Millennium Face Shield (MFS) offered multiple functions to prevent from the covid-19 virus. The features provided were more advance from other mask and will give our product more competitive advantages against the existing face shield. Millennium Face Shield (MFS) also has been provided with several additional functions, considering all of the information that we have gathered from our survey among the market regarding face shield. This functions not only provided the best application of face shield as protection tools against Covid 19 outbreaks but also fashionable, to suit and to be compliment with today's demand and requirement. Safe yet stylish.

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ESTIMATION SECOND ORDER ORDINARY DIFFERENTIAL EQUATION USING RUNGE-KUTTA METHOD

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Abstract

Several branches of economy, science and engineering frequently contain mathematical models of ordinary differential equations. A differential equation is defined as an equation that involves a relation between an unknown function with one or more of its derivatives. In solving the second order ODE, numerical methods are very important because most realistic systems of ODE cannot be solved analytically. Second order ODE can be solved by any numerical methods such as Euler's (RK1), Heun's (RK2), RK3, RK4 and Butcher's (RK5) method. In this research, three types of non-homogeneous test functions with initial value problems are chosen and tested under three different step sizes which are h=0.1, h=0.05 and h=0.01 to solve the second order ODE problems. These methods are tested by using MAPLE 2016 software. The number of iterations, the percentage relative error and CPU time are recorded for numerical analysis. The results are evaluated to determine the best method to solve second order ODE problems. As a conclusion, the higher order of Runge-Kutta method (Butcher's) using smallest step sizes is the most accurate method as it has the lowest percentage relative error yet not the fastest method since the lower order of Runge-Kutta method will have the fastest CPU time and, in this research, goes for Euler's (RK1) method.

Keywords: Second order ODE, Runge-Kutta methods, Numerical methods

1. INTRODUCTION

Differential equations are often used in science and engineering for numerical demonstrations. Ordinary differential equation (ODE) could be classified as either initial-value problem (IVP) or boundary-value problem (BVP) [1]. Runge-Kutta is a method with less computational requirement and high accuracy. Besides, it is one of the most widely used and most successful of all one-step formulas [2]. The most discussed IVP are in class of first and second order. These problems are often solving analytically once they are linear. However, only a few nonlinear problems are often solving analytically. Thus, one must believe numerical scheme to unravel these problems. Numerical methods for Second Order ODEs is named as Runge-Kutta methods are designed for special second order differential equations and this system were introduced around 1900 by C. Runge and M. W. Kutta [3]. Then after passage of time this

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method took a serious role within the study of iterative methods supported explicit and implicit which applied to unravel ODEs. This approach is straightforward to implement but it will enlarge the equation system and can increase the value for the method.

Since many problems are not analytically solvable, we need numerical methods since it enables solution of a complex problem with a great number, but of very simple operations. Hence, this paper wants to compare between those numerical methods in giving the best approximate solution and investigate the factors that influence the accuracy of giving the best approximate solutions for the test functions chosen. Methods that have been chosen are Euler, Heun's, RK3, RK4 and Butcher's method [4, 5]. The error will be calculated and compared between these five methods. The method that gives a high-level accuracy and less CPU time will be chosen as the best method.

2. METHODOLOGY

In this paper, the non-homogenous second order ODE are solved numerically using different order of Runge-Kutta methods. The results were analysed based on percentage relative error and CPU time taken. Three different test functions were selected with five numerical methods and three step sizes, h=0.1, h=0.05 and h=0.01. The test functions chosen are Non-Homogeneous Undetermined Coefficient, Non-Homogeneous Variation Parameters and Non-Homogeneous Cauchy-Euler are presented below:

i. Non-homogeneous Undetermined Coefficient

ODE Equation: $\frac{d^2y}{dx^2}+6\frac{dy}{dx}+18y=180\ ;\ y(0)=1$

General Equation: $y(x)=-\frac{2}{5}e^{-3x}\sin(3x)-9e^{-3x}\cos(3x)+10$

ii. Non-homogeneous Variation Parameter

ODE Equation: $\frac{d^2y}{dx^2}+\frac{dy}{dx}=3\sin^2(x)\ ;\ y(0)=1$

General Equation: $y(x)=-\frac{3}{20}\sin(2x)+\frac{3}{10}\cos(2x)+\frac{6}{5}e^{-x}+\frac{3}{2}x-\frac{1}{2}$

iii. Non-homogeneous Cauchy-Euler

ODE Equation: $x^2\frac{d^2y}{dx^2}-2x\frac{dy}{dx}+2y=6x^2+4\ln(x)\ ;\ y(1)=1$

General Equation: $y(x)=-3x-5x^2+6x^2\ln(x)+2\ln(x)+3$

Then, the second order ODE are solved numerically using the methods the shows in (1) – (5) based on three values of steps size. The general numerical formula of Euler (RK1), Heun's (RK2), RK3, RK4 and Butcher's (RK5) method are described below [4, 5]:

Euler's Method (RK1): $y(x_0+h)=y_0+hf(x,y,z)$ (1)

Heun's Method (RK2): $y(x_0+h)=y_0+\frac{h}{2}(k_1+k_2)$ (2)

RK3 Method: $y(x_0+h)=y_0+\frac{h}{6}(k_1+4k_2+k_3)$ (3)

RK4 Method: $y(x_0+h)=y_0+\frac{1}{6}(k_1+2k_2+2k_3+k_4)$ (4)

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Butcher's Method (RK5) : $y(x_0+h)=y_0+\frac{h}{90}(7k_1+32k_3+12k_4+32k_5+7k_6)$ (5)

Next, the accuracy of the numerical solutions is analysed based on the relative percentage error and CPU time taken. All the methods are computed using Maple 2016 software. The formula of percentage of relative error is presented in (6).

Percentage of relative error = $\left|\frac{V_{Actual}-V_{Estimatel}}{V_{Actual}}\right|\times 100$ (6)

3. RESULTS AND DISCUSSION

Table 1. Analytical and Numerical Solutions of second order ODE

Test Function	h	Iteration	Analytical	RK1	RK2	RK3	RK4	RK5
Non Homogemeous UC	0.1	30	10.00058815	9.998635934	10.00014328	10.00704126	10.00059211	10.00058824
	0.05	60	10.00058815	10.00170750	10.00045440	10.00304475	10.00058834	10.00058815
	0.01	300	10.00058815	10.00095062	10.00058274	10.00095062	10.00058818	10.00058817
Non Homogemeous VP	0.1	30	4.328220021	4.390646454	4.494338580	4.389708286	4.389707903	4.328220021
	0.05	60	4.389707893	4.359823455	4.389922933	4.441759355	4.389707912	4.389707890
	0.01	300	4.389707893	4.383862379	4.389715910	4.400070012	4.389707898	4.389707888
Non Homogemeous Cauchy-Euler	0.1	20	28.52228819	25.80827787	28.44378224	28.75756194	28.52225648	28.52228720
	0.05	40	28.52228819	27.15647414	28.50297358	28.64785306	28.52228634	28.52228812
	0.01	200	28.52228819	28.24819784	28.52152964	28.54842525	28.52228821	28.52228813

Table 1 shows the analytical and numerical solutions of second order ODE for y(3). There are three step sizes use which are h= 0.1, 0.05 and 0.01. The number of iteration will increase when the number of step size decreasing. Form the table 1, the results show the estimation of RK5 values are closest to the analytic compare to the others RK methods.

Table 2. Analysis of Percentage Relative Error

Test Function	h	RK1	RK2	RK3	RK4	RK5
Non Homogemeous UC	0.1	1.9E-02	4.4E-03	6.4E-02	3.9E-05	8.9E-07
	0.05	1.1E-02	1.3E-03	3.6E-03	2.9E-07	1.9E-07
	0.01	3.6E-03	5.4E-05	3.6E-03	2.9E-07	1.9E-07
Non Homogemeous VP	0.1	1.4	2.1E-02	2.38	8.9E-06	2.2E-07
	0.05	1.68E-01	4.8E-03	1.18	4.3E-07	6.8E-08
	0.01	1.3E-01	1.8E-04	2.3E-01	1.1E-07	1.1E-07
Non Homogemeous Cauchy-Euler	0.1	9.5	2.7E-01	8.2E-01	1.1E-04	3.4E-06
	0.05	4.7	6.7E-02	4.4E-01	6.4E-06	2.4E-07
	0.01	9.6E-01	2.6E-03	9.1E-02	7.0E-08	2.1E-07

Table 2 presented the analysis of percentage relative error by computing the absolute of residual error between the analytic results and estimation results. It shows RK5 with the least of step size give the smallest residual error for all test functions, while RK1 provides the largest errors for all step size use and it followed by RK3, RK2 and RK4.

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Table 3. Analysis of CPU time

Test Function	h	RK1	RK2	RK3	RK4	RK5
Non Homogemeous UC	0.1	0.234375	0.234375	0.234375	0.265625	1.703125
	0.05	0.140625	0.15625	0.234375	0.265625	1.796875
	0.01	0.21875	0.21875	0.234375	0.28125	1.640625
Non Homogemeous VP	0.1	0.234375	0.234375	0.296875	0.296875	1.640625
	0.05	0.1875	0.20312	0.234375	0.265625	1.859375
	0.01	0.171875	0.250	0.250	0.28125	1.765625
Non Homogemeous Cauchy-Euler	0.1	0.171875	0.250	0.265625	0.28125	1.625
	0.05	0.1250	0.1875	0.234375	0.250	1.71875
	0.01	0.281250	0.265625	0.265625	0.28125	1.828125

Table 3 shows the CPU time taken for each numerical methods and it is analysed that RK1 method has the fastest time taken to solve the second order ODE equations and increasing when the order of Runge-Kutta method increasing. CPU time become longer if the step size chooses smaller, since the number of iterations increasing.

4. CONCLUSION

As a conclusion, RK5 method is the most accurate method in order to solve second order ODE compared to other Runge-Kutta methods since it has the lowest percentage relative error and smallest difference value with the analytical value. RK1 has the least value of CPU time which means that it is the fastest method to solve the equation due to its simple formula compared to others.

ACKNOWLEDGEMENT

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AUGMENTED REALITY MOBILE APP FOR PRESCHOOL MATHEMATICS LEARNING

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Abstract

Preschool education is an important elementary education for children in the development of an individual life after receiving home education. Preschool subject like mathematics is one of the most relevant topics at the beginning of school that covers counting and simple calculation like addition and subtraction. It is known that children in ages four to six years are difficult to focus during the learning session because they like to play and have fun in the classroom. If this situation is not observed and teachers do not take necessary actions, children will refuse to learn mathematics by avoiding activities or learning that involve numbers and counting. Nowadays, a learning technique that uses a method such as Augmented Reality (AR) makes the learning system more interesting and offers an improved learning environment that could possibly stimulate children's knowledge and experience during the learning process. The perfect platform for AR is a mobile application since it is user-friendly, easy to use, downloadable, inexpensive, and can be run on most mobile phones. This application provides real-life examples of mathematics ideas and meets the current way of learning by implementing interactivity in the application. The result from Functionality Test shows that all features in this application are worked well. While the User Acceptance Test (UAT) result indicates that this application obtained the positive acceptance and has the potential to be used as the new approach for the teachers to grab their attention by creating and expanding activities with the current technology. This application benefits teachers and parents as they can measure the mathematics skill of the children and at the same time, they can identify which areas in mathematics that the children have difficulties. Therefore, teachers or parents can take appropriate action to help these children.

Keywords: augmented reality, mathematics, preschool, mobile application

1. INTRODUCTION

Preschool subject like mathematics is one of the most relevant topics at the beginning of school as mathematics is a discipline that can be taken up to the university level. Children use mathematics in their daily lives like counting their steps, sorting blocks, and many informal learning activities. In formal education, mathematics for preschool normally covers counting and simple calculation like addition and subtraction.

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However, preschool teachers facing a big challenge to apply the best practice in teaching mathematics because children at this age difficult to focus during the learning session due to their 'fun and play' nature. Other than that, conventional methods of learning in preschool do not suit the children, and learning practices get bored. In addition, static materials like text-based and less attractive materials also contribute to this problem.

Nowadays, a learning technique that uses method such as Augmented Reality (AR) makes the learning system more interesting and technologically relevant in today's modern flow. AR improves user perception and offers an enhanced learning environment that could potentially influence children's experience and knowledge during the learning process [1]. The perfect platform for AR is a mobile application because it is easy, user-friendly, inexpensive, downloadable, and run-able on most mobile phones.

In [2] study, students need to use headphone camera to scan the target object in the mobile AR application that has been developed for the fraction and volume of liquid topics. In another study conducted by [3], the interest and understanding of learning volume and 3D composition have significantly promoted among the students when they learn the topics using AR Math Learning App. Mobile AR Apps are also helpful and make learning more enjoyable in other topics such as mathematical modelling and problem solving [4], building space concepts [5], basic mathematics operations [6], multiplication table [7] and vector geometry [8].

Since AR has great potential to capture students' attention, it has been used in this mobile application to provide real-life examples of mathematics ideas with interactivity elements. To enhance this application, multimedia elements such as video, sound, and 2D models have been applied that cover numbers recognition, simple addition, and subtraction for preschool children.

2. METHODOLOGY

This study applied the System Development Life Cycle (SDLC) Waterfall model to demonstrate the process workflow of the application development. In this model as shown in Figure 1, six phases must be completed, namely Analysis, Design, Development, Implementation, Testing, and Documentation.

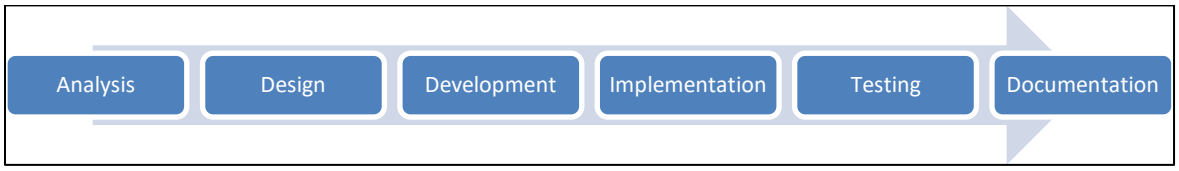

Figure 1. SDLC Waterfall Model Phases

In the Analysis phase, the problem statement, objective, scope, and significance of the project are defined after articles review is performed. Next, several tasks have been done in the Design phase including designing the site map, storyboard, character, graphic design, and application interfaces. These designs help in defining the overall mobile app architecture. With the inputs from Design Phase, the mobile app prototype is developed in the Implementation Phase by writing the coding as well as applying multimedia elements and multimedia principles to integrate the interfaces using Unity 3D. While Vuforia Engine Development Portal has been used as the platform for mobile AR development.

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After the prototype is completed, testing is performed to ensure that there are no errors or defects in the application. Two types of testing have been done in the Testing phase which are Functionality Testing and User Acceptance Testing. The target users are preschool children, teachers, and parents. Finally, the Documentation phase has been performed to report all the activities, results, and finding of the study.

3. RESULTS AND DISCUSSION

3.1. Mathematics Augmented Reality prototype

Some of the interfaces of Mathematics Augmented Reality App is shown in Figure 2. There are three chapters namely 'Bab 1 Nombor Bulat 1 hingga 10', 'Bab 2 Penambahan', and 'Bab 3 Penolakan'. Each chapter consists of two modules namely 'Pembelajaran' and 'Imbas Jawapan'.

Figure 2. Some of the Interfaces in the Mobile App

The user has to scan the image on the learning materials (either softcopy or hardcopy) using this application to see the augmented reality effects. The attractive and interesting AR images are clearly displayed in the application.

3.2. Functionality Testing

Functionality testing is done by the developer to validate the application against the functional requirements to ensure that all the functions in this application are work well. Table 1 shows the main tasks in Functionality Testing and the results confirmed that all tasks are worked well.

Table 1. Functionality Testing Result

No.	Task	Result
1	Every button in the application is functioning properly	Passed
2	When user clicked the button in the application, it is navigated to the correct page	Passed
3	The information on how to use this application is displayed after 'How to use' button is clicked	Passed
4	The augmented reality is displayed after scanning the target image	Passed
5	When scanning the target image, the augmented reality object is displayed quickly	Passed
6	When the target image is scanned, the augmented reality display the object clearly	Passed

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3.3. User Acceptance Testing (UAT)

UAT in this study uses Technology Acceptance Model (TAM) to test the acceptance of respondents towards this mobile application in terms of its usefulness and perceive ease of use. The total participants involved in this evaluation is 19 respondents consists of students, lecturers, and parents. Figure 3 illustrates the summary of UAT means score results. It shows that all criteria achieved 4.3 out of 5 scale measurement that indicates positive acceptance from the respondents.

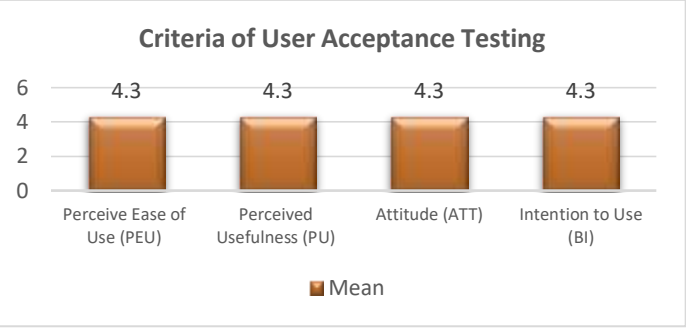

Figure 3. User Acceptance Testing Result

4. CONCLUSION

AR technology in education can help children become more interested in learning through the use of interactive 2D models in learning materials. This application helps teachers and parents to make sure the children succeed in mathematics through the engagement with learning activities at school or home. Further study should be done to investigate the use of a game element in learning materials.

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SMARTPHONE READ QUANTITATIVE BLOOD TEST DEVICE FOR DENGUE FEVER

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Abstract

The dengue virus is transmitted through a human-to-mosquito-to-human loop, with the mosquito Aedes aegypti serving as the primary vector which can lead to dengue fever. Usually, dengue fever will be diagnosed using laboratory tests which are very helpful and can be used to monitor the progress of dengue fever patients. They will perform a blood test which is a test for antibodies to detect Dengue Immunoglobulins M antibody (IgM) and Immunoglobulins G antibody (IgG) antibody in the patient's blood. Regarding from that, this case study report illustrates the issues that are faced by the healthcare staff and patients which is waiting for a long time to get the results in detecting dengue fever. Thus, the new product development is proposed for the purpose is to solve this problem and identify market opportunity into a marketable new product to satisfy customer requirements. Besides, there were also discussions on what methodology that we used to collect information. For this case study, we conducted an online survey and distributed it to all the healthcare staff and patients at Hospital Kuala Lumpur. In addition, this case study also explained the limitations of the new product development. During the new product development process, there were several steps which usually begin with research and development to product design and features to concept testing to building prototype and the last step is test marketing. Besides, the businesses may be required to participate in this phase due to shifts in customerexpectations, increased competition, and technological advancements, or to capitalize on a new opportunity. Lastly, the case study also explained the stages and identified the feasibility and viability of the product's new development for commercialization.

Keywords: Aedes, blood test, dengue, new product development

1. INTRODUCTION

The dengue virus is transmitted through a human-to-mosquito-to-human loop, with the mosquito Aedes aegypti serving as the primary vector, which can lead to dengue fever. There are many ways to diagnose a person whether they have dengue fever or not. Those who have signs of dengue fever can undergo evaluation for dengue fever, physical examination, laboratory tests and others. Dengue testing is done to ensure that the patient has been infected with the virus that causes dengue fever. Usually, dengue fever

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will be diagnosed using laboratory tests which are very helpful and can be used to monitor the progress of dengue fever patients. They will perform a blood test which is a test for antibodies to detect Dengue IgM antibody and IgG antibody in the patient's blood.

In this age of sophistication, technology is growing rapidly and is used everywhere in any field. Everything will be done easily and in an instant. This greatly simplifies and speeds up the implementation of things. Similarly, many people in the medical field believe and ask for something that can be completed quickly and easily. Due to that, there is a demand from the public to create a faster technology in detecting dengue symptoms in the community. This can lead to the early diagnosis of dengue fever and prompt care without the need to wait for the normal assessment. Therefore, a device has been introduced to facilitate the detection of dengue in the community, namely the Smart Phone Read Quantitative Blood Test Device for Dengue Fever.

2. MATERIALS AND METHODS

2.1. Build Prototype

The Smartphone Read Quantitative Blood Test Device for Dengue Fever is the device that incorporated a smartphone socket, external lens filter. Laser diode powered by AAA batteries, power switch, chip slot and emission filter for the smartphone camera. This product is an external device that needs cooperation with smartphones to help in detecting human blood to detect the early stage of dengue fever without the long wait at the hospital. The illustrations of the product were sketched as the 2D prototype before passing it to the engineer. Besides that, the product illustrations give a clear picture for the engineer to create the devices as well as the user to understand how the Smartphone Read Quantitative Blood Test Device for Dengue Fever looks like. Figure 1 below is the example of 2D product prototypes of the devices.

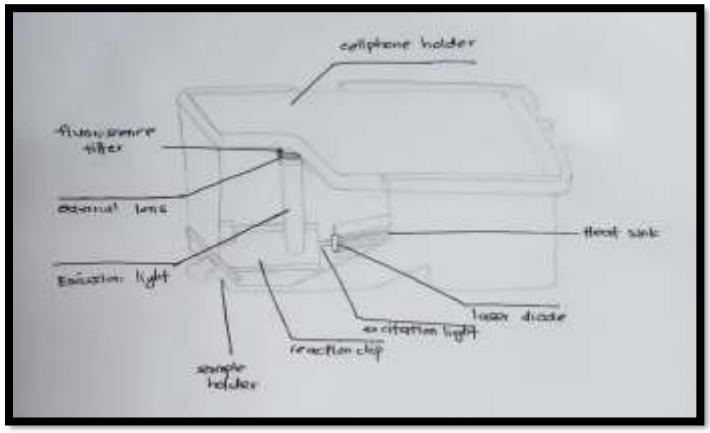

Figure 1. 2D product prototype.

Picture above shows all the equipment was used to build the prototype of the devices. At the top of the devices is where the smartphone will be placed. Inside the devices, the laser diode will be used to laser the blood sample that was put inside the sample holder in help of excitation light. As soon as the blood samples are put inside the devices, the reaction chip will give signal to the excitation light and laser diodes do their job to laser the blood which will give signal to the fluorescence filter that will give the

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result to the smartphone that is connected to the devices. Lastly, the smartphone will read the blood result and print the result into the smartphone.

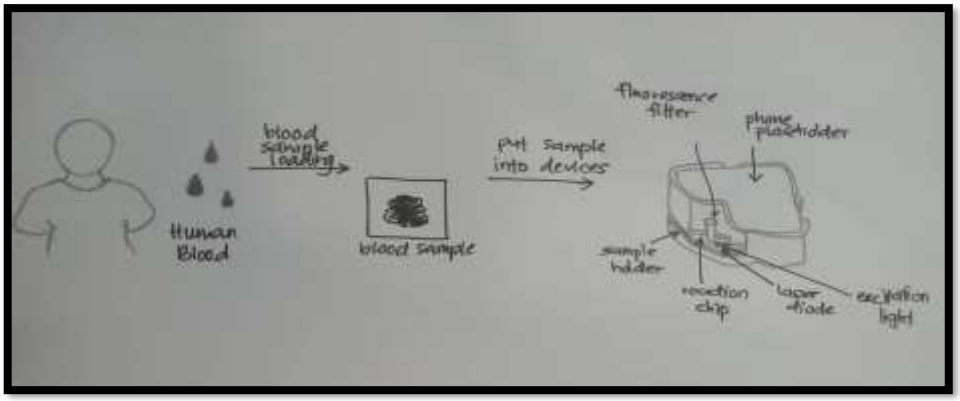

Figure 2. Device Manual.

Figure 2 above shows how to use the devices. First, the blood needs to be draw first to check whether they got dengue fever or not. The blood will need to be put into the blood sample container which the sample will put inside the devices as shown at the diagram above. The devices will start processing, then the result will be printed into smartphones.

3. RESULTS AND DISCUSSION

3.1 Survey Format

An online survey was conducted by using google form to collect the data about the technology of Smartphone Read Quantitative Blood Test Device for Dengue Fever.

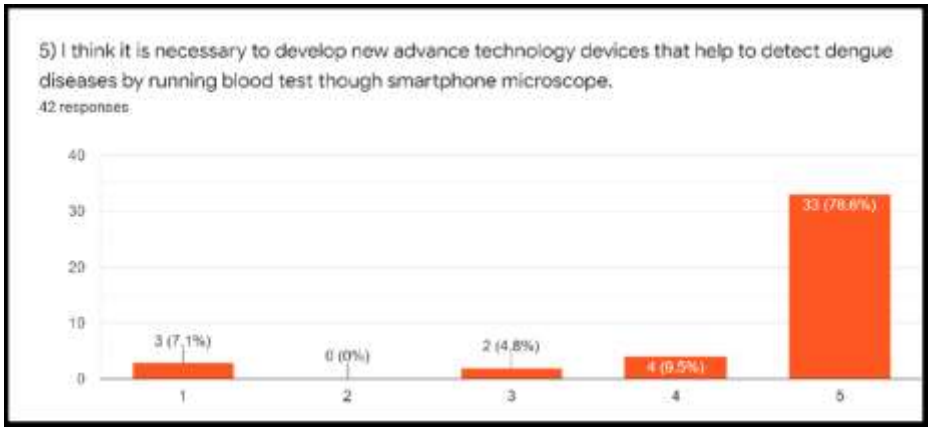

Figure 3. Develop New Advance Technology Device

The result from Figure 3 shows that 78.6 percent strongly agree it is necessary to develop new advanced technology devices that help to detect dengue diseases by running blood tests through a smartphone microscope.

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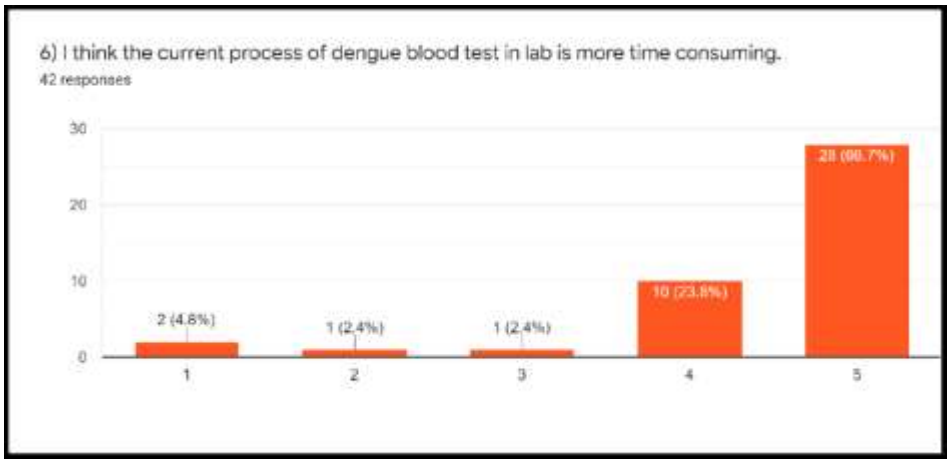

Figure 4. Time Consuming

Based on the result from Figure 4 above, 66.7 percent strongly agree that the current process of dengue blood tests in the lab is taking more time.

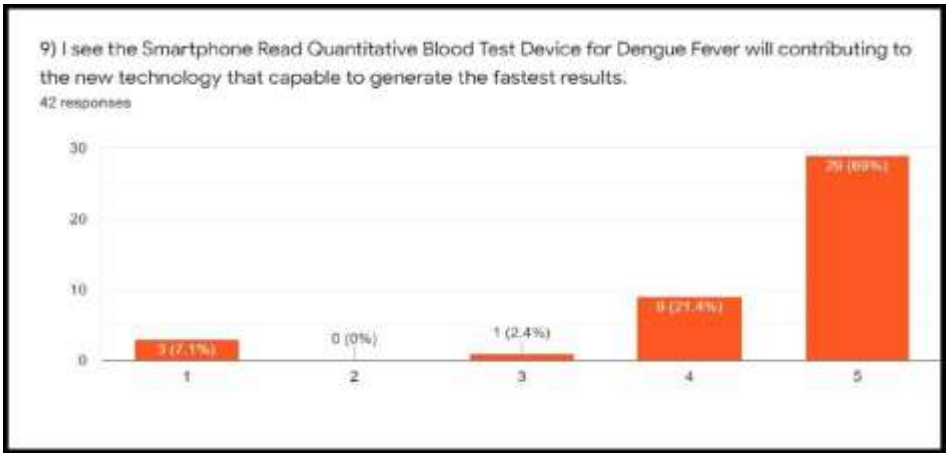

Figure 5. Fastest Result

Based on Figure 5, the result shows 69 percent strongly agree that the Smartphone Read Quantitative Blood Test Device for Denue Fever will contribute to the new technology that can generate the fastest results.

4. CONCLUSION

By having this information, it is still a hope for the healthcare industry to expand the use of their machine and laboratory devices that are used to perform tests and get results on. As much as technology grows aggressively for other industries such as tech, engineering, etc. the same goes to the healthcare industry which needs to be focused on more since it is regarded with human lives and each lives matter to be saved.

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COVID-19 DETECTION DEVICE (C19-DD)

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Abstract

The pandemic of COVID-19 receiving extensive attention especially the emerging of variant or known as variant of concern (VOC) spreading all over the world. The innovation of COVID-19 Detection Device (C19-DD) is capable to reduce the potential of spread of the disease by educating, warning, and empowering those on the ground to be mindful of the situation, as well as significantly reducing the effects. C19-DD is a very useful technology that built in with audio sensors with ability to detect human's cough as COVID-19 infection nowadays are asymptomatic. This device is built in with camera and sensors that proficient to detect the presence of facemask on a person. The individual can only enter the store with face mask on, or the alarm will sound and the device will take a picture and send off to the server in cloud. Using the 2MP camera that positioned at eye-level enables for optimal recognition to take picture of individual who do not wear face mask in public areas. C19-DD built in with temperature detection scanner to scan body temperature and able to display the current total number of customers in the store by considering the standard of procedure (SOP) and social distancing. This device comes with adjustable height which enables the children and adult to use it easily. With built-in sensor, C19-DD provides alarming message to the individual who do not wear face mask, body temperature over 38°C and have coughs. This device is useful to control many customers at one time, and capable to reduce the potential of spread of the disease.

Keywords: COVID-19 Detection Device (C19-DD)**,** Variant of Concern (VOC)**,** asymptomatic

1. INTRODUCTION

Technology is very important and in fact, has become unavoidable part of our lives. Nowadays, we cannot survive in today's society without technology [1]. At an accelerated pace, technology has changed every aspect of how businesses operate. Technology has been critical in the corporate world because it can offer a modern and better method of handling our daily life such as business transactions, educations, societies, healthcare, communications and many more by making them simpler, more reliable, and more convenient. The epidemic of COVID-19 has had a huge impact on medical centres, businesses, schools,

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and the economy [2]. It led to a rapid demand for efforts to use innovative technologies to cope with damage from the COVID-19 pandemic. Currently, most of the shopping malls, stores, and companies provide security personnel at the entrance to take registration through MySejahtera and temperature reading to apply proper standard operating procedures (SOP) for each visitor where they have to follow the rules which has been set by the business [3]. In order to cope with these problems, a technology needs to be produced. A COVID-19 Detection Device (C19-DD) can be used to reduce the spread of the COVID-19 virus. Initial temperature assessment screening to detect a prospective person with abnormal temperature plays a significant role in limiting the spread of COVID-19 since body temperature had already long been used as a natural indicator of sickness [4]. Similarly, to earlier epidemics, infrared thermography (IRI) is currently being used to contain the COVID-19 outbreak, owing to its contactless aspect and abilities to immediately detect skin temperature (Tsk) variation and fever [5]. This development technology device will facilitate, save time and can make it more effective and efficient to consumers in line with objectives to achieve a specific goal.

2. METHODOLOGY

This project focused on the innovation of C19-DD and the problem among the owner store and public people that maintain control of standard operating procedures (SOP) to prevent the spread of COVID-19. This project uses the requirements to develop an innovation device and lastly the evaluation of the device in term of reasonable and effectively through people's opinions of the innovation device (C19-DD). During the preliminary study, a total of 48 respondents responded all of the problems, opinions and needs of C19-DD for environment changes. The researchers distributed the online survey through Google Form which started from 10 May 2021 until 13 May 2021. The collection of data was participated by people aged from 18 to 36 years and above and they included both male and female. However, the numbers of women who joined this survey is more than men. The reasons for this data collection are to identify respondent’s desires, and opinions about our products. The result shows that around 77.1% of respondents think that innovation device will be able to help minimize the spread of the COVID-19 virus if it has features such as a face mask detector, cough scanner, warning siren and many more.

2.1. System Design & Modules

C19-DD was invented to monitor individual body temperatures easier in order to restrict the spread of COVID-19, especially in crowded areas. The technology also includes cameras and audio sensors to help detect people who are not wearing masks and are having COVID-19 symptoms like cough. Meanwhile, the owner can set the capacity of C19-DD in accordance with the government's standard operating procedures (SOP), and the amount will be displayed on the device's screen to control social imprisonment between customers in the store. Also, the users received an alarming message, especially those who did not use masks, had a body temperature over 38 degrees Celsius, and coughed. Regardless, the C19-DD comes with rechargeable batteries to save costs and automatically adjusts height based on the person's height, making it easier for the owner to use.

3. RESULTS AND DISCUSSION

This project implemented the characteristics of a self-service temperature scanner which include features of face and temperature recognition, visually informative, warning siren, adjustable stand, and data storage. Several sets of survey research were distributed to 48 respondents which involved demographic respondents, and the four constructs which are innovation required, help consumers, interested and

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minimize the spread of the COVID-19 for the proposed product innovation support. Based on the results, the innovation of C19-DD got the highest percentage, which is 83.3. It implies that the respondents agreed this type of innovation is required as well as it is helping consumers and owners of stores to control or prevent COVID-19 virus from being infected.

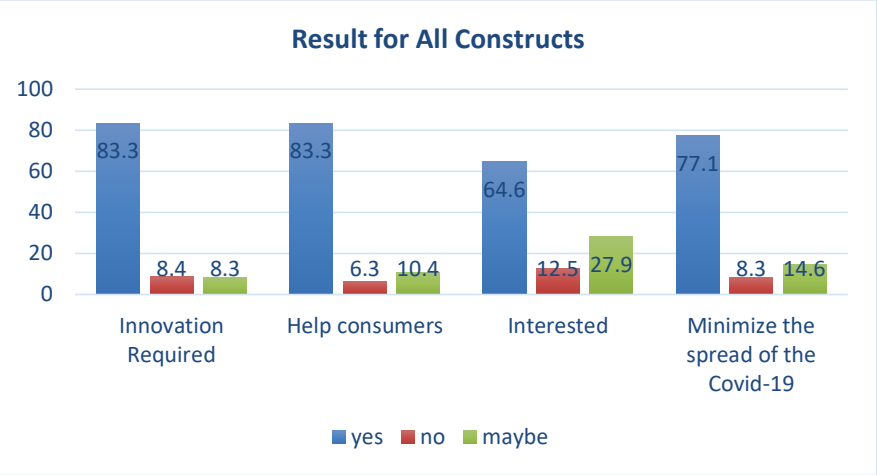

Figure 1. Analysis of The Market for Product or Service

4. CONCLUSION

In conclusion, users are satisfied with C19-DD that the device helps detect individuals who are not wearing masks, as well as the social distance between individuals in the store can be controlled. Individuals with symptoms can be kept from spreading to others, and the number of COVID-19 cases in the country can be reduced over time using technology like this. Now, the use of MySejahtera application and C19-DD has been the main requirement for every store, shopping mall, building, companies or any public places to enhance the security of owners and users.

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VISUALIZATION AND SIMULATION OF KLEIN-GORDON EQUATION

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Abstract

Partial differential equation (PDE) is an equation that has two or more partial derivatives as the independent variables in its terms. Partial differential equation is very important and used to model real problems in sciences and engineering that involve the change of some variables with respect to another. In most real-life situations, the differential equation that models the problem is too complicated to solve exactly because the equation consists of many variables to be considered. The number of partial differential equations (PDEs) is immense in scale and diversity. In principle, all fundamental laws of physics are constructed in terms of PDEs. In addition, approximations to these fundamental rules, which construct a patchwork of mathematical models ranging from the smallest to the largest measurable space-time dimensions, are often formulated in terms of PDEs. One of the second-order partial differential equation is Klein-Gordon equation which is mostly use in physics field. The Klein–Gordon equation describes how the quantum state of a physical system changes in time. Since the equation is complicated and hard to solve exactly, we use the finite difference method to solve the equation. The solution of the Klein-Gordon equation is visualized by using Visual C++ which is a friendly user programming that need users to enter the input according to their problems. The user needs to enter the inputs to proceed with the solution. The approximate values will be displayed in rectangular grids as the results for the problems. The errors from both methods are almost zero which means this simulation is almost accurate by comparing with the theoretical calculation.

Keywords: Klein-Gordon Equation, Finite Difference Method, C++ Programming, Partial Differential Equation

1. INTRODUCTION

An equation that has two or more partial derivatives is called Partial differential equation (PDE) as the independent variables in its terms [1]. In most real-life situations, the equation that models the matter is just too complicated to unravel exactly. The number of partial differential equations (PDEs) is immense in scale and diversity. In principle, all fundamental laws of physics are constructed in terms of PDEs. In addition, approximations to these fundamental rules, which construct a patchwork of mathematical models ranging from the smallest to the largest measurable space-time dimensions, are often formulated in terms of PDEs. The varied uses of PDEs in science and technology attest to the simplicity and

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expressiveness of the vocabulary of PDEs. Klein-Gordon equation is a type of second-order partial differential equation [2]. The Klein-Gordon equation or Klein-Fock-Gordon equation is a relativistic version of the Schrödinger equation [3]. In physics, especially quantum mechanics, the Schrödinger equation is an equation that describes how the quantum state of a physical system changes in time [4]. In other words, the Klein-Gordon equation is the equation of motion of a quantum scalar or *pseudoscalar* field, a field whose quanta are spinless particles. Basically, certain differential equations are very difficult to be solved by any means other than an approximate solution by the application of numerical methods. In physics, the motion of a quantum scalar obtained the Klein-Gordon equation The Klein-Gordon equation plays an important role in mathematical physics. One of the ways to solve the equation is by using the numerical simulations in order to find the approximate solution for the equation. Finite difference method will be used to solve the equation and the solution will be visualized by using Visual C++ [5],[6]. We created a user-friendly programming in C++ to solve the Klein-Gordon equation.

2. VISUAL SIMULATION OF THE KLEIN-GORDON

In this section, a simple problem has been used to verify this code programming which is $u_{tt} - u_{xx} = 0$ where $0 < x < 4$ and $0 < t < 3$. The two initial values are given in this problem, that are at $t = 0$ as $u(x,0) = 5\ sin(0.79x)$ and $u_t(x,0) = 0$. The left and right boundaries which are the boundary conditions for this problem are the functions of t, given by $u(0,t) = u(4,t) = 0$. By solving theoretically, we get $u(x,t) = 5 \sin\frac{\pi}{4}x \cos\frac{\pi}{4}t$. We compared this simulation with theoretical calculation and find the error for both methods using the following formula,

$$|error| = |u(x,t)| - |u(i,j)|$$

where $u(x,t)$ represents the results for theoretical calculation while $u(i,j)$ shows the results for the simulation. From the simple problem, we used the programming to visualized the solution where $\alpha = 1$ and $\beta = 0$. We choose $n = 4$ and $m = 3$ while $0 < x < 4$ and $0 < t < 3$ as Figure 1. The results for this problem are shown in rectangular grids as Figure 2.

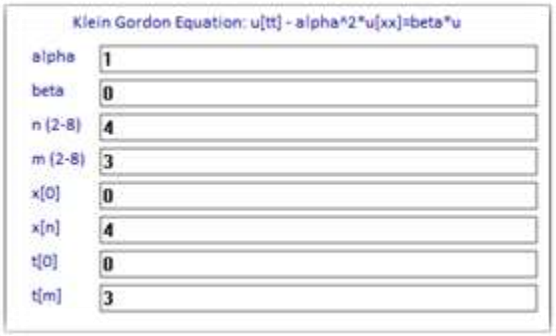

Figure 1. The Input for the Verification Problem

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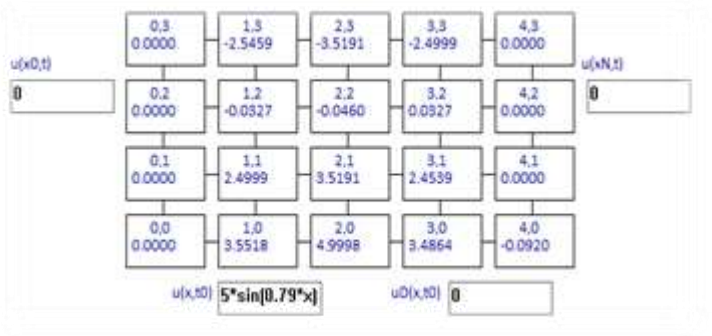

Figure 2. The Output of the Verification Problem

3. COMPARISON BETWEEN SIMULATION AND THEORETICAL METHOD

The results from both methods are shown in Table 1. It includes the result, u from simulation calculation and theoretical calculation with their errors.

Table 1. Results of the Problem Using Simulation and Theoretical Methods

i	j	x_i	t_j	$u(i,j)$ (simulation)	$u(x,t)$ (theoretical)	$\|error\|$
0	0	0	0	0.0000	0.0000	0.0000
0	1	0	1	0.0000	0.0000	0.0000
0	2	0	2	0.0000	0.0000	0.0000
0	3	0	3	0.0000	0.0000	0.0000
1	0	1	0	3.5518	3.5518	0.0000
1	1	1	1	2.4999	2.4999	0.0000
1	2	1	2	-0.0327	-0.0327	0.0000
1	3	1	3	-2.5459	-2.5459	0.0000
2	0	2	0	4.9998	4.9998	0.0000
2	1	2	1	3.5191	3.5191	0.0000
2	2	2	2	-0.0460	-0.0460	0.0000
2	3	2	3	-3.5191	-3.5839	0.0648
3	0	3	0	3.4864	3.4864	0.0000
3	1	3	1	2.4539	2.4539	0.0000
3	2	3	2	0.0327	-0.0321	0.0006
3	3	3	3	-2.4999	-2.4990	0.0009
4	0	4	0	-0.0920	-0.0920	0.0000
4	1	4	1	0.0000	-0.0648	0.0648
4	2	4	2	0.0000	0.0008	0.0008
4	3	4	3	0.0000	0.0660	0.0660

From the results that shown in Table 1, the errors from both methods are almost zero which means this simulation is almost accurate by comparing with the theoretical calculation.

4. CONCLUSION AND RECOMMENDATIONS

This paper focused on the Klein-Gordon equation which is one of the second order partial differential equation. The equation is too complicated to solve directly by using analytical method. By using the finite difference method, the equation was solved easily. The solution for the equation was visualized in the

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Visual C++ programming. This friendly user programming will help the user to solve the problems that related with this equation especially in mathematical physics field. The user needs to enter the inputs to proceed with the solution. The results will be displayed in rectangular grids as their approximation values. This study had focused in visualizing the solution of the Klein-Gordon by using the Visual C++. It is recommended if the researcher using other software to visualized the solutions of the Klein-Gordon equation to compare the results. It is also suggested to add a graphically for more information to the users. The graph will help them to interpret the equation and analyzing the information of the equation. Besides, they also can change this programming code for other partial differential equations that are complicated to solve. Hopefully, all the recommendations that were suggested above will help the next researchers to investigate more about this topic.

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2nd GRADUATE DIGITAL INVENTION, INNOVATION & DESIGN GIDID2021

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HITECH-PILLOW

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Abstract

HiTech-Pillow is an improvised version of an existing pillow that provides users with numerous purposes. This innovative pillow is made in a simple, cozy, and compact manner. It features a stylish form and excellent functionality, making it appropriate for a wide range of applications and functions. It is created specifically for people who have problems falling asleep or waking up from their slumber. Despite the presence of a thin electronic inside this pillow, it retains its soft, fluffy nature and is quite comfortable to use. The primary functions of this pillow are to assist customers to wake up in the morning and to provide twice the comfort of standard pillows. Since the initial goal of this HiTech-Pillow is to help users to wake up in the morning; therefore, it connects to a smartphone via Bluetooth. Users will subsequently utilize their phone to set the alarm. The preferred type of ringtone or song can also be selected by users. The volume of the smart pillow's alarm can be adjusted, just like any other alarm. Furthermore, this pillow also features the vibration which further helps to awaken user. Every aspect of safety, performance and functionality has been a great concern in developing this pillow to deliver optimum value to the market and users.

Keywords: Bluetooth technology, innovative pillow, sleeping difficulty, vibration mechanism

1. INTRODUCTION

The most common yet recurrently overlooked and readily curable health problem is sleep disorder. According to National Institutes of Health, averagely, the sleep hours for pre-school children are 10 to 12, schooling children and teenagers are 9 hours and adults are 7 to 8 hours [1]. Numerous changes to the biological and physiological functions of the body happen during sleep. This include the regulation of heart rate, blood pressure, cellular repair, hormonal secretion and immune defense functions, temperature control, restoration of memory capacity and cognition [2]. The main factor of sleep disorder includes stress and individual's lifestyle. Irregular work shift between day and night could heavily alter sleep schedule of a person, hence inducing insomnia. Between 10% and 30% out of 278 adults enrolled in the study struggle with chronic insomnia [3]. This will eventually force the said person to take medication such as sleeping pills. Problems such as debt, bill payment and job may also build up stress over time,

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thus causing difficulties to get quality sleep. Sleep disorder possesses serious mental and physical health problem such as anxiety, weight gain and daytime sleepiness.

Pertaining to the immense consequences of sleep disorder, the latest innovative technology named HiTech-Pillow was introduced as a sleeping aid to assist an individual to sleep and wake up on time, reduce snoring as well as improve comfort. This improvised version of an existing pillow provides users with numerous purposes that viable to various situations. It exhibits few competitive advantages that set it apart from the existing pillow in the market. Featuring its stylish form and excellent functionality, this pillow is suitable for a wide range of applications and functions.

2. MATERIALS AND METHODS

2.1. Prototype

Figures 1 and 2 show the 2D-right and left side of the HiTech-Pillow. It has a panel on the right side of the pillow that consists of on/off button, vibrator button and battery level screen, while USB port to charge the pillow on the left side. The pillow has a built-on battery which is rechargeable by using USB cable. The product also has speakers on both sides to ring the alarm. The inside of the pillow consists of the built-on battery, 2 vibrators, force sensor resistor, remote control for the panel and Bluetooth sensor, as displayed in Figure 3.

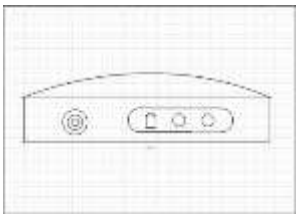

Figure 1. 2D-Right side of HiTech-Pillow

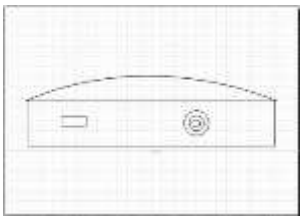

Figure 2. 2D-Left side of HiTech-Pillow 2D

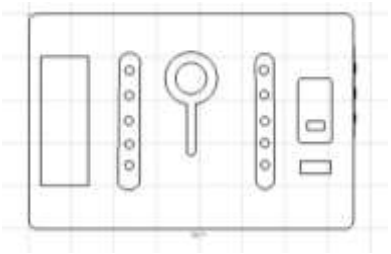

Figure 3. Inside HiTech-Pillow

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2.1. Component

This pillow is designed with the utmost consideration of the user preferences and safety. The unique features of this pillow are as follows:

Table 1. The unique features of HiTech-Pillow

Component	**Description**
Vibrator	Vibrator will active along with the alarm to produce a small vibration in order to help people wake up. The vibration also helps to keep snoring at bay. If an individual starts to snore, the pillow's two motors gently vibrate, encouraging individual to roll over and stop snoring.
Speaker	To produce the alarm sound via Bluetooth application.
Force sensitive resistor	To detect the presence of pressure so that the pillow can detect whether the consumer is awake.
Bluetooth sensor	This pillow can connect to a smartphone through Bluetooth. Users can also track the quality of their sleep using this Bluetooth application.
USB port	To connect the charger of the pillow
Cotton	The pillow is made up of cotton which is a waterproof fibre. Its purpose is to keep wet or damp pillows from being utilised when the hair is wet or exposed to saliva.
Screen Panel	Screen panel on the right side of pillow consists of button to switch on and off the pillow, vibrator button and battery level screen that shows battery level.

3. RESULTS AND DISCUSSION

Similar as a cellphone vibration, a smart pillow has a small vibrating motor to detect snoring and urge users to shift their head. Some smart pillows feature built-in airbags that tilt users head without waking them up [4]. Differs to smart pillows, this HiTech-Pillow is a rechargeable product. A fully charged battery can last for about a week before it needs to be recharged. Since the pillow can connect to a smartphone through Bluetooth; therefore, users can easily set the alarm through their phone and track the quality of their sleep. Apart from that, the speaker can be utilized via Bluetooth connection to play song or sound that help to calm and ease user to fall asleep. The vibration on both sides of the pillow is designed to wake up the users in the morning and prevent snoring. Some anti-snoring smart pillows with built-in motors give user the option to set vibrating alarms, rather than sound-based alarms [5].

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4. CONCLUSION

The competition in the technology industry is undoubtedly high especially in this era where every company is competing to make the best innovation that can be useful for consumers. Entrepreneurs need to use all the resources that they have including skills and knowledge to compete with another brand of smart pillow [6]. While the concept of a HiTech-Pillow perplexes us more than anything else, we must agree that they are sort of cool.

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PRO C-DUSTER

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Abstract

Technology is currently progressing. Most of the people tend to appreciate the latest technology that be employed in many devices or gadgets. In comparison to previous generations, life has grown more accessible and comfortable. Cleaning activities are one of the routines that spend most of our daily hours. If people were provided with the cleaning tool that able to acquire less energy and times, it will be mostly beneficial. Pro C-Duster is a new device with a variety of functions using advanced technology that is applicable for this modern era. Pro C-Duster is made up of a very high quality of materials that will guarantee a lifelong usage. This product also has numerous advantages that will pique consumers' curiosity and attention. The Pro C-Duster is capable of preventing dirt and dust from falling to the ground. It is also very practical in handing with higher places such as windows, ceiling fans, and other surf aces that are difficult to reach. Cleaning the dust from higher places and follow with clearing up the dust on the floor, involves two different processes and directly spend more time and energy. As a result, it will help consumers by reducing the amount of time they spend in cleaning activity. It will keep them from becoming overworked. The Pro C-Duster is aimed for people who want to clean their homes, offices, or accessories, particularly ladies or housewives. This product is significant and practical to be offered because it able to make life easier in fulfilling their tasks.

Keywords: Cleaning tool; dirt; duster

1. INTRODUCTION

In this era of globalization, the existence of technology has greatly changed the routine of human life in many aspects and segmentation. According to Tutt [1], technology would revolutionize the world and lead to ground-breaking changes in transportation, industry, communication, education, energy, healthcare, entertainment, government, warfare, and even basic research. Furthermore, technology has also contributed to the advancement of home appliances products. These home appliances products have been embedded and innovated with various new technologies that will probably offer new or improved functions related to a specific task. Household appliances are tools or equipment that is often used f or cleaning purposes. It is not only used at home and in other suitable places such as at the office, classroom, and many more. There are various kinds of household appliances used depending on the type of cleaning work, such as vacuum, mop, washing machine, and many more. A feather duster is also one of the tools that are usually used to sweep and clean the dust in a specific area, such as on the window, cupboard, and frame. It is easy to use

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as it has a lightweight, simple design and easy to keep once the cleaning work complete. In addition, the feather duster also is easy to get as it is available at most supermarkets and low-cost stores. However, the current feather duster has led to several problems for the consumer.

Based on the survey, consumers face several problems while using a feather duster. The cleaning area is not completely clean because it only consists of two parts which are the feather and the holder. Thus the only function that it can perform is to sweep the dust. The dust may appear in various forms such as fine dust, coarse and there is also permanent dust caused by fine dust that has not been cleaned f or a long time and then forms a stain that sticks to the surf ace. As a result, it may be hard to remove and cleaned. At this point, the use of feather duster no longer works as it may need some new additional f unction and feature to ensure the cleaning work can be complete thoroughly. Cleaning job consists of high cardiovascular, muscular, and postural load [3]. Consumer also will be having back pain either during the cleaning process or once completed. It is not only happened to the elderly but also the young people. This is due to inappropriate posture while performing the cleaning work. The problem that usually faced by consumers is twice work performed. For example, the consumer needed to sweep up the falling dust on the floor right after using the feather duster. This will require a lot of time to completing the cleaning work. Therefore, we should make some innovations to increase productivity among the consumer.

2. METHODOLOGY

2.1 List of limitations

The target users, the problems with the existing products and the solutions were identified. The existing cleaning duster cannot provide satisfaction to customers which is why Pro C-Duster stand for professional cleaning duster will be developed to counter that problem, giving the customer maximum satisfaction when shopping. The Pro C-Duster will also have additional functions incorporated to the product. The design for Pro C-Duster was outlined and will require good and flexible design to attract the customers to use the product. Pro C-Duster is an improvement of an existing product because we discovered that the existing product has its limitations that can be improved. Additional features or functions will be included with the product such as dryer, wiping cloth, vacuum and the important function is the cleaning duster can be rotate f or cleaning purpose. This function will make the cleaning process more effective better than use the current cleaning duster.

2.2 Market Survey

Market survey is an essential part in generating new idea for product development. The questionnaire was created by using google form and had distributed through WhatsApp application group.

2.3 Product Design & Features

This is a method of producing a new product for an organization to market to the consumers. According to Steve Job, co-founder of Apple, Inc. “Design is not just what it looks like and f eels like. Design is how it works”. In general, it is simply the effective and efficient development of ideas into a process that leads to a new product. The design of the product focuses not just on how a product is presented, but also on how it works, designed to create the benefit and experiences to consumers. Since the Pro C-Duster has many new features that been integrated, this feather duster is constructed differently than other common products. Pro

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C-Duster is a user-friendly tool because the efficient cleaning task will be as easy as only by pressing the button on it. It is a new product that the battery used was the same as DSLR battery and it is rechargeable with the fast- changing technology. The Pro C-Duster is a super lightweight tool, comfortable handle and thick bristles. The dimension of Pro C-Duster is 40*1.5*5cm (length*height*width). The width of the feather is just 8cm and the handle of the pro c -duster is 5cm. The technology that applied in Pro C-Duster is a sensor technology. Sensor technology is a detector or device used to detect dust, dirt, or other particles in the air and on surf aces. Since the main purpose of the Pro C-Duster is to detect dust, this technology is appropriate. Then, this product closely related to the cleaning tool product, it also has a microfiber cleaning technology. It is not only able to reduce time and energy; it is also environmentally friendly and rarely requires the use of chemicals. The use of microfiber also beneficial in clinical applications which improved cleaning for every patient regardless of known or perceived risk, occupational health and safety advantages, and reduced cost of cleaning, allowing for expansion of cleaning activity without the need for additional human resources [2]. Microfiber wiping cloth has been developed for smaller surfaces such as counters, windows and mirrors and it also can clean better overall. This product provides a few buttons that used for cleaning such as the dryer, rotator and bend button. This product is flexible where user can bend and rotate it with angle of 360^{o}. The dryer button is used for drying purpose but not for water absorb.

2.3 Concept Testing

The purpose of this process is to identify and test the effectiveness of a product. Next is to get the feedback and acceptance of this new product among consumers. From this testing process, it can show either the product produced is successful or failed. To identify the ideas and concepts and innovations that must be taken to make it more effective and efficient f or the use of Pro C-Duster by users.

3. RESULTS AND DISCUSSION

Figure 1 shows how Pro C-Duster been sketched and designed. The 2-dimesional and 3-dimensional prototype were built with the detailed information about the product as shown in Figure 2.

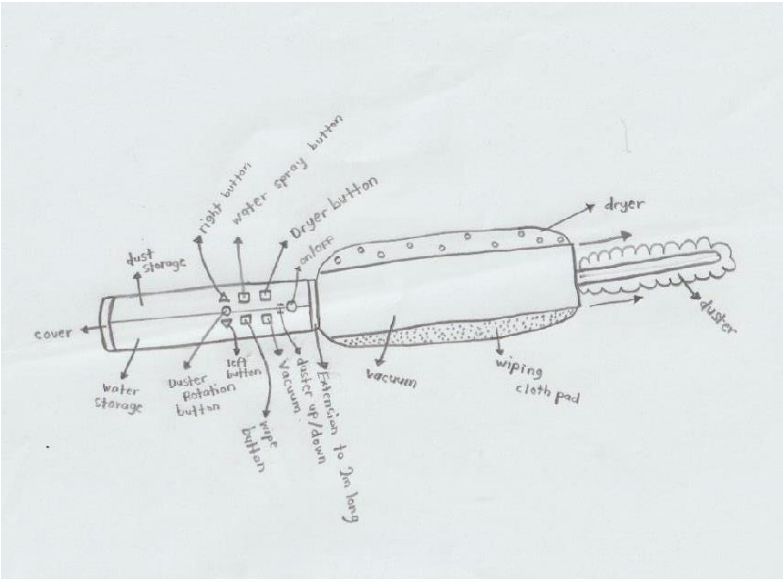

Figure 1. Sketch of Pro C-Duster

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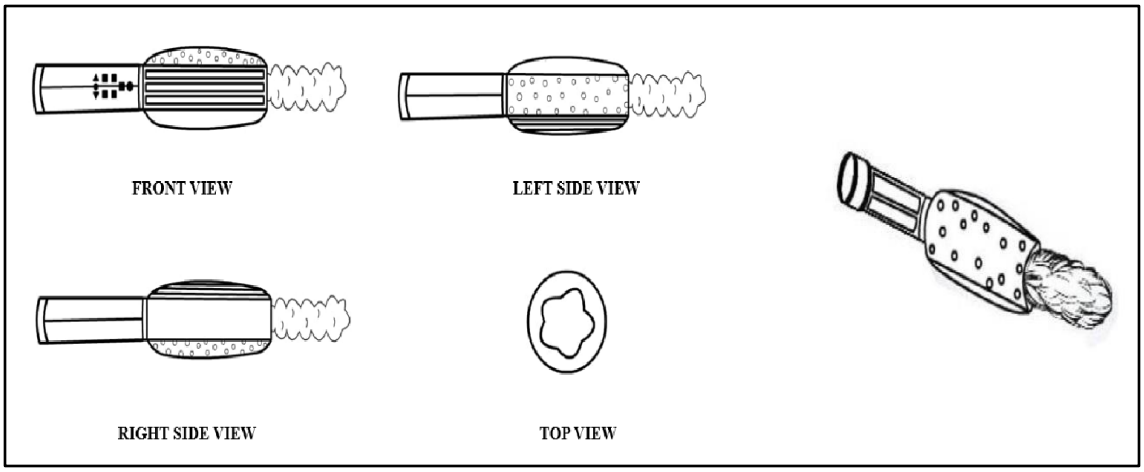
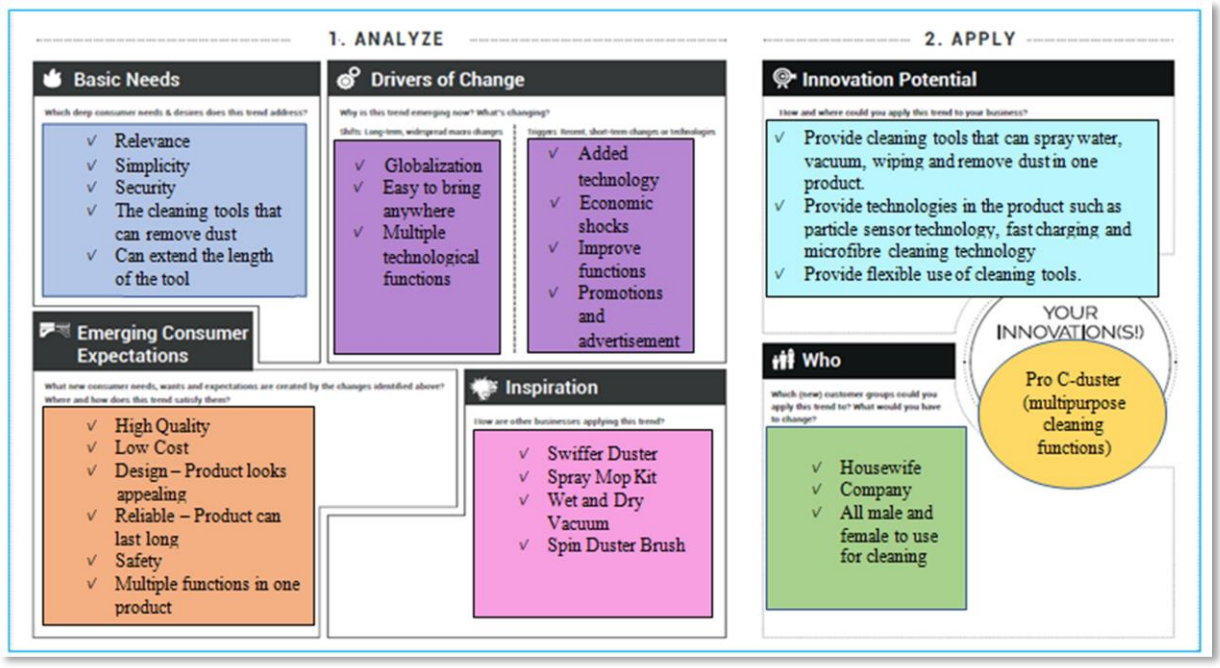


Figure 2. Pro C-Duster in 2D and 3D

Consumer Trends Canvas (CTC)



4. CONCLUSION

The use of technology in innovating and producing new products has given a huge impact on various industries. This is including the household and home appliance industries which have variety of new products that were originally a basic tool and then innovated into a better product in term of its functionality, design and sophistication. Same goes to the Pro C-Duster (PCD). It is basically a basic feather duster then it has undergone several changes causing it to turn into multi-functional electronic feather duster or the given name which is PCD. Apart of that, the PCD offers a few benefits for its consumer as follows:

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i. Reduce time and energy in performing cleaning tasks.
ii. Flexible as it has an adjustable rod which prevent back pain and injury.
iii. Lightweight which easy to carry and use
iv. Provide other multiple functions such as dryer, vacuum etc. which able to increase productivity.

This new product would have its own targeted user. Thus, it is seemly to be promoted and advertised using various platforms such as through Facebook, television program that offer a live advertisement such as Go Shop or Wow Shop that can promote a special introductory price to our customer. This will lead to gain customer acquisition. If it is acquiring a very high demand which penetrate the industrial household and home appliances market, then the improvement is essential to upgrade the performance of the product. Therefore, the PCD might be possible to be upgraded by embedding the idea of Artificial Intelligence (A.I) in it.

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CORPORATE FRAUD DETECTION APP

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Abstract

Companies face a wide variety of threats, and one of them is the risk of corporate fraud. Corporate fraud has demonstrated significant adverse financial and non-financial impacts at the corporate level and the public society. Therefore, preventing corporate fraud is critical by identifying the early red flags of corporate fraud occurrences in business organizations. This app aims to provide a corporate fraud detection system that may be useful for business society to identify the risk of corporate fraud so that losses due to fraud can be minimized. The app was developed based on the Fraud Triangle Theory. The fraud triangle is a powerful illustration for understanding and preventing the three principal drivers of corporate fraud: perceived opportunity, perceived pressure, and rationalization. This app employs the Google Sheet to analyze the input data of selected corporate governance characteristics to detect any signs of red flags. The corporate governance data can be obtained from publicly available information such as the company's annual report. Interested parties can easily access this app via an URL link created from Google Form and can be shared with others using emails, messaging apps, or networking websites. The initial analyses and findings of this application have been developed based on the corporate fraud detection model in the previous study. This app will help the business society, such as future investors, auditors, and other parties with direct or indirect interests in the business corporations, to identify corporate fraud risk and take necessary precautions, especially before making their investment decisions.

Keywords: Corporate fraud, corporate governance, Fraud Triangle Theory

1. INTRODUCTION

Companies face a wide variety of threats, and one of them is the risk of corporate fraud. Corporate fraud can be described as an intentional misrepresentation of a company's financial information and corporate activities by management, employees, or third parties, on or against a company with the intention to mislead the public and gain advantages over others. It has been reported that fraud cases worldwide continue to rise every year and significantly increase the financial and non-financial losses at the corporate level and the public society [1] [3]. Therefore, it is important for the business society to identify the red flag of corporate fraud to avoid being the victim, hence minimizing fraud losses. However, the fraud detection tools or models that have been developed in the past mostly require financial information and demand high expertise to run and analyze the data. The complex applications of these tools or models pose challenges to the

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business society to employ them as decision-making guidance, especially in identifying the corporate fraud risk. Hence, this app is developed as an alternative or complementary tool to assist the business society in detecting corporate fraud risk. This app is developed based on the Fraud Triangle Theory that describes the three factors commonly found when fraud happens: perceived opportunity, perceived pressure or incentive, and rationalization. The three conditions are translated in the form of corporate governance characteristics. Board size, board independence, frequency of board meetings, and duality are perceived opportunities, while CEOs and directors' share ownership, and executive directors' compensations are perceived pressure. The age of the CEO is used as the proxy for rationalization. This app is constructed using google free web-based software, Google Form and Google Sheet so that users do not require to spend extra costa to install in their devices and can be applied straight away as long as there is an internet connection. The users do not have to interpret the data because the final result given is in a form that all users can understand. In addition, the input data required for this app can be easily accessed in publicly available information such as the annual report of a company. This app will help the business society, such as future investors, auditors, and other parties with direct or indirect interests in the business corporations, to identify corporate fraud risk and take necessary precautions, especially before making their investment decisions.

2. MATERIALS AND METHODS

The corporate fraud detection app has been developed using Google Form and Google Sheet. Interested parties can easily access this app via an URL link created from Google Form and can be shared with others using emails, messaging apps, or networking websites. Google Form is used as the source to obtain the input data from the user. The data required are the corporate governance characteristics of a company, namely, the total number of board members, the total number of independent directors, the frequency of board meetings, CEO duality, the total number of ordinary shares of a company, the percentage of ordinary shares held by CEO and executive directors, executive directors' compensation, and the age of the CEO. All these corporate governance data can be easily obtained from published information such as the annual report of a company.

The input data or responses from the Google Form were retrieved using Google Sheet. The responses are recorded in tab known as ‘Form Responses 1’. A new tab, ‘1st Input Data’, was created to ensure the latest input data was always recorded on the top row. This step is critical to ensure the formula to organize and transform the data will always refer to the same row and cell. The recorded responses in the Google Sheet are then analyzed further by organizing the input data in the new sheet known as ‘Input Data’. In the Input Data tab, the data are automatically arranged in the form of a table that can be easily viewed. This stage is important to easily facilitate the conversion of data into information needed for the next analysis.

The analysis of the data will be conducted in the new tab known as 'Result'. In this tab, data such as the proportion of independent directors to the total board members will be recalculated. Data for duality in the form of 'yes' or 'no' will be converted into numerical form, '1' or '0'. Other input data are remains. This corporate governance information will then be converted into z-value by multiplying them with the coefficients obtained in the initial analysis and findings of the corporate fraud detection model [2]. The z-values will be added together to obtain the final score. The final score will be used to identify the low or high probability of corporate fraud risk. A score of less than 2.10 denotes that the company is identified as having a low probability of corporate fraud risk. A score of more than 2.10 signifies that the company has a high probability of corporate fraud risk. The framework used in developing this app can be illustrated in Figure 1.

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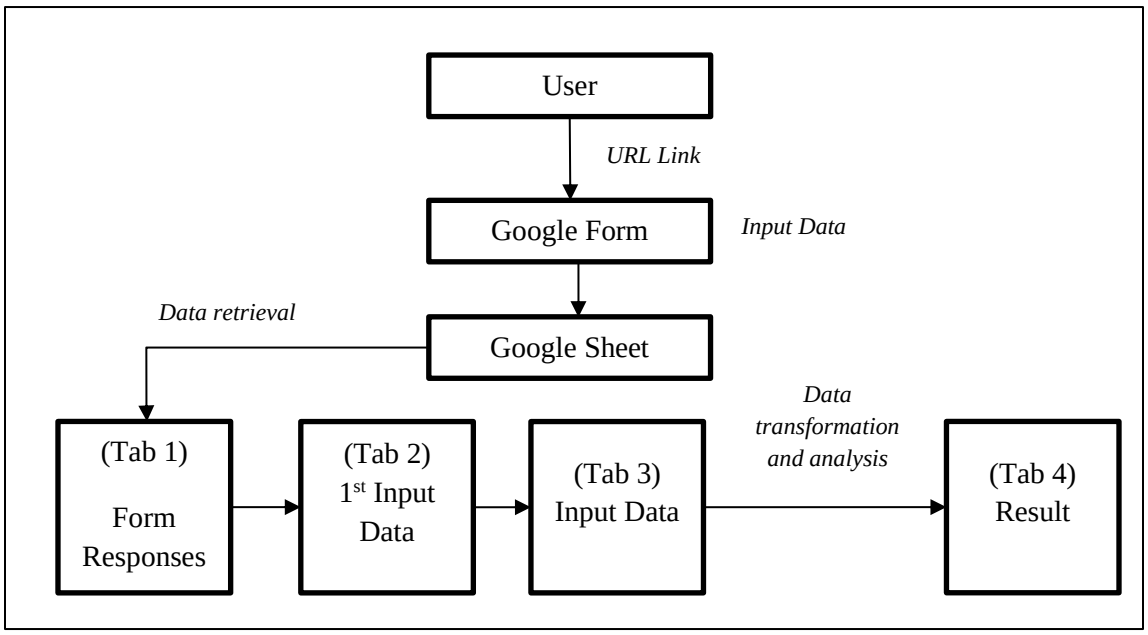

Figure 1. Corporate Fraud Detection App Framework

2.1. Corporate Fraud Risk Score

The Corporate Fraud Risk Score (CFRS) has been developed based on the corporate governance characteristics data in the previous study [2]. The corporate governance data of the fraudulent and non-fraudulent companies are multiplied by the same coefficients employed in the app to arrive at the z-value. Since the observations were done for four years for each company, the average value of the z-value for each company was taken. The average z-values were then classified according to the fraudulent and non-fraudulent categories. The CFRS was computed by taking the average of the average z-value for fraudulent and non-fraudulent categories. The outcomes are presented in Table 1.

Table 1. Corporate Fraud Risk Score

Category	Average of average z-value
Non-fraudulent companies	2.10
Fraudulent companies	3.74

Based on the corporate fraud detection model [2], the outcome presented in Table 1 implies that the higher the value of CFRS, the higher the probability of corporate fraud risk. The CFRS of the non-fraudulent companies at 2.10 is used as the point of reference to indicate a red flag for corporate fraud risk. A score of less than 2.10 denotes that the company is identified as having a low probability of corporate fraud risk. A score of more than 2.10 signifies that the company has a high probability of corporate fraud risk. The CFRS probabilities can be summarized as shown in Table 2.

Table 2. CFRS Probabilities

CFRS	Indication
Less than 2.10	Low probability of corporate fraud risk
More than 2.10	High probability of corporate fraud risk

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3. CONCLUSION

The ability to detect red flags will help many parties to minimize their losses due to fraud. The need to have a simple and easy-to-use app is vital so that users can take necessary precautions and be able to make fast decision-making. This Corporate Fraud Detection App can be applied as the initial step for others to develop more user-friendly and cost-efficient tools for detecting corporate fraud risk in the future.

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MAQASID AL-SHARIAH INDICATOR SCALE FOR SHARIAH FINANCING AND INVESTMENT DECISION MAKING

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Abstract

All investors and customers rely on the relevant financial information to assist them in financing and investment decision making. A Muslim investor or depositor concerned about Shariah compliance needs to evaluate the financing and investment portfolio that offers benefits in return and fulfils the Shariah objectives. Commonly, under the conventional practice, the investors or depositors rely on which products offer good returns. In other words, higher interest on investment and lower interest for financing are forbidden under the Shariah law. Therefore, the Muslim investors or depositors tend to choose products under the Islamic banks, which falls within the Shariah laws. In Malaysia, there are 16 Islamic banks registered and licensed under Bank Negara Malaysia. Now, it is choosing which Islamic banks offer good returns on financing or investing products and higher achievement on delivering the Shariah Objectives. Therefore, this can be achieved by evaluating the Maqasid Al-Shariah scale based on the financial information of each Islamic bank. This innovation paper aims to estimate and forecast the application level of the Maqasid Al-Shariah objectives among Islamic banks in Malaysia based on the financial ratios available on the financial data. The user needs to key in the information on google form then data is extracted to the excel application. The extracted data is then calculated and estimated on excel applications using sophisticated tools, namely the Fuzzy TOPSIS approach, to determine the Maqasid Al-Shariah scale. This approach evaluates each element for Islamic banks and criteria for each Shariah objective. Based on the evaluation of each element and criteria for Islamic banks or products, it will be ranked accordingly from the higher to the lower application level of the Shariah objectives. Thus, the users will choose which products or Islamic banks fulfil their desire portfolio for investment and financing decision making.

Keywords: Maqasid Al-Shariah, Indicator, Shariah, Financing, Investment, Decision Making

1. INTRODUCTION

The relevance of Maqasid Al-Shariah as the core Islamic law has expanded globally. To address stakeholder needs, Maqasid Al-Shariah is focused on the prohibition of riba and shariah compliance and achieving Shariah objectives [1]. These objectives are congruent with Maslahah emphasis on serving for the benefit of the public. The common financial performance measure does not represent the realization on Maqasid Al-Shariah.

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This paper focuses on the achievement score on Shariah objectives by establishing justice and helping for the public good. The achievement of both objectives facilitates the formulation of moral judgments, as well as help, maintain a balance between the individual's self-interests and the overall public interest [2].

2. MATERIALS AND METHODS

This paper aims to estimate and forecast the application level of the Maqasid Al-Shariah objectives among Islamic banks in Malaysia based on the financial ratios available on the financial data. The user needs to key in the information on google form then data is extracted to the excel application. The extracted data is then calculated dan estimated on excel applications using sophisticated tools, namely the Fuzzy TOPSIS approach, to determine the Maqasid Al-Shariah scale.

2.1. Maqasid Al-Shariah Financial Value

The Malaysian Accounting Standard Board (MASB) accepts that the conventional framework does not treat Shariah-compliant financial transactions and events to provide information required by Islamic law [3]. Few shariah scholars claimed that the Islamic banking and finance sector has failed to meet the Maqasid Shariah objectives. It was found that public interest and justice are generally used as Islamic banks' performance measures based on 16 Islamic banks registered under *Bank Negara Malaysia* [4]. Maqasid Al-Shariah's objective on establishing justice (*Al- 'Adl*) translated to three ratios. If the percentage is growing, the Islamic banks played an unstoppable role in the community economy's growth by funding justice with a benefit such as reducing the wealth inequality, reducing injustice and profit-sharing principles financing. Furthermore, another three ratios are included in the public interest or welfare (*Al-Maslahah*). If this objective rate is high, Islamic banks offer more Maslahah or welfare for banks themselves and society.

Table 1. The Average Weights for the Objectives and Elements by Shariah Experts

Average weights for the objectives and Elements given by Shariah experts Objectives	**Criteria**	**Performance ratio**	**Average Weight**
Justice (Al- ‘Adl)	C1.	Net Income / Risk Weighted Asset	30
	C2.	Non-Performing Financings / Gross Financings	32
	C3.	Interest-free income / total income	38
	0.41	**Total**	**100**
Welfare (Al-Maslahah)	C4.	Net profit / total asset	33
	C5.	Zakah / Net Income Annual Report	30
	C6.	Short Term funding / Total assets	37
	0.29	**Total**	**100**

The Maqasid Al-Shariah performance model based on the Maqasid framework developed based on Sekaran's operationalization concept has been validated and approved by the Shariah experts from the Middle East and Malaysia [4]. Table 1 above shows the data to be obtained to measure Maqasid Al-Shariah objectives and the weightage for each criterion as the elements of the Maqasid Al-Shariah score.

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2.2 Fuzzy TOPSIS approach

The Fuzzy TOPSIS is used and applied for decision situations includes a selection of alternatives, ranging from the most to the desirable, prioritisation according to the merit of the set of alternatives, resource allocation, benchmarking by comparing the process of one firm to the best practice of another firm, quality management and conflict resolution for incompatible goals or positions [5]. Thus, the advantage of using the integrated Fuzzy TOPSIS approach is benchmarking the application level of Maqasid Al-Shariah among the Islamic banks in Malaysia and ranking for the best practice. Therefore, the Fuzzy TOPSIS approach applies seven steps to determine the Maqasid Al-Shariah ratio's application level in the Islamic banks financial reporting and identify which Islamic banks in Malaysia practice the most delivering the Maqasid objectives.

3. RESULTS AND DISCUSSION

3.1. The Value of Closeness Coefficients for the Best and Worst Ideal Solution

The value of closeness coefficients is determined based on the best and worst ideal solution and average performance score based on the objective for the best and worst ideal solutions among Malaysia's Islamic banks. Table 2 below represents the total value of distances among Islamic banks in Malaysia.

Table 2. The Total Value of Distances for the Best and Worst Ideal Solution Score for Criteria of the Maqasid Al-Shariah objectives.

Criteria	Beneficial / Non-Beneficial	Ideal Solution	
		Ideal Best (Si+)	Ideal Worst (Si-)
C1	Beneficial	0.2466	0.0583
C2	Non-Beneficial	0.0616	0.2376
C3	Beneficial	0.1979	0.1835
C4	Beneficial	0.2227	0.0562
C5	Beneficial	0.0000	0.0000
C6	Beneficial	0.1913	0.1799

Criteria 1 (C1) and 3 (C3), both elements were on the net income to risk-weighted asset and interest-free income on total income, respectively. Thus, the higher the income, the better the performance of the firm. Whereas criteria 2 (C2) of Maqasid Al-Shariah objective on non-performing financing to gross financing implied that the high rate of the ratio shows the growing gap in income distribution due to debt. Hence, banks may impose penalties or repossess assets or projects. For this reason, this criterion is classified as a non-beneficial element. As for criteria four (C4) on Banks's profit, the higher the profitability, the higher the financial Maslahah. For criteria 5 (C5), the higher the Zakah to net asset ratio shows the transfer of income and wealth to the poor and the needy, thereby helping to bridge the inequality gap. As for criteria 6 (C6), short term funding to total assets ratio indicates if the bank is directly investing in long term projects, often proxied for contribution to the real sector investments. The importance of these real economic sector investments has direct implications to the broader population, especially those in the rural areas and the long-term capital formation of a country.

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3.2. Ranking for Maqasid Al-Shariah Objectives Score

The researchers use the Fuzzy approach to evaluate each element for Islamic banks and criteria for each Shariah objective. Then, the average ideal best and the worst score is used to determine the performance score for each objective and Islamic bank.

Table 3. The Ranking for Maqasid Al-Shariah Objectives Score

Islamic banks (IB)	Justice (*Al-Adl*)	Welfare (*Al-Maslahah*)	Maqasid Al-Shariah Score	Rank
IB 1	7.42%	7.60%	15.02%	4
IB 2	24.11%	18.84%	42.94%	1
IB 3	38.23%	1.87%	40.09%	2
IB 4	7.66%	27.93%	35.59%	3

Based on table 3, the evaluation of each element and criteria for Islamic banks is ranked accordingly from the higher to the lower application level of the Shariah objectives. Then, the users will choose which products or Islamic banks fulfil their desire portfolio for investment and financing decision making.

4. CONCLUSION

The findings of this study provide insight for the Muslim community, especially the investor or depositor, to obtain more knowledge or Shariah product awareness before making the final decision for investment and financing selection. These indicator scales assist more users to make the best decision for financial returns, Shariah compliance confidence and satisfaction on the Shariah objectives fulfilment.

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ESTIMATION OF MALAYSIA FERTILITY RATE BY USING LEAST SQUARE METHOD

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Abstract

Fertility refers to the ability to have children or the condition of being fertile. The fertility rate has become an important issue and a major factor to Malaysia's rate. Fertility measured by total fertility rate (TFR) declined dramatically over the last three decades in Malaysia. The fertility rate in Malaysia is expected to continue declining. This study was conducted to examine the fertility rate in Malaysia. The data was obtained from the Department of Statistics Malaysia, Official Portal. The finding of this study can support the government to act of actively in organizing various programs to increase the fertility rate in Malaysia. All actions will be more effective if knowing the patterns and outcomes aware of the declining fertility rate data. For this project, two methods were used to estimate the data on fertility rate in Malaysia. The Least Square method are the methods that is used in this project. By using this method, the data of fertility rate will be estimated, and the errors of each method will be compared. When the error value is lower, the accuracy becomes high. So, a method with the least error, can be concluded as the high accuracy. Based on this study, it was found that Cubic Least Square method is the best method used.

Keywords: Least Square Method, Relative error, Fertility rate

1. INTRODUCTION

The fertility rate refers to the average number of children a woman has during her reproductive years. Nutrition, sexual behavior, culture, instinct, way of life, and emotions all have an impact on human fertility [1]. It is important to study and analyse the level of fertility, especially in Malaysia because of the fertility measured by Total Fertility Rate (TFR) declined dramatically over the last three decades in Malaysia according to the latest figures released by the Department of Statistics [2]. Ultimately, fertility rate become a stressful issue for married couples, who know that every married couple dream of having children even Infertility does not discriminate against anybody, and it is a well-known condition, with fertility specialists accessible all over the world to help moms and couples who are having difficulty having a kid [3]. In recent years, a few studies have previously described research previously been described a time series approach to analyze the fertility rate in Malaysia [4,5]. Thus, support from the government to act or to be active in organizing various programs to increase and stabilize the fertility rate in Malaysia will be more effective if knowing the patterns and outcomes aware of the declining fertility rate data in the country [4]. In this paper, the focus is to analyse the pattern of fertility rate from year the 1950 to 2021 using the Least Square method and Newton method. The error and accuracy for each method is calculated and compared

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with the exact value to determine the best method used.

2. METHODOLOGY

2.1 Least Square Method

2.1.1 Linear Least Square Method

The least squares approximation of linear functions to data known as Linear Least Square (LLS) [6].
The general function for linear least square is

$$f(x) = a_0 + a_1 x \tag{1}$$

where,

a_0 and a_1 = coefficien t of variable

x = exact value

the coefficients of a_0 and a_1 are calculated in the normal equation in matrix of (2x2) in the form $Ax = b$.

$$\begin{bmatrix} n & \sum_{i=1}^{n} x_i \\ \sum_{i=1}^{n} x_i & \sum_{i=1}^{n} x_i^2 \end{bmatrix} \begin{bmatrix} a_0 \\ a_1 \end{bmatrix} = \begin{bmatrix} \sum_{i=1}^{n} y_i \\ \sum_{i=1}^{n} x_i y_i \end{bmatrix} \tag{2}$$

where, n = number of the data point

2.1.2 Quadratic Least Square method

The process of finding the equation of the parabola that best fits a set of data known as the Quadratic Least Square method. Therefore, function and calculation steps are shown below [6].
The general function for quadratic least square is

$$f(x) = a_0 + a_1 x + a_2 x^2 \tag{3}$$

where,

a_0, a_1, and a_2 = coefficient of variable

x = exact value

the coefficients of a_0, a_1, and a_2 are calculated in the normal equation in matrix of (3x3) in the form $Ax = b$.

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$$\begin{bmatrix} n & \sum_{i=1}^{n} x_i & \sum_{i=1}^{n} x_i^2 \\ \sum_{i=1}^{n} x_i & \sum_{i=1}^{n} x_i^2 & \sum_{i=1}^{n} x_i^3 \\ \sum_{i=1}^{n} x_i^2 & \sum_{i=1}^{n} x_i^3 & \sum_{i=1}^{n} x_i^4 \end{bmatrix} \begin{bmatrix} a_0 \\ a_1 \\ a_2 \end{bmatrix} = \begin{bmatrix} \sum_{i=1}^{n} y_i \\ \sum_{i=1}^{n} x_i y_i \\ \sum_{i=1}^{n} x_i^2 y_i \end{bmatrix} \quad (4)$$

where, n = number of the data point

2.1.2.1 Cubic Least Square method

The process of finding the equation of the curve that best fits a set of data known as Cubic Least Square method. Therefore, function and calculation step are shown below [6].

The general function for cubic least square is $f(x) = a_0 + a_1 x + a_2 x^2 + a_3 x^3$ (5)

where,

a_0, a_1, a_2, and a_3 = coefficient of variable

x = exact value

the coefficients of a_0, a_1, a_2, and a_3 are calculated in the normal equation in matrix of (4x4) in the form $Ax = b$

$$\begin{bmatrix} n & \sum_{i=1}^{n} x_i & \sum_{i=1}^{n} x_i^2 & \sum_{i=1}^{n} x_i^3 \\ \sum_{i=1}^{n} x_i & \sum_{i=1}^{n} x_i^2 & \sum_{i=1}^{n} x_i^3 & \sum_{i=1}^{n} x_i^4 \\ \sum_{i=1}^{n} x_i^2 & \sum_{i=1}^{n} x_i^3 & \sum_{i=1}^{n} x_i^4 & \sum_{i=1}^{n} x_i^5 \\ \sum_{i=1}^{n} x_i^3 & \sum_{i=1}^{n} x_i^4 & \sum_{i=1}^{n} x_i^5 & \sum_{i=1}^{n} x_i^6 \end{bmatrix} \begin{bmatrix} a_0 \\ a_1 \\ a_2 \\ a_3 \end{bmatrix} = \begin{bmatrix} \sum_{i=1}^{n} y_i \\ \sum_{i=1}^{n} x_i y_i \\ \sum_{i=1}^{n} x_i^2 y_i \\ \sum_{i=1}^{n} x_i^3 y_i \end{bmatrix} \quad (6)$$

where, n = number of the data point

2.2 Error Measurement

2.2.1 Relative Error

Relative error is defined to be the absolute error divided by the magnitude of the exact value. The relative error indicates how accurate a measurement is in relation to the size being measured [7].

$$\text{Relative error} = \left| \frac{\text{Exact valu e - Approxomate value}}{\text{Exact valu e}} \right| \quad (7)$$

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3. RESULTS AND DISCUSSION

All the estimation results for all methods are plotted in a graph as shown in Figure 1. The difference between the exact value and the estimation value can be seen in this plotted graph.

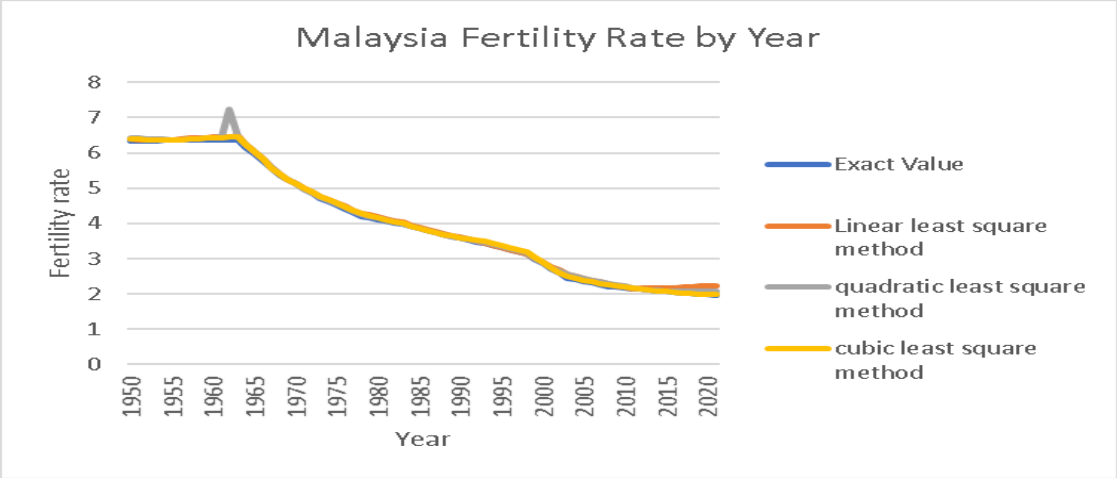

Figure 1. Graph for the exact value, Linear Least Square method, Quadratic Least Square method, and Cubic Least Square method for Malaysia fertility rate from year the 1950 to 2021.

Figure 1 shows the difference between exact value and estimation value by using Linear Least Square method, Quadratic Least Square method, and Cubic Least Square method. All the methods show the decrease in estimation value with years. In 1965, fertility rate for Linear Least Square method and Cubic Least Square method started decreasing. In 2014, fertility rate for Linear Least Square method slowly increased until 2021. In 1962, fertility rate for Quadratic Least Square method drastically increased, then decreased in 1963. In 2014, fertility rate for the Quadratic Least Square method slowly increases until 2021. However, it can be clearly seen that Cubic Least Square method more is accurate with exact value compared to others methods.

The error for each method has been calculated and the total of absolute error and relative error as shown in the Table 1 below.

Table 1. Total of error comparison between Least Square method

Method	Absolute Error	Relative Error
Linear Least Square	15.99582968	4.515558205
Quadratic Least Square	12.57611380	3.172248374
Cubic Least Square	11.02977657	2.541862775

Based on the Table 1 above, it was found that the total error value for the Cubic Least Square method is the lowest. When the number of errors is small then the accuracy is high. So, the method is the best method among the other methods used.

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4. CONCLUSION

The linear, quadratic and cubic Least square method can be used to estimate the fertility rate in Malaysia. Results for each method used are analysed and shown in graph to see the pattern of fertility rate. Then, the relative error is obtained and compared to determine the best method used. Therefore, it was found that the Cubic Least Square method is the best method because it has the lowest relative error value.

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ESTIMATION OF UNEMPLOYMENT IN MALAYSIA USING FOURTH-ORDER TAYLOR'S SERIES METHOD AND FOURTH-ORDER RUNGE KUTTA METHOD

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Abstract

The number of unemployment increase and decrease in every month but the number always remains high. The data for unemployment in Malaysia can be search at Department of Statistic Malaysia (DOSM) online portal. For this research, mathematical modelling method are used to estimate the data collected from DOSM online portal which is the data of unemployed number in Malaysia. Data collected are from 2015 to 2020 by month. Mathematical modelling method that are used in this research to estimate the number of unemployment are Taylor's series method and Runge-Kutta method where the degree order for both methods are fourth-order. The estimation value of fourth-order Taylor's series method and fourth-order Runge-Kutta method are compared and analysed by using the error analysis. Comparison of error of both methods is to determine which method is more accurate, so that the method will be concluded as the best method for this research. Based on this study, fourth-order Runge-Kutta method is the best method as the method has least total value of error and more accurate.

Keywords: Runge-Kutta, Taylor's series, Unemployment

1. INTRODUCTION

The COVID-19 pandemic has huge impact on the global economy in 2020. Since the lockdown was implemented, all Malaysian had been doing their work at home through the internet, this has significantly reduced the productivity, business closure and trade disruption that had many effect on Malaysia's finance later. When there is not enough money to pay the worker, some company started to fire their worker causing many people started to become unemployed. Job scope had been narrowed that there are not many job opportunities that opened to other people. Unemployment is a term that refers to individuals who are without work, available for work and are looking for work but are unable to find a job [1]. The unemployed are divided into active unemployed and inactive unemployed. People who were actively jobless during the reference week are those who did not work during that week and are actively searching for work. Persons who did not seek for employment because they felt there was no work available or that they were not qualified, people who were waiting for the results of job applications, and people who had sought for work prior to the reference week are all considered inactively jobless [2]. According to Department of Statistics Malaysia (2021), Malaysia's unemployment rate went up to 4.8% with 764.4 thousand unemployed persons

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in November 2020. Unemployment rate estimation can be calculated by divide the number of unemployed people by the number of laborers, which includes all employed and unemployed people [1]. This paper focus to estimate the number of unemployment in Malaysia using fourth-order Taylor series method and fourth-order Runge-Kutta method. The error and accuracy for each method is calculated and compared with the actual value. The best method out of both method is determined.

2. METHODOLOGY

2.1 Taylor Series Method

The Taylor's series method represents a function as an infinite sum of terms derived from its derivatives' values at a single point. The order 4 Taylor's series method is used in this paper. Taylor's series order 4 as follow [3];

$$\frac{dy}{dx} = f(x,y) \quad y(x_0) = y_0 \qquad \text{for} \quad x_i \le x \le x_{i+1}$$

$$y(x+h) = f(x) + hf'(x) + \frac{h^2}{2!}f''(x) + \frac{h^3}{3!}f'''(x) + \frac{h^4}{4!}y^4(x) \tag{1}$$

2.2 Runge-Kutta Method

The fourth-order Runge-Kutta method is a numerical technique one of the most widely used for solving the initial-value problems of differential equation. The equation as follow [4];

$$\frac{dy}{dx} = f(x,y) \quad y(x_0) = y_0 \qquad \text{for} \quad x_i \le x \le x_{i+1}$$

$$y_{i+1} = y_i + \frac{1}{6}(K_1 + 2K_2 + 2K_3 + K_4) \tag{2}$$

where,

$$K_1 = hf(x_i, y_i)$$

$$K_2 = hf\left(x_i + \frac{h}{2}, y_i + \frac{K_1}{2}\right)$$

$$K_3 = hf\left(x_i + \frac{h}{2}, y_i + \frac{K_2}{2}\right)$$

$$K_3 = hf(x_i + h, y_i + K_3)$$

2.3 Error Measurement

Error refers to the difference between the exact value and approximated value. Error measurement is important to determine the computational error and to predict how the error affect the reliability of the final result. The size of the difference between the exact value and the estimated value is known as absolute error. The relative error, on the other hand, is defined as the absolute error divided by the exact value [5].

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$$\text{Relative Error} = \frac{|\text{Exact Value - Approximate value}|}{|\text{exact valu e}|} \quad (3)$$

3. RESULTS AND DISCUSSION

3.1 Estimation Results

The estimation value of unemployed in Malaysia from 2015 until 2020 by using fourth-order Taylor's series method and fourth-order Runge-Kutta method were plotted in a graph as shown below.

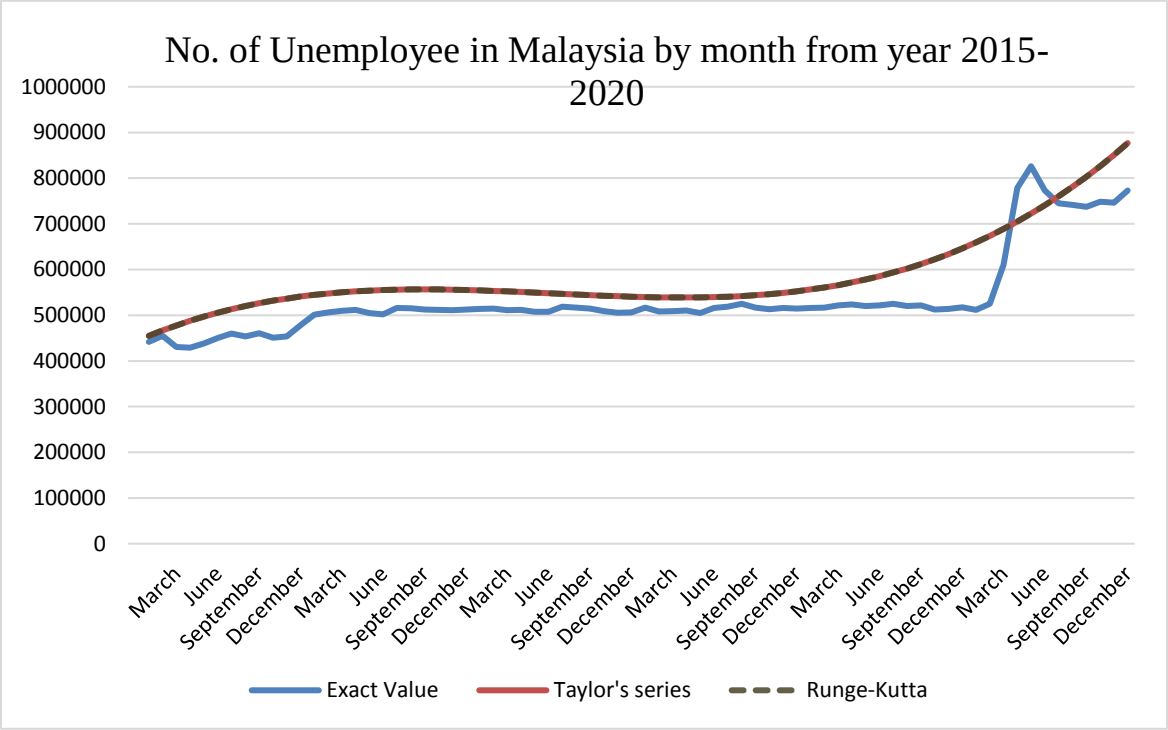

Figure 1. Comparison graph between the exact value with 4th order Taylor's series method and RK4 method for number of unemployed

The Figure 1 shows the comparison the exact value of unemployment in Malaysia with the estimation value of implementation fourth-order Taylor's series method and fourth-order Runge-Kutta method. From the graph, the estimation value using fourth-order Taylor's series method and fourth-order Runge-kutta method have slightly difference. Both method show the increasing number of unemployment in Malaysia.

3.2 Error Analysis

In order to determine the best method, the total of absolute error value and relative error value obtained from both methods were compared in table below. The method with least amount of error value will be determined as best method.

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Table 1. Total error value comparison between 4th order Taylor's series method and RK4 method

Method	Absolute Error	Relative Error	Relative Error Average
4th order Taylor's Series	3846357.6202	7.23864714660	0.1005367659
RK4	3846357.6180	7.23864714226	0.1005367659

Table 1 shows that the error value for fourth-order Taylor's series method and fourth-order Runge-Kutta method are a bit similar but fourth-order Runge-Kutta method have least total error value. The least total error value will give more accurate result. Thus, it can be concluded that fourth-order Runge-Kutta method is the best method used in estimation number of unemployment in Malaysia compare to fourth-order Taylor's series method.

4. CONCLUSION

Fourth-order Taylor's series method and fourth-order Runge-Kutta method can be used to estimate number of unemployment in Malaysia. The estimation number of unemployment are analysed and plotted in a graph. The pattern of this graph are very useful to government in the future planning. All the event and program will be more effective. Then, the error for the estimation value from implementation of each method were calculated. Relative error is important as it measure of the uncertainty of measurement compare to the size of the measurement and relative error is used to put error into perspective. From the result of relative error calculation, fourth-order Runge-Kutta method is the best method and more accurate as it has least total error value compare to fourth-order Taylor's series method.

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THE QUPER MASK

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Abstract

The COVID-19 pandemic, also known as the coronavirus pandemic, is an ongoing global pandemic of coronavirus disease 2019 caused by severe acute respiratory syndrome coronavirus 2. It gives a huge impact in all the system in Malaysia. Everyone from all levels of society and walks of life must follow the Ministry of Health's Standard Operating Procedures (SOPs) and cautions to avoid the spread of COVID-19 infection such as Safe social distance, hand hygiene (regularly washing hands with water and soap), and the use of facemasks in public and crowded places. Malaysians also are encouraged to wear double face masks and a face shield in crowded and high-risk public areas. Besides that, the government took a proactive approach by developing a contact tracing application knowing as MySejahtera. This application can be used to track the infected or suspected cases. Hence, this can help the government in controlling outbreaks and allowing the Ministry of Health to slow the virus's spread. MySejahtera application is used by scanning QR code via mobile phone. All the premises are compulsory to provide QR code. Everyone who visit the premise will line up to scan the QR code. This will lead to more time consumption especially if they are not prepared with the phone. Therefore, Quper Mask is introduced in this paper. Quper Mask is a new product with a QR code scanner that has been specially programmed for use with the MySejahtera application. This scanner is placed on the face shield to make it easier for users to scan the QR Code. This Quper Mask will be connected directly to the MySejahtera application via Bluetooth service. This product can save the time by speed up the process of scanning the QR code.

Keywords: MySejahtera, Face mask, Face shield, COVID-19

1. INTRODUCTION

Nowadays, all countries including Malaysia are experiencing the COVID-19 pandemic. The COVID-19 pandemic, also known as the coronavirus pandemic, is an ongoing global pandemic of coronavirus disease 2019 (COVID-19) caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). The problems that have occurred have forced everyone to maintain distance and movement and maintain cleanliness. In Malaysia, several Standard Operating Procedures (SOPs) have been set by the authorities. Among them is wearing a face mask. Wearing a face mask is considered an obligation for Malaysians to deal with the COVID-19 pandemic.

The government has also introduced a new application in conjunction with this pandemic, namely the

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Mysejahtera application. MySejahtera is an application developed by the Government of Malaysia to assist in monitoring the spread of COVID-19 in the country by enabling users to perform self-health assessments. In this application, there is an additional function that is MySejahtera Check-In [1]. MySejahtera Check-In is an additional function in the MySejahtera application where it gives permission to all types of premises to follow the Economic Reopening SOP outlined by the Government of Malaysia. MySejahtera Check-In Registration is for businesses, premises, public transport, and others, to obtain and display the MySejahtera QR Code. MySejahtera users can use the MySejahtera QR Code Scanner contained in the application to scan the displayed QR Code. Everyone who comes to the location will form a queue to scan the QR code. This will take up additional time, especially if they do not have the phone with them. Therefore, this paper will introduce the Quper Mask. Quper Mask is a new device that includes a QR code scanner that has been customised for use with the MySejahtera app. This scanner is mounted on the face shield to facilitate scanning the QR Code easier for users. The Quper Mask will be immediately connected to the MySejahtera application through Bluetooth. This device can help you save time by speeding up the QR code scanning process.

2. MATERIALS AND METHODS

2.1 Market Survey

A market survey was conducted by distributing online questionnaires. The online questionnaire consists of twenty-two questions that contained several questions on user involvements, problems and requirements related to the product to be launched. The demographic questions are questions asking on gender, age, race, marital status, residential area, and employment that was achieved by the respondents. This questionnaire is distributed online via social media such as Facebook, Intagram and groups chat in Whatsapp to gather as much information and opinions as possible whether the Quper Mask are accepted and get a positive response or not. Data was collected randomly from the public. The data collected then were analysed to find out the problems faced and whether they needed technology-based solutions.

2.2 Designing the Quper Mask

In the designing the Quper mask, the main concern is to always priorities the design functionality for people. The performance criteria of the product such as performance, reliability, safety in use, durability and special features must be considered in the design thinking process to develop a good product [2,3]. The process manufacture of face shields has been made by achieving a few of product specifications which are, the face shield must provide adequate coverage, should be made of optically clear, distortion free, lightweight materials and allowing adequate space between the wearer's face and the inner surface of the visor to allow for the use of ancillary equipment (medical, respirator, eyewear, etc.).

The Quper Mask is an enhancement product from the existing product which is a face shield and comes with a QR scanner linked with the MySejahtera application through Bluetooth. Since the personal data already filled in the MySejahtera apps, the QR scanning will be completed or successful. The Quper mask is one size fits all with 50cm to 64cm and 148g assembled weight as brow guard or headband. It also built with QR scanner, light indicator, battery, and power button. Each of these components has its own function.

The QR code scanner is for scanning or reading QR codes connected to the mobile phone application, which is MySejahtera, to interpret the output. The Quper Mask can relate to any mobile phone via a Bluetooth connection to interpret the scanner results. While for light indicator, it has two colours which are red and

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yellow. The purpose of the colour is to indicate whether the QR code scanner is turned on or not. If the indicator shows red, this means it is not on yet. As for yellow, this means the QR code scanner is on. Battery will supply energy sources to convert it to electricity supply to allow the QR code scanner to on. The LR41 battery type was used for this mask. The battery is a circular disc-shaped cell, so its size can be expressed as a diameter. The battery life can be up to 2 months. But it can go any longer or shorter because it depends on the how user use the mask and the frequency with which it is used. Power button is for on/off switch for the QR code scanner. Figure 1 show the sketch of the Quper Mask.

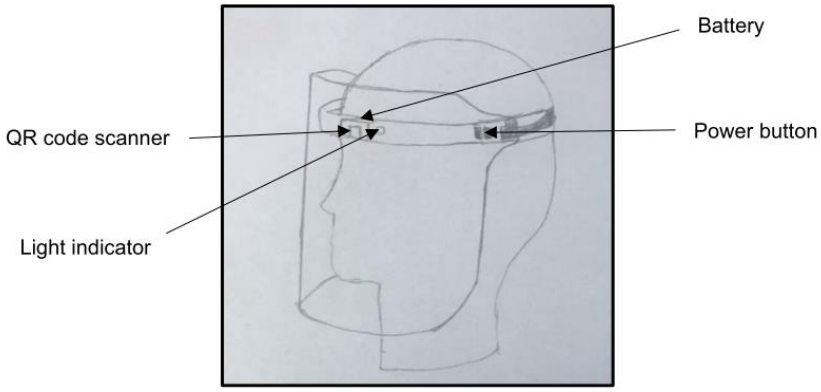

Figure 1. The Quper Mask.

3. RESULTS AND DISCUSSION

The online questionnaire was answered by thirty-four Malaysians of all ages. From the findings, 52.9% (18 respondents) were females and 47.1% (16 respondents) were males. The age of the respondents is ranged from below 20 to 50 years old.

Table 1. Descriptive statistics in percentage

Items	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
In my opinion, scaning a Qr Code via a smart phone before entering a premise burdensome.	35.3%	38.2%	17.6%	8.8%	0
I often forgot to open the MySejatera app on my smartphone in advance, causing people behind to wait a long time.	52.9%	26.5%	14.7%	5.9%	0
I love face shield that provided a scanner on it was invented	67.6%	17.6%	8.8%	5.9%	0
Technology can lighten my load	61.8%	17.6%	14.7%	5.9%	0

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Table 1 shows the descriptive statistics in percentage for market survey conducted. 35.3% are strongly agree and 38.2% of the respondents agree that scanning a Qr Code via a smart phone before entering a premise burdensome. Respondents who are forgot to open the MySejatera app on the smartphone in advance and causing people behind to wait a long time are about 52.9% strongly agree and 26.5% agree. The feedback from the respondents shows that they love face shield that provided a scanner on it was invented when 67.6% of them strongly agree and 17.6% of them agree with this statement. 61.8% of them also strongly agree that technology can lighten their load. Therefore, it can be concluded that the Quper Mask are suit to them.

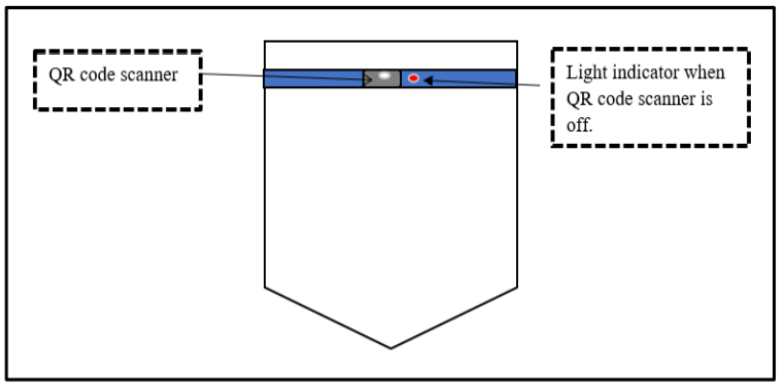

Figure 2. The Two- dimensional Prototype design of the Quper Mask

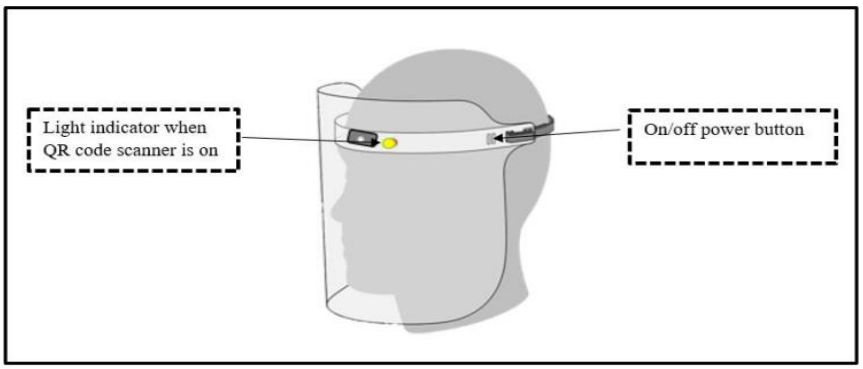

Figure 3. The Prototype of the Quper Mask

Figure 2 and figure 3 show the prototype of the Quper Mask. The design made is to meet the user's demand. The available features can suit the tastes of all users. It was easy to use and to put on because it is lightweight. The current product of face shield is just a simple face shield with clear plastic and the only function of the face shield is to cover all parts of the face. While this product has additional functions that are very easy to use. When it comes to scanning the QR code, people need to take out their smartphone to check in with MySejahtera apps before entering any stores or places. People might think it is troublesome and just write down their information in the book by using the provided pen. The provided pen is not sanitized and might have germs of transmissible disease like Covid-19.

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People may scan the QR code with the Quper Mask without having to take out their smartphone. To use the Quper mask, they need to turn on the face shield by pushing the button at the side of the face shield and the light indicator will turn yellow. The user of the Quper mask needs to turn on Bluetooth on their smartphone to be connected. The Quper Mask also user-friendly for Hijabis where they will not have difficulty opening and wear it back and they don't need to wear an extender. Since Covid-19 happened, the safety measures such as wearing a face mask or face shield, wearing hand sanitizer, and scanning a QR code have become everyone's daily routine.

4. CONCLUSION

The Quper Mask should not only satisfy the needs of a user but be easy to implement and have a commercial model as well. This product can be used during the COVID-19 pandemic season. Users only need to wear this face shield as usual and use the scan on the face shield when they want to enter a premises, event, or public transport. Consumers need to get the Quper Mask because it can facilitate the user and make the scanning process faster than by using the phone. This Quper Mask gives more convenience to the customers as it helps them save time and provides double convenience. The Quper Mask are safe to use and more secure to user as it does not attract the thieves. All Malaysians have the potential to have this Quper Mask in providing a solution.

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HALAL BOTTLE PRO

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Abstract

Nowadays, there are many companies that produce the water bottle handles the problems that they face with lack of performance and quality. There are in need a product that can produce the best ones do it longer such as can reheat a drink that has cooled by using the portable charger. In addition, other features such as wide-mouth openings that make it easier to fill, clean, and add ice are also included. They're durable, less prone to leaking, lighter than those that came before and the most important Halal Bottle Pro being made using halal material. Halal Bottle Pro is a new product that has been developed that has multiple functions which this product can be used in solving the problem faced by others company who has a lack of performance and quality of the products. This function will surely replace an existing standard water bottle because of its greater performance and better value. Besides, there are many functions of these multi-function water bottles that can make people happy by no longer reheating their drinks manually because they can reheat their drinks by using the technology that has been developed. These products also have a new feature of LED temperature indicator that can show that the charger is active or not. For example, a red light indicates when the water is hot. Furthermore, the main objective of Halal Bottle Pro is to give satisfaction, convenience and hygiene toward the travelers or people who like to do outdoor activities. In addition, the competitive advantages that applied to Halal Bottle Pro are quality and innovation. The method that being used were idea generation and idea screening that will care more about satisfaction toward customer., Halal Bottle Pro will provide more features than other competitors and surely make this product different from other products in the current market. beyond shadow of doubt, Halal Bottle Pro will be noticed by customers and satisfy their needs and will be well received by the target market.

Keywords: Halal bottle, Bottle Pro

1. INTRODUCTION

Extended This part will describe about the background that related to the study on this project. It's also an initial guide to understand what this study is all about. This discussion is to ensure that this project is eligible to proceed and at the same time to provide a guidelines or standards on how the project will works. For that purpose, to find the best solution to overcome this problem is by improving the technology of their products.

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One of the main problems associated with the water bottles is about their quality and performance. Currently, many water bottle products are being made of plastic and stainless steel that comes from material that we do not know. In this case, that plastic water bottles are not resistant to hot water. This will cause the bottle to break or be damaged because the plastic bottle cannot withstand hot drinks or water. Also, if we produce more plastic bottle, by plastic it will be bad for the atmosphere.

In addition, even though the stainless steel bottle can hold the hot water, the drinks will last less from 5-6 hours only. However, this will cause them to reheat the water by manually. Moreover, the competition with others competitor is challenges with many companies are spend a lot of money on their product because of new features technologies nowadays. This is one of the challenges that we need to face to make sure our product is always be the favorable, safe and hygiene product to customer. The new feature that we provide has made our product step in front of the other product in current market.

2. MATERIALS AND METHODS

The materials that being used are came from six component that are, stainless steel body, LED temperature Indicator, button, battery protector and wireless charging port. All component being made using halal material and hygiene.

Halal Bottle Pro is an improvement on existing products is divided into four classes such as addition to existing lines, improvements and revisions to existing products, cost reductions and repositioning. The addition to existing lines is subsets to the new product 7 lines and targeted to different market segments while improvements and revision to existing products is where new products to replace existing products with cosmetic and functional enhancements. The cost reductions are offer no new benefits to the consumer other than possibly reduced price and also provides enormous added-value to the firm while repositioning is a new application to existing products which more to do with consumer perception rather than technical development. The R&D process for this product went through two phases which is:

2.1. Idea generation

The process of creating, developing, and communicating abstract, concrete, or visual ideas is referred to as idea generation. It is the first stage of the idea management funnel and focuses on developing potential solutions to perceived or actual problems and opportunities. The 5W+H process, social listening, brainstorming, role playing, using online resources, mind mapping, and thinking in reverse are all methods for generating ideas. Based on our observations as well as interviews, we found out that the current product are not satisfied the user because they need a bottle that can boil the water and safe (halal) that can use to all people. As a result, this process involves all group members brainstorming various ideas and opinions to solve the problems.

2.2. Idea screening

Idea creation is the second subcategory of the research and development phase in the new product development process is idea screening. It is focused on knowledge from experience and market analysis and includes the use of scoring templates, checklists, or personal judgments. Screening also requires group members' opinions to determine whether or not the product would be effective.

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First and foremost, we must recognize the security needs of companies and private homes, and we discovered that only a few devices would meet those needs. As a result, we wanted to include a product that not only meets the needs of the consumer, but also includes additional functionality that will persuade companies and private homes to use this product.

The products that were chosen to be developed is an improvement for similar already-in-the-market product because the existing product has a few flaws that give the sense of insecurity to users. Our company will improve current products by adding several features from trusted resource (halal) that can increase the functionality and safety of the product. The functions that will be included with the newly developed product are boil water and wireless charging.

3. RESULTS AND DISCUSSION

3.1. Features

There are several specialties within design positions within the user experience sector, such as interface designer, visual designer, information architect, motion designer, prototype, and these positions might overlap with other domains like as marketing, architecture, industrial design, or even sound design.

Our new Halal Bottle Pro is created by mixing all of the high-tech capabilities in a unique design that sets it apart from another bottle. We've combined a number of innovative features and functions in this multifunction bottle with a perceptible difference.

Halal is defined as permitted, permissible and lawful. Halal is more than just concerning about food, it involves cosmetics products, pharmaceuticals products and services. Every Muslim must adhere to the Islamic principles and every product must not involve the use of non-Halal ingredients, manipulating the environment and labor, and not harmful or intended for harmful use.

Role of Halal Bottle pro is to contain and protect the goods during journey, activities and others. It is also to protect customer during handling goods such as chemical, liquid or loose products. In addition, Halal Bottle Pro will eliminate or minimize the chances for damages, spoilage or misplacement throughout the activities. In the context of Halal, this product will protect goods from any cross-contamination between Halal and non-Halal substance. Besides that, halal Bottle Pro also acts as a protection from any damages to the Halal product so that the Halal status is still intact. We can conclude that Halal Bottle Pro is designed to protect our customer safety when using the bottle.

Halal Bottle Pro are available in a variety of colours, including white, black, blue, red, purple and many more that designed to meet the preferences of customers. Our bottle is compact, light and easy to carry. The dimension of our product is 6*22*6cm (length*height*width) and the weight is around 500g. Halal Bottle Pro is appropriate for employees like lecturers and anyone in the business and management area who has the financial means to purchase them. The interface of the bottle came with various. When using in boiling state, a picture will come out from the bottle interface which is depends on colours customers choose. As example, purple color will come out flower picture. In addition, the others attraction of our Bottle Pro is glow in the dark version. Our product is designed with neon colours to help users find their bottles in dark or dull environments. All of the colours are unisex, which means they are suited for both men and women.

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The bottle can also be customized to match our product branding. The price may be hefty, but it is still cheap due to the sophisticated technology, which is expected to cost more than RM50 when incorporating the charging port.

Besides that, this multifunction bottles have a very safety compare to another bottles. This bottle is designed to have stainless steel upgraded with high strength halal material, where users not to worries about the risk and safety to crack once being drop. Food safety is becoming increasingly important as the economy grows and people's living standards rise. This product is BPA-free, contains healthy and halal materials, has no odor, is non-toxic, eco-friendly, safe and healthy, and is difficult to crack. Reusable for sports and everyday water requirements.

Next, the Halal Bottle Pro has its own specialty which is provided with boiling function. Thus, the user can easily use the bottle for reheat the water inside. The LED light indicator designed to react the change of temperature as example blue light means cold and red light means hot state. If the colours does not change, it is indicating that the bottle in natural state.

Last but not least, we included wireless charging port. By following the trend, the wireless charging is waterproof and anti-dust feature which help low the risk from broken. The battery is about 5000 mAh which about 1 days long last. Taking about 10 minutes' full charge for the bottle functionally well.

3.2 Build prototype (2D or 3D)

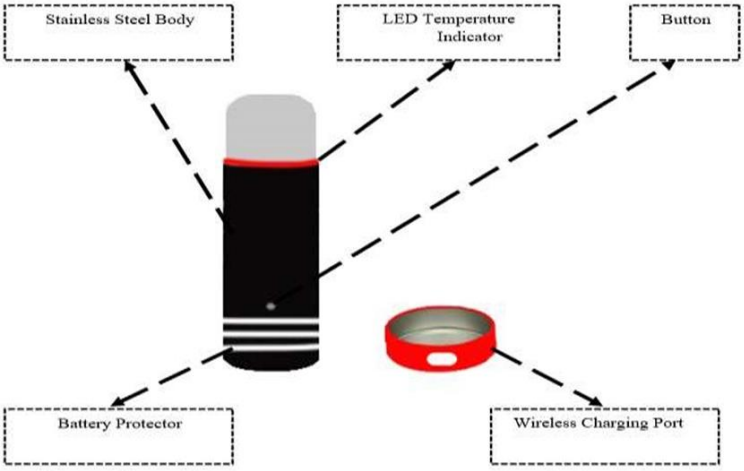

Figure 1. 2D prototype

Figure 2. 3D prototype

4. CONCLUSION

New product enhancement (NPD) is an important way for companies to continue to address challenges and meet the changing needs of current customers. Furthermore, innovative product development would open up new advertising channels, expanding the pie even more. In addition, to achieve a good result, the right procedures for putting together and fruitful bearings are critical. In conclusion, we hope the creativity of

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the product will be noticed by customers and satisfy their needs and the multi-function Halal Bottle Pro will be well received by the target market.

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ANALYZING STUDENTS' DROPOUT FACTORS IN OPEN AND DISTANCE LEARNING (ODL) USING A DEMATEL METHOD

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Abstract

The outbreak of Covid-19 pandemic has changed many sectors and the lives of people at large. Education is one of the affected sectors as all public and private academic institutions need to be closed in preventing the disease from spreading. As an adaptation to this situation, the Open and Distance Learning (ODL) mode of learning has been introduced. The ODL helps students to continue the learning process from home, or anywhere as long as they have the devices such as smartphones or laptops, and also the internet connection. However, the report concerning the high dropout rate of massive online open courses (MOOCs) among students has become one of the issues being discussed. As the implementation of MOOCs mode and ODL is almost similar, the issue is important to be focused and the factors behind the students' dropout need to be considered. Therefore, identifying the factors that have contributed to the students' dropout in ODL is very crucial. For that reason, the Decision-Making Trial and Evaluation Laboratory (DEMATEL) method was applied in this study. A DEMATEL method can analyze variable correlations using crisp values and solve complicated systems by providing the cause and effect relationship among the components. The DEMATEL method has five steps to be implemented which are constructing the direct relation matrix, normalizing the matrix, calculating the total relation matrix, building up the causal diagram and calculating the weight of factors. Ten sub-factors were selected and classified into four main factors. 50 data were collected from the questionnaire distributed to final semester degree students in UiTM Kuala Terengganu. Based on the analysis on the ten sub-factors, the result obtained presents the academic skill and abilities sub-factors turned out to carry the highest weight value, thus was ranked at the first place. The findings of this study can assist students in recognizing the most influential dropout factors in ODL to plan and make sensible decision for their study.

Keywords: DEMATEL, ODL, Dropout factors.

1. INTRODUCTION

The current use of advanced technologies has become a necessary part of our daily lives. In developing countries' higher education institutions, the use of information and communication technology (ICT) has increased at a rapid rate creating new opportunities and challenges. Because of the advancement of ICT, the learning process has shifted from traditional classrooms to e-learning environment. Open and distance

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learning is getting a lot of attention due to its adaptability and flexibility [1]. The advantages of open and distance learning are students can discuss the task given, make their own self-study, watch the video or sources, and a few other advantages. Students are able to access the content everywhere, and this brings a lot of benefits, as an adaptation to this pandemic of Covid-19. However, students also face a few challenges like lack of facilities such as laptop or smartphone and poor internet connection that will lead to a harder situation. Not just that, some other reasons may arise from personal, social, academic or course factors. Due to many obstacles faced by students, some have given up, and decided to drop out from this ODL classes. Hence, a study that investigate the reasons behind this situation needs to be done as to apply the best decision-making method to address the problem.

Decision making trial and evaluation laboratory (DEMATEL) is known to be an effective method for determining the trigger chain components of a complex structure [2]. It deals with the estimation of interdependent relationships between variables and the recognition of essential relationships through a visual structural model. Because of its benefits and capabilities, the DEMATEL approach has piqued the interest of many academicians over the last decade, and it has been utilized to tackle complicated machine problems in a variety of disciplines [3]. Therefore, the main purpose of this study is to apply the DEMATEL method to study the factors of students' dropout in open and distance learning (ODL).

2. METHODOLOGY

In this paper, the factors that contributed to students' dropout in ODL and their effects were analyzed. Ten sub-factors were selected and classified into four main factors; personal, social, academic, and course (Table 1).

Table 1. The dropout factors and sub-factors in ODL

Factor	Code	Sub-factor
Personal	F1	Academic skills and abilities
	F2	Prior experience
	F3	Family/Work circumstances
Social	F4	Social interaction
	F5	Social support
Academic	F6	Motivation
	F7	Feedback
Course	F8	Content difficulty
	F9	Commitment
	F10	Course time

The step of DEMATEL method are as follows [4-5]:

Step 1: Constructing direct relation matrix.
Step 2: Normalizing direct relation matrix.
Step 3: Calculating total relation matrix.
Step 4: Building up causal diagram.
Step 5: Determining the weight of sub-factors.

Data were obtained from the distribution of questionnaire and were analyzed subsequently. The implementation of DEMATEL method produced the weight for each sub-factors chosen which were grouped into cause and effect groups.

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3. RESULTS AND DISCUSSION

Table 2 shows the cause and effect and Table 3 shows the weight for each sub-factor.

Table 2. The cause and effect of dropout sub-factors.

Code	Factors	R	D	R + D	R - D	Impact
F1	Academic skills and abilities	3.98	2.29	6.27	1.69	Cause
F2	Prior experience	3.86	2.34	6.20	1.52	Cause
F3	Family/Work circumstances	3.45	2.64	6.09	0.81	Cause
F4	Social interaction	3.26	2.87	6.13	0.39	Cause
F5	Social support	3.08	3.01	6.09	0.07	Cause
F6	Motivation	3.00	3.13	6.13	-0.13	Effect
F7	Feedback	2.84	3.30	6.14	-0.46	Effect
F8	Content difficulty	2.58	3.56	6.14	-0.98	Effect
F9	Commitment	2.45	3.75	6.20	-1.30	Effect
F10	Course time	2.31	3.90	6.21	-1.59	Effect

Table 3. Weight for each sub-factor

Code	R + D	R - D	$(R+D)^2$	$(R-D)^2$	$w_i = \sqrt{(R+D)^2+(R-D)^2}$	$W_i = \frac{w_i}{\sum_{i=1}^{n} w_i}$
F1	6.27	1.69	39.4380	2.8488	6.5028	0.1039
F2	6.20	1.52	38.6304	2.3068	6.3982	0.1022
F3	6.09	0.81	37.2463	0.6506	6.1560	0.0983
F4	6.13	0.39	37.6796	0.1578	6.1512	0.0982
F5	6.09	0.07	37.2296	0.0047	6.1019	0.0975
F6	6.13	-0.13	37.7385	0.0183	6.1447	0.0981
F7	6.14	-0.46	37.8210	0.2190	6.1677	0.0985
F8	6.14	-0.98	37.8165	0.9742	6.2282	0.0995
F9	6.20	-1.30	38.4881	1.6996	6.3394	0.1013
F10	6.21	-1.59	38.6674	2.5129	6.4172	0.1025
					$\sum_{i=1}^{n} w_i = 62.6074.$	

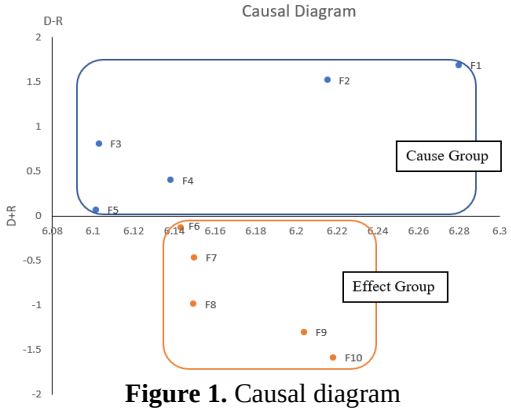

Figure 1. Causal diagram

Based on the causal diagram, the factors of students' dropout in ODL were divided into cause and effect groups. The results of this research revealed that the cause group in the causal diagram has five sub-factors which are academic skills and abilities (F1), prior experience (F2), family/work circumstances (F3), social

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interaction (F4), and social support (F5). The effect group consists of five sub-factors of students' dropout in ODL which are motivation (F6), feedback (F7), content difficulty (F8), commitment (F9) and course time (F10). The causal diagram is shown in Figure 1.

The sub-factors of students' dropout in open and distance learning (ODL) were ranked based on the calculation of the weight of each sub-factor. As a result, the sub-factor academic skills and abilities was ranked at the first place with a weight value of 0.1039 followed by the course time with a weight value of 0.1025. Table 4 shows the ranking for each sub-factor on students' dropout in ODL.

Table 4. Ranking for each sub-factor

Rank	Sub-factor	Code	Weight of each sub-factor
1	Academic Skills and Abilities	F1	0.1039
2	Course Time	F10	0.1025
3	Prior Experience	F2	0.1022
4	Commitment	F9	0.1013
5	Content difficulty	F8	0.0995
6	Feedback	F7	0.0985
7	Family/Work Circumstances	F3	0.0983
8	Social Interaction	F4	0.0982
9	Motivation	F6	0.0981
10	Social Support	F5	0.0975

4. CONCLUSION

As a conclusion, DEMATEL method was effectively applied to determine students' dropout factors in open and distance learning (ODL). The cause and effect groups were identified using a causal diagram, with five factors in the cause group and five factors in the effect group. The ranking of each factor on students' dropout in ODL was finally established. It is hoped that the result will benefit the students to find ways to face the obstacles, then complete their study in ODL mode successfully. It is recommended for future studies to consider using different number of factors and sub-factors, together with different approaches to yield more comprehensive results.

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SENSING GLASSES

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Abstract

Nowadays, online learning is important during Covid-19 pandemic. The impact of pandemic in education institutions effect the ways of teaching and learning. All schools and institutions in Malaysia using online learning to replace the physical classes. Even though technology give benefits in education, it is also increased plagiarism problem. A new product is produced namely "Sensing Glasses" that is developed with the aim to be assisting the teaching staff or lecturer to prevent students from violating the rules of the examination as well as preventing the act of plagiarism. The glasses are equipped with a camera lens with sensors that can record videos in a high resolution and a built-in cell phone detector. An application called CAP-SPY is used to synchronize with the glasses. The application allows the user to view videos that had been recorded, transferring and sharing the videos, as well as changing the video related settings for the glasses. The product can decrease plagiarism in educational institution to produce innovative and idealistic students.

Keywords: Sensing Glasses; CAP-SPY; plagiarism, educational, Covid-19

1. INTRODUCTION

Technology is created to solve problems or issues faced by peoples. All problems and issues before the creation of technology are identified and clarified to get an idea using technology. It is very helpful in providing information about the concept of the technology on purpose of developing product that technology based. Unquestionably, sensing is to perceive or become aware of something by the senses. While glasses is a pair of lenses set in a frame resting on the nose and ears, used to correct or assist defective eyesight. In this paper, we proposed a product namely Sensing glasses which is a technology-based product that focus in education. This project focusing on new functions from the normal eyeglasses to technology-based eyeglasses. The new additions functions to the glasses included distinguish plagiarism and detecting student's device such as smartphones and smart watch. This sensing glasses also can be used for poor vision people in their daily life.

Idea screening in a method of innovative product creation that follows idea generation is the second subcategory of research and development processes. The product that is proposed to be developed is an improvement for similar already-in-the-market product because the existing product does not have function

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that give the sense of insecurity to customers. The product is improved by adding several features that can prevent cheating among students. The act of students that imitating during exams is a big problem and very prevalent since a long time ago. There are already many ways used by lecturers to combat imitation in examinations. Unfortunately, there are still students that success in violating examination's rule. Other than violating rules time examination, most students imitate in their assignments. Lecturers had to ensure their students' assignments did not have plagiarism from any source. Sensing Glasses is a product with the detector function to detect the plagiarism.

2. PRODUCT DESIGN AND FEATURES

Sensing Glasses is a special glasses designed for the education industries. There are several features and functions that are combined in the Sensing Glasses in order to create a multifunctional glasses. The main objective of this glasses is to prevent students from cheating in exams, it can also be used by teachers or lecturers to detect plagiarism in students' assignments. Sensing Glasses uses a 3.7V Li-ion, 480mAH that can last up to 1.5 hours and can be charged with a USB cable.

The glasses is equipped with a vertically tillable camera lens that can be adjusted 12° downward and 10° upward. The camera allows wearers to record video like their perspective in a High Definition 1080p or 720p resolution and up to 60 frames per second that allows for more smooth fluid looking video recordings. It uses the 8MP Sony CMOS sensor that will ensure better image quality, enhanced low light performance, and low power consumption. It also has and expandable memory feature that supports up to a 128GB micro-SD card, so there will be plenty of spaces to save more and longer recordings. This feature can help in recording videos during exams that can be used as an evidence if there is any cheating situation is discovered.

Sensing Glasses has a built-in cell phone detector to prevent students from bringing cell phones into the examination hall. The cell phone detector come with bugs which are meant to detect RF transmission signal. The moment this bug detects the RF transmission signal from an activated cell phone, the LED light started blinking, and it starts making a beep alarm. This feature helps the wearer to detect the presence and existence of cell phones that may be brought in by students to cheat.

Furthermore, Sensing Glasses can help examiners to detect any plagiarism in assignments. The glasses will capture the picture of the assignment and send it to the connected device with a specific application. The examiners can later upload the picture to an online database system called Turnitin. The system will match the text within an assignment by comparing it against an archive of internet documents, internet data, a repository of previously submitted papers, and subscription repository of periodicals, journals, and publications. It then creates an 'Originality Report' which can identifies where the text within the assignment has matched another source. The result will then be sent back, and the examiners will know if there is any plagiarism involved.

In addition, Sensing Glasses have lens correction feature, that can automatically adjust the power of the glasses based on the wearer glasses prescription that can be inputted using the associated application. In this case, any person can use this glasses, whether they are near-sighted or far-sighted. Sensing Glasses can be a Wi-Fi signal and wirelessly connect it to any iOS/Android device using an application called CAP-SPY that can be downloaded on Google Play store or Apple Application store. The application allows the viewing of videos that has been recorded by the glasses, transfer and share function that can be used to transfer the videos to other devices or share them on social media platforms. The application can also be

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used to change video related setting such as resolution, white balance, sharpness, video file length, audio volume, or exposure.

3. BUILD PROTOTYPE (2D & 3D)

Figure 1, 2 and 3 show the prototype of the Sensing Glasses.

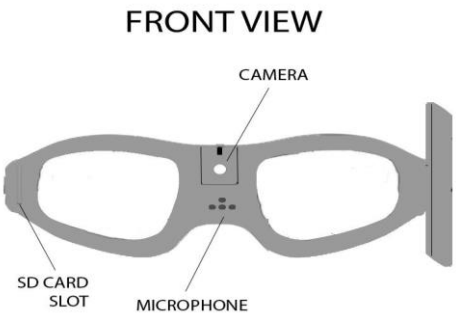

Figure 1. Two-Dimensional(2D) from front view for Sensing Glasses

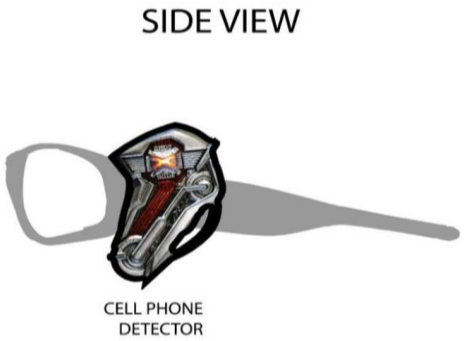

Figure 2. Two-Dimensional(2D) from side view for Sensing Glasses

Figure 3. Three-Dimensional(3D) for Sensing Glasses gate

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4. CONCLUSION

Sensing Glasses is a product designed for the education industries. Our main purpose for developing this product is to prevent the cheating and plagiarism in the educational institute. To verify the high quality of the latest Sensing Glasses products in the market, the principle of marketing testing is used to continue the marketing campaign until it is available in the market on a large scale. The purpose of product implementation in test marketing is to assess the potential and breadth for target markets especially for private and government educational companies. In marketing testing, we focused on new product performance, customer satisfaction, and product features accessible, user-friendly, and new product efficiency, customer efficiency, and customer acceptance. Hopefully in the future, the Sensing Glasses will become one of the advantages to educational institute to prevent cheating and plagiarism and can be improved to its function.

ACKNOWLEDGEMENT

The authors would like to express utmost gratitude to the editors and the referees for their recommendations and valuable comments.

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NG DENTAL CLINIC APPOINTMENT MANAGEMENT SYSTEM (AMS)

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Abstract

The Appointment Management System (AMS) for Ng Dental Clinic is an online platform for patients to make an appointment. There are three users of this system which are the manager or dentist of the clinic, staff, and patients. The problems faced by staff and patients have been identified through face-to-face interviews and surveys through the initial phase of the development. Therefore, AMS was developed to solve the problems and enhance the current business process. By using AMS, it helps the patients easy to check the availability of the date and time and be able to make an appointment online. With a computerized system, it also helps the staff and dentist handle the appointment made by the patients and track the clinic's performance. AMS was developed by following the Adapted Waterfall Model, which consists of six phases. The phases are planning, analysis, design, development, testing and evaluation, and documentation. The theory used for this system is Ten Usability Heuristics, which is significantly related to user interface design and functionalities and serves as a guideline for the developer to develop AMS. Moreover, user evaluation is conducted to test the system's usability. An expert evaluation and system testing have been conducted to get feedback and recommendations to improve the functionalities of AMS. All the recommendations and feedback received during the testing session can be used as a reference for future work to enhance the functionality and usability of the system. Based on the user evaluation result, the highest mean for satisfaction is 4.55. The result concludes that most of the respondents are satisfied with the usability of the system.

Keywords: Appointment Management System, AMS, Usability Heuristics

1. INTRODUCTION

A Management Information System (MIS) is an information system used in an organization for decision-making and for information communication, monitoring, analysis and visualization. As cited by Hasan Al-Mamary et al., (2014) the MIS benefits produced when the systems provide useful information without delay and improve the organization's work management. Appointment management is one of the core business processes in any dental clinic. Ability to sort out appointment systematically is crucial to satisfy patients need and to facilitate staff in keeping track with the appointment dates alongside with the type of treatment for each day.

A dental clinic has been chosen as a case study for data collection which is Ng Dental Clinic located in Ipoh, Perak. Based on the investigation conducted through interview, there are few issues faced by the clinic in using current manual procedure for appointment data management. The first issue with the

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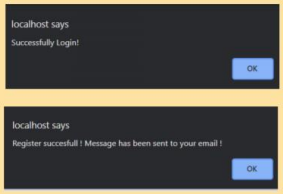
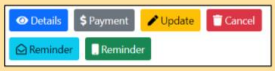
current business process is that the patient needs to allocate a specific time to make an appointment. From the survey conducted, 62.2% of the respondents answered that it would be difficult for them to walk-in or make a phone call to set an appointment. The respondents are mostly students and workers who are bound to specific class or working hours. Furthermore, the respondent has lack information on the availability of appointment date and time. Next issue is the staff require more time to arrange and manage the duration of treatments manually in the logbook because different treatments have different duration of treatments. By keeping appointment record manually using logbook, there is difficulty in making any changes in the logbook because staff must make changes by considering the next appointment to avoid the incoming patient wait for a long time.

The Online Clinic Appointment Management System (AMS) for Ng Dental Clinic was developed to facilitate the current appointment management process and making slot availability information accessible for patients to make an appointment through the system. The development of AMS focuses on achieving the main three objectives. The objectives are to identify the current process and problems related to make an appointment with dentist at Ng Dental Clinic, to design and develop an online appointment management system for Ng Dental Clinic and to evaluate the functionality and usability of the proposed system.

The system usability of AMS follows the guideline from Ten Usability Heuristics theory by Jacob Nielsen. Nielsen (1994) said it is called 'heuristics' because the meaning is not a specific usability guideline but general rules of thumb. Usability is an important quality attribute in the system. Table 1 shows snapshot of theory implementation.

Table 1. Snapshot of the Theory Implementation

Principles	Descriptions	Implement in AMS
1. Visibility of system status	Keep users about **current activities** and state within reasonable time when using the system. For example, when users log in into the system, the system **notify** the users that they are successfully login into the system.	
2. Match between system and real world	The uses of **icon** that match with the real world. For example, the delete button can be replaced a **bin icon** that users familiar that the icon of bin is **delete.**	

2. METHODHOLOGY

Appointment Management System (AMS) was developed by adapting the Waterfall System Development Model. System planning, system development and system documentation are the three major phases involved in achieving the objectives of the project. Figure 1 summarizes phases involved in AMS development.

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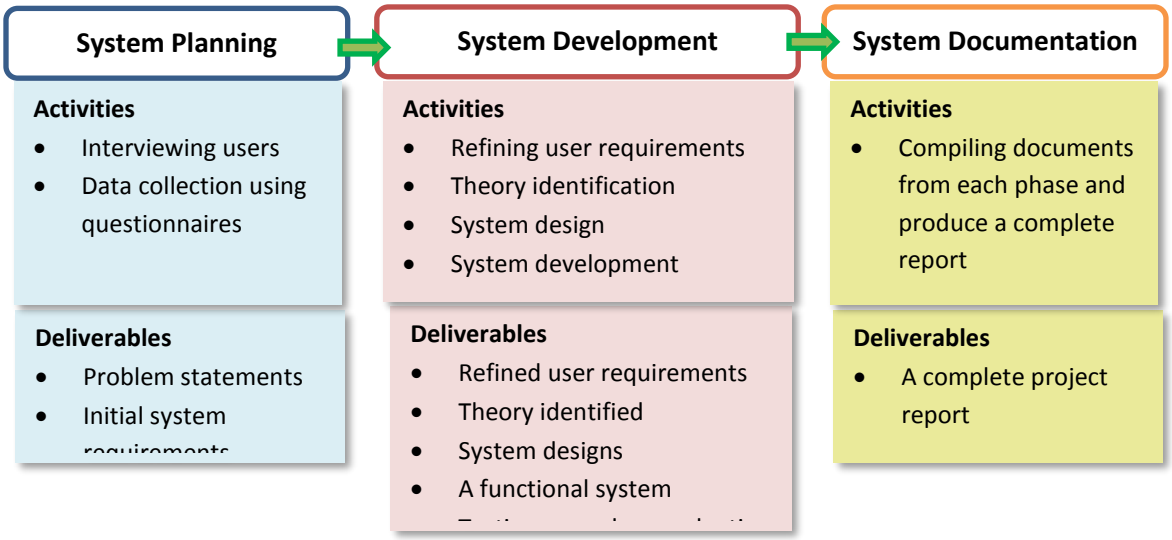

Figure 1. Project Development Methodology

3. RESULTS AND DISCUSSION

3.1. System Testing

The purpose of system testing is to ensure the Appointment Management System (AMS) is functioned as per user requirements. Test plan is used as the instrument to record the functionality of each function. System testing is conducted by the developer and one other tester. As a result, all functionalities required has successfully been implemented for each user.

3.2. Expert Evaluation

The expert evaluation is done by a selected expert in system development field. This is to ensure that the system meets the requirements. There are several sections that have been evaluated by an expert which are perceive usefulness, ease of use, satisfaction, consistency, efficiency, and implementation of Nielsen Heuristics theory. As a result, an expert suggested to add more features or option for payment and dentist can view the patient's status. Furthermore, an expert agreed that the system is easy to understand by the users. Table 2 summarizes the expert evaluation results.

Table 2. Summary of Expert Evaluation Results

SECTION	RESULT
Perceive Usefulness	Comment : Okay and Clear
Ease of Use	Comment : Can add more features / option for payment.
Satisfaction	Comment : Yes and Clear
Consistency	Comment : Yes and Clear
Efficiency	Suggestion : Dentist can view the patient's status
Nielsen's Heuristics Evaluation	Comment : Easy to understand

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3.2. User Evaluation

The user evaluation focused on how the system fulfils the criteria that are important to ensure that the system meets all the requirements. Thus, the questionnaire is used to get feedback on the user's satisfaction using the system. The questionnaire consists of several constructs which are interface, learnability, consistency and satisfaction. Most of the respondents are female between 18 to 21 years old. From the evaluation, the respondents agreed that the characters and font used in the system is appropriate and the user remember how to use the system. Furthermore, they agreed that the system displays a consistent output for each task performed and overall, they are satisfied with the performance of the system. Table 3 summarizes the user evaluation results.

Table 3. Summary of User Evaluation Results

SECTION	RESULT
Demographic Information	Gender = Female (25) Age = 18-21 years old (21) Employment Status = Student (25)
Interface	The characters and font used in the system is appropriate = 4.65
Learnability	I remember how to use the system = 4.53
Consistency	The system displays a consistent output for each task performed = 4.59
Satisfaction	Overall, I am satisfied with the performance of the system = 4.55

4. CONCLUSION

In a nutshell, AMS can be a platform for users to help in performing appointment management related tasks. The evaluation results show the usability of the system has achieved the requirements set in the early phase of the development. It is hoped that AMS meets the user's requirements and solves the major problems faced by the users. Nevertheless, all the comments and suggestions may be added to improve and enhance the AMS's functionalities, scope and usability in future development.

ACKNOWLEDGEMENT

Praise to the Almighty Allah for the successful project completion. Special thanks to UiTM Terengganu, the supervisor, parents and everybody involved in any way along the process.

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ACCOUNTING CONSERVATISM AUTO SENSE SYSTEM

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Abstract

According to the Society for Human Resource Management (SHRM), pre-screening process is important in getting the best talent possible for a particular job or position. The article added that pre-screening helps to eliminate candidates who do not meet the basic requirements of the position offered. Based on this notion, it seems like the pre-screening process is very much needed in selecting candidate to work in accounting field since accounting requires special technical skills. Thus, this project attempts to develop a pre-screening tool to assist any organization in hiring potential candidates to work in the accounting related posts in the organization. According to [1], the education background plays an important role in determining quality of the company's financial reporting. Hence, it becomes the purpose of this study to provide a preliminary judgement on a characteristic of a candidate applying for accounting post in an organization. Thus, the sensing model is to assist the organization in the early stage of selecting the potential candidate. The model is hoped to find out how conservative a candidate is based on the selected criteria on the potential candidate's accounting backgrounds and demographic attributes. The model was developed by deploying the firm-year measure of conservatism (C_Score), developed by [2] and [3], which was acquired and later correlated with the CEO's accounting backgrounds to determine their relationship. The model was formulated in a simple manner; data from the candidate is gathered through google form and later extracted to the excel format to generate the score to form the pre-selection score of suitable candidates for accounting posts. Thus, it comes in handy with any online vacancies advertisement which the candidates can provide their details at the same time they submit their application. The criteria used for the pre-screening is free from employer's discriminatory intent as all the criteria chosen were information showing relationship to the job qualifications. Overall, the model is useful in selecting potential candidates to hold an accounting-related post in any organization. The organization benefited from this model through the better selection of candidate to hold accounting related post, in effort to boost the organization's financial reporting quality.

Keywords: CEO, Accounting Background, Accounting Conservatism

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1. INTRODUCTION

As the world's largest professional society, the Society for Human Resource Management (SHRM), through its articles, suggested that pre-screening of potential candidates is a vital step in the staffing process. This process assists the organization or potential employers to eliminate candidates who do not meet the basic requirements of the post offered. Finding suitable candidates to be part of the workforce is crucial as human capital determines the development and growth of an organization [4]. Competent workforce creates value, able to spot opportunities and implement strategies that ultimately optimizes the organizational performance. This study developed a pre-screening tool specifically related to hiring potential candidate for accounting posts. Following [1] which suggested that Chief Executive Officers (CEO) with accounting backgrounds displayed higher level of accounting conservatism as compared to their non-accounting counterparts, the pre-screening tool attempts to sense the accounting conservatism of the potential candidates. Motivated by this finding, this study formed a general model aims at assisting the company in selecting the most suitable candidate to hold an accounting post in the hiring oragnization. The pre-screening tool developed in this project also helps the hiring organization to capture the range of accounting ability among the candidates who apply for the posts. Based on [1], the firm-year measure of conservatism (C_Score), with reference to [2] and [3], was acquired and later correlated with the CEO's accounting backgrounds showed, at 10% significance level, CEOs with accounting backgrounds have higher level of accounting conservatism as compared to CEOs without accounting backgrounds. This result indicates that an individual with accounting backgrounds practice conservative accounting as compared to those people with no accounting backgrounds. Besides, [1] also included demographic attributes of the CEO into their model and found that women CEOs are more conservative than their male counterparts. The pre-screening tool is hopeful to help an organization to find a suitable candidate which mean someone that practice conservative accounting so that the organization's financial reporting quality is enhanced and provide meaningful financial information for the relevant users of accounting information. Selecting a suitable candidate with strong accounting backgrounds is also important to ensure the organization gets the accounting workforce which is more efficient and reliable in doing the accounting works. As mentioned before, in order to achieve the desire to have an efficient workforce, the organizations must ensure that they hire the right people with the right qualification. The model developed in this study also able to categorize the candidate as to ease the selection process to be done by the organization. The characteristics and the components of the model application is explained next.

2. MATERIALS AND METHODS

According to [1], there were two criteria that can be associated in determining the existence of accounting conservatism of an individual. The two criteria are the individual's accounting backgrounds and demographic attributes. For accounting background, there are four indicators highlighted; firstly, the academic qualification in accounting (i.e., degree or master in accountancy); secondly, the professional qualification in accounting (i.e. ACCA, ICAEW, CIMA, CPA Australia); thirdly, experience in holding an accounting post in any organization (i.e. Chief Finance Officer, accounting officer); lastly, a member of Malaysian Institute of Accountant (MIA). For demographic attributes, the individual's gender and age are being considered as the important factors that can influenced that level of accounting conservatism of an individual.

Based on the criteria mentioned above, a model was developed using the excel worksheet, hence, it is user friendly and easy to use. The data of the candidate is first gathered using the google form. The company can provide the google form link together with the vacancy advertisement for the candidates to fill up upon

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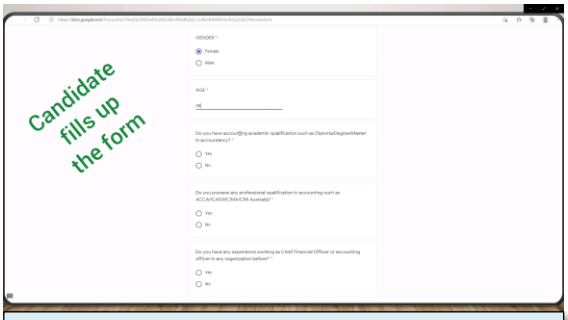
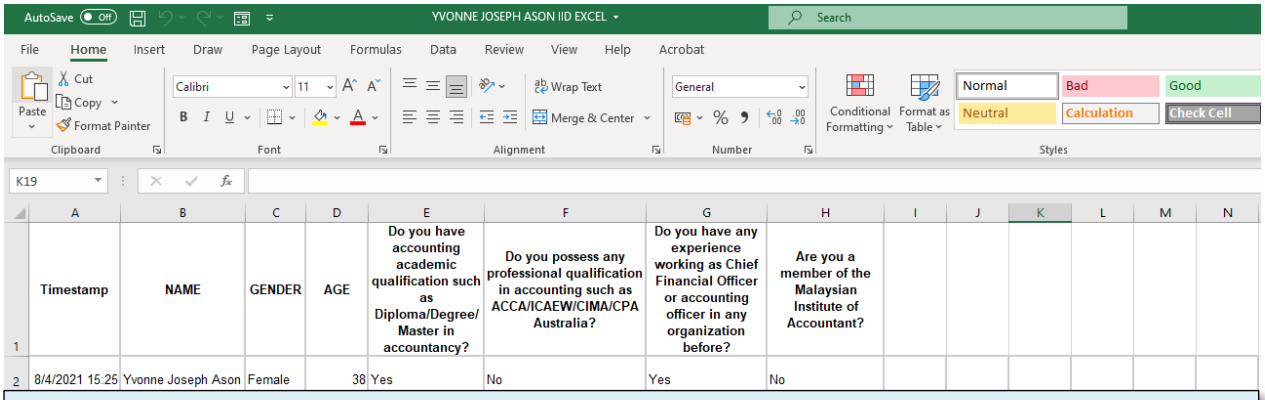
the submission of their resumes. Then, the data will then be extracted by the company to the formulated excel worksheets to generate the suggestion on the suitable candidates. For the scoring, a candidate will get 1 mark for each of the accounting backgrounds criteria he or she met. For the demographic attributes, female candidate will get 1 mark because it is believed that female is more conservative than the male counterparts. As for age, candidate aged above 35 will get 1 mark because younger candidate is less conservative than the older counterparts. This study used the definition of young people given by World Health Organization (WHO) which classify people below the age of 35 as young. The total score of each candidate will be calculated and categorized using the IF function in the Microsoft Excel. Candidates who score 5 and above are categorized as HIGHLY RECOMMENDED and are the best to fulfil the vacant accounting post. Next, candidates who score 3 and 4 marks categorized as CONSIDER which means the candidates that can be considered at least to attend the interview before the final decision whether to hire the candidate for the accounting post. Lastly, for candidates scoring 2 marks and below, these candidates are categorized as NOT RECOMMENDED which means that the candidates under this list are not suitable to hold a higher accounting related post in the company. However, if the company is looking for a lower-level accounting staff, these candidates could have their chance of being hired. The pre-selection of the suitable candidate is then resolved. Simple demonstration with pictures on the application of the pre-screening worksheet are as follows:

Step 1: The google form link will be placed together in the vacancy's advertisement to gather information about the potential candidates.



Step 2: Potential candidates will fill up the form while submitting the resume.



	A	B	C	D	E	F	G	H
1	Timestamp	NAME	GENDER	AGE	Do you have accounting academic qualification such as Diploma/Degree/ Master in accountancy?	Do you possess any professional qualification in accounting such as ACCA/ICAEW/CIMA/CPA Australia?	Do you have any experience working as Chief Financial Officer or accounting officer in any organization before?	Are you a member of the Malaysian Institute of Accountant?
2	8/4/2021 15:25	Yvonne Joseph Ason	Female	38	Yes	No	Yes	No

Step 3: The hiring organization will extract the candidates' data to the formulated excel worksheet.

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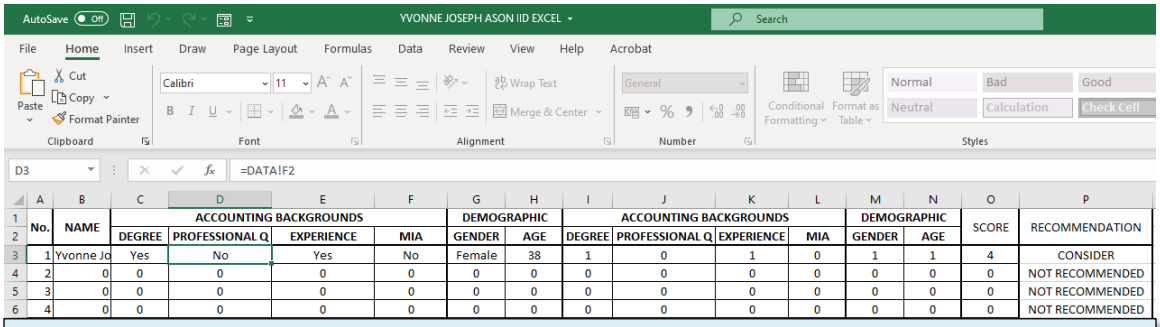

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	No.	NAME	ACCOUNTING BACKGROUNDS				DEMOGRAPHIC		ACCOUNTING BACKGROUNDS				DEMOGRAPHIC		SCORE	RECOMMENDATION
2			DEGREE	PROFESSIONAL Q	EXPERIENCE	MIA	GENDER	AGE	DEGREE	PROFESSIONAL Q	EXPERIENCE	MIA	GENDER	AGE		
3	1	Yvonne Jo	Yes	No	Yes	No	Female	38	1	0	1	0	1	1	4	CONSIDER
4	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	NOT RECOMMENDED
5	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	NOT RECOMMENDED
6	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	NOT RECOMMENDED

Step 4: The category as to whether the candidate is HIGHLY RECOMMENDED, CONSIDER or NOT RECOMMENDED will be shown in the recommendation section of the formulated excel worksheet.

3. CONCLUSION

This model is a simple application from the adaptation of results documented in the study done by [1]. The application is user friendly since it is the execution process is using the google form and formulated excel worksheets. This simple application is hoped to assist the companies in the pre-selection process of finding suitable candidate to hold an accounting related post in their organization. For future development of this project, the selection criteria such as length of service in the previous accounting position held by the candidate could be added to enable a more comprehensive pre-screening on the candidates applying for the accounting post.

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COMPENDIOUS HYBRID COMPOSITE FAILURE PREDICTOR (CHYCLOP)

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Abstract

To date, the used method to test the developed new material especially composite laminates and hybrid composite laminates only limit to physical test and Finite Element only. The used of analytical method are rarely found due to the mass and complex calculation involved. However, both experimental and FE methods have it owned limitation that has slowdown the development of new material for composite laminates (hybrid) which is costly, tedious and time consuming for experimental and, expensive and limitation on the applicable theories. The developed program can be valuable yet simple tool which can assist the design and the development of new hybrid composite laminates. This tool can simply and accurately estimate the mechanical properties of standard and hybrid composite laminates thus reduce the dependency on the experimental, which is tedious, very costly and time consuming in which it can significantly contribute to new knowledge about failure behaviour of hybrid composite laminates. The implementation of the program can minimize or eliminate the physical test on the new developed composite laminates material thus can reduce or eliminate the waste. A new developed MATLAB based program to determine the failure and deformation behaviour of hybrid composite laminates by exact solution (analytical) based on the HSDT and failure criteria with interaction. The program can be used to pre-determine the material properties of newly developed hybrid composite laminates based on data of the combined composite laminates accurately. To identify the mechanical properties of material by the experiment method, it involved with destructive and non-destructive test which is very costly and time-consuming process. With the benefit of reducing time and cost on the development of new composite material, and reducing waste of the minimize destructive testing, it is to be expected that the academia and industries to use this program.

Keywords: Hybrid composite laminates, MATLAB, HSDT, Graphical User Interface (GUI)

1. INTRODUCTION

The use of composite material is not new. Although the precise beginnings are unknown, historical evidence showed that ancient Egypt during Pharaonic time used a chopped straw to strengthen their mud bricks [1]. There are various types of composite materials, but Jones [2] described them as four commonly accepted types namely fibrous composite, structural or laminated composite, particulate

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composite, and combinations of some or all of the three types. A fibrous composite consists of fibers in a matrix. A laminated composite consists of layers of various materials, and a particulate composite is a composite composed of particles in a matrix. Callister Jr. [3] also included another new type of composite material under a similar laminated composite class during his time. Sandwich panel composite is considered as a kind of structural composite that consists of two outer sheets separated by and adhesively bonded to a thicker core.

The increase of use in composite started when automotive industries is looking for lighter alternative material to increase the fuel efficiency. Due to the great extend in research and development of this material, there is significant improvement enhancement in structural, mechanical, and tribological properties of this material thus led to the increase in demand for this material in current and future usage [4].

Failure analysis is a study to identify the strength of composite material which is conducted by using physical test. But to depend only on the conventional method is very costly and time-consuming. The current control movement order (CMO) situation due to the COVID-19 is make it worse. Therefore, the finite element (FE) method or analysis is introduced. The only drawback for FE is the software is expensive and take time to master it. The other method is analytical method but solving problem related to the mechanics of composite materials need high mathematical skills and involve with massive calculation. This study is conducted to develop a new tool using MATLAB program for failure analysis of hybrid composite laminates.

2. METHODS

A new method is adapted by developing a program using the high level and complex mathematical solution to solve problems pertaining to failure behaviour of hybrid composite laminates. The study has fully utilized the advancement in computer application MATLAB (V8.1.0.604, R2013a, The MathWorks, Inc.) to assist with the calculation. In the program, all three lamination theories, namely Classical Lamination Theory (CLT), First Order Shear Deformation Theory (FSDT), and Higher Order Shear Deformation Theory (HSDT) and several failure theories, namely Maximum Stress Criterion, Tsai-Wu Criterion and Mall Criterion; are employed to predict the failure loads of hybrid composite laminates under uniaxial tension.

The process of making the program as a functional and accurate as to detect the failure load is dividing into three stages which is;

1. Collection of knowledge
2. Program Development
3. Results Validation

The program is written in such a way that the change of input parameter data is straight forward. Figure 3.2 shows the process flow of steps taken by this developed program for failure analysis of hybrid composite laminates representing analytical approach.

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2.1. Collection of Knowledge

Knowledge of composite laminates used to solve in this program is collected from three main source which is from book [2], Thesis [5], and journals [6, 7, and 8]. All the related equations are extracted and converted into program code and later used in the development of program.

2.2. Program Development

Before start writing the program, coding of equations is organized to ensure solving the problem of mechanics of composite laminates in order and design a solution to predict the failure load of hybrid composite laminates. Once completed, the program is tested and debugged before the development of Graphical User Interface (GUI).

2.3. Results Validation

The complete program is validated through the comparison of results with past data, FE software, and experiment data.

3. RESULTS AND DISCUSSION

Test #1
Material: Graphite
Lamination Scheme: [0/10]s
Apply load: 20 KN

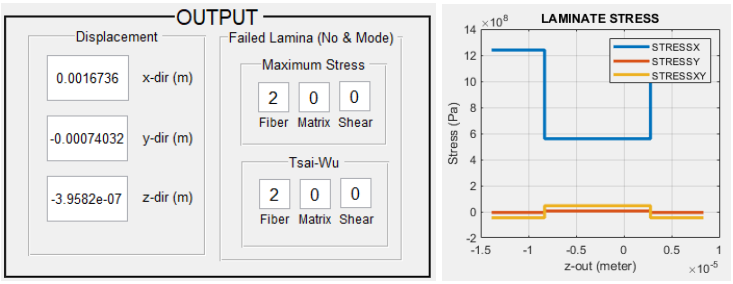

Figure 1. Results obtained from Test 1

Test #2
Material: Graphite & Glass
Lamination Scheme: [0/10]s
Apply load: 20 KN

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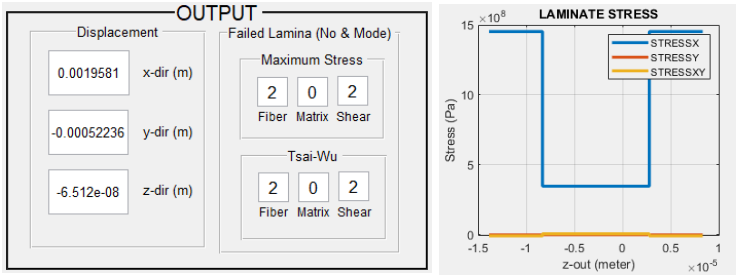

Figure 2. Results obtained from Test 2

4. CONCLUSION

A MATLAB program has been successfully developed and accurately predicted the displacement and failure loads of hybrid composite laminates based on multitudinous combined lamination and failure theories. The program is developed using Higher Order Shear Deformation Theory (HSDT) with Maximum stress criterion and Tsai-Wu criterion as failure theories, is used in this study to compute the displacements and to identify the failure load of hybrid composite laminates are novel as it has never been reported by any other researchers before.

ACKNOWLEDGEMENT

This work is supported by the Ministry of Higher Education (MOHE) Malaysia and Universiti Teknologi MARA under the Fundamental Research Grant Scheme, (grant no FRGS/1/2018/TK03/UITM/02/8 AND 600 - IRMI/FRGS 5/3 (165/2019)).

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JEWELLERY E-COMMERCE SYSTEM WITH CUSTOMER RELATIONSHIP MANAGEMENT(CRM)

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Abstract

Jewellery E-commerce System is a prototype of an e-commerce website where customers can place an order via the system. The Jewellery E-commerce System is developed by utilizing the Customer Relationship Management (CRM) method. CRM can help the customer representatives access all available information to help solve a customer's issue. It is proposed as an alternative for the customer that using the system. With the presence of a Jewellery E-commerce System, the ordering process can be done easier and faster. This prototype system was developed using Adapted Waterfall Model where it includes six sequential stages. The stages are planning, accompanied by analysis, design, implementation, testing and documentation. A set of questionnaires has been designed for collecting evaluation data from targeted users and experts to assess the system functionality and usability. Two experts have evaluated this system, and their feedback and recommendation have been taken into consideration. Besides, user testing was also conducted by demonstrating the system using a freemium web server, and the result was captured using Google Form from 31respondents. Based on the results, the highest mean is 4.58 (SD=0.56) for the user satisfaction construct. This concludes that the users that tested the system were satisfied with Jewellery E-commerce System. It is hoped that Jewellery E-commerce System will enhance the current business process for the customers and the organization.

Keywords: CRM, E-Commerce

1. INTRODUCTION

Nowadays, E-Commerce is an important platform that everyone can use to buy or sell goods or expand their business either domestically or internationally. This is not particularly new to us. It has been used for many years, but this platform is important for our daily lives due to the pandemic globally. As we know, E-commerce, called Electronic Commerce, refers to the buying and selling of goods, products or services through the Internet. The broad concept of electronic commerce (EC) refers to exchanging goods/services and information through computer networks, including the Internet, the Extranet and the Intranet (Kurnia et al., 2015). Also, the use of computer networks and the Internet to perform processes such as the purchase, sale, transfer and exchange of services, products and information can be defined as e-commerce. (bt Mohd & Zaaba, 2019). Through the Internet, consumers can find all the information about the product details. According to (Ibarra et al., 2015), using technology can give users the opportunity and

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convenience to compare prices quickly and effectively. These conditions are conducive to eCommerce. Today, consumers use the information they find online during the purchase process. Electronic commerce or e-commerce has become an important channel for individuals to purchase (Lu et al., 2020). Ecommerce is not just a fashion term but a part of our daily life. Without eCommerce, it is not easy to consider life. (Yoo & Jang, 2019). For general knowledge, E-commerce is a subset of e-business related to the trade of goods and services.

According to (Stroburg, 2016), customer relationship management (CRM) often refers to managing the interaction of customer-related information and the activities of the business to maximize profitability by fulfilling customer needs. (Anshari et al., 2019) state that CRM is a tool and strategy for using technology to automate business processes to manage customer interactions. According to (ElFarmawi, 2019), a CRM system involves using technology to manage and automate multiple processes of product, sales, service, and marketing, and conduct timely interactions between the company and its customers to establish satisfactory mutual relationships. On the other hand, (Baashar et al., 2020) has defined Customer relationship management (CRM) as an advanced technology that aims to improve customer satisfaction, loyalty and profitability through the acquisition, development and maintenance of efficient customer relationships and interactions.

Gift Queen is an online business that sells accessories, for example, watches, rings and necklaces. Mr Haris own this organization, and this company started in July 2019. Gift Queen was created out of a need for on-trend fashion jewellery at affordable prices. Their designs are used every day, and their styles have been really updated, which really helps to draw inspiration from current trends. In order to provide fashionable jewellery for daily and special occasions, they truly believe that fashion is not necessarily expensive.

One of the main problems faced by Mr Haris is regarding the ordering process, where there is a high probability for the administrator to miss an order or reply late due to the ordering has taken through WhatsApp. Suppose there are many messages from customers. In that case, the administrator needs to reply to all the messages one by one. This will cause the administrator to miss an order or reply late. The next problem is mismanaging and overlooking the data of products and customers. This happens because all the data are saved manually through logbooks. This problem will affect the efficiency in managing data and the process of ordering because the administrator needs to check the availability of the product before notifying their customers. This thing is worthless and a waste of time for both administrators and customers.

Three research objectives:

i. To identify the requirement related to ordering process in Gift Queen.
ii. To design and develop an E-commerce System for Gift Queen.
iii. To evaluate the functionality and usability of the purposed system

2. MATERIALS AND METHODS

2.1. System Development Framework

The project development methodology is a set of approaches, strategies, procedures, guidelines, models and best practices used in the project's development process. The specific development methodology used

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in this study is the Adapted Waterfall Model. Adapted Waterfall Model is the modified version of the original Waterfall Model. This model begins with planning, accompanied by analysis, design, implementation, testing and documentation.

Table 1. System Development Framework

Phase	Activity	Outcome
Planning	• Conduct an online interview with Gift Queen's owner. • Observe the current process of Gift Queen	• User requirement. • Problem statement. • Proposed solution.
Analysis	• Literature review. Requirement finding	• Literature review. Features to be included in proposed system. Adapted Waterfall Model MIS
Design	• Design Context Diagram. Design Data Flow Diagram • Design Entity Relationship Diagram. • Design Site Map. • Design User Interface	• Context Diagram. Data Flow Diagram. • Entity Relationship Diagram. Site Map. User Interface Design.
Implementation	• Developing system.	• System prototype.
Testing	• Conduct system testing. • Demonstrate system to users. • Conduct user testing. • Evaluate the system testing	• Evaluated the functionality and usability of the system.
Documentation	• Report writing.	• Project report

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3. RESULTS AND DISCUSSION

3.1. Contribution

One of the users who can benefit from this system is customers do no longer have to wait for the response from the administrator to reply every time they want to buy items from Gift Queen. With this system, customers can choose the items they favour, make an order, and proceed with the payment. It is way more convenient and faster. This system also provides a live chat where customers can interact with the person in charge if they have any questions about the selling items or Gift Queen. Also, all the data about the customers and their orders will automatically insert in the administrator page. This way, the mismanaging order or other problems can be avoided.

Table 2. Business Improvement for Gift Queen

Process	Without Jewellery E-commerce System	With Jewellery E-commerce System
Ordering process	Customers need to wait for their message to get replied.	Customers can make an order without waiting.
Contact	Customers need to contact the administrator through WhatsApp.	Customers can contact the administrator through live chat .
Ordering Information	Administrator insert the customer's order manually.	The ordering information are insert automatically to the admin page.

3.2. Limitation

In developing the Jewellery E-commerce System, several limitations need to be considered because of some reasons. Firstly, this system does not have a profile page for the customer that shows the time and date when the user login into the system. Next, the system does not have a sign or label on the product, such as preferred or popular. Other than that, the administrator will not get a notification when ordering from customers; also, they need to insert monthly sales manually. This feature may be added in the future to accommodate the expansion of the business. Lastly, this system does not provide promotions and discount features. Suppose there is any festival such as Hari Raya Aidilfitri, and Gift Queen want to promote during the period. In that case, this system does not calculate any discounts price. This feature is expected to be added in the future to attract more users to use Jewellery E-commerce System.

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3.3 Recommendation and Future Enhancement

The Jewellery E-commerce System can include the real payment gateway. It acts the same as the standard e-commerce website where the system is linked to real banks such as Maybank, CIMB and Bank Islam. The policy of the payment process needs to be followed as it is related to the customer's personal information. Other than that, this system should have a profile page that allows customers to edit or delete their profile, and rating features should be added to this system. Next, this system should have a notification every time customers order in. So, the administrator will be alerted of the upcoming order. Besides that, this system should automatically calculate every day, weekly, monthly, and yearly sales. Lastly, this system should carter a discount code feature. This feature will increase the sales as customers are more attracted to order a cheaper but attractive item.

4. CONCLUSION

Jewellery E-commerce System allows customers to make an order directly from Gift Queen. However, some limitations of the Jewellery E-commerce System have been identified and listed to improve the system in the future. With the existence of a Jewellery E-commerce System, it is hoped that the ordering process can be done quickly via the website. Lessons learned during the development of this project include the need for developers to be more productive to increase system efficiency and ensure that the system is completed within a specified time frame. Time management is essential as working conditions become difficult, and it is essential to always stick to the plan. Next, to gain new experience, a new method should try such as running user testing on a real web host.

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Praise to the Almighty Allah for the successful project completion. Special thanks to UiTM Terengganu, the supervisor, parents and everybody involved in any way along the process.

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REQUIREMENT AND DESIGN FOR ELECTRONIC WASTE (E-WASTE) MULTIMEDIA APPLICATION

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Abstract

Electronic Waste Multimedia Application (EWMA) is web-based courseware where the case study has been done at UiTM Terengganu. Currently, the process of sharing information about E-waste is through talk and reading articles on the internet. They do not have advanced material to present. They used Microsoft PowerPoint to highlight the information and no use of quizzes or games in encouraging learning. This project aims to identify the current process and the problem of the electronic waste multimedia application, design and develop the E-Waste Multimedia Application, and evaluate the functionality and usability of the proposed multimedia application. The ADDIE model is used for this project's requirement analysis, design, implementation, and testing. Two (2) experts have tested the system. It consists of the expert in the decision support system field, the examiners of this project, and the user testing for this system is thirty (30) respondents. The highest mean is 4.33 that has been achieved for the activities evaluation from the respondents of user testing that means this system reflects more on activities than the other elements. In conclusion, it is hoped that Electronic Waste Multimedia Application (EWMA) will give solution and more advantages to the UiTM community in sharing the knowledge and information of electronic waste.

Keywords: Research, Multimedia Web Application, Cognitive Theory of Multimedia Learning, ADDIE Model

1. INTRODUCTION

A web-based application is any software accessible through HTTP over a network connection rather than being stored locally on a device. A web browser is frequently used to execute web-based applications. Browsers play an essential role in optimizing applications. Hence, web-based applications are usually used on dedicated servers. The web-based application can also be client-based, in which a small segment of the software is downloaded to the user's desktop, but processing is done on an external server through the internet. Nowadays, there is a lot of courseware developed for users. However, not many courseware

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use games or training in their applications. The researcher found that most issues of the multimedia application used by UiTM staff are formal in terms of multimedia elements, user-friendliness, questions designed, and others. The following issues are the distribution of knowledge about e-waste is lower. UiTM Library can only invite outsiders such as the Department of Environment to brief and share about E-Waste, which usually takes about an hour. But the problem faced by librarians is that they only provide slide presentations as the material of E-Waste. Researchers intend the solution from the issues to produce multimedia software that integrates with computer games. This multimedia application is made especially for members of the UiTM community. This multimedia application can help improve understanding and knowledge about E-Waste, especially for the UiTM community who do not read. The objective of this project is to identify the requirement of the electronic waste multimedia application for the UiTM community, to design and develop the Electronic Waste (E-Waste) Multimedia Application for the UiTM community, and to evaluate the functionality and usability of the proposed Multimedia application.

2. MATERIALS AND METHODS

ADDIE is a learning model used by instructional designers and training developers to create effective learning experiences. This method has included the process of analyzing, planning, implementation, and evaluation phase.

2.1. ADDIE Model

ADDIE model has been implemented as the guideline of this Electronic Waste (E--Waste) Multimedia Application for UiTM Community project. It is the plan-driven procedure that enables the Electronic Waste (E--Waste) Multimedia Application for UiTM Community project timeline to be correctly planned for each phase to deliver the anticipated result. ADDIE Model is used due to the time limitation of the development of the Web Based Application. Figure 1 shows the ADDIE Model.

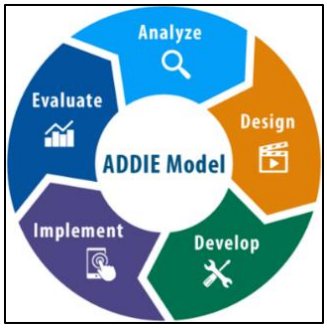

Figure 1 ADDIE Model

3. RESULTS AND DISCUSSION

3.1. User

This multimedia app is called Electronic Waste (E-Waste) Multimedia Application. E-Waste multimedia app delivered in Malay. This multimedia app contains several chapters to be better understood by the UiTM community because there is no age limit reserved for this an application. "University Community

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Member" means a student, university official, faculty member, or team member employed by the University. The term "University" means Universiti Teknologi MARA (UiTM) Kuala Terengganu.

3.2. Site Map

Throughout the conceptual model, the navigation map represents the route instructions, as it were shown. Besides, the conceptual navigation map shows the route which allowed and required the user 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.

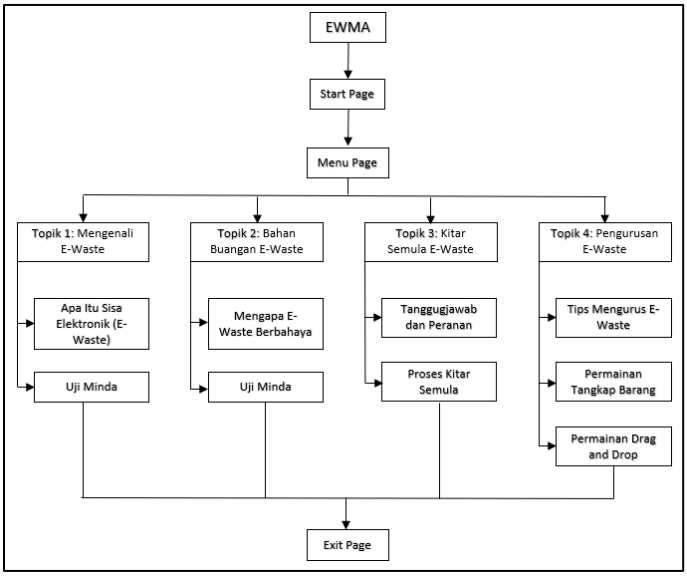

Figure 2 Site Map of EWMA

3.3. Storyboard

A storyboard referred as 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.

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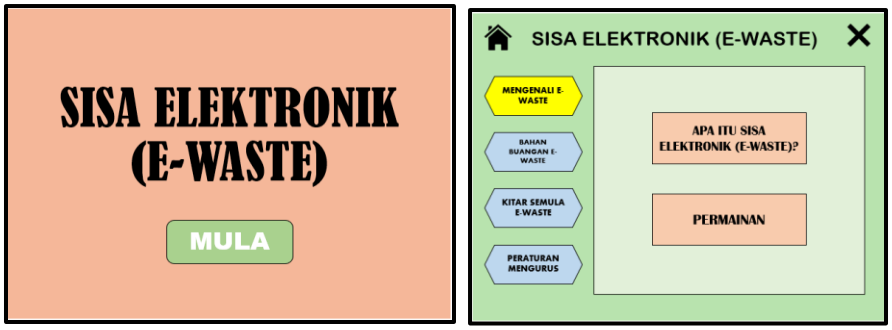

Figure 3 Start Page and Menu Page of EWMA

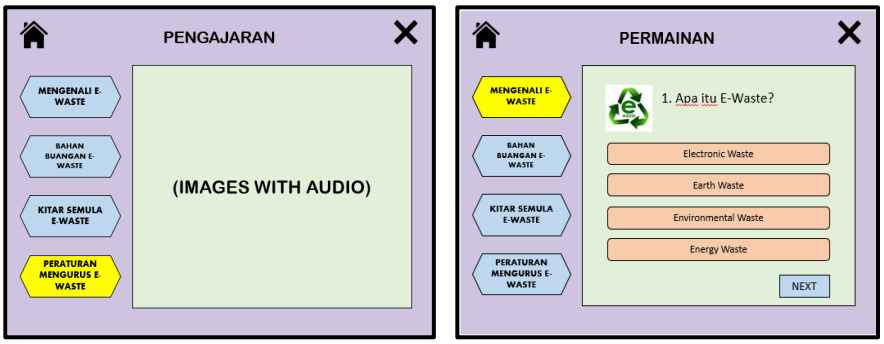

Figure 4 Content Page and Quiz Page of EWMA

4. CONCLUSION

E-waste Multimedia Application (EWMA) has successfully been developed and achieved the objectives based on the required content, design and development, and the evaluation to help the UiTM community enhance their knowledge on e-waste. Besides, EWMA helps the users obtain information more interactively and benefits by doing some activities.

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ONLINE ORDERING FURNITURE BASED ON E-PERSONALIZATION

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Abstract

Technology if not in line, we will be left behind with the passage of time. It encourages businesses to sell goods online by using ecommerce as a platform. Similarly with the company Rhufine Touch Design, they want to ensure that the product can be marketed faster. Therefore, Online ordering furniture-based on e-personalization has been developed to make it easier for customers to buy the furniture for sale. Customers simply need to log into the system and make a choice of furniture and make payments directly into the system. Originally, customers had to make a call to purchase the manufactured furniture. It presents difficulties to customers and management in terms of furniture installation management. With Online furniture ordering, the process of buying furniture can be done easier and faster. This is because the booking process can be done through the system. The prototype system was developed using the Waterfall Model where it covers five sequential levels. The stages are needing analysis, planning, implementation, testing and maintenance phase. Next, an evaluation is also conducted for experts and users to assist in improving the project developed. Online furniture ordering is expected to improve the current business process for customers, owners and company admins.

Keywords: Online Ordering System, Furniture system, E-Personalization

1. INTRODUCTION

In the digital world, e-commerce has become an essential part of industry. E-Commerce refers to the usage of the internet and also the website to engage in commerce [1]. E-Commerce on commercial transactions within and between organizations and individuals that are digitally activated. Next, the furniture industry's e-business has a lot of potential and a bright future [2]. However, the physical characteristics of furniture items, as well as the high demands for delivery and after-sale support, are impeding the growth of ecommerce and influencing customers' decisions to buy furniture online. The major purpose is to assist companies in the online furniture industry in better understanding the difficulties surrounding those platforms and making recommendations for the type of strategy to implement in order to meet the needs of the emerging new market [3]. In an attempt to improve customer satisfaction, e-tailers offer a range of customer support, many of which are personalized. Various real-time data, such as site cookies, transaction history, click-stream, customer private details, or browsing

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history, are increasingly used to aid client profiling [4]. Consequently, big data analytics allows for personalized customer customization.

2. METHODOLOGY

This project focused on online ordering furniture based on e-personalization and the difficulty faced by furniture industry owners who wish to sell their products, as well as the requirements for developing a system and, finally, the system's evaluation in terms of functionality and usability. A brief interview with the owner of the company Rhufine Touch Design was done during the preliminary study. The interview's goal is to discover issues that need to be addressed by the company. As a result of the interview, the owner agreed to develop an e-commerce system to help optimize his business process. Throughout the project, an adaptive waterfall approach will be used to construct the system, with five phases: requirement analysis, design, implementation, testing, and documentation. The implementation phase is the most important since it is at this phase that the system's designs are implemented and tested. During the testing phase, 30 people completed the questionnaires thru google form. In the meantime, the final phase is focused on documentation.

2.1. System Design & Modules

The use of a website platform has been developed as part of the methodological process to help facilitate the purchasing and selling process between owners and customers. Customers can purchase directly from the system through the website. Customers can register and log in to access the e-catalog, examine and purchase furniture, and make payments online. Administrators will be able to utilize the established system to review and handle customer orders, as well as catalogue changes to ensure customers have the most up-to-date information on the latest furnishings. But since built website allows for e-personalization, users can alter the system's language to their preferred language, also in the website provide a Wishlist for customer choose furniture they want and like, and check customer reviews using the review and rating tools.

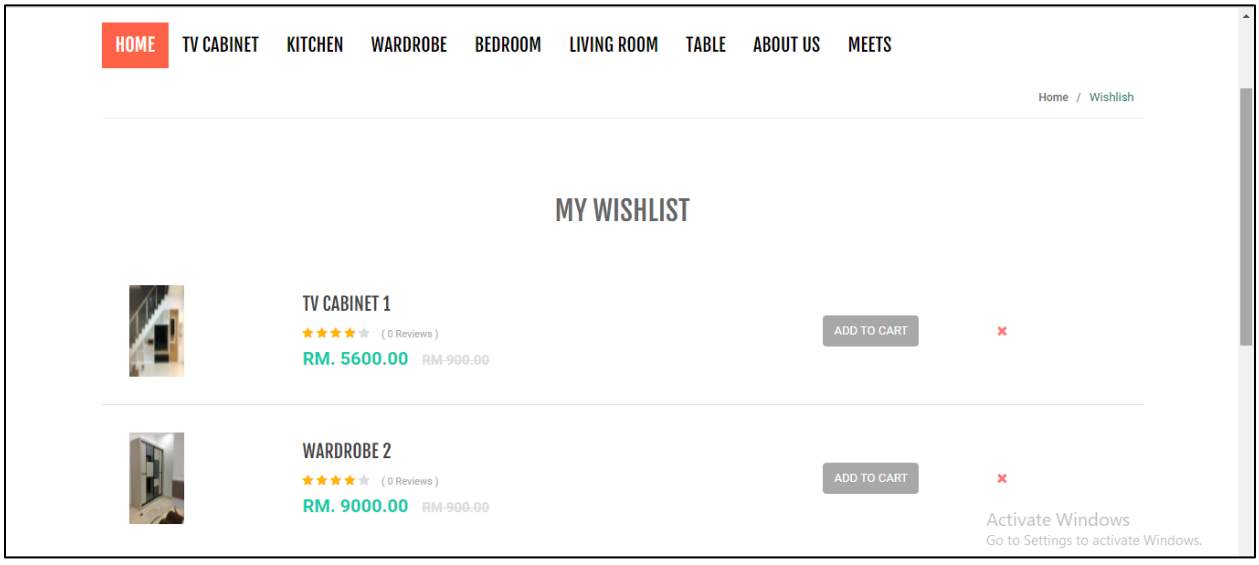

Figure 1. Wishlist has been choose by customer

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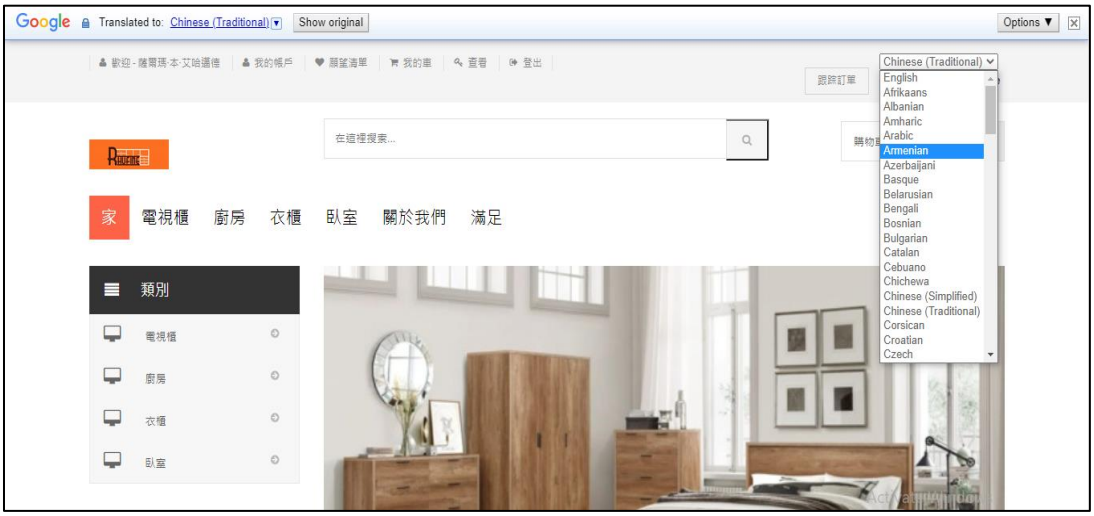

Figure 2. Language

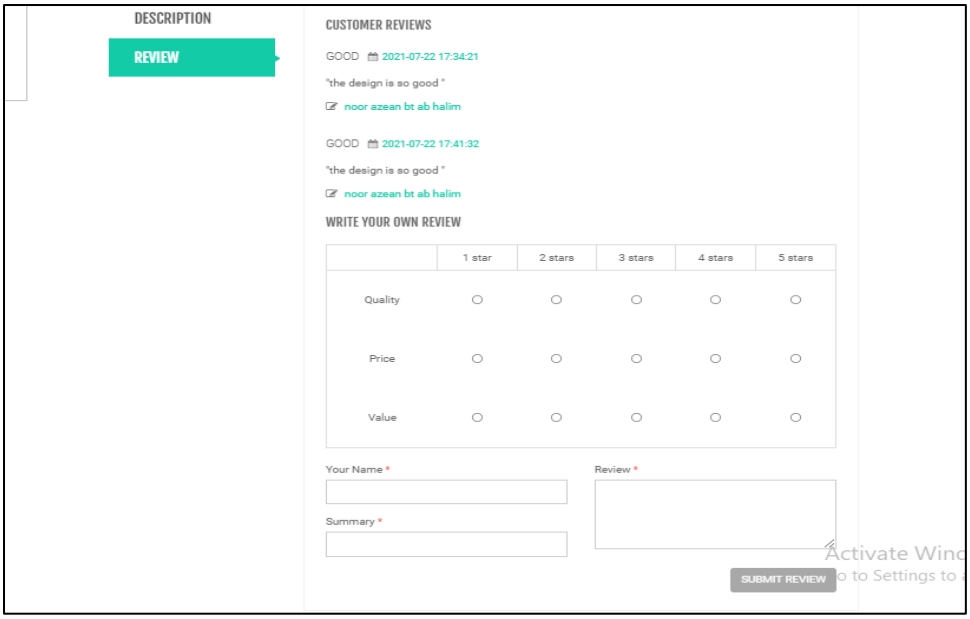

Figure 3. Review and rating features

3. RESULTS AND DISCUSSION

This project involves an e-catalog, shopping cart, payment gateway integration, and evaluation system for online purchases. Users were evaluated using a Google form with 30 respondents, using user demographics and five different structures for the system. The constructs of online ordering furniture learnability, user usefulness, and satisfaction received the highest scores of 4.80 and 4.77, respectively, based on the findings. This demonstrates that the system is simple to use for users, and that ordering furniture and being content with the system built is simple.

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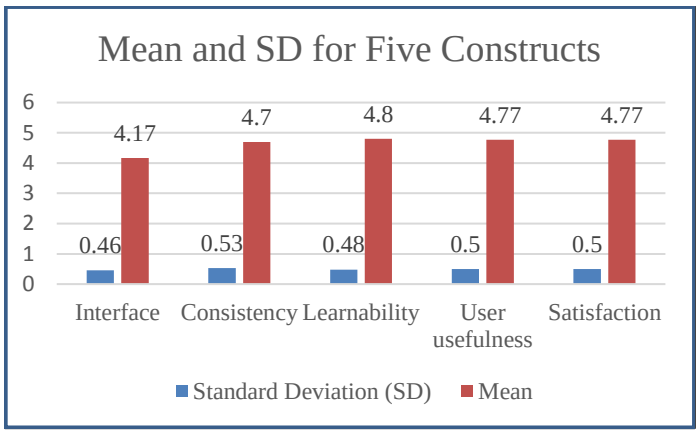

Figure 4. Analysis of system evaluation

4. CONCLUSION

In conclusions, users of the system are satisfied with ordering furniture online is easier and that it allows owners to market furniture quicker than customers walk in the store in person. With the advancement of technology, the furniture industry must now be more responsive to technological developments in order to compete in the market and give customers with a more up-to-date level of service.

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CONSUMER-BASED FOOD SAFETY INDICATORS FOR CONSUMER PURCHASE DECISIONS USING BUSINESS INTELLIGENCE SYSTEM FRAMEWORK (SafeFoodBI)

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Abstract

Food safety events have had an influence on food industry income due to risk avoidance and changes in purchasing behaviour, which has become a worldwide and national issue. Food safety concerns that have had a detrimental impact on health or have ended in death must be properly investigated since they have caused purchase avoidance, which has had a substantial impact on the food industry's income. There are currently no food safety standards that connect the relationship between food safety indicators and consumer segmentation and may be directly utilize in supply chain management to anticipate food industry income. In terms of food safety, the complexity of industrial processes has led to changes in customer purchasing behaviour as a result of scares, avoiding behaviour, and choosing alternative competition brands, resulting in food sector losses. Thus, a comprehensive framework might be accomplished by incorporating food safety indicators that could anticipate customer purchase intention in advance, as it has a strong effect on consumer buy behaviour. Despite recognizing the necessity of regulating food safety across supply chain operations, some corporate organizations are still uninformed and do not know precisely what food safety indicators might be routinely adopted to improve customer purchasing decisions. As a result, a business intelligence system framework (SafeFoodBI) is proposed as an innovative solution to deal with those issues by providing four main pillars consisting of food safety indicators' key element to improve consumer purchasing choice in food supply chain based on consumer segmentation and balancing cost and revenue as well as return on investment for food industry using a computerized visual decision support system. The suggested framework and technology are intended to forecast customer purchase intentions in the food supply chain.

Keywords: Food Safety Indicators, Consumer Purchase Decisions, Business Intelligence, Supply Chain

1. INTRODUCTION

A challenge to promote change and innovation in the face of the difficulties of sustainable development is that whole supply chains and networks are required. In the last decade, food safety and nutritional concerns have been among the most major impacts on the food industry [1]. Consequently, customers are seeking more detailed information on everyday meals regarding supply chain processes [2]. However, most of the present research on sustainable innovations is conducted at the corporate level, and the dominant company focus in practice encourages "silo" methods, short-term thinking, and profit maximization [3]. This

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extended abstract provides a process model for achieving sustainable supply chain innovation. Analytical methods suitable to be applied in information processing and management according to [4] are topic modeling, network-based method and theoretical method. The topic modeling method has purpose to identify the topics mentioned by consumers, public, or general users of a system.

2. MATERIALS AND METHODS

Information visualization techniques can be employed using tools including IBM SPSS, R, or special in-house software built called business intelligence system (BIS). By integrating this analytical software into the system, the performance of business operation could be monitored accordingly. As a start, a BIS framework must be specified.

2.1. Principle of frameworks

Business intelligence (BI) frameworks seek to improve business operations and data management, as well as monitoring and decision making in supply chain management [5], and BI might be used to address various decision-making processes in companies [6]. Organizations that have expertise utilize information about their customers, marketplace, and company processes will be able to profit from business opportunities and establish sustainable competitive advantage in a new and quickly changing business environment. Firms must fundamentally evaluate correct and timely information in an environment where global marketplaces are becoming more competitive, customers and markets are becoming more volatile, and product life cycles are constantly shrinking [7].

2.2. Component of frameworks

The component of frameworks is comprehensive that could be accomplished by incorporating food safety indicators that could anticipate customer purchase intention in advance, as it has a strong effect on consumer buy behaviour. Despite recognizing the necessity of regulating food safety across supply chain operations, some corporate organization are still uninformed and do not know precisely what food safety indicators might be routinely adopted to improve customer purchasing decisions. This paper establishes the framework with theoretical foundation for business process innovation in supply chain and to create a conceptual basis for managing advances enterprise information system. BI comprises a set of tools to transform data into information to support decision. BI is a collection of technologies that turn data into information to aid decision making [8]. BI refers to a collection of methodologies for knowledge discovery that employ a variety of analytical techniques, such as data mining. BI analyses an organization's performance, allowing it to enhance income and competitiveness, develop new strategies, and make better choices [9]. Current BI System research is few, and one of the few instances is a study performed by [10], which focuses on the adoption of BIS at the employee level, where the other focus on BIS components that use the technology acceptance model (TAM) framework [11].

3. RESULTS AND CONCLUSIONS

3.1. Business Intelligence System Framework (SafeFoodBI)

Consumer-based Food Safety Indicators in Business Intelligence System Framework (SafeFoodBI) is a new concept to directly link different supply chain actors. Consumer needs and satisfaction, clear roles and

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definition, easy-to-use, user friendly interface design are among the expected function from a business intelligence system. As a result, a SafeFoodBI is proposed as an innovative solution to deal with those issues by providing four main pillars consisting of food safety indicators' key element to improve consumer purchasing choice in food supply chain based on consumer segmentation and balancing cost and revenue as well as return on investment for food industry using a computerized BIS. The four-pillar used in current study are C-A-R-A (Commitment, Assurance, Regulation and Assessment) which integrates various role of supply chain actors as a measure to improve supply chain performance. The suggested framework and technology are intended to forecast customer purchase intentions in the food supply chain. Figure 1 and Figure 2 illustrates the comparisons of the classical framework and the proposed framework as mentioned in Table 1.

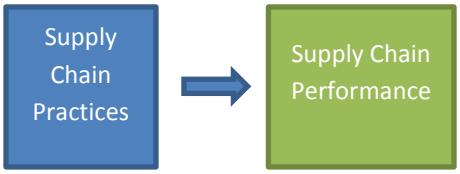

Figure 1. Classical Framework of Supply Chain procedures based on understanding from [1][3][5]

Figure 1 shows mainly that the classical framework had not covered the solutions using BIS database as in Figure 2.

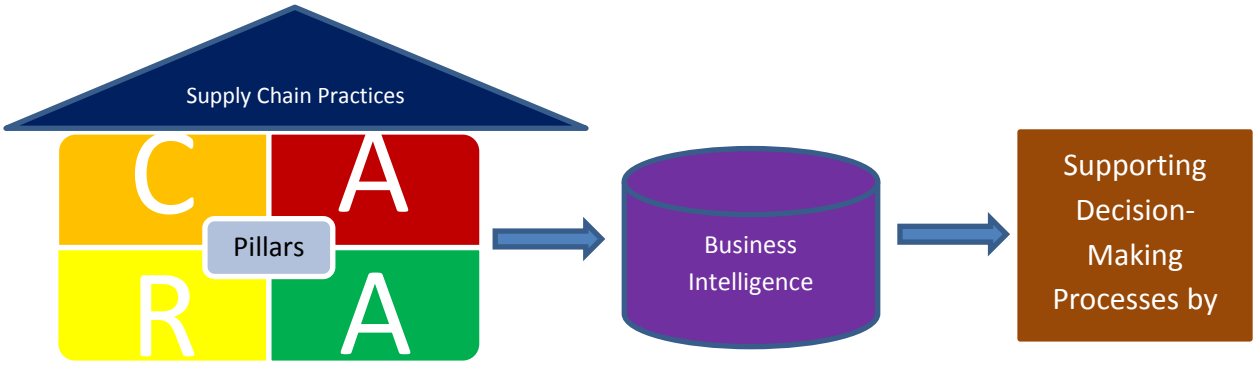

Figure 2. Proposed Framework (SafeFoodBI)

The details for the comparisons between these frameworks are specified in Table 1.

Table 1. Comparisons of the Classical Framework and the Proposed Framework (SafeFoodBI)

Aspects	*Classical Framework*	*Proposed Framework*
Supply Chain Practices	Yes, but separate with performance	Yes, and together with its performance's measurement
Integrated Role of Actors	Not explicit	Explicit and clearly specified
Food Safety Indicators	Not compulsory	Important key
Databases	Not necessarily; mainly in hardcopy	Yes
Online Monitoring	Depends on the companies	Must-have features
Decision Maker	Supplier or service provider	Consumer or pool of customers

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4. CONCLUSIONS

There are currently no food safety standards that connect the relationship between food safety indicators and consumer segmentation and may be directly utilized in supply chain management to anticipate food industry income. In terms of food safety, the complexity of industrial processes has led to changes in customer purchasing behaviour as a result of scares, avoiding behaviour, and choosing alternative competition brands, resulting in food sector losses. Food safety events have had an influence on food industry income due to risk avoidance and changes in purchasing behaviour, which has become a worldwide and national issue. Food safety concerns that have had a detrimental impact on health or have ended in death must be properly investigated since they have caused purchase avoidance, which has had a substantial impact on the food industry's income. Business intelligence system framework through SafeFoodBI is expected to make an initial path towards the creation of a more comprehensive guidelines.

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"g-PAT": EMPOWERING PRODUCTIVITY IN GREEN CONSTRUCTION PROJECT PERFORMANCE

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Abstract

"Productivity" is often used as a performance indicator in construction projects, also to evaluate the effectiveness of a building project performance. Conferring to Construction Industry Transformation Programme (CITP) 2016 – 2020, under strategic thrust number three, it is highlighted that productivity is the primary engine of growth towards Malaysia's high-income target. The construction industry, as a crucial sector for the nation's advancement, will lead with high productivity levels through the effective adoption of new technology and modern techniques, as well as a highly-skilled and well-paid workforce. Driving toward sustainable development across the country, Malaysia is amid a robust increase in the level of green activities driven by Green Technology Master-plan (2017 – 2030) and several green initiatives. Productivity enhancement is perceived as the essence of achieving superior and sustainable construction performance, which is a necessity to ensure the competitiveness of a regional and sustainable economy. "*g-PAT*" is a tool for Productivity Assessment, specifically design for Green Construction Projects. The main purpose of developing a tool is to enhance the overall performance of construction sites by thoroughly going through the root causes which affect the construction productivity. Main beneficiaries of this tool are project managers, decision makers, as well as all green construction practitioners. Furthermore, this tool assesses the current productivity issues in the construction site from pre-planning stage up to the project's completion.

Keywords: Construction Productivity, Green Construction, Project Performance, Assessment Tools.

1. INTRODUCTION

Productivity is one of the most widely debated issues in the construction industry due to its essential to the success of most construction projects. Traditionally, productivity has been defined as the ratio of input/output, i.e., the ratio of the input of an associated resource, to real output (in creating economic value) [1]. Here, the output can be any outcome of the process, whether a product or service, while input factors consist of any human and physical resources used in a process. Previous researchers have determined different factors that influence construction productivity in conventional construction projects, but yet, there is limited research on productivity particularly in Green Construction Projects (GCP). The construction of GCP is part of sustainable construction. Sustainable construction is applied throughout the entire life cycle

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of construction, from pre-construction to disposal of the building [2]. Moreover, the construction of GCP is more complicated than traditional buildings because it's integrate more technology and materials that have a lower impact on the environment [3].

Malaysia Government has high ambitions to increase the delivery of GCP in order to meet some ambitious targets in the areas of energy productivity, financial savings on resource consumption and zero carbon building [4]. As reported in Green Building Index (GBI), as of December 2019, there is 467 numbers of GBI certified GCP in Malaysia. As the target goal in Green Technology Master Plan (2017 – 2030), the numbers will be increased by 1750 number of Green Construction by 2030, inclusive of green constructions certified by various agencies and organisations such as MyCREST, Green Construction Index, Green RE etc [5]. However, as for current state, Malaysia has not develop any platform to access productivity performance in construction project [6]. Monitoring productivity performance is important to ensure the project is successful delivered without any glitch especially in term of time, cost, quality and safety. To overcome this issue, **"*g-PAT*"** is a tool specifically design for GCP productivity assessment. The main purpose of developing a tool is to enhance the overall performance of GCP by thoroughly going through the root causes which affect the construction productivity.

2. MODELLING GREEN PRODUCTIVITY ASSESMENT TOOLS ("g-PAT")

In construction industry, there are various common tools that use for managing construction projects. The tools can be either in form of checklist, data sheet or an innovative management software such as Primavera, Building Information Modelling (BIM) and many more. ***"g-PAT"*** is a tool specifically design for GCP productivity assessment. "g-PAT" is the web or cloud based services, whereby it is easy for user to log in, and can be access at anywhere in the world where the internet can be capture. The tool offered a "*pay-as-you-go*" for services such as storage, networking, and virtualization, henceforth this can be one of the features that can attract the potential user to use the application. The key features that available in *g-PAT* are:

i. Detail portfolio of the green construction projects (GCP)
ii. Resource monitoring (financial, manpower also construction material)
iii. GCP Performance Assessment – Assessment is based on Time, Cost, Quality and Safety. This include the "Relative Productivity Assessment Value".
iv. Project Report (Daily, weekly, monthly or Final report as required)

To ensure the effective and attainment of the desired designed tool, the following approach will be adopted. The approach comprises four (4) stage as below:

- *Stage 1 : Key feature Green Construction Projects*
  The key features of GCP will be identify. Such features, for example: the type of building (residential/commercial/industrial etc.) procurement, type of contract, project cost, stake holder information etc. will be used for the development of the tools.
- *Stage 2: Green Construction Projects & Resource input*
  At this stage, the issues and factor influence to green construction productivity also the information about resource input will be identified. Result from the literature review has found that there is eighty six (86) factors influence to GCP performance. The result has been filter and reduce to seventy eight (78) based from the findings of questionnaire survey also reduction from EFA analysis. The result is being categorized based on the major influence to the factors such as project, manpower, management, technical and external factors. This is an important steps whereby all the variables act as the main contribution to the tools development and productivity assessment.

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- *Stage 3: Risk Assessment Analysis & key strategy*
  Risk Assessment Analysis and Key Strategy is the output of the tool. This will be the guideline for the user to overcome the issues and to improve productivity in the GCP. These recommendations were developed based on construction industry experts' opinion and based on validated research guidelines.
- *Stage 4:* Modelling Framework & "g-PAT" Development
  The final stage of developing g-PAT is when the modelling framework is being finalize, and the tool development is created. All the data input will be synchronized with the system accordingly**.** **'**Relative Productivity Assessment Value' will be the major output of the system and the user will use the value as the performance productivity benchmark. This value will help the user to better understand the current level of their construction site when compared to an ideal situation. Guided recommendation will be proposed and the user will follow recommended steps to overcome the problems.

2.1 Commercialization of g-PAT: NABC Approach

NABC approach is an essential method to quickly structure, analyze and develop value propositions for projects. NABC model help researcher to clarify and organize the ideas of developing g-PAT tools. Based for the NABC model, the proposed g-PAT has the following values:

- Need: This tools is designed especially for the Green Construction Project practitioners. The user can be either the stakeholder (public or private client), Green Consultant (Architect, Engineers, Quantity Surveyor, or Project Managers), Contractors also green Suppliers.
- Approach: g-PAT Tools is design to analyze the strength & weakness, and the areas of improvement in GCP. The tools enable the user to closely monitoring and managing the GCP at anywhere and anytime they wanted.
- Benefits : Increase Productivity (monitoring & measuring the resource for productivity performance); Increase Quality & improve the GP Performance & Process efficiency and increase profitability
- Competition: Current Assessment tools in Construction such as KPI (Key Performance Indicator), CALIBRE approach (France) : project productivity measure for trade contractor also QLASSIC (Malaysia/CIDB) –Quality Assessment for Main Contractor

2.2 g-PAT Potential

g-PAT has a full potential in monitoring and empowering the productivity in green construction project. The features of g-PAT can help the user to forecast and managing productivity, and facilitate group work, both in-office and remote. g-PAT can also provide an accurate measurement of overall efficiency and establish target for productivity improvement at all level. Thus, this tools is also considered as an efficient capital management and provide valuables and efficiency information to company. The development of this tools can also offering a great collaborative teamwork with the industry players such as Construction Industry Development Board (CIDB), Information Technology Software Companies, or any local or international universities for further research and development (R&D) or grant.

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3. "g-PAT": CURRENT ACHIEVEMENT

Currently, the development of this tools is still under research stage, however, it is believe that this tool has a great potential value to be commercialized. As for present achievement, this research topic has been award with "*Geran Penyelidikan Khas UiTM 2020*", and a few papers has been publish in Scopus index journal.

4. CONCLUSION

"**g-PAT**" is a tool specifically design for GCP productivity assessment .The main purpose of developing "g-PAT" is to enhance the overall performance of green construction projects by thoroughly going through the root causes which affect the construction productivity. The potential values of this tools will beneficiaries to the project managers, decision makers, as well as all green construction practitioners.

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