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TABLE OF CONTENTS

PREFACE

Borneo Engineering & Advanced Multidisciplinary International Journal (BEAM) is a peer-reviewed journal that publishes original theoretical and applied papers on all aspects of Engineering, Management, Business, Accounting, educations, IT and Linguistics to publish high-quality papers and references. The topics to be covered include, but are not limited to quantitative, qualitative, and hybrid research on new approaches to using technology to improve learning, design, and educational results. Articles on applied theory in educational practice, as well as practical applications of research, current policy initiatives and research evaluations, theoretical, pedagogical, and methodological challenges relating to educational technology, are all welcome. This journal is an open access journal that provides an online publication (published twice a year). I would also like to congratulate and thanks all individuals exclusively to technical and editorial boards for their interest and strong support to this publication.

Best wishes,

Dr. Habsah binti Mohamad Sabli

Chief Editor, **BEAM International Journal**

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Smart Automatic Black Pepper Drying Tray with IoT Using Wemos

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Abstract

Due to Malaysia's unpredictable weather, farmers find it difficult to complete their work of drying pepper in a day. Existing drying machines are either inefficient or difficult to install and maintain during the drying pepper process. In contrast to the United States, where electric drying is mostly used, roughly 16 billion kW, or 5.8% of total residential power use, is consumed annually. If we compare this electricity usage rate to that of Malaysia, farmers won't be able to pay it. The concept used in the smart black pepper platform is ergonomic which can facilitate the way people work in agriculture. This smart black pepper platform is equipped with smart sensor system to detect rain, weather, sunlight with automation control in order to reduce manpower consumption. The design and prototype for a smart platform for drying black pepper in wet conditions are displayed in this capstone project. The smart black pepper drying tray is made up of the drying rack frame, the linear actuator, sensors, and motor controls, as well as the cover curtain mechanism. Depending on the atmosphere, the gear-chain mechanism in the drying rack frame releases and exposes the black pepper. This document outlines the design development procedures, prototype development, prototype testing outcomes and analysis, as well as some recommendations for future work.

Keywords: - Black Pepper, drying, solar, Wemos

1. Introduction

Pepper is the most significant and expensive spice in the world, as seen in Fig. 1. It is a crucial component in numerous recipes and is employed to flavour meals (Hammouti et al., 2019). The berries of Piper nigrum are used to make a variety of seasonings, including black pepper, white pepper, green pepper, and "Tellicherry" pepper. In the spice industry, these peppers come in a variety of grades. (Jayashree & John Zachariah, 2022).

All around the world, pepper is currently grown in tropical climates. In the Pacific, notably in the Federated States of Micronesia, it is a significant cash crop (the island of Pohnpei). Hawaii and several other Pacific islands are excellent places for the plant to flourish, but cultivation is not very common there. The nations that produce the most pepper on a global scale are India, Indonesia, Brazil, Malaysia, Thailand, Sri Lanka, Madagascar, Mexico, and a few more.

Black pepper is made by manually or mechanically threshing fruit spikes and separating the stalks from the green berries. Afterwards, depending on the amount and duration of sunlight, the berries are sun dried for 4-5 days on mats on top of a raised platform (Sharangi, Upadhyay, Alshammari, Saeed, & Al-Keridis, 2022). The berries are often spread out in a thin layer and turned regularly to facilitate even drying (Dhas & Korikanthimath, 2003).

Fig. 2 shows how to dry the pepper at 55ºC (130ºF) until it has 12% water content. This temperature is suggested for the best colour and flavor (Paul et al., 2021). Higher temperatures are acceptable if the pepper does not exceed 70ºC (160ºF). The time required varies depending on several factors, but it is usually less than a day. One of the most crucial unit processes in the

preparation of green peppers is drying the harvested pepper. The most popular way of drying is sun exposure (Vieira et al., 2022). During 4-5 days in the sun, the despiked pepper berries are dried to a moisture content of less than 11% (Gabriel, David, Elpa, & Michelena, 2020).

Fig. 1. Pepper

Fig. 2. Dry the pepper

The problem that farmer faces during the drying process are when sudden rain (Tunde-Akintunde, Afolabi, & Akintunde, 2005). The farmers need a smart and automatic pepper drying tray because current drying process needs to be monitored and collected manually every day. Therefore, the Smart Automatic Black Pepper Drying Tray with Blynk Internet of Things (IoT) was proposed and developed in this paper.

This tray is designed and fabricated to fulfill four main design requirements, which is the first design requirement is that the tray is simple and easy to start and end of the drying process automatically. The second design requirement of this tray is it can start and end the drying process automatically without laborious human power. The third design requirement is the drying process is fully monitored by smart IoT technology to detect the rain drop, the intensity of sun light, temperature, humidity, and to start motor to open the tray or keep the tray under the roof automatically and its duration which all could be monitored and controlled in long distance with wifi technology in real time. A message will be sent when rain detected to handphone. The fourth design requirement is that this machine can be powered by solar panel which adopts green technology and less pollution to the environment. The concept used in the smart black pepper platform is ergonomic which can facilitate the way people work in agriculture. This smart black pepper platform is equipped with a sensor system to detect rain to reduce manpower consumption.

2. Design of Smart Automatic Black Pepper Drying Tray

2.1 Block Diagram

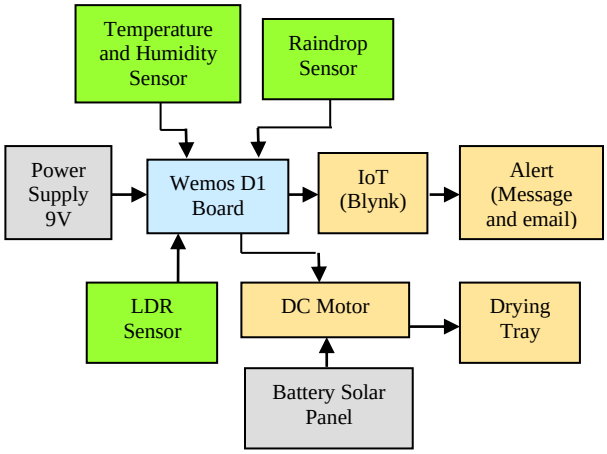


Fig. 3. Block diagram of proposed system

2.1.1 ESP8266 WeMos D1 Board

The WeMos D1 is an Arduino Uno-like wifi board built on the ESP-8266EX, as seen in Fig. 4. The Arduino IDE is compatible with the ESP8266-D1 802.11 (Wifi) wireless microcontroller development board (Gawande et al., 2023). The widely used ESP8266 wireless (Wifi) module is transformed into a complete development board in this way. This board's layout is based on a typical Arduino hardware design, and its dimensions are comparable to those of the Arduino Uno and Leonardo.

Fig. 4. WeMos D1 ESP8266 base board

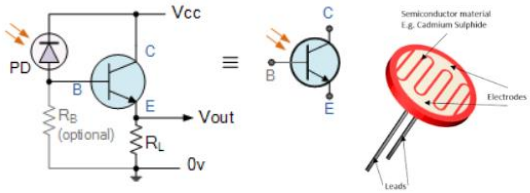
2.1.2 Raindrop Sensor

Fig. 5 shows the raindrop sensor. It is a simple tool for detecting rain. It can be used as a switch when a raindrop falls through the raining board, as well as to measure the intensity of the rain.

Fig. 5. Raindrop sensor

2.1.3 Light Dependent Resistor (LDR) Sensor

As shown in Fig. 6, light-sensitive devices called light-dependent resistors (LDR), often referred to as photoresistors, are frequently employed to detect the presence or absence of light or to calculate the intensity of light. Infrared or visible light (photons) can be converted into an electrical signal by using light sensors, which are photoelectric devices (Setya et al., 2019).



(a) (b)

Fig. 6. (a) LDR Sensor Schematic, (b) Component of LDR sensor

2.1.4 DHT11 Temperature and Humidity Sensor

The DHT11 is a widely used temperature and humidity sensor that includes a dedicated NTC to measure temperature and an 8-bit microcontroller to output temperature and humidity values as serial data, as illustrated in Fig. 7.

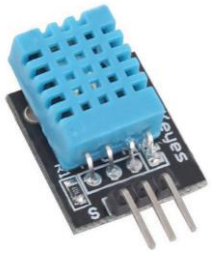


Fig. 7. DHT11 temperature and humidity sensor

2.1.5 Direct Current (DC) Motor

DC motor converts electrical energy in the form of Direct Current into mechanical energy in the form of rotational motion of the motor shaft as shown in Fig. 8. The DC motor speed can be controlled by applying varying DC voltage, whereas the direction of rotation of the motor can be changed by reversing the direction of current through it.

Fig. 8. DC motor

2.1.6 Solar Panel and PWM Solar charge Controller

PWM Solar Charge Controller is an automatic control device used in the solar power generation system, which controls the multi-channel solar cell array to charge the battery and the battery to power the load of the solar inverter as shown in Fig. 9. Solar charge controller is the core control part of the whole photovoltaic power supply system (Antonov, Kanchev, & Hinov, 2019).

Fig. 9. Solar panel with PWM solar charge controller

2.2 Software Development

2.2.1 Programming Flow Chart

Fig. 10 shows the programming flow chart for smart automatic black pepper drying tray with Internet of Things (IoT). This flow chart starts with reading from LDR sensor, temperature & humidity sensor, and raindrop sensor in determining the tray location of this project. Based on the programming, if the reading of LDR sensor is less than 50, that's mean the tray is in a dark environment and no sunlight detected. The temperature and humidity reading could be read from DHT11 sensor that was selected in this project. Meanwhile, rain sensor could detect the present of rain drops with reading more than 800. Based on all these sensors reading, Wemos will activate motor to move the tray under the roof when bad

weather and deploy the tray under the sun when weather is good automatically.

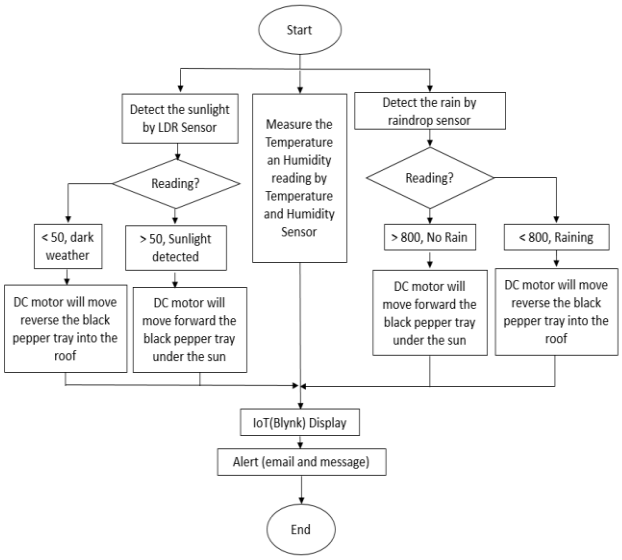


Fig. 10. Flow chart

2.2.2 Arduino IDE Software

A code editor, a message area, a text terminal, a toolbar with buttons for basic tasks, and a series of menus are all features of the Arduino Integrated Development Environment (IDE), also known as Arduino Software (IDE), as depicted in Fig. 11. The Arduino hardware is interfaced with, and programmes are uploaded there.

Fig. 11. Arduino software

2.2.3 Blynk

Blynk was designed for the Internet of Things as shown in Fig. 12. It can control hardware remotely, it can display sensor data, it can store data, visualize it and other things. Rain sensor, light sensor and temperature and humidity sensor will monitor the weather and all the reading will be updated on handphone in live. When rain is detected, a message will be sent to handphone automatically.

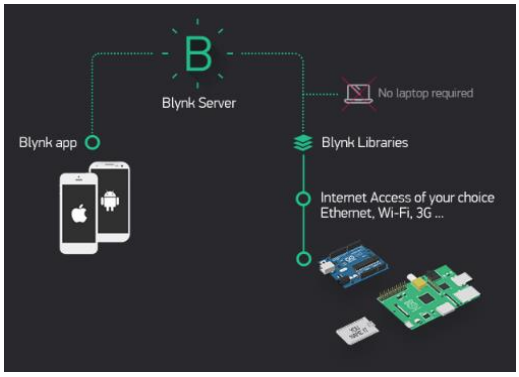
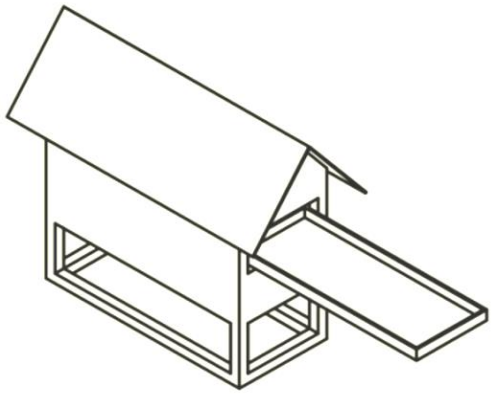


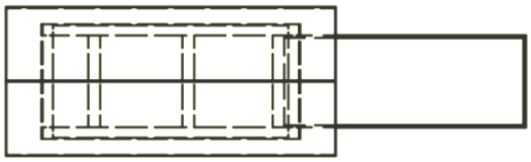
Fig. 12. Blynk

2.3 Casing Design

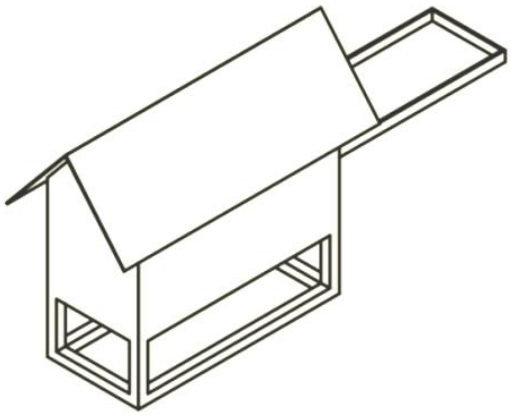
Fig. 13 shown in front side view, top view, and back side view for smart automatic black pepper drying tray with IoT.



(a)



(b)



(c)

Fig. 13. (a) Front side view, (b) top view, (c) back side view

3. Results and Analysis

Fig. 14 shows the design of smart automatic black pepper drying tray with Blynk IoT. Rain sensor, light sensor and temperature/ humidity sensor will monitor the weather and all the reading will be updated on handphone in live. When rain is detected, a message will be sent to handphone automatically. Wemos will activate motor to move the tray under the roof when bad weather and deploy the tray under the sun when weather is good automatically as shown in Fig. 15 until Fig. 18.

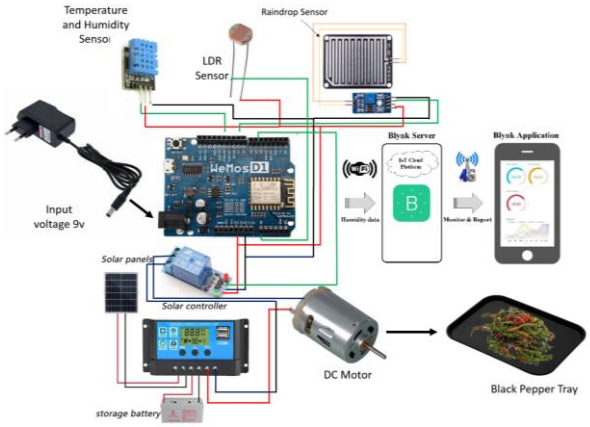


Fig. 14. Design of smart automatic black pepper drying tray with Blynk IoT

LDR sensor is used to detect sunlight, if sunlight is detected, LDR will send a signal to Wemos and Wemos will control the DC motor to move forward. If the weather is dark, then the LDR will send a signal to Wemos to control the DC motor to move reverse to keep a tray of black pepper in the roof. Raindrop sensor is used to detect the rain, if rain is detected, raindrop sensor will send a signal to Wemos for controlling the DC motor to move reserve in the roof. It can be controlled using wifi and apps on the user smartphone as shown in Fig. 19. It can automatically read the temperature in the user smartphone. It can on and off automatically when the user is far from the smart automatic black pepper drying tray.

Fig. 15. Side view

Fig. 16. Front view

Fig. 17. Back view

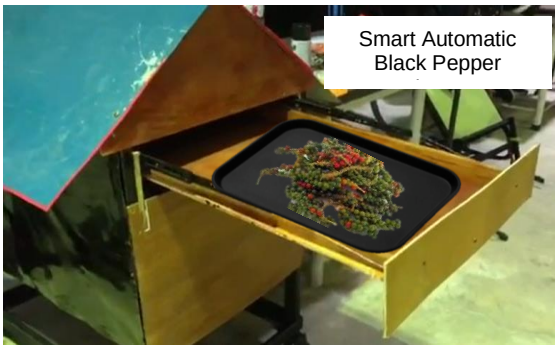


Fig. 18. Smart Automatic Black Pepper Drying Tray

The test run carried out for this project was successful because the tray exited in just 2.5 seconds without touching anything on the project and returned to its original position when the light sensor dropped from 100 to 50. This project is equipped with a frame for a drying rack with a gear-chain system. a control module that includes an WeMos, a DHT11 temperature & humidity sensor, a water sensor, an LDR, and one stepper motor to control the movement of tray which depend on the weather.

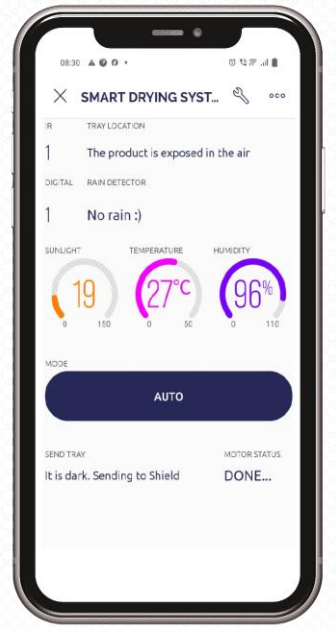


Fig. 19. Smart Automatic Black Pepper Drying Tray with Blynk IoT

Fig. 19 shows the output results from the Blynk application. This app has displayed the measurement for sunlight reading from LDR sensor, Temperature and humidity reading from Temperature and humidity sensor, and raining status from raindrop sensor. Table 1 shows the results and findings for Smart Automatic Black Pepper Drying Tray with Blynk IoT.

Table 1. Results and finding

Testing	Sunlight detected by LDR Sensor	Rain detected by Raindrop Sensor	DC Motor movement
Testing 1	Yes	No	Move Forward
Testing 2	No	Yes	Move Reserve

5. Conclusion

Smart Automatic Black Pepper Drying Tray with Blynk IoT has been created, which is used for drying black pepper under the sunlight. This project can monitor the weather condition with smart sensor and data shown in phone through IoT features. The tray moves in and out from the roof based on the weather condition automatically. This project has adopted solar panel as green technology. This project concept can be applied to other applications such as automatic cloth rack and fish cracker drying tray.

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Preliminary Study on Response of Different Water-Cement Ratio and Curing Conditions on Concrete Properties

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Abstract

The water-to-cement ratio (w/c ratio) is a critical parameter in the formulation of mortar and concrete. The w/c ratio is a fundamental factor that significantly affects the performance and properties of the final product. This study investigated the influence of different w/c ratios and curing conditions on concrete properties. The preliminary test was conducted on coarse and fine aggregate by complying with ASTM C33. The concrete proportion ratio of 1:2:4 was adopted by mixing with various amounts of distilled water to create ratios of 0.5, 0.6, 0.7, and 0.8. The hardened concretes were divided into two types of curing conditions (pond curing and burlap curing). Compressive strength, sorptivity, and carbonation tests were conducted by complying with the concrete's standard procedure to determine the concrete's properties. This research has revealed that a higher w/c ratio contributes to higher porosity and negatively impacts its strength. The higher w/c ratio has decreased compressive strength and increased water filtration (sorptivity) and carbon dioxide ingression (carbonation). Based on the results, lower w/c ratio with pond curing showed better concrete physical and chemical properties at 28th days.

Keywords: - Curing condition, water-to-cement ratio, concrete properties

1. Introduction

Concrete is a composite material composed of cement, water, aggregates, and often additional additives. The properties of concrete that are resistant to extreme weather, durable, insect-resistant, non-flammable, and adaptable for different designs and finishes make concrete a prime choice of building materials by architects and engineers.

In concrete mixing, the water-to-cement (w/c) ratio is considered one of the major factors influencing concrete properties. During the hydration phase, water will react with the cement compound to form calcium-silicate hydrate (C-S-H) and calcium hydroxide ($Ca(OH)_2$). Inadequate water will cause poor workability (Masum & Manzur, 2019), increase porosity (Jagtap et al., 2020), greater permeability (Serag et al., 2019), cracking (Huang et al., 2022) and lead to a loss in strength of concrete. In addition, Oikonomopoulou et al. (2022) also point out that the compressive and split tensile strength reduced to 15 % and 26.9 %, respectively, due to the low w/c ratio.

The w/c ratio may vary, influenced by raw materials (types of binder, fine and coarse aggregate properties, water), mix design proportions, and admixtures. It was believed that the size and types of raw material would influence the amount of water needed and change the mechanical properties of concrete. Nematollahzade et al. (2020) investigated the effect of the w/c ratio on self-compacting concrete and discovered that as the w/c ratio increased, it gave a favourable workability feature, but the

compressive strength declined. The study by Langhah & Saand (2020) stated that the 0.5 w/c ratio was incompatible with the increasing amount of eggshell powder as a partial cement replacement. Rashad & Sadek (2020) found that concrete with 50 % granulated blast-furnace slag based on a w/c ratio of 0.5 gives concretes the highest mechanical strength. Sangeetha et al. (2022) reported a concrete mix design of 5 % of seashell powder and 10 % seashells aggregate with 0.5 w/c ratios showed the highest compressive strength among modified concrete in 90 days period curing days but still lower than the control specimen.

Other than quantity, water quality in concrete mixing is important in determining concrete properties. Water consists of impurities such as chloride, sulphate, organic matter, dirt, clays, biological contaminants, and metals that will influence the mechanical strength, setting time and durability (Kucche et al., 2015). Ali et al. (2020) studied the effect of well water in mixing and curing concrete. They found that the strength of concrete is lower and decreases linearly when it is cured using well water. Then, Hassani et al. (2020) revealed in the High-Resolution Scanning Electron Microscopy (HRSEM) image that the increasing penetration of chloride ions is due to increasing voids and porosity found on the surface and its consequence of impurities in wastewater.

During the hydration process, the formation of calcium silicate hydrate (C-S-H) is a consequence of the reaction between calcium oxide (cement) and silica (sand) and water as an activator. The properties of C-S-H play a critical phase in determining the mechanical strength of concrete (Li et al., 2021). Zheng et al. (2021) have revealed higher w/c ratio creates a higher number and size of pore spaces in scanning electron microscopy (SEM) images. In addition, water in capillaries evaporated to the surroundings due to lower relative humidity and high temperatures. This condition may influence void ratios.

Concrete curing is a technique for moistening concrete during hydration to develop desirable strength. During the early hydration stage, the evaporated water might not be replaced adequately (Allam et al. 2020; Khan et al. 2021). The curing procedure may vary depending on the concrete's size, form, or in-situ planting. Previous studies employed the wet burlap method, ponding method, plastic membrane method, sprayed method, and others (Nasir et al., 2022; Nadir et al., 2022; Secanellas et al., 2019; Ren & Houben, 2020).

Numerous studies have been conducted on concrete, but the characteristics of different w/c ratios and curing conditions are not fully understood. This research investigated the effect of different curing conditions (pond curing and burlap curing) with different w/c ratios (0.5, 0.6, 0.7 and 0.8) to concrete's physical properties (workability, compressive strength, sorptivity) and chemical properties (carbonation), from the early hardening stage up to 28 days. The mixing design ratio 1:2:4 (cement:fine aggregate:coarse aggregate) was adopted. All concrete specimens were cured with distilled water at ambient temperature to avoid impurities or temperatures that might interfere with the experimental results.

2. Materials and Methodology

The material used is cement (ASTM C150 – Standard Specification for Portland Cement), fine and coarse aggregate (ASTM C33 – Standard Specification for Concrete Aggregates), and distilled water. The laboratory test complied with ASTM C143 (Slump of Hydraulic Cement Concrete test), ASTM C31-19 (Standard Practice for Making and Curing Concrete Test Specimens in The Field), BS EN 12390-3:2021 (Testing Hardened Concrete - Compressive Strength Test), ASTM C1585 (Sorptivity) and BS EN 14630: 2006 (Carbonation).

2.1 Raw Material Preparation

a. Cement

The locally manufactured Ordinary Portland cement Type I (NS cement) was selected. The composition of Portland cement reported by Zhao et al. (2020) is tabulated in Table 1.

Table 1. Chemical composition of Ordinary Portland Cement Type I (Zhao et al., 2020)

Chemical name	Percentage (%)
Calcium Oxide (CaO)	64.18
Silicon Dioxide (SiO_2)	22.02
Aluminium Oxide (Al_2O_3)	3.50
Iron Oxide (Fe_2O_3)	0.96
Magnesium Oxide (MgO)	2.65
Sulfur Trioxide (SO_3)	3.25
Sodium Oxide (Na_2O)	0.20
Titanium Dioxide (TiO_2)	0.24

b. Fine Aggregate and Coarse Aggregate

The fine and coarse aggregate was dried in a ventilated oven at 105 ± 5 °C for 1 hour to remove excess water and the moisture accumulated in the sand particles to obtain the actual quantity of water. The 1000 g and 5000 g of dried fine and coarse aggregate are sieved using a mechanical sieve shaker and left to vibrate for 5 minutes. The size of coarse and fine aggregates selected is in the range of 10 mm to 20 mm and less than 4.75 mm, respectively.

2.2 Mixing Formulation and Specimens Manufacturing

This study adopted a mixing ratio of 1:2:4 with four varying w/c ratios with three replications. As Thillo et al. (2021) and Hosseinzadeh et al. (2019) recommended, the concrete was mixed by the hand-mixing method to avoid air-entrapped during rotation mixing. All solid ingredients are dry-mixed for approximately two minutes. Once the dry mix was homogenous, distilled water was added as a

binder activator to avoid any chemical substance that may influence results. The mixed proportion used in this study is shown in Table 2.

Table 2. The mixed proportion used in this study

Specimen	Cement (g)	Coarse Aggregate (g)	Fine Aggregate (g)	Water (ml)
Pond curing (pc)				
$S_{0.5pc}$	1000	2000	4000	500
$S_{0.6pc}$	1000	2000	4000	600
$S_{0.7pc}$	1000	2000	4000	700
$S_{0.8pc}$	1000	2000	4000	800
Burlap curing (bc)				
$S_{0.5bc}$	1000	2000	4000	500
$S_{0.6bc}$	1000	2000	4000	600
$S_{0.7bc}$	1000	2000	4000	700
$S_{0.8bc}$	1000	2000	4000	800

The slump test determined the workability of the fresh concrete by complying with ASTM C143 – Slump of hydraulic-cement concrete. A 300 mm conical frustum with top and bottom open at both ends, 100 mm and 200 mm diameters, respectively, was placed on its plate on a flat surface. This cone was packed with three phases of fresh concrete with 25 times tapping at each layer by a long bullet nose metal rod. Then, the cone was steadily lifted vertically without interruption, the conical frustum was placed inversely next to the sample, and the slump of fresh concrete was measured by a ruler. The slump test result is shown in Fig. 1 with different water ratios.

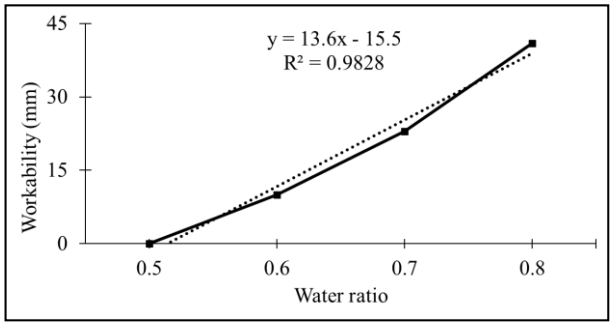

Fig. 1. Slump test results

A standard size 150 mm x 150 mm x 150 mm concrete was cast using steel mould for each water-cement ratio for three replications. Afterward, specimens are removed from the mould after 24 ± 8 hours (ASTM C192) and marked before curing for up to 28 days. The specimens were divided into two types of curing: pond curing and burlap curing.

For pond curing, specimens were fully immersed in a container with distilled water at ambient temperature (25 ºC) following ASTM C31-19, as shown in Fig. 2. The metal rods were placed under specimens to allow water absorption on the surfaces. While for burlap curing, the specimens were covered with damp gunny cloth and sprayed with distilled water twice a day until 28 days (Zeyad et al., 2022). The specimens with burlap curing were placed sheltered to avoid excess evaporation.

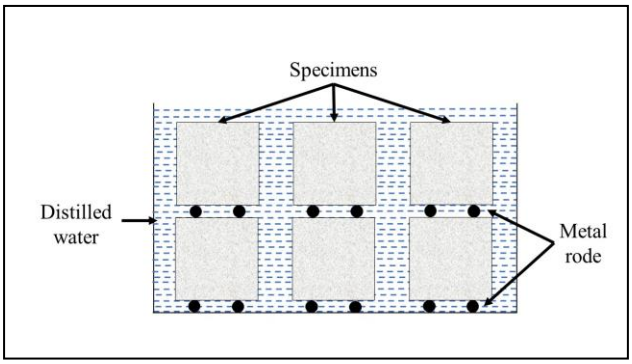

Fig. 2. Pond curing set-up

2.3 Physical and Chemical Properties

a. Compressive Strength

All specimens were tested with compression tests in compliance with BS EN 12390-3:2021 using an automatic compression testing machine. The platens were cleaned before the specimen was placed at the centre of the platens. Force was applied at the top and bottom of the specimen with a constant rate in the range of 0.2 N/mm2 to 1.0 N/mm2 and increased continuously until it reached the maximum force. The compressive strength was evaluated at ages 7, 14, and 28 days.

b. Sorptivity

Each specimen's fluid absorption by capillary was observed by complying with ASTM C 1585. In this test, distilled water was chosen as fluid. Before this test was carried out, all 28th days specimens were dried in a drying oven at 105 ± 5 °C for 30 minutes. For accuracy, all vertical surfaces of the specimen were wrapped with masking tape to avoid water immersion on side surfaces. As shown in Fig. 3, specimens were held on a pair of metal rods and allowed to immerse in a 3 ± 0.5 mm depth of distilled water. Water absorption readings are taken every 1, 5, 10, 20, and 30 minutes. The sorptivity values were determined by Equations 1 and 2.

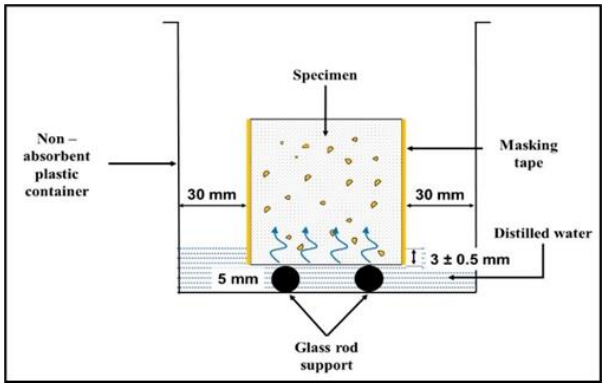

Fig. 3. Sorptivity test setting up

$$S = I/(t)^{0.5} \quad (1)$$

$$I = m_t/(a\ x\ d) \quad (2)$$

Where;
S = sorptivity
I = the absorption
t = Time (s)
mt = the change in specimen mass in grams, at the time, t
a = surface area (mm²)
d = water filtration depth (mm)

c. Carbonation

After the curing process, all specimens are left in an atmospheric environment for the carbonation process. To ensure that the carbonation process occurs evenly on each surface, specimens are placed on metal rods, as shown in Fig. 4 below. After the 28th day, the specimens were split into two parts. The new broken concrete area was sprayed with colourless phenolphthalein ($C_{20}H_{14}O_4$) solution by complying with BS EN 14630: 2006. The uncarbonated concrete area instantly turned to a pink stain, while the carbonated area remained colourless. The carbonated area's depth a, b, c, and d (see Fig. 4) was measured using a Vernier calliper to get accuracy. The carbonation rate was measured as in Equation 3.

$$Carbonation\ rate = \frac{Average\ carbonation\ depth\ (mm)}{Days} \quad (3)$$

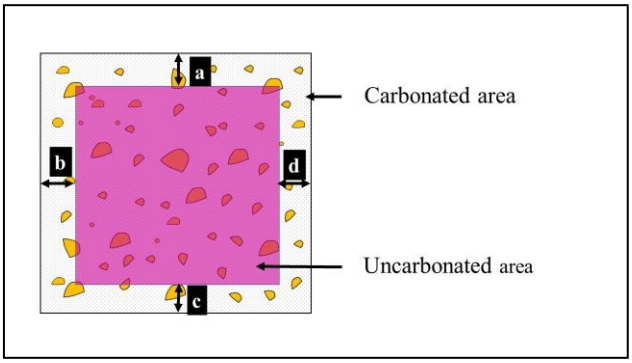

Fig. 4. Carbonation measurement depth

3. Result and Discussion

3.1 Compressive Strength

The compressive strength test results are illustrated in Fig. 5. Based on the graph, the strengths of all specimens increased with age but decreased as the w/c ratio increased. Cao et al. (2019) & Rao et al. (2021) point out that a high w/c ratio will weaken the bonding matrix, and increase the void ratio, resulting in weakening the concrete. In addition, the lower w/c ratio will also result in high compressive strength, low drying shrinkage, and decreased workability (Qin et al., 2022). On the other hand, the graph showed that the strength of all specimens with burlap curing is slightly lower than those with pond curing.

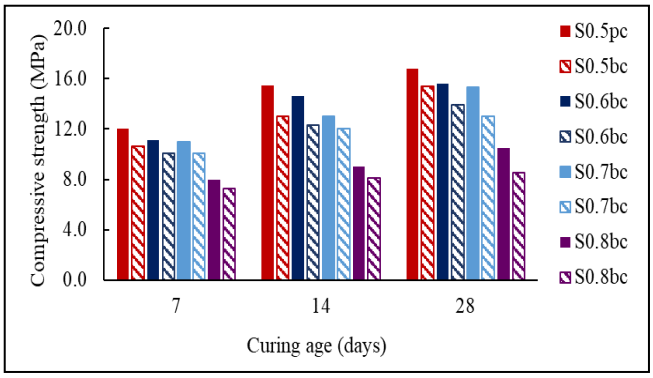

Fig. 5. Compressive strength results

3.2 Sorptivity

Based on the graph in Fig. 6, the sorptivity increased dramatically as the w/c ratio increased. The water filtration by capillaries is higher as the w/c ratio increases and exhibit high porosity. Previous researchers have reported a w/c ratio (Zhou et al., 2020), raw material properties (Razali et al., 2023), aggregate sizes (Zhang et al., 2021), and mixing proportion (Yeih et al., 2019) have influenced the concrete's porosity. Liu et al. (2019) emphasize that greater accessible porosity will lead to great water transportation. They claimed that water diffusivity increases uniformly with the increase of porosity. Free water (not used in the hydration process) in the mixing will evaporate to the surroundings and leave voids and capillaries (Malecot et al., 2018; Muslim et al., 2020).

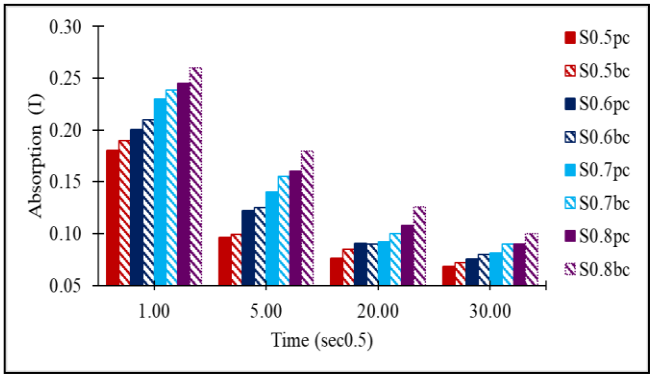

Fig. 6. Sorptivity test results

3.3 Carbonation

The physical observation of the carbonation depth rate is shown in Fig. 7. From the graph, it can be observed that the carbonation rate decreased as the age increased. Then, the graph also showed that the specimens with pond curing have lower carbonation rates than those with burlap curing.

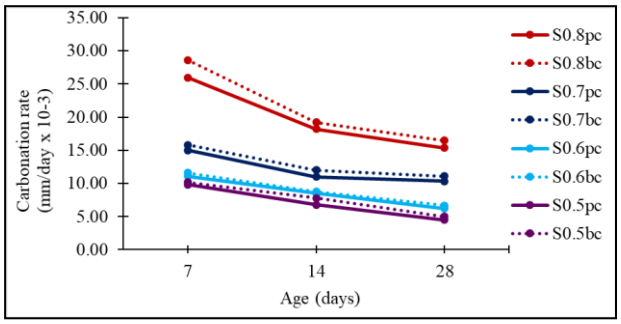

Fig. 7. Carbonation test results

Carbonation is a reaction of carbon dioxide with calcium hydroxide in concrete to produce calcium carbonate and water (see Equation 4). According to Wolińsk et al. (2018), the variables that might influence carbonation rates are carbon dioxide concentration, relative humidity, curing condition, types of cement, porosity, admixtures, and w/c ratio. In this case, the carbonation rate is believed to increase as the w/c ratio consequenced to high porosity. A similar result was obtained by Al-Ameeri (2021), who claimed higher w/c ratio will accelerate carbonation rates.

$$C_a(OH)_2 + CO_2 \rightarrow CaCO_3 + H_20 \quad (4)$$

4. Conclusion

The value of the w/c ratio in concrete mix and curing condition has significantly influenced the characteristics of the hardened concrete. This study has provided valuable insights into the relationship between the amount of water and cement in concrete mixtures and their resulting properties, such as workability, strength, durability, and shrinkage characteristics.

A lower w/c ratio generally leads to higher compressive strength and improved durability due to reduced porosity and improved cement hydration. However, a lower w/c ratio may also decrease workability, making the mixture more challenging to handle and place.

Conversely, a higher w/c ratio improves workability by increasing the flowability of the concrete, making it easier to mix and place. However, excessive water content can result in weaker, more porous concrete with reduced long-term durability and increased shrinkage. Excessive water evaporates to the surrounding during the early hardening stage and leaves air voids that might result in a crack. Then, the high amount of void ratios significantly increases the interconnected pores and the number of capillaries, negatively impacting the mechanical properties of concrete. The capillaries will act as a transporter of water and carbon dioxide into the concrete and will cause weakness in the concrete.

According to the results, the mechanical strength of concrete with different curing methods is slightly different. The ponding curing gives a higher compressive strength result, lower water filtration, and lower carbonation rate. It is believed that the evaporated water for the burlap curing method during the early hydration stage might not be adequately replaced. On the other hand, for burlap curing, it is recommended to spray burlap severally in the early stage to keep adequate water for hydration.

The experimental findings emphasize the importance of finding an optimal balance between workability and desired performance characteristics when selecting the appropriate w/c ratio for a specific application. This requires considering the desired strength, exposure conditions, aggregate properties, and any additives or admixtures used. By understanding the significance of the w/c ratio and its effects on the concrete, engineers and concrete technologists can make informed decisions regarding mixture design, leading to the development of high-quality, durable, and workable concrete suitable for various construction applications.

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Research of Innovation Smart Sensor Floating Trash Trap

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Abstract

The collection and disposal of rubbish in modern cities causes environmental issues. As a result, cities that want to manage costs, resources, and time efficiently must now implement smart waste management systems. To solve everyday difficulties like trash management, the trend is now moving toward smart gadgets and internet of things (IoT) solutions. Optimizing the process of trash collection is the main purpose of the smart solutions provided by industry. However, the cost of applying such solutions is still relatively high. The purpose of this research is to present an effective smart sensor floating trash trap for localized and small-scale cases, such as small parks, university campuses, and housing areas. The literature of this research will present a literature review of past related papers and commercial solutions. The methodological section describes the process of producing products. The data obtained was analyzed to obtain results at the site, in addition to the design of the floating garbage trap and smart sensors. Finally, the results of this conclusion also show that the product can solve the problem of waste on a small scale resulting from discharge in the drain. and future work.

Keywords: - Waste, recycled, trash traps, waste characterization

1. Introduction

The problem of uncontrolled waste disposal everywhere including waterways, rivers, and oceans, is not new. Pollutants are made up of materials such as plastics, metal, paper, cans etc. (Ab Ghani, et al., 2011). Pollutant problems are caused by the industrialization and the urbanization of the world. The amount of plastic production is getting higher as it increases from 1.7 to 288 million tons for the past 60 years (Gasperi et al., 2014). Even so, consciousness in society will be important. Several innovations have been developed to help with the management of waste.

Based on Glascock (2016), annually there are about 8 million tons of plastic that escape to the ocean, and it is predicted that there will be 1 ton of floating debris for every 3 tons of fish in the sea.

Waste is defined by how much, for example, dried leaves, twigs, plastic, aluminum cans and many others. To reduce this waste, it should be planned so that it can be reduced. (B.A.E. Gay et al, 1994). Characterization of municipal to county solid wastes and forecast waste-generation rates are essential to planning and implementing disposal and recycling activities (M.B.L.D. Diola et al., 2020).

In the case studies that have been carried out, which focus on drainage drain water and garbage that is often seen besides leaves and twigs of trees, domestic garbage is also a factor in clogged drains, such as plastic bottles, food wrappers, beverage cans, and waste materials that are hard to rot. These garbs can not only invite the stench, place mosquito breeding, and even be the focus of mice and flies that can invite various kinds of dangerous diseases and disrupt the surrounding ecosystem. Even the safety of the locals can also be disturbed.

This research aims to design, fabricate, and test the floating trash traps using recycled material and characterize the collected waste in selected perimeter drain at Politeknik Mukah quarters area. These model traps are strategically placed in perimeter drain to stop

solid waste. Specifically, the study will: design a floater trash trap using recycled material.

Objectives of this research is to design products that can collect garbage in drain holes, develop products to reduce the effects of pollution and testing the effectiveness and functionality of the product in terms of reducing the cost of maintaining clogged drains.

The scope of this project is applicable to the drain hole measuring 26 cm x 31 cm x 26 cm. In terms of that, this research focused on drains in staff residences at Polytechnic Mukah Sarawak, concentrated on the drain flow and directly to the main drain. It is easy to develop as it is made from environmentally friendly materials, and by using sensors on this product, it provides a value-added element of Industrial Revolution 4.0 (IR4.0).

2. Methodology

This study was carried out by producing a model of the product to be designed, collecting information, and analyzing the data obtained throughout the study, as shown in Fig. 1.

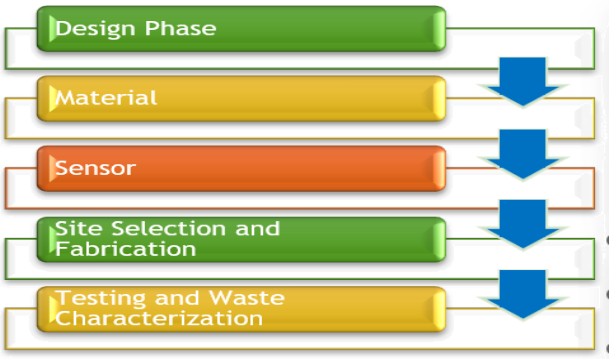

Fig. 1. Methodology flowchart

2.1 Design Phase

The design of the drain floater trash traps is the first step in the process. To ensure that the project performs successfully in both predicted and worst-case circumstances, the necessary functions of trash traps are identified in this phase while taking the design parameter and engineering concept into consideration. The traps are made with the following characteristics of the materials:

a) Floating Material

It acts as a barrier for the garbage that is gathered by floating; Tying material is used to bind and retain the floating material together; The floating material is covered with a net, which also serves as a mesh for solid trash that escapes the trap. Rope: This is used as the tension cable from the post connecting the trash traps on either side of the river.

The choice of material is carried out based on count, suitability and low cost. The materials used are easily obtained and meet the objectives of the study. The design of the drawing is made to depict the model to be produced.

2.2 Site Selection and Fabrication

The next study strategy is to locate rivers and potential site locations. However, based on the purpose of putting traps, researchers developed and applied deciding elements to pick drain and potential places. Additionally, preliminary research and measurements on drains have been made for usage in the creation phase of trash traps.Engineering methods appropriate for each part and component of trash traps were used in the fabrication process.

2.3 Testing and Waste Characterization

For testing and data collection on waste characterization, phase traps were put together and installed in a few different bodies of water. This floater is monitored by researchers to ensure it is safe and in good condition. To separate the waste, it is physically removed from the traps and placed in a trash bag. This procedure, which is repeated every seven days for a month, classifies the samples into biodegradable, recyclable, residual, and special trash. The wet weights of the samples for each category and type were recorded by the researchers. Calculating the waste produced by each trap and compiling a list of potential causes for design improvement served to finalize the outcome. As a last step, the researcher properly disposed of garbage.

3. Result and Discussion

The installation was done according to the prescribed steps. All points are considered so that the data obtained can be accurately evaluated. in the fabrication of traps. All details were secured and surely firmed to avoid such problems during data gathering shown in Fig. 2.

Fig. 2. Floating trash trap

The data obtained is collected and weighed to gain its weight. It is determined by class. for 1 month depending on the rainy day shown in Fig. 3 to Fig. 6.

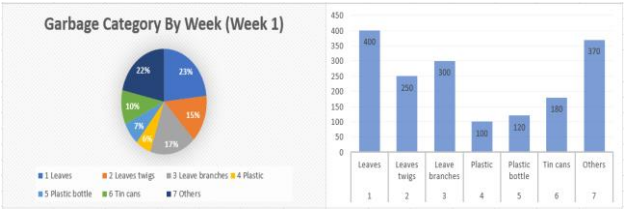

Fig. 3. Garbage category week 1

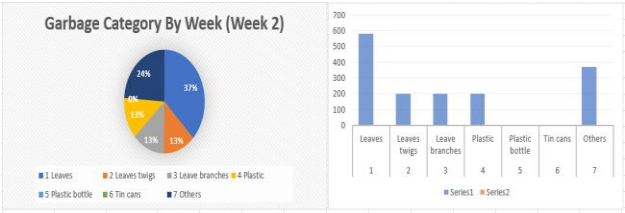

Fig. 4. Garbage category week 2

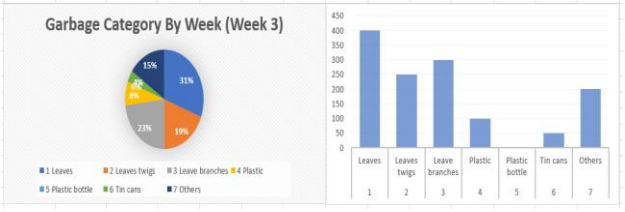

Fig. 5. Garbage category week 3

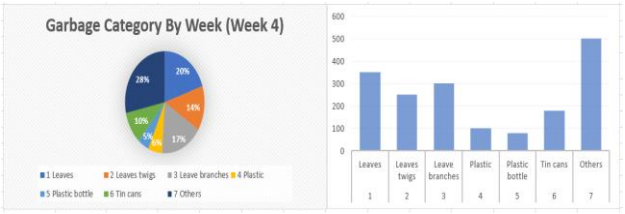

Fig. 6. Garbage category week 4

On-site monitoring is carried out weekly. All data was taken for analysis in a waste trap. From the data collection, the traps generated a total of 6,830 grams, leaves 24%, leave twigs 14%, leave branches 16%, plastic 7%, plastic bottle 4%, tin cans 8% and others 27% shown in Fig. 7.

No	Item	Total	Percentage (%)
1	Leaves	1630	24%
2	Leaves twigs	950	14%
3	Leave branches	1100	16%
4	Plastic	500	7%
5	Plastic bottle	240	4%
6	Tin cans	540	8%
7	Others	1870	27%
	Total	6830	100%

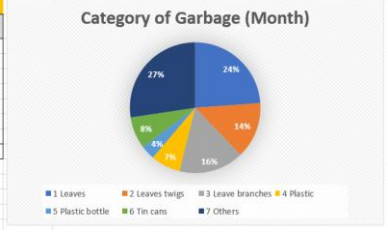

Fig. 7. Category of garbage (month)

4. Conclusion

This floating trash trap has shown a high level of effectiveness in trapping waste where almost all the garbage that goes into the drainage is stuck in a garbage trap. From the tests done, all the rubbish that has been declared is retained in high percentage. This shows an effective structure in trapping all kinds of garbage.

Some suggestions to enhance the effectiveness of this waste trap are:

i. Perform site experiments in contaminated drains. This is important for covering the level of water quality after the installation of a garbage trap.
ii. Produce a more practical waste trap model for use on large drain parameters.
iii. Increase data intake when raining to know the reliability and effectiveness of the structure.
iv. Determine water quality parameters to assess its effectiveness in improving water quality levels in drains.

As a result of this Research of Innovation Smart Sensor Floating Trash Trap project, it can be concluded that Research of Innovation Smart Sensor Floating Trash Trap has achieved the objective of the study which is to build a waste collection machine that can save time and even ergonomics, test the effectiveness of the product to collect waste according to the amount of collection and test the ability of this product to collect waste in the drain area of the parameters in the building.

The idea of the smart sensor floating trash trap has proven that it has the potential to accumulate waste from the perimeter drain at the building. The traps generated leaves, leave twigs, leaves branches, plastic, plastic bottle, tin cans, and others.

The results of this study can be used by various sectors including government and private sector in safeguarding the environment.

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A Discrete Event Simulation Case Study of Energy Consumption and Time Required for Medium Voltage Power Cable Manufacturing

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Abstract

Cable manufacturing is a very competitive industry. Hence, to face with this competitiveness manufactures must offer the similar product at a lower price. The fuse of this issue and manufacturer capacity resulted the idea to have a new more productive production line. This requires expected to have an ideal production line – economical production line and shorter processing time. For having the new line, experimentation on the line is compulsory to make sure it is more productive than the existing one. Though, because of having new physical experimentation is too costly and difficult due to the size and weight of the machines, discrete event simulation is proposed. Therefore, this paper aims to propose an alternative production line flow that is more optimal in terms of energy consumption and time required to manufacture the selected cable through discrete event simulation. The model will be developed and simulated by Arena Software. This model initially is verified and validated by production line technical staff through Face and Historical Data approaches. Fortunately, the proposed alternative production line outperformed standard production line. The lesser energy consumption (0.75%) and time required (3.28%) can be obtained through the alternative production line. Thus, this is a winnable strategy in this competitive market of the cable manufacturing industry. In large, to manufacture the pre-determined cable structure at certain cable length through this alternative production line, numerically not only the time required is less three days, also the energy reduction about 3GJ can be achieved.

Keywords: - Discrete event simulation, medium voltage power cable, manufacturing industry

1. Introduction

In the manufacturing industry, the rapid change due to stiff competition among the industries in needing the most economical product arises more intensely than ever. This need includes the great needs for cable in many countries, that is one of the primary resources for the development in infrastructures (Chen et al. 2019). In cable manufacturing industries, the competition in a million of Ringgit Malaysia (RM) bidding tender is contested by few RM. Thus, high competition in the international and domestic market for cables has hammered the defeated companies' growth (Setiawan et al., 2021). Industry players must bid for the lowest price to win the open tender competition. Setiawan et al., (2021) remarked that there has not been much focus on the industry players' efforts in developing the countries' economy based on previous studies under competitive strategy issues. This clearly suggests that cable manufacturing studies should be given more attention. Basically, the manufacturing industries can be classified into Power Cable and Telecommunication Cable manufacturing industries. The interest of this paper is to study whether there is an

opportunity to lower costs in Medium Voltage (MV) power cable production line.

Power cable manufacturing production line is an example of a production system that is increasingly becoming more sophisticated and complex (Esmaeilian et al., 2016). Such sophistication and complex production line are often connected with the dense processes in cable manufacturing, involving a vast number of parameters that affect the product output (Abdulkareem et al., 2020). To have a new optimum production line, testing by experimentation requires a setup of multiple new production lines. However, this experimentation cost is not economical for the industry players' immediate return. Moreover, machines for the production line are huge and heavy – adding to the main constraining factor for new production line experimentation. The experimentation is important to design and evaluate a manufacturing system with the prime attempt to lower the production cost, analyse the gathered data through the experimentation production line, and acquire the meaningful insight such as new optimum machine usage schedule. Moreover, Daneshdoost et al., (2022) suggests that by adopting the new schedule, it is possible to decrease the overall production cost and products lead time. However, the possibilities of running actual power cable production line experimentation are required for others alternative because of considering the constraint.

The constraint for the experiment suggests that another economical approach that can replicate the experimentation should be employed. This paper is in favour of the simulation approach since it is much more economical than experimentation approach (Gajsek et al., 2019). Besides, simulation has proven to be a useful tool in various manufacturing applications compared to traditional analytical techniques and simple mathematical models (Reinhardt et al., 2019). Manufacturing systems simulation has proven to be a powerful tool for designing and evaluating a manufacturing system due to its low cost, quick analysis, low risk and providing meaningful insight – thus establishing knowledges of the system components' influence, e.g., machine and process (Mourtzis, 2020). Furthermore, while establishing new knowledge, such an approach would not disturb the actual system (Mourtzis et al., 2014). Though, establishing a simulation study required for sureness in its category, hence a study's category focus needs to be clarified.

Notably, the term simulation covers a wide scope of study that is clearly categorised by stochastic and deterministic systems. As for this paper's simulation study, it investigates stochastic system through replicating experimentation approach for observing the system in a function of time. This stochastic system can be classified in two simulation types – discrete event and continuous (Manuel, 2016). Through a discrete event simulation, the advantage is information gathered can be focused on a selected point in time when certain changes happen in the studied system. This is in line with the paper's interest to obtain the overall system's performance at the simulation end time. Besides, by adopting discrete event simulation, the replicated system can be simulated in several scenarios (Gajsek et al., 2019). In this case, this paper focuses to simulate the replicated system in two scenarios – standard and alternative production line. However, this paper has no interest in collecting information at every point of time, as it focuses on describing continuous simulation type. Thus, due to the study's interest in a discrete event simulation, the information collection is collected between the start and end points. In this paper, start to end process time is known as lead time, is interchangeable used with the word 'time required'. Furthermore, the use of this simulation category is supported by a lot of studies in manufacturing systems.

The current trend of research in discrete event simulation in manufacturing systems covers various product manufacturing systems. In this line, research on specific products includes semiconductor product (Sakr et al., 2019), fixture parts (Kasie & Bright, 2019), gold metal processing (Peña-Graf et al., 2022), extrusion-based additive manufacturing (Bhandari & Lopez-Anido, 2020), and precast component production (Yuan et al., 2020). Besides, discrete event simulation research in manufacturing can be clustered into production system scheduling (Yang et al., 2022), warehouse problem (Ashrafian et al., 2019), and transport manufacturing (Steringer et al., 2019). This literature review evidence that the intense in effectiveness used in the discrete event simulation in the manufacturing system.

Based on the available literature, the current pattern of research in the cable manufacturing system and related studies are classified into five areas. These include, improving cable manufacturing system performance (Daneshdoost et al., 2022); study specific changes of cable structure fabrication (Monssef et al., 2022; Abdulkareem et al., 2020); concentrate on quality control and cable testing (Kong et al., 2022); study on proposing a new design of material, system, and operation (Setiawan et al., 2021); and cable related study of management (Onwuchekwa et al., 2019). Based on the literature, it is found that, currently there is no discrete event simulation study on MV power cable production line, hence this justifies this paper's study. The consideration of the MV manufacturing system in this paper because of the studied system's facilities such as machine and processing time required, are not fully utilized. Therefore, this study is expected to propose a new system which is much more economical in terms of manufacturing cost.

For introductory, this study is interested in MV cable production lines based on the IEC 60502 standard for the maximum system voltage of 7.2kV, 12kV, 21kV, and 36kV. Though, there are other standards for MV cable design, the standard is the most common and acceptable used by international customer's design for MV cable, which includes the local use, i.e., Malaysia. For a short length of cable demand, commonly the quotation for the cable length can be between a few km and up to hundreds of km. Besides, based on a country's power supply needs, the cable structure is customized design based on a standard. MV cables applied for power distribution

between an energy generator to sub-stations, transformer, and any application based on the cable maximum system voltage. The cable's designed of external layers are chosen depending on the environment the jacket will be exposed to. For instance, the cable installed in a trunk, it's not required for armour layer. However, for the cable directly installed underground, it's required for armour layer of cable.

By this information, remarked that the cable is customizable at design of cable structure that required machines for each process or layer. The cable manufacturing system's case study used in this paper has an issue with more than one machine for each process in the production line. This is because there is a standard machine used for certain cable size, cable structure, and cable voltage. However, other machines are also applicable for processes in similar production lines. So, in this paper, the first stage is to develop the standard production line based on standard machine usage. Then, based on the standard product line, the alternative production line is developed. Thus, these discrete event simulation models are manipulated in two scenarios, through this paper aiming to determine the optimum production line performance metrics, i.e., electricity consumption and time required. The optimum production line in this case is to propose a production line with less energy usage at the acceptable time required for the proposed cable structure and pre-determine cable length.

2. Simulation

MV cable refers to cable that withstands the voltage range of certain voltage ratings. Manufacturers refer to the voltage rating in the non-uniform range since they focus on the cable that they manufacture. For an appropriate voltage rating guide, cable standard is referred here. According to International Electrotechnical Commission (IEC), MV cable based on the IEC 60502 standard is rated above 1kV up to 100kV, define uniform rate of cable voltage (International Electrotechnical Commission, 2005). American National Standard Institute (ANSI) based on ANSI C84.1-1989 standard definition that the Medium Voltage Cable is within the range of 2400V to 69000V (American National Standards Institute, 1989). Thus, this voltage rating range for MV cables based on maximum voltage system value will be the basis for this paper. Since the complexity of the actual system of MV production line, the system is simplified in such a way that only concerned processes are counted for the system's production line simulation model. Moreover, for costing purposes, testing, and packing processes are excluded in the simulation model. The test is conducted while undergoing the process as well as prior to the manufacturing process to ensure any new material used is in accordance with the referred standard. Therefore, no additional time is required for manufacturing. Besides, energy consumption for the test is too small and can be ignored for energy consumption. Similarly, for the case of the packing process, it is common that the Sales Department excludes any energy consumption and time required for costing from Packing Department. Due to the cable market being so competitive, it is imperative to protect the company's data used in this study. Hence, the company's name, production output, and certain technical details are kept confidential. Besides, the only data which is generated from the company's original data will be displayed in this paper.

2.1 Cable Structure Based for Sequence of Processes

Due to wide cable varieties can be manufactured by the company, this study will only focus on the MV multiple cable types and selected maximum voltage system. Fortunately, through this study, by simulation the modelled production lines allow the replication of actual operation. The simulation is proposed to run only on MV multiple cable types and selected maximum system voltage. The multiple cable types based on core number, XLPE Insulating, PVC Bedding, and PVC Sheathing, with or without steel amour cables. Besides, the cable lengths are pre-determined to set the cables manufacturing completion is proposed. These proposed features detail is shown in Table 1, including cable types, i.e., selected structure layers, core number, cable lengths, and maximum voltage system for each cable modelled for the simulation study.

Table 1. Proposed cable type and pre-determine length

Cab.	V_m	Len.	NC	Scrn.	Armour
1	12kV	19km	1	Cu. Wire	Steel Wire
2	21kV	21km	1	Cu. Tape	–
3	36kV	17km	1	Cu. Wire	–
4	7.2kV	16km	3	Cu. Tape	Steel Wire
5	7.2kV	13km	3	Cu. Tape	Steel Wire
6	12kV	18km	3	Cu. Tape	–

Note: Cab. = Cable; V_m = Maximum System Voltage; Len. = Length; NC = Number of Core; Cu. = Copper; Scrn. = Screening Material; – = Not Applicable; All of these cables' construction: Copper Conductor, Triple Extrusion XLPE; PVC Outer Sheath; For Armoured cables with PVC Bedding and PVC Outer Sheath.

In this paper, the studied MV cables are within the Wm range of 7.2kV and 36kV. Processes in the simulation model are developed based on the structure of a cable. All the processes are mentioned in the following discussion based on the image shown in Fig. 1 below. The structure of these cables is both single core and three cores - the specified commonalities in cable standard design for cable making. The single core structure is applicable to Cable 1, Cable 2, and Cable 5, and triple core structure is for Cable 4, Cable 5, and Cable 6.

The first process in manufacturing a MV cable is conductor fabrication. The conductor reached the factory in a bigger size of wire known as a rod. This rod will be reduced into a standard wire size which is called Drawing process. This is followed by the Stranding Process to strand the wires. The stranding of a certain number of wires by certain wire diameter size sums up the total conductor area size. These conductors are based on wire

numbers and wire diameter for a conductor area size as follows: seven wires with 2.14mm wire diameter indicates in this code 7/2.14mm for 25mm² conductor area size; code 19/1.53mm for 35mm²; code 19/2.14mm for 70mm²; 61/2.85mm for 400mm²; 61/3.20mm for 500mm²; and 61/2.25mm for 240mm².

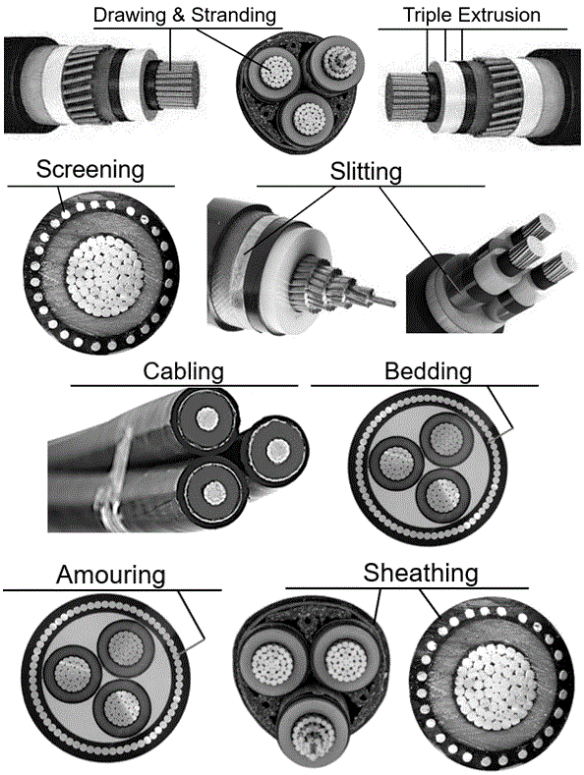


Fig. 1. Cable structure for the studied cable

The third process is a triple extrusion process. This polymer acts as the insulation for the conductor in three layers of polymers. XLPE is the actual insulation for the conductor. However, the first and the third layers made of semi conductive polymer material enforce and serve as a protective layer to the XLPE layer. Hence, all MV cables must be insulated with this triple extrusion. Cable structure design depends on the customers' request based on a particular standard. The customer may request screening layer after the triple extrusion process in either spirally applied copper tape or copper wire. For this layer, the name of the process is Screening, if several copper wires are applied – common for a single core. However, for a three-core cable design, after the insulation, when copper tape is applied, known as Slitting process, then the cable undergoes the cabling process. Later, if a cable does not need any further protective layer, extrusion for outer sheath or Sheathing layer is the next process. However, for a cable that requires a further protective layer, specifically for underground cable, a steel wire layer, i.e., Armouring is applied before the outer sheath layer. Furthermore, a polymer layer cushioning this protective layer must be applied and named as Bedding layer. Hence, for a cable with this protective layer it requires Bedding, Armouring, and Sheathing processes accordingly.

2.2 Modelling with Arena

This section describes the use of discrete event simulation with Arena Software in modelling MV production line system. The model replication is to highlight the significance of a numerical application through a simulation of the system. The explanation on the implementation of simulation models in real-time working of the MV production line system is included to indicate the outcomes of the proposed alternative system. The system's behaviour is easier replicated using the simulation software compared to traditional numerical analysis or experimental approach. The integration of discrete event simulation with the MV production line system's performances focuses on time required and electricity consumption to complete the whole cables proposed in this paper. The integration of the performances depends on the MV production line system's production line flow. In addition, the integration of the model is designed as realistic as possible to assist this study to gain the intended outcome out of the simulation results. The results are expected to assist in decision making in this study in selecting the most optimal condition for the selected performances. It begins with developing models that replicate actual systems for a single cable production line. Then the actual system, i.e., both the standard and alternative, is developed based on this finding and settings. After the simulation result is generated, the data is analysed by comparing the outcome of the standard production flow and the alternative production flow. Briefly, in Arena Software, the model is designed in sequence modules in a flowchart. These modules define the process to be simulated: such as Create, Dispose, Process, Decide, and Record modules. In simulation conceptual design, during the simulation there is the entity that will flow through and serve by these modules. In manufacturing's system, the entity includes parts, sub-components, or from partially complete cable to complete cable.

2.3 Verification of Simulation Model Separately

Before the complete system is modelled, a simple standard flow for each cable is developed to verify the system in a separate single production line. These production line models are simulated unconnected to collect the output from each line model. Based on this line output, it is compared repetitively to meet the correct system's replication. Besides, the output is also verified by the previous production record and production line technical staff. The separated single cable for each cable type is modelled and shown in Fig. 2 for the standard production line, and Fig. 3 for the alternative production line.

2.4 The Complete Simulation Model Development

The main sub model in developing a complete simulation model with Arena Software is a module. Its setup variable and other types of numerical values and expression are related to the whole model. In addition, the models used in this paper are Flowchart Modules and a Data Module to complete the production line system's model. Although these two types of modules are categorized, they are nevertheless interconnected. A new setting in Data Module would change directly or automatically in Flowcharts Models, and vice versa. A Flowcharts Module describes the flow process for the designed model. Create, Dispose, Process, Decide, and Record are the Flowcharts Modules applied on the line model. The entity in this model is referring to the partially complete MV cables, i.e., Cable1 up to Cable6, being manufactured undergoing certain processes. Furthermore, there are processes that need to entertain more than one entity at a time, and the sequence of processes needs to be decided. Therefore, the condition of queueing and deciding to follow or sequence the processes must be set in the model.

Create and Dispose Module establishes the starting and ending points of the model. These modules are created based on the time between these points. The starting point for Create Module named as Copper Rod and Dispose Module at the model end point named as Packing. Record module is placed before the Dispose Module, due to this model the statistic can be recorded before the entity is disposed in Dispose Module. Basically, Record Module collects statistics in the simulation model in various data – time, entity statistics, general observations, and interval statistics, that is important for this study to analysis the data later.

The Process Module in the rectangle shape is the main module compared to the rest. This module is named as process following the process stages in a flowchart; in this case study is the production flow line. Besides, for entity setting and recognise ability purpose, the module's sub name given is Cable1, Cable2, and up to Cable6 that represent the six cables under study. The setting in the module includes a "triangular distribution" of entity distribution flow, and for time the setting is "delay and release". This setting is to set the modules like an actual machine behaviour to manufacture MV cable. For the whole model setup, the sequence of the machines is arranged according to cable's construction, i.e., size and cable type. Furthermore, this whole model setup also replicates an actual production flowline. Then, the electricity consumption is determined in accordance with the time required and cable construction.

This model also requires a decision to be made for two conditions based on entity or cable type. This is due to the following process that depends on the cable construction. Hence, Decide Module in diamond shape is applied in the model. Decide Module shown in Fig. 4 and Fig. 5, is set in the 2-way conditions, implement a basic if-then-else construction, with the entity being directed along either of the two indicated paths based on whether the condition is true or false. For instance, as shown in Fig. 5, after a triple extrusion process, if the following process is screening, then the cable with screening structure will go into the screening process. And the rest of the cables undergo the slitting process. By setting certain conditions before other conditions, this model provides a simplistic flow over the conditions. In the module, the equity equation (==) applies to the condition setting, so that the logical operators operate the appropriate order that equates to the set entity.

As aforementioned, the queue condition must be set to the model, for this reason a Queue Module is one of Data Modules set to the model. A Data Module defines characteristics of various process elements, and the developed flowcharts. Thus, the Queue data module in this paper is derived from the used Process Modules. It is in the form of a spreadsheet that enables the control of queue aspects in the designed model. The control aspect set for this module is "First-in First-out". Hence, the first entity that completes the previous process will be allowed to go first in the following process. For instance, in the case of the design model shown in Fig. 5, the process of Slitting is required by Cable 2, Cable 4, Cable 5, and Cable 6, hence any cable or entity that first completes the previous process, it will be entertained first by the Slitting process. The rest will be entertained by the sequence of which cable comes earlier. The two scenarios are set in the simulation model in this study and are based on the process sequence of the machine used to make the cables. Fig. 4 defining scenario 1 – the standard production line. Fig. 5 defining scenario 2 – the alternative production line.

2.5 Model Validation

The system model and the data generated through the simulated model are validated in two approaches. According to Sargent (2010) there are various approaches that can be done in validating Simulation such as Face Validity and Historical Data Validation. In this paper, the simulation validation is conducted by Face validity approach through asking the technical staff on the production line about the inputs and outputs that should be obtained for the used machine in the model. This technique can be used in determining if the simulation model is logically correct and generates the correct input-output numerical values. Besides, Historical Data Validation is also used for this simulation model, from documents provided by the referred company. In this approach, two parts of the data are clustered – the first part of data is used in the model development and the second part used data generated from the simulated model whether it generated correct valid input-output numerical values. In model development, some available information was added from the company's document, especially production line record that originated from sales document. Once the whole simulation of the production lines is completed, the second part takes place where the additional information is compared and added. The comparison of the gathered information is used to validate the generated data through this study.

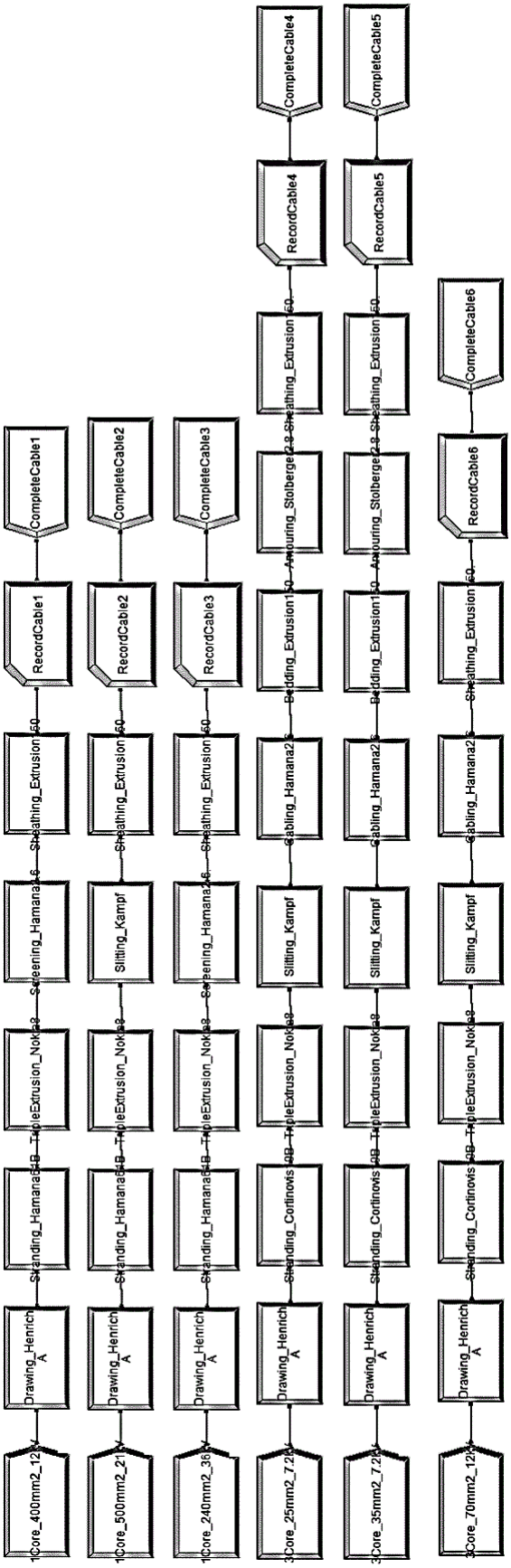


Fig. 2. Standard production flow

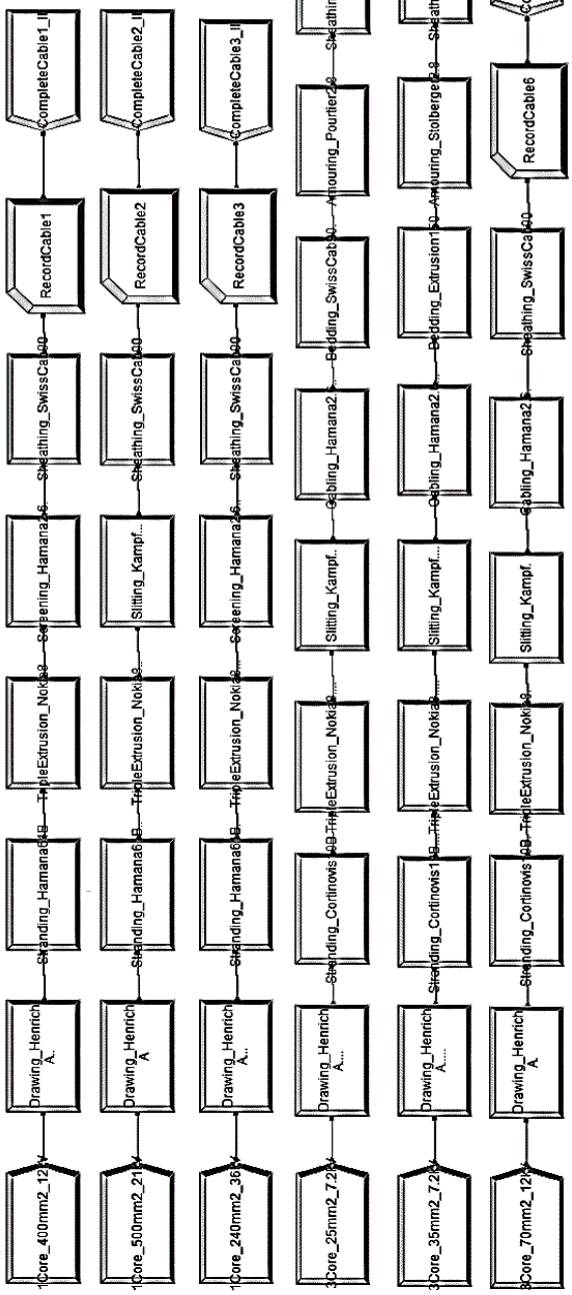


Fig. 3. Alternative production flow

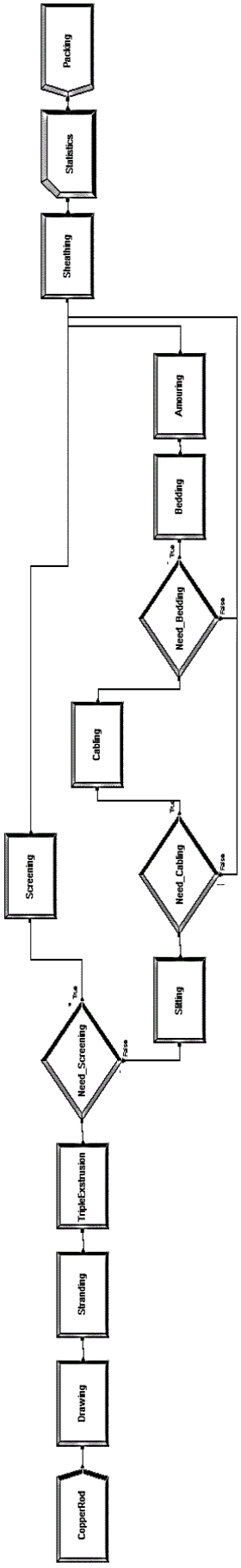


Fig. 4. The complete standard production flow

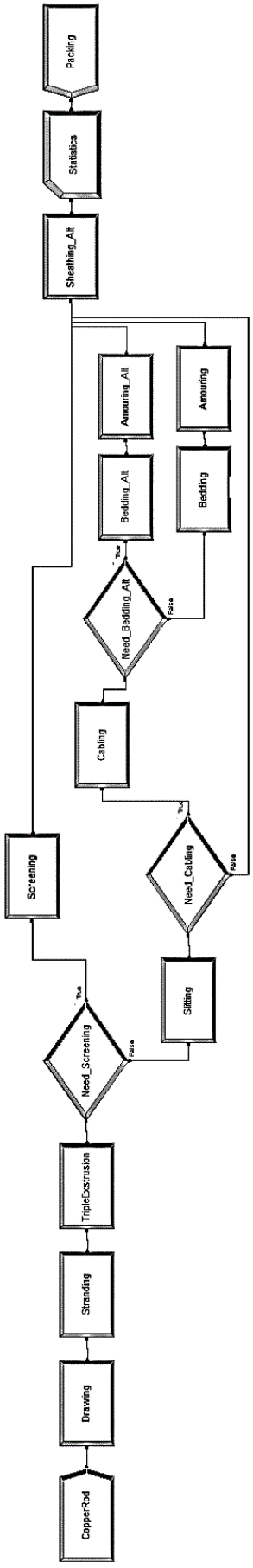


Fig. 5. The complete alternative production flow

3. Result Analysis and Discussion

Table 2. The outcome for each standard machine by process for the referred cable

	Machine/ HR/MC	Drawing	Stranding	Triple Extrusion	Screening	Slitting	Cabling	Bedding	Amouring	Sheathing	Total
Cable 1	Machine	Henrich A	Hamana 61B	Nokia 8	Hamana 2.6	-	-	-	-	Extrusion 150	
	HR (hr)	48.79	40	129.25	76	-	-	-	-	186.96	481
	EC (MJ)	210791	30240	474612	615	-	-	-	-	148074	864332
Cable 2	Machine	Henrich A	Hamana 61B	Nokia 8	-	Kampf	-	-	-	Extrusion 150	
	HR (hr)	65.63	48	124.39	-	0.44	-	-	-	227.03	465.49
	EC (MJ)	283501	36288	456746	-	359	-	-	-	179805	956699
Cable 3	Machine	Henrich A	Hamana 61B	Nokia 8	Hamana 2.6	-	-	-	-	Extrusion 150	
	HR (hr)	32.28	30.22	47.22	68	-	-	-	-	183.78	361.5
	EC (MJ)	139462	22848	173400	145557	-	-	-	-	145557	626824
Cable 4	Machine	Henrich A	Cortinovis 7B	Nokia 8	-	Kampf	Hamana 2.6	Extrusion 150	Stolberger 2.8	Extrusion 150	
	HR (hr)	10.56	9.42	23.39	-	0.15	36.57	120.41	49.23	162.44	412.17
	EC (MJ)	45635	2848	85895	-	38	29623	95368	58663	128650	446720
Cable 5	Machine	Henrich A	Cortinovis 19B	Nokia 8	-	Kampf	Hamana 2.6	Extrusion 150	Stolberger 2.8	Extrusion 150	
	HR (hr)	17.42	9.45	20.06	-	0.16	29.71	106.12	40	136.84	359.76
	EC (MJ)	75264	9360	73667	-	39	24069	84049	47664	108379	422491
Cable 6	Machine	Henrich A	Cortinovis 19B	Nokia 8	-	Kampf	Hamana 2.6	-	-	Extrusion 150	
	HR (hr)	32.26	12.52	35.71	-	0.21	41.14	-	-	195.12	316.96
	EC (MJ)	139349	12397	131143	-	52	33326	-	-	154537	470804

Remarks: hr = Hour Required; EC = Energy Consumption; hr = hour; MJ = Mega Jould.

Table 3. The performance and outcome for each alternative machine by process for the referred cable

	Machine/ HR/MC	Drawing	Stranding	Triple Extrusion	Screening	Slitting	Cabling	Bedding	Amouring	Sheathing	ER (%)/ Total
Cable 1	Machine	Henrich A	Hamana 61B	Nokia 8	Hamana 2.6	-	-	-	-	SwissCab 90	14.15%
	HR (hr)	48.79	40	129.25	76	-	-	-	-	28.84	322.88
	EC (MJ)	210791	30240	474612	615	-	-	-	-	17131	733389
Cable 2	Machine	Henrich A	Hamana 61B	Nokia 8	-	Kampf	-	-	-	SwissCab 90	12.68%
	HR (hr)	65.63	48	124.39	-	0.44	-	-	-	98.46	336.92
	EC (MJ)	283501	36288	456746	-	359	-	-	-	58483	835377
Cable 3	Machine	Henrich A	Hamana 61B	Nokia 8	Hamana 2.6	-	-	-	-	SwissCab 90	15.92%
	HR (hr)	32.28	30.22	47.22	68	-	-	-	-	101.32	279.04
	EC (MJ)	139462	22848	173400	145557	-	-	-	-	450971	932238
Cable 4	Machine	Henrich A	Cortinovis 7B	Nokia 8	-	Kampf	Hamana 2.6	SwissCab 90	Pourtier 2.8	SwissCab 90	18.17%
	HR (hr)	10.56	9.42	23.39	-	0.15	36.57	146.76	68.57	189.33	484.75
	EC (MJ)	45635	2848	85895	-	38	29623	87177	50359	112461	414036
Cable 5	Machine	Henrich A	Cortinovis 19B	Nokia 8	-	Kampf	Hamana 2.6	Extrusion 150	Stolberger 2.8	SwissCab 90	16.02%
	HR (hr)	17.42	9.45	20.06	-	0.16	29.71	106.12	40	210.98	433.9
	EC (MJ)	75264	9360	73667	-	39	24069	84049	47664	125321	439433
Cable 6	Machine	Henrich A	Cortinovis 19B	Nokia 8	-	Kampf	Hamana 2.6	-	-	SwissCab 90	13.97%
	HR (hr)	32.26	12.52	35.71	-	0.21	41.14	-	-	149.4	271.24
	EC (MJ)	139349	12397	131143	-	52	33326	-	-	88746	405013

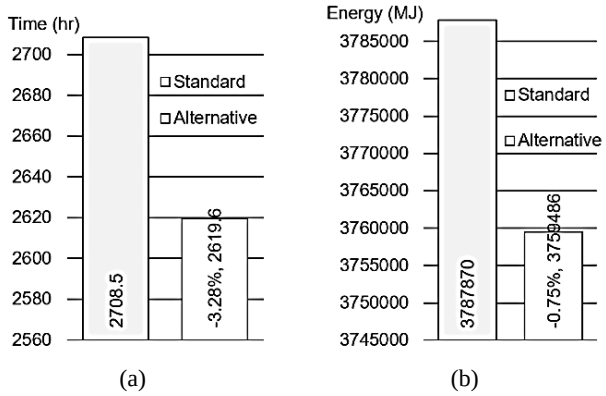
Remarks: hr = Hour Required; EC = Energy Consumption; hr = hour; MJ = Mega Jould; ER= Energy Reduction Compared to Standard Production Line (%).

3.1 Overall Production Lines Performance

Energy prices are getting higher due to the increased energy demand and decreasing energy sources. Thus, a strategy that can reduce energy consumption is imperative. This study is in line with this purpose as a possible solution to reduce the overall industry production is proposed. It needs to be pointed out that when energy consumption is reduced, it is expected that the time required will increase slightly in manufacturing a product. Thus, the small increase in time should be reasonable and acceptable to industry.

Table 4. Comparison of overall performance parameter

Production Line	Time Required (hr)	Energy Consumption (MJ)
Standard	2708.5	3787870
Alternative	2619.6	3759486



(a) (b)

Fig. 6. Overall (a) time and (b) electricity consumption for standard and alternative production lines

Based on the simulation model, each time required can be obtained from the process modules. By the value, the electricity consumption is determined. The total or overall value is gained from the record module located in the flowchart production line model. These values are tabled in Table 2 for the standard production line and Table 3 for the alternative production line. Because of the primary objective of this paper is on the overall energy consumption and time required for the pre-determined cables and cables' length, hence the summary is shown in Table 4. Furthermore, Fig. 6 shows the comparison of Alternative and Standard Production Line. Fortunately, the result shows a reduction in time for an alternative production line of about 88.9 hours or 3.28%, in parallel with the reduction of electricity consumption recorded at 28384MJ or 0.75%.

3.2 Analysis of Individual Machine Performance

The production line performance metrics are arranged as in Fig. 8 and Fig. 7 for comparing both standard production line and alternative production line to visualize the improvement. Generally, the production line performance metrics, i.e., time required, and energy consumption numerical pattern approved that both are decreased in alternative production line. Besides, Fig. 7 and Fig. 8 show how reducing the time on machines used will affect the productions overall time required. Instead, higher energy consumption on certain machines will not translate to better performance, i.e., shorter time required.

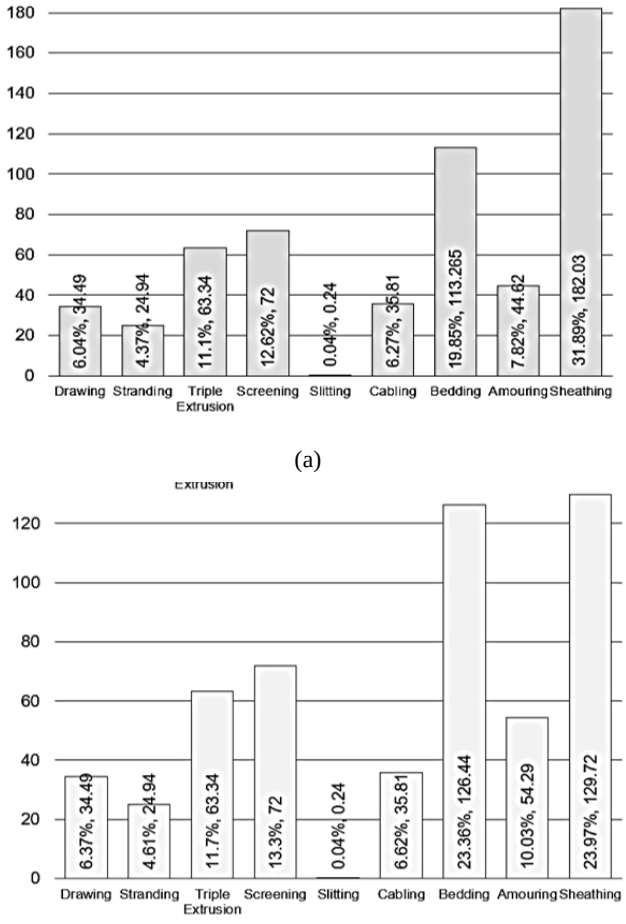
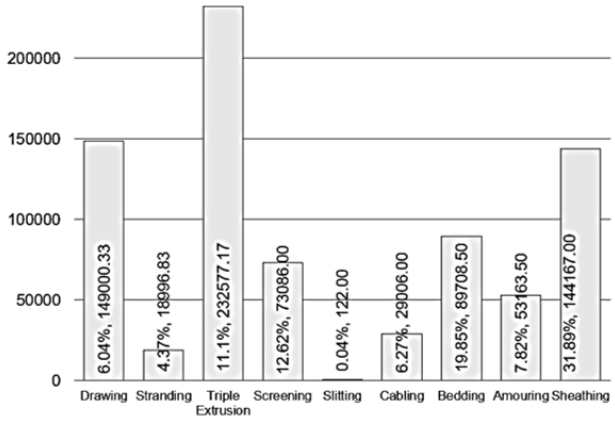
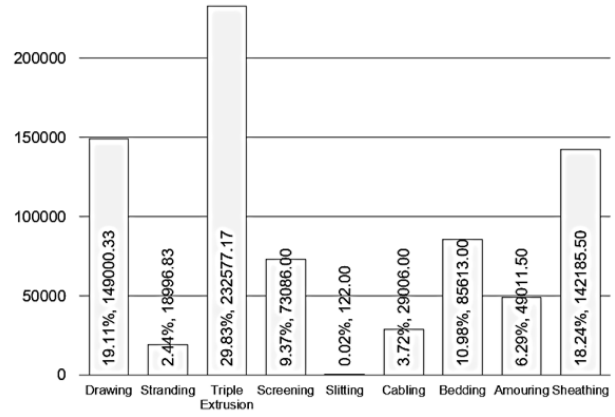


Fig. 7. Average value of time required (Hours) and percentage (%) for (a) standard production line, (b) alternative production line

The production line performance metrics are arranged as in Fig. 8 and Fig. 7 for comparing both standard production line and alternative production line to visualize the improvement. Generally, the production line performance metrics, i.e., time required, and energy consumption numerical pattern approved that both are decreased in alternative production line. Besides, Fig. 7 and Fig. 8 show how reducing the time on machines used will affect the productions overall time required. Instead, higher energy consumption on certain machines will not translate to better performance, i.e., shorter time required.



(a)



(b)

Fig. 8. Average value of energy consumption (MJ) and percentage (%) for (a) standard production line, (b) alternative production line

These outcomes show the performance metrics setting for the machines used to process the cables play a fundamental role. Though, few machines are alternately increased in one performance metric still the other performance metrics is decreased. Ultimately, the total value for both performance metrics is reduced.

3.3 Productivity of Production Line

Capacity of producing or productivity in the production line is shown in Table 5. The table shows the significant value for comparison of the time required and energy consumption which can be saved through the alternative production line. Through this study, it is shown that the available alternative resources are being wasted in the production line and consequently the industry is running at less efficient and costly compared to the alternative production line. It is due to the insufficient usage of the available resources, i.e., machines. For these reasons, certain time delays usually appear in the production system which in turn affect the energy consumption and time required to produce the cables. Besides, the result also disclosed the potential changes were made in production line, the production still can reduce the energy consumption cost and at lower time required. This eventually offers chances to compete better in this market. In addition, there is a significant reduction in percentage of the sheathing and amouring process of alternative production line. It shows 1 to 6 percent reduction or in value 45 hours and 8300 MJ.

Table 5. The significant value for individual machine energy consumption and time required

Production Line	Cable No. Process (Machine)	Time Require -ed (hr) with %	Process (Machine)	Energy Consump - tion (MJ) with %
Standard	Cable 6 Sheathing (Extrusion150)	195.12; 61.6%	Cable 4 Amouring (Stol-berger 2.8)	58663; 13.1%
Alternative	Cable 6 Sheathing (Swiss Cab 90)	149.40; 55.1%	Cable 4 Amouring (Pourtier 2.8)	50359; 12.2%

3.4 Theoretical and Practical Consequences

In this paper, the system is numerically oriented and approachable to facilitate the sensitive for market competition and the applicable as production line routine for future usage. For competitiveness issue, the studied production line is forced to change manufacturing strategies now and then because of the changes in the market economy. By numerical value, the sensitivity of the changes in the production line can be observed directly. Forecasting the correct numerical value in the production line is a main challenge because of the relentless numerical false value as it involved monetary value. Therefore, by involving the industry technical staff in this analysis it solved this false value issue. Through this study, which begins with theoretical work by computer numerical analysis, i.e., simulation, it is believed applicable for routine in the production line. Although simulation works via soft computing, it imitates the real-world processes such as in this production line. This study allows technical production staff to take part in evaluating the processes closely in a controlled environment. This helps management and technical production staff to make changes in production line operation to gain better performance metrics in the future. Besides, the simulation work can be applied as a part of the work in managing machine usability. This shall help the management to make better choices and the usage to build more simulation after this study.

4. Conclusion

Based on the comparison of the standard and alternative production flow of overall electricity consumption, it can be concluded that the better solution is on the alternative production line. This study positively outstrips the desired aim – to determine the optimum production line performance metrics and propose a lesser energy usage at accepted production line. The electricity consumption for alternative production is less at 28384MJ than standard production energy consumption. Besides, the time required for both productions was also observed, and signified substantial results. The simulation result helps to determine that the overall time for production line takes 2709 hours for the standard line, and this outstrips by alternative line by 2617 hours for the overall time. This is about 89hr or about 3 days of production time reduction.

The proposed alternative production flow is obviously more economical, and less time is required to manufacture the selected cable, which is a huge economic value for this manufacturer. Besides, this is a promising win for a bidding tender in marketing MV cables. Through extensive evaluation using real data, the proposed alternative production line is indeed effective in reducing electricity consumption and lessening the production time. In this paper energy consumption is reduced in the production line that consists of multiple machines. While it is expected that the total production time will increase when the overall electricity consumption decreases, such was not the case for this study. The overall production time required was noted to have a significant decrease in total.

As for future investigation, there are several interesting questions that have emerged. First, to extend the results studied in this paper, it is suggested to incorporate more complex and general problem setting such as all machines having various release times; includes periodical schedule counting machine maintenance time and considering the required number of operators. As such, a more concrete and comprehensive solution that can minimize the production cost can be realised.

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A Study of Customer Service Competencies and Service Quality of Tour Guide

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Abstract

Many types of research in the competency areas focus on healthcare leadership competencies, human resource development competencies, and leadership competencies but not on customer service competencies, specifically tour guide. This study was carried out to examine the relationships between knowledge competencies and service quality of tour guides. The data was gathered from 30 respondents using a simple random sampling technique, and the reliability procedure was also validated. Descriptive and regression analyses were completed using the SPSS Version 23. The constructs of customer service competencies are based on Durand's Model, which includes knowledge, skills, and attitudes, while the constructs of service quality are based on RATER's Model, which comprises reliability, assurance, tangibles, empathy, and responsiveness. The study examines a meaningful relationship between KSA competencies and the service quality of tour guides. This study will serve as a guideline for developing strategies for excellent customer service employees.

Keywords: - Customer service competencies, service quality, Durand's model, RATER's model, tour guide

1. Introduction

The tourist industry has increasingly recognised the vital role that tour guides play across the tourism system in recent years. Tour guides' performances can influence tourists' opinions of the commercial image of travel enterprises. They are critical to the success of travel companies' group package tours. Their professional abilities have the potential to make or ruin a traveller's guided tour experience and memory of a destination (Mak et al., 2011). The tourism industry began investigating techniques for enhancing tour guides' professional competences, which are commonly regarded as critical factors in determining tour guide performance (Mak et al., 2010; Mossberg et al., 2014).

Tour guides' professional competences can be considered travel products since they may influence tourists' perceptions of the service quality of tour guiding, hence enhancing tourist satisfaction. Tour guides are critical human capital for travel enterprises competing in today's highly competitive tourist industry. To compete in a niche market, modern tourism enterprises must invest not only in high-quality travel products and innovative services, but also in the professional development of their tour guides, hence enhancing tourists' satisfaction on group package tours. Tour guides should not only maintain the quality of trip, but also safeguard tourists' rights. They act as a conduit between destinations and their guests. Furthermore, tour guides should give immediate, pertinent, intangible, and inseparable services.

Professional tour guides considerably enhance the overall quality of a travel package, resulting in increased levels of travel satisfaction (Mak, Wong, & Chang 2011). Significantly, such contentment with a trip influences future behavioral intentions, including word of mouth and intent to revisit (Bowie & Chang 2005; Moon & Han 2018). Despite the important role of tour guides' professional characteristics in senior group tours, little

research has been conducted on them. Stigma leveled towards tour guides because of unfavourable stereotyping by their consumers, the tourists, may cause guides to retreat socially, lowering the overall attractiveness of tour guiding as a career (Li et al., 2020). For example, the occupational image of a tour guide will influence visitors' negative opinions of tourist attractions and their contentment with tourism services (Heung, 2008).

Additionally, when the public denigrates tourism careers, the tourist industry may lose its appeal to qualified workers (Li et al., 2020). As a result, highly educated people are declining employment opportunities in the tourism industry. Nowadays, more than 80% of qualified tour guides in China hold a degree below the bachelor's level. Additionally, tour guide occupational stigma contributes to a high likelihood of turnover due to a lack of corporate acknowledgment (Wildes, 2007). This occupational stigma has gotten worse over time because of the new media's widespread negative portrayal of tour guides (Li et al., 2020). Tour guides play a critical role in the relationship between the host and his or her visitors (Ong, Ryan, & McIntosh, 2014). According to Mackenzie & Raymond (2020), tour guides are critical and dominant actors in tourism services, acting as a link and connector between travel companies, tourists, and other tourism service units. The negative impacts of stigma on tour guides are damaging to the development and progress of the tourism industry. To date, insufficient attention has been paid to the tourism industry's de-stigmatization mechanism, particularly for tour guides (He et al., 2021).

Existing research on tour guide de-stigmatization is primarily concerned with stigma avoidance and reduction (Li et al., 2020), and rarely examines or explores practical issues such as how to re-establish the public's objective judgement of tour guides, de-stigmatize the profession in the public's mind, or even eradicate stigma (Hampel & Tracey, 2017). Given that tour guides provide a service to guests, tourists' perceptions of tour guides are crucial in de-stigmatizing the tour guide profession. To address the research mentioned above, this study will analyse methods for instilling a favourable perception of the tour guide stigma in tourists' thoughts utilising the tour guide occupation as the research object.

Numerous studies have indicated that consumers' favourable opinions and evaluations of service providers are reinforced when they receive high-quality service (Wang, 2010). As a result, tourists' impressions of tour guides and their professionalism may influence the service quality provided by their guides. According to the "Behaviors from Intergroup Affect and Stereotypes Map" (BIAS Map) Model, individual views of a particular group based on their warmth and competence will stimulate analogous emotional responses and behavioral inclinations (Cuddy, Fiske, & Glick, 2007).

Delivering the finest customer service and experience possible, while simultaneously expanding your customer base and remaining profitable, is a highly challenging process. Corporate organizations, particularly those in the service business, rely largely on staff to carry out their critical tasks. Employees continue to be a business's most significant asset. As a result, the major purpose of the business should be to establish a highly trained and productive customer service team and to retain them with extensive knowledge, skills, and attitudes. According to the BIAS Map, when tourists receive superior service, they will reciprocate by evaluating the tour guide as either exceptionally warm or extremely incompetent, and will produce positive attitudes toward them, such as praise, prompting them to defend or cooperate with the tour guide. Tourists are more likely to note that the stereotype of tour operators as "frauds" with a "bad attitude" does not apply in this scenario (Jenkins & Skowronski, 2016). On the other hand, when tourists receive subpar service, they perceive the tour guide to be lacking in warmth or competence, triggering negative emotions such as contempt and driving them to devalue and shun tour guide groups. Thus, they will endorse stereotypical public conceptions of guides and believe that the occupational stigma aimed against them is legitimate.

2. Problem Statement

Most prior research on employee competencies has focused on healthcare leadership competencies (Calhoun et al., 2008), human resource development competencies (Chen, Bian, & Hom, 2005), and leadership competencies (Yoon, Song, Donahue, & Woodley, 2010), but not specifically on customer service competencies. Historically, research has been focused on certain target groups, such as technical managers in research and development (Kenneth, Michal, & Clara, 1999) and financial experts (Scott, 1998), rather than on customer service personnel. Reid and Dold (2017) noted that developing or generating several competency sets may be seen as complex tasks in the context of competency implementation. These tasks include developing operational definitions of competencies (which include the associated knowledge, skills, behaviours, and attitudes), specifying the standards against which an individual's or organization's competence will be measured, and determining the most reliable method for applying those standards.

The previous authors noticed that most of the previous research frequently used vague competency terms and failed to solve their measurement difficulties (Reid & Dold, 2017). Durand (2000; 1998) emphasised the critical nature of three important components of human capital: knowledge, skills, and attitude, all of which influence the level of competency of targeted parties. According to the researcher's analysis of the literature, previous studies have focused exclusively on one model. This effort attempts to bridge the gap between two significant models, Durand's, and RATER.

The study will analyse the customer service competencies of knowledge, skills, and attitudes, as defined by Durand (1998). In comparison, the criteria affecting the customer service rate will include reliability, assurance, tangibles, empathy, and responsiveness, as

determined by Zeithaml, Parasuraman, and Berry, 1990). Durand (1998) categorises knowledge competencies as formal training, existing knowledge, and learning by doing; skills competencies (know-how) include instructional companionship, existing skills, and learning by doing; and attitudes competencies include social companionship, self-identity, and learning by sharing. Given the preceding, we hypothesise that service quality is a crucial factor impacting tourists' attitudes and perceptions of tour guide stigma. This study will examine the effect of service quality on tourists' stigma judgments of tour guides and recommend weakening or even eliminating the occupational stigma associated with tour guides.

3. Literature Review

3.1 Customer Service Quality

The research on customer service quality is concentrated on the RATER's Model criteria, which were generated from Parasuraman et al (1988). The customer service rating is based on the exceptional level of service provided by the staff. Thus, it is necessary to discuss the history of the Model from SERVQUAL to RATER to fully grasp the term "customer service rate" in this study. The SERVQUAL Model originally had eleven service quality dimensions: tangibles, reliability, responsiveness, communication, credibility, security, competence, civility, customer understanding, and access. However, due to overlap, these dimensions were reduced to five (communication, credibility, security, competence, courtesy, customer understanding, and access). They focused exclusively on tangibles (physical facilities, equipment, and staff appearance), reliability (ability to execute the promised service reliably and precisely), and responsiveness (willingness to assist clients and give (Parasuraman, Zeithaml, & Berry, 1988) SERVQUAL: A multiple-item scale for measuring consumer perceptions of service quality.

a) Customer Service Competencies

Thomas Durand developed the Durand Methodology, a paradigm for competency development that may be applied at both the organisational and individual levels (Durand, 1998; Durand, 2000). Durand (1998) asserted that both organisational and individual competence can be characterised in terms of three critical dimensions: knowledge (what people know), know-how (the skills individuals use to perform their tasks), and attitudes (our mental orientation to our job). Durand's methodology fosters the growth of each dimension through a series of different learning experiences, or "components" of competency development. Durand's Model, like Lucia & Lepsinger (1999) KSA Concept, is composed of two elements: knowledge and skills. Between the KSA Concept and Durand's Model, the only distinction is between Abilities and Attitudes. While the concept is broad (applicable to organisational and individual competency development), Durand's emphasis is on organisational competency development (Durand, 1998).

While organisational competency is an enthralling and wide issue, these research interests centre on how customer service professionals develop their individual competency and the relationship between customer service competency variables and customer service quality. The researcher believes it would be fascinating to evaluate whether the Durand Model's competency-building characteristics are acceptable and relevant for developing competency among tourism industry customer service professionals. Formal education, the current knowledge foundation, and self-education all fall under the knowledge dimension. In the skills dimension, these factors include instructional companionship, pre-existing skills, and active learning.

Finally, Durand's attitudinal dimensions include social companionship, self-identity, and mutual learning. Despite the simplicity of Durand's Model, there is beauty in these three components. The Model's real contents offer a wealth of information. It becomes much more fascinating considering Durand (1998, pp.318) argument that the dimensions do not have a predetermined order or priority. As can be seen, each factor is critical in determining an individual's ability. Durand (1998) defines knowledge as *"structured sets of assimilated information which make it possible to understand the world, obviously with partial and somewhat contradictory interpretations. Knowledge thus encompasses the access to data, and the ability to enact them into adequate information and integrate them into pre-existing schemes, which evolve along the way"*. Durand (1998, pp.318) defines the skills or know-how as *"relates to the ability to act concretely according to predefined objectives or processes. Know-how does not exclude knowledge but does not necessitate a full understanding of why the skills and capabilities, when put to operations, actually work. Know-How thus relates in part to empiricism and tacitness"*.

Furthermore, the researcher views this dimension as being more action-oriented than knowledge in a more passive context. Durand defines talents as the ability to apply learned knowledge to certain roles or duties. However, talent is more than simply the application of pure information in a person; it also entails the acquisition of competent application through such activities, either through observation of others performing the job or through personal experience performing the job for an extended period. As a result of the Model's nature, individuals are required to engage in physical and mental activities (Durand, 2000). Additionally, this method stressed the importance of tacit knowledge transfer within the skills component. According to Polanyi (1983), tacit knowledge can be defined in a variety of ways, but in Durand's Model, it is defined as the process of developing abilities through observation of other individuals performing the work at hand.

Attitudes are Durand's final dimension. This dimension may be difficult to grasp as a coherent conceptual framework (Miller, 2002), as attitudes are influenced by a variety of factors, including social, cultural, and self-image factors, all of which influence an individual's ability to develop competency. While the core definition of attitude is extremely broad, Durand (2000, pp. 79) defined it as an individual's reflection of "behaviours, commitment, and culture". Durand (2000) also noted that these attitude components are typically overlooked in studies of competence because most competency categories, such as organisational competence, are more involved and concerned with economic issues (Durand, 2000). Durand has undoubtedly invested much time and effort in developing a broad model that may be used to characterise organisational and individual capabilities. Durand (1998, pp. 318-319) defined attitudes by stating that "*We believe that behaviour but even more so identity and will (determination) are essential parts of the capability of an individual or an organization to achieve anything. We argue that a dedicated organization, eager to succeed, is more competent than a demoralized, passive one with the same knowledge and know-how"*. Given that this conceptual study seeks to apply Durand's Model, the researcher assumes that a customer service employee must understand their job as customer service, their skills in interacting with consumers, and their proper attitudes toward customers and co-workers.

b) Tour Guide

The term "guide" refers to someone who leads, directs, or shows the way, most often a foreign tourist who is compensated to give a tour of a city, structure, mountain, or forest and to point out areas of interest (Cohen, 1985). In the United States and Europe, a tour guide or tourist guide assists and informs clients about cultural, historical, and modern heritage at educational institutions, religious and historical sites such as museums, and various tourist attraction resorts. Tourist guiding began in Malaysia in the early 1960s. A tourist guide is defined in subsection 24 (1) of the tourism industry act, 1992, as "any individual who serves tourists or other individuals by directing them for money while they travel." According to the Malaysian Ministry of Tourism, Arts, and Culture, existing tourist guides can further their education by learning new languages and broadening their guiding languages to lead foreign tourists. Tourist guides that are multilingual are in high demand now. Tourist guides interested in training and teaching can become trainers and examiners for the tourist guide course at tourism training institutions with adequate experience. Tourist guides with the proper knowledge and cash may also find employment in tourism-related businesses such as tour agencies, hotels, and resorts. The profession as a tourist guide is divided into two, which are shown in Table 1.

Table 1. Differences between city tourist guide and local nature tourist guide

City Tourist Guide	Local Nature Tourist Guide
Tourist guides in cities throughout Malaysia can assist tourists.	Local nature guides are limited to guiding tourists within the natural regions they picked while applying for their licence.
To earn a city tourist guide license, you must attend and complete the Basic Tourist Guide Course. The course lasts 500 hours (4-6 months) and is taught by tourist training institutions that are registered with the Malaysian Ministry of Tourism and Culture.	To earn a license as a local nature tourist guide, you must attend and pass the Local Nature Tourist Guide Course. The 17-day training is taught by the Department of Wildlife and National Parks.
The license is blue in colour.	The license is green in colour.

4. Research Framework

The Customer Service Competencies Model provided in this study is based on the theories of Durand (1988) and Parasuraman, Zeithaml, & Berry (1988) RATER's Model. Information acquisition is one of Durand's Model's three fundamental pillars. Knowledge is vital because it lays the groundwork for competent performance. Without knowledge, individuals are incapable of making conceptual distinctions or organising their behaviours, and they lack the crucial information to perform better (Miller, 2002). At the individual level of knowledge, there appears to be a high association between knowledge and competence. For instance, Argyris & Schon (1992) associate the utility value of knowledge with an individual's competence to comprehend and resolve problems based on acquired information. The knowledge dimension encompasses three components that contribute to competency development: formal education, pre-existing knowledge, and experiential learning. Businesses should develop a training programme and hire workers with superior service knowledge, which will increase the reliability of customer care professionals (Wu, Lee, & Liao, 2018). Reliability of customer service representatives is crucial to achieving client contentment (Meesala & Paul, 2018). Employees must be confident in their abilities to reassure customers (Ryan & Cliff, 1997). Employees who share their knowledge with clients instil a sense of confidence and security (Albayrak, Karasakal, Kocabulut, & Dursun, 2020). Employees with 'customer need knowledge' provide superior customer service (Homburg, Wieseke, & Bornemann, 2009). Thus, a lack of prior knowledge of physical appearance impacts employees' appearance when providing services to customers and contributes to a poor impression of the business among customers, resulting in a drop in the organization's growth (Dossinger, Wanberg, Choi, & Leslie, 2019). An organisation should recognise a highly motivated employee who displays empathy and tries to remedy service issues, as they contribute to the customer's favourable opinion of the organisation (Yani-de-Soriano, et al., 2019). However, formal customer service training had no discernible effect on employees' ability to

empathise (Homburg, Wieseke, & Bornemann, 2009). In other words, because of training that provides programmed information on how to fix the customer's problem, workers are unable to empathise with consumers. This is why the consumer senses an injustice, as the employee is incapable of understanding and empathising with them. The organization's training programme demonstrates a lack of empathy for and resolution of consumer complaints or issues (Yani-de-Soriano, et al., 2019). Acquiring knowledge enables employees to be more responsive inside the organisation (Qureshi, 2019). Based on the literature, the following hypotheses were developed.

H1: Knowledge will have a positive effect on reliability.
H2: Knowledge will have a positive effect on assurance.
H3: Knowledge will have a positive effect on tangibles.
H4: Knowledge will have a positive effect on empathy.
H5: Knowledge will have a positive effect on responsiveness.

Skills (Know-how) represent Durand as the second dimension. According to Durand, know-how *"is action (taking place in the form of the various learning mechanisms) which transforms the potential competence, not yet demonstrated, into reality"* (Durand, 1998, p. 325). Thus, knowledge is action-oriented, necessitating the development of skills and procedures through repetition and practise (Durand, 2000). The know-how dimension is concerned with the acquisition of a skill - or the capacity to behave or perform a task in a particular way. According to Argyris & Schon (1992), our capability permits us to perform effectively. Evers, Rush, and Berdow (1998) demonstrate the importance of skill in the competence equation, even going so far as to define "competency" as an individual's capacity to execute with skill. The purpose of this study is to analyse how individuals develop their talents via the lens of the Model. Instructional companionship, pre-existing abilities, and experience learning are the three elements of know-how.

Employees' lack of competence decreases their customers' trust in them and their contribution to the organization's competencies (Aldubayan, Aljuraiban, & Aldisi, 2019). When employees are unable to keep their pledge to provide services on time, they continue to lack service abilities, which has a bad effect on the customer's perception of their reliability (Sharifabad et al., 2019). Thus, it is vital to enhance employees' abilities to build trust between the consumer and the employee (Garrubba & Yap, 2019). The organization's current physical appearance and physical facilities should be upgraded on a regular basis (Pakurár, Haddad, Nagy, Popp, & Oláh, 2019). The ability of employees to pay attention to client attitudes and thoughts indicates a strong correlation between employee competency and empathy (Sharifabad et al., 2019). Employees develop specialised talents that enable them to execute and respond swiftly to consumer requests (Harcourt & Ateke, 2018). Based on the literature, the following hypotheses were developed.

H6: Skills will have a positive effect on reliability.
H7: Skills will have a positive effect on assurance.
H8: Skills will have a positive effect on tangibles.
H9: Skills will have a positive effect on empathy.
H10: Skills will have a positive effect on responsiveness.

Durand (2000) contends that most of the research on competency has overlooked the effect of attitudes that favour other characteristics. Additionally, the author believes that contemporary competence theory may have placed too much emphasis on cognitive abilities and not enough on the cultural components of the organisational milieu. The author said, "Culture has a critical role in promoting or eroding competence" (Durand, 1998). In a broad sense, Durand (1998, pp. 324) states that attitudes *"are shaped through interaction when individuals conform to the group or organizational behaviour, adopt the same cultural values, and share the same basic commitments."* The body of knowledge regarding the impact of attitudes (including the components of companionship, self-identity, and learning by sharing) on the field of competency development is substantial and suggests a compelling case for this dimension of Durand's Model. The impact of culture (whether at the organisational level or within the immediate workgroup) cannot be underestimated as a dynamic and influential force influencing the individual.

Bennis and Nanus (1985) coined the term "social architecture" to refer to the web of social ties and meaning-making scenarios through which individuals comprehend an organisation. This is consistent with Durand's view of the critical function of social interaction in shaping behaviour. According to Bennis and Nanus (1985), culture exerts such a strong and pervasive influence on individuals that it frequently overcomes the ability of individuals to change their behaviour. Hamel (1998) emphasised the importance of cultural factors inside an organisation, stating that they affect both individual knowledge transmission and interpersonal communication. Hamel (1998) also investigated the role of organisational culture in members' comprehension of shared knowledge. Individuals will perform better, according to Fletcher (1995), if the corporate culture encourages them. Schein (2010) showed that as individuals' mental models, thinking processes, and learning styles become more aligned with their workgroup, they get ingrained in the corporate culture. Tobin (1998) emphasised the need of building a learning culture that promotes constant personal knowledge and ability improvement. The three components of attitude are social companionship, self-identity, and learning through sharing. As a result, an attitude problem may jeopardise the reliability of a high-quality service (Rainnie & Dean, 2009). Employee confidence and the company's favourable reputation among its consumers are affected by employees' trust in giving correct information (Ahmad, Ong, Liew, & Norhashim, 2019). Employees must be instructed to maintain a nice demeanour when dealing with consumers, as they are representing the organisation when providing services to them (Pakurár, Haddad, Nagy, Popp, & Oláh, 2019). Attitudes can be improved as an

employee develops empathy, which benefits the organisation because the person's behaviour improves because of the organisation (Tian & Robertson, 2019). When an employee is dealing with a customer's demand, their cheerful attitude helps them empathise more effectively (Balamurugan & Nivetha, 2018). Employees must be instructed to maintain a nice demeanour when dealing with consumers, as they are representing the organisation when providing services to them (Pakurár, Haddad, Nagy, Popp, & Oláh, 2019). Attitudes can be improved as an employee develops empathy, which benefits the organisation because the person's behaviour improves because of the organisation (Tian & Robertson, 2019). When an employee is dealing with a customer's demand, their cheerful attitude helps them empathise more effectively (Balamurugan & Nivetha, 2018). Based on the literature, the following hypotheses were developed.

H11: Attitude will have a positive effect on reliability.
H12: Attitude will have a positive effect on assurance.
H13: Attitude will have a positive effect on tangibles.
H14: Attitude will have a positive effect on empathy.
H15: Attitude will have a positive effect on responsiveness.

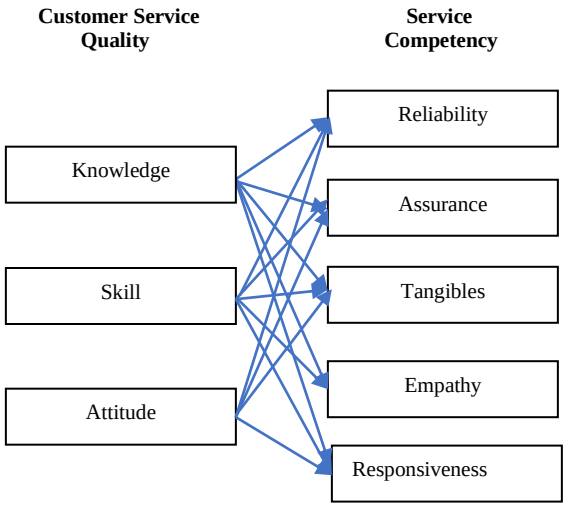

Fig.1. Conceptual framework

5. Methodology

The data for this study were gathered from tour guides in Peninsular Malaysia's central and southern regions. This research employed a quantitative approach, in which a questionnaire was used to elicit data for the study. The data collected were subjected to descriptive and regression analysis.

5.1 Research Instrument

To elicit information from respondents, a questionnaire-based survey was used. Section A, Section B, and Section C compose the questionnaire. Section A elicited demographic information on respondents, including their age, gender, marital status, religion, level of education, level of income, state of residence, number of years of job experience, and badge category. Part B included a question about the competency variable, which includes knowledge, competence, and attitude. Part C focused on service quality and included questions about accountability, assurance, tangibles, empathy, and responsiveness. The questionnaire used the Five Point Likert Scale to assess the respondent's degree of agreement on a scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree) (Strongly Agree).

The instruments for competencies were derived from Durand (1998) and consist of nine (9) sub-components, with the researcher developing the items through a four-stage process. KSA was initially identified and operationalized through a survey of the scientific literature on the construct. The instrument consisted of five-point Likert-type items derived from an existing instrument or invented by the researcher. The instruments were validated by peer evaluation during pilot research, and their reliability was determined using the internal consistency approach. Additionally, item analysis was used to eliminate weak items. The third stage entails attempting to ascertain a representative sample of current respondent competencies in this study. The instruments of competencies are shown in Table 2.

Table 2. Competencies construct & sub constructs

Knowledge	Formal training
	Existing knowledge base
	Learning by learning
Know-How (Skill)	Instructional companionship
	Existing skill
	Learning by doing
Attitude	Social companionship
	Self-identity
	Learning by sharing

The instruments used to assess service quality were adapted from Parasuraman, A., Zeithaml, V. A., and Berry, L. L. (1988). They consist of five (5) constructs, each of which contains 4-5 items. Some of the items used to determine reliability include the following: 'I will provide quality services as promised,' 'I know how to respond to customers' inquiries,' 'I am always dressed appropriately,' 'I understand customers' specific needs,' and 'I will provide prompt services to customers,' and so on. The data collection was coded and entered SPSS version 23.

5.2 Sample Size

According to Gorsuch (2014), the total sample size in the pilot study should not be less than 100 persons. According to Dermoot and Sarrela (1996) the total sample size in the pilot test should not be less than 20 people. Rather than that, MacCallum et al. (1999) proposed that the appropriate number of participants in the pilot study should exceed 100. According to Forza (2002), fifteen people. Hair et al. (2003) limited the sample size to 5-30 persons. As a result, the sample size of 30 is sufficient for this investigation. This data was gathered using simple random sampling.

6. Results and Findings

According to Konting (1993) and Darusalam & Hussin (2016), the allowable coefficients are more than a =>. Whereas Nunally (1978) suggests that the 'Cronbach Alpha' score should be greater than a =>. 70 to be considered acceptable. The interpretation of Cronbach alpha (a) correlation coefficients is as follows:

0.00 to + 1.00 = basically (Lyman, 1986)
.60 to .70 = Satisfied (satisfied coefficients)
.70 to .80 = Stability (stability coefficients)
.80 to .90 = Customary coefficients
.90 to .95 = Adequate coefficients (Gall, Borg, & Gall, 1996)
.80 to .90 = Acceptable reliability
.90 to + 1.00 = Very good reliability (Vierra & Pollock, 1992)
.95 to + 1.00 = Uniformity of internal consistency accepted (acceptable standardized test for internal consistency (Kubiszyn & Borich, 1993)

A pilot study or pilot test was conducted by taking a sample of n = 30, as shown in Table 3. the findings of the pilot test study show from the aspect; 'Formal training' alpha value is α = .671, which indicates the degree of reliability of the sample to the items is 67.1 percent (.671 x 100), based on the Cronbach alpha index value (a) correlation coefficients above, then the alpha value α = .671 means satisfied coefficients according to Gall, Borg, & Gall (1996). Similarly, the aspect of 'Existing Knowledge Base' alpha value is α = .939, which indicates the degree of reliability of the sample to the items is 93.9 percent (.939 x 100) based on the Cronbach alpha index value (a) correlation coefficients above, then the alpha value α = .937 means outstanding reliability according to Vierra & Pollock (1992). Learning by learning alpha value is α = .636, which indicates the degree of reliability of the sample to the items is 63.6 percent (.636 x 100) based on the Cronbach alpha index value (a) correlation coefficients above, then the alpha value α = .671 brings meaning satisfied coefficients according to Gall, Borg, & Gall (1996).

Instructional companionship alpha value is α = .927, which indicates the degree of reliability of the sample to the items is 92.7 percent (.927 x 100), based on the Cronbach alpha index value (a) correlation coefficients above. The alpha value α = .927 brings excellent meaning reliability, according to Vierra & Pollock (1992). The existing skills alpha value is α = .682, which indicates the degree of reliability of the sample to the items is 68.2 percent (.682 x 100) based on the Cronbach alpha index value (a) correlation coefficients above, then the alpha value α = .671 means satisfied coefficients according to Gall, Borg, & Gall (1996). Learning by doing alpha value is α = .754, which indicates the degree of reliability of the sample to the items is 75.4 percent (.754 x 100), based on the Cronbach alpha index value (a) correlation coefficients above, then the alpha value α = .754 carries the meaning of stability coefficients according to Gall, Borg, & Gall (1996).

Table 3. Cronbach Alpha item value

Section	Statement	Item	*Correlation coefficient Cronbach* α
Knowledge	Formal training	1 - 6	.671
	Existing Knowledge Base	7 - 12	.939
	Learning by learning	13 - 17	.636
Know How (skills)	Instructional companionship	18 - 23	.927
	Existing sklills	24 - 28	.682
	Learning by doing	29 - 33	.754
Attitude	Sosial companionship	34 - 39	.895
	Self - identity	40 - 44	.951
	Learning by sharing	45 - 49	.813
Service quality	Reliability	1 – 5	.926
	Assurance	6 - 9	.837
	Tangibles	10 - 13	.637
	Empathy	14 - 17	.837
	Responsiveness	18 – 21	.861

Social companionship alpha value is α = .895, which indicates the degree of reliability of the sample to the items is 89.5 percent (.895 x 100), based on the Cronbach alpha index value (a) correlation coefficients above, then the alpha value α = .895 brings meaning; customary coefficients or sufficient coefficients according to Gall, Borg, & Gall (1996). The self-identity alpha value is α = .951, which indicates the degree of reliability of the sample to the items is 95.1 percent (.951 x 100), based on the Cronbach alpha index value (a) correlation coefficients above. The alpha value α = .951 carries the meaning of outstanding reliability, according to Vierra & Pollock (1992). Learning by sharing the alpha value is α = .813, which indicates the degree of reliability of the sample on the items is 81.3 percent (.813 x 100), based on the Cronbach alpha index value (a) correlation coefficients above, then the alpha value α = .813 means; customary coefficients or sufficient coefficients (Gall, Borg, & Gall, 1996).

The reliability of the alpha value is α = .926, which indicates the degree of reliability of the sample to the

items is 92.6 percent (.926 x 100), based on the Cronbach alpha index value (a) correlation coefficients above, then the alpha value α = .926 means outstanding reliability (Vierra & Pollock, 1992). Assurance of alpha value is α = .837, which indicates the degree of reliability of the sample to the items is 83.7 percent (.837 x 100), based on the Cronbach alpha index value (a) correlation coefficients above, then alpha value α = .837 means; customary coefficients or sufficient coefficients (Gall, Borg, & Gall, 1996). Tangibles alpha value is α = .637, which indicates the degree of reliability of the sample to the items is 63.7 percent (.637 x 100) based on the Cronbach alpha index value (a) correlation coefficients above, then the alpha value α = .671 means satisfied coefficients (Gall, Borg, & Gall, 1996). Empathy alpha value is α = .837, which indicates the degree of reliability of the sample to the items is 83.7 percent (.837 x 100), based on the Cronbach alpha index value (a) correlation coefficients above, then the alpha value α = .837 means; customary coefficients or sufficient coefficients (Gall, Borg, & Gall, 1996). Responsiveness alpha value is α = .861, which indicates the degree of reliability of the sample to the items is 86.1 percent (.861 x 100), based on the Cronbach alpha index value (a) correlation coefficients above, then the alpha value α = .861 means; customary coefficients or sufficient coefficients (Gall, Borg, & Gall, 1996).

7. Conclusion and Future Research

The previous study has emphasised the critical nature of customer service competencies, including knowledge, skills, and attitude, in terms of service quality, measured in terms of reliability, assurance, tangibles, empathy, and responsiveness. This study attempts to shed light on its variables. As a result, it is anticipated that many these variables will be significant. Additionally, this article might be expanded to include different sorts of respondents, such as travel agents, managers, and business owners in the tourism industry, as there is a dearth of research on travel agencies. This research is expected to add to the body of knowledge by expanding the body of literature on customer service competency in the tourism industry context. The research is significant in that it aims to improve and contribute to educational institutions where students need to learn about customer service tasks relevant to their knowledge, abilities, and attitudes. The anticipated contribution of this study to the literature on competency, specifically customer service competency from a tourism perspective, will contribute to a deeper understanding of the relationship between travel agencies and the tourism industry, which is currently lacking, particularly in the Malaysian context. Additionally, this discovery will contribute to future studies on a bigger scale. Thus, the customer service competency model produced in this research can serve as a reference for future research in which other researchers can adapt the Conceptual Model developed in this research to the Malaysian context in general and more advanced to Asian or even Western contexts.

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Attainment of The Program's Educational Objectives (PEO) among Community College Students in The Field of Civil Engineering & Built Environment as Semi-Skilled Workers

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Abstract

Program Educational Objectives (PEO) are required for every academic program to describe and represent the program's objectives. Outcome-based education (OBE) requires that PEOs be enhanced in an integrated manner with the involvement of stakeholders to address the demands and requirements of the programme in response to current obstacles and challenges. Furthermore, required is a link between the updated PEOs and the objectives of the Jabatan Pendidikan Politeknik & Kolej Komuniti (JPPKK). Each redesigned program must create several PEOs statements that refer to the five clusters of Malaysian Qualification Framework 2.0 (MQF 2.0) learning outcomes and an MQF 2.0 level descriptor. Analyzing PEOs accomplishments to determine whether they were met or not depends on the department's Key Performance Indicator (KPI). To evaluate community college graduates' contributions to society and industry within four to five years of graduation, this study measures PEO's achievement of community college graduates in the field of construction. In this study, questionnaires are used in a survey design using a quantitative approach. A simple random sample method was used to choose 356 graduates from three civil engineering & built environment study programs that were available in Kolej Komuniti, Malaysia. The three PEOs that have been established are mentioned in the questionnaire item. The findings for PEO1, PEO2, and PEO3's successes in producing knowledgeable, skilled workers and entrepreneurs in the construction industry are discussed in this research article. The study's data findings demonstrate that all of its objectives were met, with a mean score above the KPI target of 3.80 and a high degree of program objective attainment measurement. The results of this study have implications for improving the quality of study programs available to fulfill the needs of the global labour market and cutting-edge technology, according to respondents who submit comments. This paper deserves consideration because it is a pilot research project for community colleges looking at graduate achievement within the specified time frame. Additional research can be conducted using the educational goals of other programmes to observe graduates holistically in accordance with their vision and mission, particularly those of Kolej Komuniti, Malaysia.

Keywords: - Program Educational Objectives, community college, Civil Engineering & Built Environment

1. Introduction

As the primary criterion for evaluating programs created for certification under Levels 3–6, MQA has modified outcome-based education. The five learning outcome clusters listed in the Malaysian Qualification Framework 2.0 are referenced in the PEO statement (MQF 2.0). The PEOs stated expectations for graduates' performance three to five years following graduation.

PEO emphasizes the expectations of students and their capacity to comprehend what must be done when they graduate from the program. PEOs assessed as a percentage of predicted success. PEO will be evaluated 3 to 5 years after graduates have finished their education.

After graduating from the program, PEOs are evaluated based on their present employment, graduate vertical advancement in the industry, and research done with higher education in Malaysia or overseas (Zainal, 2009).

The main goal of core domain courses should be to prepare students with a thorough understanding of fundamental concepts in the domain as well as modern skills needed by industry, with plenty of opportunities for students to work hands-on and complete design projects.

1.1 Background of The Research

The purpose of this study was to assess the success of a certificate programme in civil engineering field offered by a community college. Others than that, the goal of this study is to evaluate the PEO program's performance in producing graduates who meet both national and industry needs. In addition, as a result of the study's findings and reporting, a continuous quality improvement (CQI) effort and monitoring are being carried out to improve the program's implementation.

The Curriculum Division, *Jabatan Pendidikan Politeknik and Kolej Komuniti* (JPPKK) has also established a performance-based improvement plan linked to the goal and suitability of the strategic plan and/or improvement plan in raising the standard of higher education. The following are the objectives of this study on PEO achievement measurement:

i. Identifying the level of programme goal achievement (PEO 1) of graduates of the community college certificate programme in civil engineering and built environment;
ii. Identifying the level of programme goal achievement (PEO 2) of graduates of the community college certificate programme in civil engineering and built environment;
iii. Identifying the level of programme goal achievement (PEO 3) of graduates of the community college certificate programme in civil engineering and built environment; and
iv. Evaluating the overall level of programme objective attainment (PEO) for community college students who have completed the certificate programme in civil engineering and built environment.

2. Literature Review

The objectives and outcomes of the recommended education handbook are typically used to evaluate the accreditation of a program that is being designed. According to Puteh et al. (2009), any program established will result in graduates who have certain skills and capacities to suit the needs of stakeholders.

Every program must also have a plan for ongoing evaluations that includes recorded studies for program improvement. OBE adoption becomes a crucial pillar, and Malaysian education has grown stronger as a result. According to (Chowdhury, 2013), curriculum is one of the most important aspects of educational development, and it must be carefully planned and coordinated with what industry and academia require right now.

2.1 Curriculum Design and The Relationship Between Vision, Mission, and PEO

Any certificate program at a community college should focus on three main areas: determining the direction of TVET (technical and vocational education and training), the evaluation process (assessment), and continuous quality improvement (CQI). For instance, short-term and long-term aims are two of the goals that are set. The goal is students attain the essential proficiency after the program. The students able to pursue further education and employment after graduation. While the long-term target is purposefully set to require alumni to acquire particular competencies after three to five graduation years, the short-term targets aim to have students attain the essential proficiency after the program. Complementary and linked Program Educational Objective Targets (PEO) serve stakeholders' needs. It's important to assess and gauge the goals and results. PEO has a clear objective that is consistent with higher education institutions' vision and mission and that responds to expressed objectives from program stakeholders who describe what graduates should accomplish in their careers and professional lives three to five years after graduating. Standards for a good PEO comprise specific, unambiguous, quantifiable, doable, results-oriented, and time-bound elements (Shivakumar, 2015).

Each program determines its criteria to continuously monitor the academic progress of its graduates by measuring and evaluating it at various stages and through various exams throughout the program. PEOs integrate information and skills to be completed by graduates who meet a set of standard requirements to be semi-skilled workers or entrepreneurs in the sector. A clear path to outcome program (PO) and curriculum design should also be available to PEOs. All flaws must be remedied gradually using sound CQI planning.

2.2 PEO Statement

PEO is an overall mandate that describes what graduates ought to do for a number of years (often three to five years and beyond) following graduation, once they have completely engaged themselves in their chosen careers. Establishment PEOs are developed based on the requirements of the program, the stakeholders, and their expectations. PEOs are occasionally regarded as a peculiar quality that distinguishes the graduates of a specific institution from those of other universities. Sustainability, leadership, ethics, lifelong learning, Malaysia's goals, economic growth, efficiency, and entrepreneurship are some of the things that PEO statements often talk about. According to Abet (2009), instead of having a fixed domain, an institution's PEO statement should be determined by the institution itself through a methodical and structured process. For example, all PEOs must be written down, shared, and made known to all relevant people, institutions, and parties. Rashid (2012) recommends mapping the relationship between the PEO and the institution's mission using a matrix structure.

The institute's vision and goals are fixed for a set period of time, but PEOs are more adaptable and must be revised every three to five years after stakeholders have been consulted. It is also critical to ensure that the PEO statement's domain is relevant and consistent with its vision and goal. Annual meetings with stakeholders are planned, and meeting minutes must include the outcome of the debate. More stakeholders are preferable in an important area that represents the interests of many different groups.

The domain statement is an important part of every PEO because it sets the direction and future course of the program. Additionally, MQA advises that domains should be consistent with the current PO, but they are not limited to the mentioned framework. Moreover, the domain for PEOs needs to be timely, detailed, measurable, reachable, and reasonable. A PEO assessment is carried out through the evaluation of findings based on objective evidence.

PEOs are created and revised using a variety of methods, including employer questionnaires, industry training input, industry panel meetings, and alumni surveys (Juwairiyah A. R., 2016) As an illustration, one of the efficient technique for gauging the opinions of external stakeholders and employers is the evaluation of PEO statements using a five-level Likert scale. According to the questionnaire about PEO, the replies ranged from "irrelevant" to "extremely important" (Abdullah et al., 2008).

3. Methodology

3.1 Research Design

The methodology of this study is quantitative and uses a survey format. Quantitative techniques use descriptive analysis since this study can clarify anything by looking at numerous components and aspects.

3.2 Population and Sample

The sample size is controlled by the degree of confidence, the margin of acceptance of error, the types of statistical analyses and the total estimate of the population as most social science studies researchers assumed that the population attributes are about 3% ~ 5% margin error at 95% confidence level as referring to Table 1 (Krejcie & Morgan, 1970).

Table 1. Determination of sample size from known population (Krejcie & Morgan, 1970)

Population (n)	Sample (s)	Population (n)	Sample (s)	Population (n)	Sample (s)
10	10	220	140	1200	291
15	14	230	144	1300	297
20	19	240	148	1400	302
25	24	250	152	1500	306
30	28	260	155	1600	310
35	32	270	159	1700	313
40	36	280	162	1800	317
45	40	290	165	1900	320
50	44	300	169	2000	322
55	48	320	175	2200	327
60	52	340	181	2400	331
65	56	360	186	2600	335
70	59	380	191	2800	338
75	63	400	196	3000	341
80	66	420	201	3500	346
85	70	440	205	4000	351
90	73	460	210	4500	354
95	76	480	214	5000	357
100	80	500	217	6000	361
110	86	550	226	7000	364
120	92	600	234	8000	367
130	97	650	242	9000	368
140	103	700	248	10 000	370
150	108	750	254	15 000	375
160	113	800	260	20 000	377
170	118	850	265	30 000	379
180	123	900	269	40 000	380
190	127	950	274	50 000	381
200	132	1000	278	75 000	382
210	136	1100	285	1 000 000	384

The selection of the research sample is based to population of community college graduates in the fields of civil engineering and the built environment who graduated between 2014 and 2018. The sample for this study consisted of 365.

3.3 Instrument

The study's instrument was a collection of questionnaires that a group of specialists from polytechnics, community colleges, and public universities created. The questionnaire items were changed to make sure that the instrument would measure what it was supposed to measure in this study.

According to Price et al. (2015), validity refers to the degree to which the measurement scores that come from an instrument (questionnaire) reflect the variable to which they aim. Besides that, validity is the ability of an instrument to measure what it is designed to measure (Kumar, 2011). Meanwhile, Sekaran (2003) defined reliability is a testing, or measurement to illustrate on what degree it is without prejudice and accurately measured over

time and at some other point in time. In other words, the answer should not change over time to ensure that any measurement is correct at any point in time. If a measurement has strong test-retest reliability and internal consistency, the researchers should be more confident that the results indicate what they are supposed to be (Hair et al., 2010).

A Likert scale is used to evaluate this research tool. Pandey & Pandey (2015) suggested that the distribution of sample attitudes can be represented in the form of the distribution of frequencies on a specific subject. The employed Likert scales are 1 - Strongly disagree; 2 - Do not agree; 3- Not sure; 4 – Agreed; 5 - Strongly agree.

This research tool is split into two sections.

a. Section A

Respondents' demographic profile includes gender, race, employment status, age, career field, year of job experience, and monthly income.

b. Section B

PEO opinions from community college graduates with a focus on civil engineering and the built environment (Refer to Table 2)

Table 2. Item of research

PEO	Sample Measurement Items
PEO 1: Knowledgeable and technically adept in the areas of building upkeep, construction technology, site supervision, and furniture design by standards set by the industry	Q1: Experts in their field of study and ready to meet the needs of the field
	Q2: Able to address issues involving knowledge from the topic of study
	Q3: Possess technical expertise in the topic of study
PEO 2: Capable of solving problems, communicating well, being committed, and having good ethics to provide good services in an organization	Q4: Critical thinking skills for problem-solving
	Q5: Effectively communicate in a work context
	Q6: Always adhere to ethics, morals, and relevant rules in completing assignments and providing services
PEO 3: Able to pursue a career in business through entrepreneurship and other forms of continuous learning	Q7: Utilizing entrepreneurial abilities on the job
	Q8: Willing to enrol in higher education to further their education and keep current with market trends
	Q9: Capable of managing a team in an industrial setting

3.4 Population and Sample

To facilitate data collection, this research instrument was distributed to respondents via Google Forms. The data collected after the respondents completed the questionnaire was used to assess the reliability of the research tool in this study. A pilot test will be performed before the actual survey. The questionnaires were structured and designed to avoid confusions in the easiest way possible. The expert studied the questions in this area and went through multiple clarification rounds to achieve greater clarity and prevent misinterpretation of the questions. Since the questionnaires did not identify individual companies or goods, a framework was provided to direct the respondents towards the survey's objectives. The aim of doing so was to ensure that respondents were able to fully interpret the questions and provide the expected answers. It has defined and developed ambiguous words and questions for better comprehension. A pilot test will be conducted using 50 sets of questionnaires and will be distributing for the validity analysis purpose and reliability test was conducted by SPSS version 26.0 software.

Cronbach's Alpha is the most commonly used measure of consistency reliability (Sekaran, 2003; Hair et al., 2010). Cronbach's Alpha coefficient is essential for measuring multipoint-scaled products, as shown in Table 2. The higher the coefficients, the better the reliability. Cronbach's Alpha is widely used because questionnaires contained several Likert-type items that were aggregated to form a composite ranking (Leech et al., 2015).

Cronbach's Alpha was the average correlation of an item on the scale with others (Price et al., 2015). A reliability coefficient of 0.70 or higher is considered good in social science research (Zikmund et al., 2013). According to Andale (2014), a high Cronbach's Alpha value indicates that the questions are redundant. A low Cronbach's Alpha value, on the other hand, may indicate a lack of test questions.

Table 3. Cronbach's Alpha coefficient range

Cronbach's Alpha value	Internal Consistent
> 0.9	Excellent
0.80 to 0.90	Very good
0.70 to 0.80	Good
0.60 to 0.70	Fair/ Moderate
< 0.60	Poor

4. Results

4.1 Demographics

Gender, race, employment status, age, career field, year of job experience, and monthly income are among the demographic information provided by respondents. The following information is summarised in Table 4.

Table 4. Respondents' demographic profile

Demographic Variables	Frequency (N)	Per cent (%)
Gender		
Male	250	68.5
Female	115	31.5
Race		
Malay	195	73.6
Chinese	15	5.7
Indian	20	7.5
Others	35	13.2
Status of work		
Employed	313	85.8
Further study	35	9.6
Unemployed	17	4.7
Age		
21 - 25 years	280	76.7
26 - 30 years	85	23.3
31 - 35 years	0	0.0
> 35 years	0	0.0
Work in field		
Yes	278	76.2
No	87	23.8
Working experience		
< 1 year	67	18.4
1 - 2 years	245	67.1
> 2 years	53	14.5
Monthly income		
< RM 1,000.00	98	26.8
RM 1,000.00 - RM 2,000.00	198	54.2
> RM 2,000.00	69	18.9
Working experience		
< 1 year	67	18.4
1 - 2 years	245	67.1
> 2 years	53	14.5
Monthly income		
< RM 1,000.00	98	26.8
RM 1,000.00 - RM 2,000.00	198	54.2
> RM 2,000.00	69	18.9

According to the study's findings, 85.8% of graduates have jobs, 9.6% are pursuing further education, and only 4.7% are still looking for work. Even though most graduates work in civil engineering or built environment, only 23.8% of graduates do not work in those fields. 18.9% of graduates earn RM 2,000 or more per month on average.

4.2 Descriptive Analysis

a) Data Analysis

Descriptive statistical analysis describes the data as it is analysed without drawing broad generalisations or conclusions. The data were analysed using the Statistical Package for the Social Sciences. Using this software, the researcher applies the data gathered for the description in the form of frequency, percentage, and mean score. The obtained data were analysed using descriptive statistics. The interpretation from Zaihan and Hilmun (2016) in Table 5 will be used to interpret the mean score analysis.

Table 5. Mean score interpretation (Zaihan & Hilmu, 2016)

Mean score	Interpretation
1.00 – 1.89	Poor
1.90 – 2.69	Fair/ Moderate
2.70 – 3.49	Good
3.50 – 4.29	Very good
4.30 – 5.00	Excellent

b) Reliability Test

The consistency of a scale can be determined using the reliability test. The Cronbach's Alpha coefficient (α) is used to measure consistency. Cronbach's Alpha coefficients on a scale are considered acceptable if they are greater than 0.6. (Zikmund et al., 2010). The scales used in this study passed the reliability test with a score greater than 0.6, indicating that they are more consistent and reliable. Table 6 summarises the reliability test.

Table 6. Cronbach's Alpha coefficient range (N=365)

Variables	No. of Items	Coefficient Alpha (α)
PEO	9	.837

Table 6 shows that this questionnaire instrument has strong internal consistency because it measures the overall accomplishment level of the Community College Certificate study programme in the subject of civil engineering and built environment with a value =.837.

4.4 PEO's Inference Statistics

a) PEO 1

PEO 1 of this study's research instrument consists of three question items. Table 7 shows the mean score and standard deviation for PEO 1.

Table 7. The mean score for PEO 1 (N=365)

No. of Item	Item Statement	Mean	SD
Q1	Experts in their field of study and ready to meet the needs of the field	4.14	.618
Q2	Able to address issues involving knowledge from the topic of study	4.25	.578
Q3	Possess technical expertise in the topic of study	4.41	.530

According to Table 7, the mean value of question item Q1 is 4.41, with a standard deviation of.618. The Q2 data, on the other hand, show a mean score of 4.25 and a standard deviation of.578. The average Q3 score is 4.41, with a standard deviation of .530. This shown the extremely high level of achievement of respondents in PEO 1.

b) PEO 2

The following three PEO 2 question items focus on the respondent's soft skills, such as communication and social responsibility. Table 8 shows the mean score and standard deviation for PEO 2.

Table 8 shows that the mean Q4 score is 4.29, with a standard deviation of.502. The mean score for Q5 was 4.31, with a standard deviation of .508. In comparison, the Q6 mean mark data is 4.37 with a .517 standard deviation. According to the mean mark data for the three items in this question, the respondents have a very high level of PEO 2 achievement.

Table 8. The mean score for PEO 2 (N=365)

No. of Item	Item Statement	Mean	SD
Q4	Critical thinking skills for problem-solving	4.29	.502
Q5	Effectively communicate in a work context	4.31	.508
Q6	Always adhere to ethics, morals, and relevant rules in completing assignments and providing services	4.37	.517

c) PEO 3

PEO 3 also includes three question items that assess respondents' soft skills using a lifelong learning approach. Table 9 shows the mean score and standard deviation for PEO 3.

Table 9 shows that the average S7 score is 4.14, with a standard deviation of .611. Following that, the S8 mean score is 4.28 with a standard deviation of .901. S9 has a standard deviation of .569 and a mean score of 4.31. The mean score data show that PEO 3 has achieved a lot.

Table 9. The mean score for PEO 3 (N=365)

No. of Item	Item Statement	Mean	SD
Q7	Utilizing entrepreneurial abilities on the job	4.14	.611
Q8	Willing to enrol in higher education to further their education and keep current with market trends	4.28	.901
Q9	Capable of managing a team in an industrial setting	4.31	.569

d) Overall Attainment of PEOs

The data analysis for the overall mean score for the three PEOs in this study shows that the respondents' level of achievement for PEO 1 to PEO 3 is high.

Table 10. The mean score for PEOs (N=365)

PEO	Item Statement	Mean	SD
1	Knowledgeable and technically adept in the areas of building upkeep, construction technology, site supervision, and furniture design following standards set by the industry	4.34	.575
2	Capable of solving problems, communicating well, being committed, and having good ethics to provide good services in an organization	4.33	.509
3	Able to pursue a career in business through entrepreneurship and other forms of continuous learning	4.24	.694
	Overall Mean Score	**4.30**	**.593**

Respondents who completed a certificate programme in civil engineering and built environment at a community college can be said to have achieved a very high level of programme objective achievement, with a mean score of 4.30 and a standard deviation of .539. As a result, the results of this data analysis met the JPPKK's target KPI for measuring the study's PEO achievement, which is a mean mark value of 3.80. Graduates of community college's Civil Engineering and Built Environment Program have demonstrated high levels of achievement in the program's operational and educational objectives.

5. Conclusion

In general, the study's data findings show that all study objectives were met with a mean score higher than the 3.80 KPI target and that programme objective achievement assessment was high (PEO). This is consistent with the role of Community College as one of the institutions used by the Ministry of Higher Education to provide public TVET (KPT). Community colleges play an important role in meeting the training and skill needs of people of all ages, as well as in providing educational opportunities for high school graduates before they enter the labour force or continue their studies at a higher level. This shows how JPPKK prioritised a balance between the application and evaluation of skills and curriculum when providing higher education services to graduates of the Community College Certificate programme in civil engineering and the built environment.

The findings of this analysis enable JPPKK and the institutions that host the programme to identify the necessary steps for improvement to ensure that the intended outcomes are met by the next graduating cohort. Of the possible improvement measures is a review or revision of the PEO statement, which can be coordinated at the department level. More Community College Certificate holders in civil engineering and built environment can be included in this study, increasing the number of respondents and allowing for a widening variety of opinions to be collected.

As a result, the study's findings are critical because graduates are one group that has the right to acquire information, practical abilities, and soft skills that will aid them in continuing their education at a community college.

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Factors Affecting the Acceptance of E-Learning Among Students Diploma in Finance and Banking, Polytechnic Metro Betong Sarawak

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Abstract

During the Covid 19 Pandemic, practically all educational institutions in Malaysia embraced the teaching and learning strategy known as e-learning. This study was conducted at Polytechnic Metro Betong Sarawak, namely in the Endemic Phase of Covid-19, to determine the factors influencing students' adoption of e-learning. 60 students from the Polytechnic Metro Betong Sarawak who were pursuing a Diploma in Banking and Finance made up the study's sample. A Google form-created questionnaire was the study's primary tool. To determine the mean score values and correlation values for this study question, SPSS V.22 software was used for analysis. The study question was disseminated using WhatsApp. The findings revealed that most students had owned a computer to access the internet for more than three years, had a fixed monthly network plan, and used cellphones for an average of more than three years. According to the data obtained, all students own smartphones, because they are a necessity and are in line with the latest technological developments. The results also showed that the students' acceptance level towards e-learning was high at 4.72. The results of the regression analysis of the relationship between six factors on E-Learning Acceptance Among Students, showed that there was not a single factor influencing students' acceptance of e-learning. While the relationship between the independent and dependent variables is significant. Useful response factors, user-friendly response factors, lecturer characteristics, technical support factors, system quality factors, and information quality factors are all interconnected and have an impact on one another. These results allow PMBS to plan for a future when e-learning can be applied more successfully.

Keywords: e-learning, student acceptance level, Polytechnic Metro Betong, Sarawak

1. Introduction

In the 1970s, electronic e-learning first appeared (Waller & Wilson, 2001). The terms "online learning," "Internet-based learning," "technology-based learning," "computer-based learning," "web-based learning," and "virtual learning" might occasionally refer to the same thing (Mishra, S 2009). Additionally, some people relate this concept of e-learning to Learning Management Systems (LMS) like Blackboard, WebCT, Moodle, MyGuru and MyLMs (Yusup, 2012).

According to Yusup (2012), E-learning is a blend of technology and pedagogy that stresses technology and media as a delivery mechanism in face-to-face or remote mode. These sorts of technology include computers, ROM CDs, electronic gadgets, and the Internet. While pedagogy deals with individual learning, networking learning, interactive learning, online learning, blended learning, face-to-face learning, remote learning, web-based learning, and computer-aided instruction. Currently, the primary instrument for e-learning is mobile learning, or mobile learning employing mobile learning equipment including mobile phones, computers, tablets, and other delivery methods. According to Sattarov & Khaitova (2020), Mobile techniques, methods, equipment, and production processes utilized by society to gather, store, process, and distribute information are employed to accomplish

educational objectives in a mobile learning environment. Wireless and information and communication technology

A new, more personalized, student-centered, pervasive, collaborative, and environment for lifelong learning is created by mobile technology (Sharples et al., 2005). To deliver, transfer, and facilitate the sharing of information more effectively, e-learning is used. Students can communicate online using tools like chat, "instant messaging," online forums, email, SMS, and MMS. However, the introduction of web 2.0 tools like Facebook, Twitter, Blogs, Instagram, WhatsApp, and WeChat has made them rivals to the Institute's Learning Management System (SPP).

Electronic learning has been implemented at the Polytechnic. The Polytechnic Education Department's Digital Instructional and Learning Division has established the Center of eLearning and Teaching in accordance with the National e-Learning Policy (CeLT). Through the Learning Management System (LMS) module of the CIDOS portal, Celt has developed a platform that enables professors and students to implement the teaching and learning process utilising e-learning. The benefit of employing LMS CIDOS is that periodic monitoring of students' access to the offered resources is possible.

The Internet has emerged as one of the key tools for instructors and students to share and access resources for learning and research (Hartshorne & Ajjan 2009). Technology-based e-learning uses the internet in conjunction with other significant technical resources to create learning materials, provide instructional materials, and source course content in businesses (Fry, 2001).

2. Methodology

Descriptive survey studies had been conducted by researchers utilizing pre-existing and redeveloped questionnaires. The questionnaire's structure is split into two parts: Part A (Respondent Information) and Part B. (Factors Influencing e-Learning Acceptance). Part A contains 7 items that contain personal information. 48 question items make up Part B, which is broken down into 6 categories relevant to the acceptability of e-learning, including (a) usefulness response elements, (b) usability response factors, (c) lecturer characteristics factors, and (d) technical support factors. (e) System Quality Factors, (f) Information Quality Factors.

For Part B (Factors influencing E-learning Acceptance) the study question was in the form of a Likert scale—strongly disagree, disagree, be uncertain, agree, and highly agree. Three levels of tendency are—low, medium, and high—are present for the mean score, according to Ghafar (2003). If the mean score value is 1.00 – 2.33 then the inclination level is low and the mean score of 2.34 – 3.66 is a moderate level. In addition, the mean score is 3.67 – 5.00 then the level of inclination is high.

3. Result and Discussion

3.1 Demographics Respondents

Table 1 summaries the respondents' backgrounds. The sample consisted of 60 students, of which 25% were male and 75% were female (75 per cent). Most of the students are in their first year of study (semester 1: 35 percent; and semester 2 26.7 percent). According to the research, most students (91.7%) had monthly fixed network plans and had used cellphones for more than three years (56.7 percent). The survey also revealed that up to 75% of people had a personal computer and internet connectivity. According to this data, practically all students today have access to phones and laptops because to the increasingly affordable technology advancements.

Table 1. Demographics of respondents

Item		*n*	%
Gender	Male	15	25.0
	Female	45	75.0
Semester	Semester 1	21	35.0
	Semester 2	16	26.7
	Semester 3	12	20.0
	Semester 4	2	3.3
	Semester 5	9	15.0
Since when did you start using a smartphone?	0-1 year	1	1.7
	1-2 years	1	1.7
	2-3 years	3	5.0
	More than 3 years	55	91.7
What internet plan do you use?	Prepaid	25	41.7
	Fixed network (monthly)	34	56.7
	No just using free from Wifi	1	1.7
Do you have your own computer that can access the internet?	No	15	25.0
	Yes	45	75.0

3.2 Level Of E-Learning Acceptance by Students in The Diploma in Banking and Finance

The amount of e-learning acceptability is displayed in Table 2. According to the research, the majority (85%) agreed with e-learning, with 13.3 % disagreeing. Even if some students are against online learning, that percentage is rather modest (1.7 per cent). The overall student acceptance rate is at a high of 4.72 percent. The study by Ngadiman et al. (2019) was used to determine the level based on the mean score.

Table 2. Diploma in Finance and Banking students' acceptance level of E-Learning

Items	Response	*N*	%	Total mean
Acceptance of E-Learning	No	1	1.7	4.72 (High)
	Not sure	8	13.3	
	Yes	51	85.0	

3.3 Factors Affecting E-Learning Acceptance Among Students

Table 3 displays the findings of the regression analysis of the association between the six criteria and students' acceptance of e-learning. As evidenced by the p-values obtained, which were ($p > 0.05$), the results demonstrated that there was no one element that affected students' acceptance of e-learning. All factors have p-values higher than 0.05.

3.4 The Relationship Between All Student E- Learning Acceptance Variables.

To ascertain the association between six parameters and the degree of student acceptance of e-learning, the study used Pearson's correlation analysis. According to the strength scale Davies proposed in Darusalam & Hussin (2016), the relationship strength in this study is evaluated in Table 4.

The results of the study in Table 5 show that independent variables have a significant relationship with dependent variables. Therefore, hypothesis 1: There is no relationship between all e-learning acceptance variables among students was rejected. Useful Response Factors, Easy-Use Response Factors, Lecturer Characteristics Factors, Technical Support Factors, System Quality Factors, and Information Quality Factors are mutually affecting each other. All significant level values or 'p' values are indicative of excellent results in a relationship. The value of 'p' does not exceed 0.05.

3.5 Discussion

3.5.1 Demographics Respondents

The findings revealed that most students utilize a monthly fixed network and have smartphones for longer than three years. Most students also have their own laptops for study. This information demonstrates that nearly all students have access to smartphones, computers, and other modern technology that are also becoming more and more affordable.

3.5.2 Level Of E-Learning Acceptance by Students In The Diploma In Banking And Finance

The findings indicated a high level of acceptance for online learning. According to the research, 85 percent of students agreed with e-learning, with 13.3 percent disagreeing. The overall student admission rate is at a high of 4.72 percent. The study by Ngadiman et al. (2019) is used to determine the level based on the mean score. This is because students have already experienced e-learning, especially when the Movement Control Order was in force. Even though face-to-face approaches have been used, this experience and expertise enables individuals to be more accepting of e-learning in their present learning and teaching process.

3.5.3 Factors Affecting E-Learning Acceptance Among Students

There was not a single element that affected students' acceptance of e-learning, according to the findings of the regression analysis of the relationship between six factors and acceptance among students. E-learning acceptability is not influenced by elements like useful response, easy-to-use response, lecturer characteristics, technical support, system quality, or information quality. This is because e-learning has become a crucial learning requirement, particularly in the education industry. This is supported by Yuliana (2020) in her study Analysis of the effectiveness of the use of e-learning as a medium of learning Islamic religious education during the Corona pandemic (Covid-19).

According to Radin & Yasin (2018). Implementation of 21st century education in Malaysia: An early survey. Findings from these studies show that local research focuses more on two domains of skills, namely creativity and communication, which is the use of information technology in teaching and learning.

The use of cellphones is becoming necessary for its students and consumers in today's digitally transformed world. Similar rules apply to laptops. In addition, Polytechnic Metro Betong in Sarawak offers its students access to its lab and online resources, which helps them accept e-learning. The provision of the Device by the Ministry of Communications and Multimedia Malaysia to all IPTA students has also encouraged the acceptance of e-learning among students.

3.5.4 The Relationship Between Students E- Learning Acceptance Variables and The Non-Dependent Variables

The results showed a significant relationship between leaning characteristics and all non-dependent variables. This null hypothesis was therefore disproved. There is a reciprocal relationship between the useful response factor, easy-to-use response factor, lecturer characteristics factor, technical support factor, system quality factor, and information quality factor.

Table 3. Analysis of Factors Affecting E-Learning Acceptance Among Students

Independent variables	Dependent variables	Standard Deviation	Beta	t-value	p-value	Sig
Useful Response Factors	Acceptance of e-Learning among Students	.243	-.343	-1.208	.232	No sig
Easy-Use Response Factors		.257	.318	.982	.331	No sig
Lecturer Characteristics Factors		.216	-.154	-.517	.608	No sig
Technical Support Factors		.193	-.032	-.118	.906	No sig
System Quality Factors		.260	.130	.426	.671	No sig
Information Quality Factors		.232	.440	1.533	.131	No sig

Table 4. Correlation coefficient value "r"

The value of the correlation coefficient "r"	Interpretation of the coefficient
1.00	Perfect
0.70 – 0.99	Very high
0.50 – 0.69	Strong
0.30 – 0.49	Simple
0.10 – 0.29	Low
0.01 – 0.09	Negligible

Table 5. Analysis of correlation between all E-Learning acceptance variables among students

		Useful Response Factors	Easy-Use Response Factors	Lecturer Characteristics Factors	Technical Support Factors	System Quality Factors	Information Quality Factors
Useful Response Factors	Pearson Correlation	1	.871**	.813**	.788**	.839**	.817**
	Sig. (2-tailed)		.000	.000	.000	.000	.000
	N	60	60	60	60	60	60
Easy-Use Response Factors	Pearson Correlation	.871**	1	.868**	.814**	.831**	.833**
	Sig. (2-tailed)	.000		.000	.000	.000	.000
	N	60	60	60	60	60	60
Lecturer Characteristics Factors	Pearson Correlation	.813**	.868**	1	.863**	.767**	.759**
	Sig. (2-tailed)	.000	.000		.000	.000	.000
	N	60	60	60	60	60	60
Technical Support Factors	Pearson Correlation	.788**	.814**	.863**	1	.792**	.761**
	Sig. (2-tailed)	.000	.000	.000		.000	.000
	N	60	60	60	60	60	60
System Quality Factors	Pearson Correlation	.839**	.831**	.767**	.792**	1	.884**
	Sig. (2-tailed)	.000	.000	.000	.000		.000
	N	60	60	60	60	60	60
Information Quality Factors	Pearson Correlation	.817**	.833**	.759**	.761**	.884**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	
	N	60	60	60	60	60	60

**. Correlation is significant at the 0.01 level (2-tailed).

4. Conclusion

Students enrolled in the Diploma in Banking and Finance are generally extremely well accepted online learning. This acceptance might have been sparked by internet capabilities, computer lab capabilities, and the availability of student gadgets. Students now must use e-learning as a crucial component of the teaching and learning process. However, in keeping with the rapid advancement of technology, other aspects that are also closely related to the acceptability of e-learning must also be considered.

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E-book Acceptance in DBC20012 Computer Application Classroom

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Abstract

Recently, e-book was used in conducting DBC20012 Computer Application course in Politeknik Ungku Omar. Their thought towards e-book usage is needed since they are the direct users who mostly use it for learning. Thus, the purpose of this study was to determine students' adoption of e-book in DBC20012 Computer Application classroom. The sample of this study was students who took DBC20012 Computer Application course at Politeknik Ungku Omar. The data was collected using questionnaire which contained 6 sections; demographic profile, behavioural intention, performance expectancy, social influence, effort expectancy and facilitating conditions. The data was analysed using descriptive statistic and correlation analysis. Result indicated that performance expectancy, social influence, effort expectancy and facilitating conditions influence the adoption of e-books. The findings of this study could help to improve DBC20012 Computer Application course delivery via e-book in accordance with the preferences and capabilities of students.

Keywords: - e-book, computer application

1. Introduction

The Covid- 19 pandemic affected many sectors, including education. It resulted in the physical closure of educational institutions. (Piramanayagam and Seal 2021). Changes in teaching and learning occurred. It was done online. At the same time, the learning material has been converted to digital learning material. One type of learning material is an e-book.

E-books were recently used in the DBC20012 Computer Application course at Politeknik Ungku Omar. It is a common core subject offered by Jabatan Perdagangan, Politeknik Ungku Omar for the Diploma in Banking and Finance, Diploma in Business Studies, and Diploma in Retail Management.

Therefore, this study was conducted to determine factors influencing the acceptance of e-book that is recently used in conducting DBC20012 Computer Application course. The effectiveness of educational activity is determined students' perception. The activity become more beneficial when students' perception about it become more positive (Manalu, 2019). Furthermore, it is hoped that this study will provide new insights into the effectiveness of e-books in students' learning styles.

The foundation of this research is Unified Theory of Acceptance and Use of Technology (UTAUT). It has been widely accepted that the UTAUT model contributes to better understanding about the acceptance and use of technologies rather than other similar theories (Dulle and Majanja, 2011).

In the UTAUT, there are four determinants of user acceptance and usage behaviour; performance expectancy (PE), effort expectancy (EE), social influence (SI), and facilitating conditions (FC) (Ventakesh et al., 2003). These determinants will influence the behavioural intentions (Maduku, 2015; Martins et al., 2018; Okocha, 2019; Lin, 2019; Gunawan et al., 2019; Primanayagam and Seal, 2021).

According to Okocha (2019), PE is the students' degree of believe that e-book will improve academic performance and the learning process become better. During the pandemic, the class is conducted online. Therefore, the students do not have an option for printed books or access to the library. They had to choose for e-books (Primanayagam and Seal, 2021).

SI is the influence of surrounding groups believe about the e-book usage (Venkatesh et al., 2003). Surrounding groups consist of peers, colleagues, and the media (Okocha, 2019). SI lead to the intention of usage. Abbad (2020) stated that SI is a significant determinant in the usage of new technology-based products and innovations in a study of hospitality students, e-book is considered to create suitable learning environment (Primanayagam and Seal, 2021).

According to Okocha (2019), EE is the degree of students believe that the adoption of e-books will be free of effort. Primanayagam and Seal (2021) in their study, considers the EE as students' level of expectation regarding easily understand their subject using e-book. This includes their effort to access the e-book compared to printed books.

According to Venkatesh et al. (2003), FC is the degree to which an individual believes that an organisational and technical infrastructure exists to support the use of the system. Primanayagam and Seal (2021) in their study stated that FC is the accessibility of e-books which are either freely downloadable from various websites or institutional support for providing e-books to the students.

Research by Hsu et al. (2017) and Okocha (2019) on electronic book adoption has shown that PE, EE, SI and FC influence the adoption of e-books.

However, these findings differed from Yoo and Roh (2016); Primanayagam and Seal (2021) study in which EE did not influence intention to adopt electronic books. Lin (2019) conducted a study on e-book usage at Fujian, China. Researcher stated that PE has no positive impact on users' intentions to use e-books. Although the e-books can improve user reading performance, the user does not necessarily more willing to use e-books. Lin (2019) also found that SI has no positive impact on users' intentions to use e-books. It can be interpreted that surrounding groups do not necessarily influenced user on e-book usage. While, EE and FC have significant influence on e-book usage intention. Therefore, the following hypotheses were developed:

H_1: Performance expectancy has positive effect on behavioural intention to use e-book.
H_2: Social influence has positive effect on behavioural intention to use e-book.
H_3: Effort expectancy has positive effect on behavioural intention to use e-book.
H_4: Facilitating conditions has positive effect on behavioural intention to use e-book.

2. Methodology

The respondent of this study consists of DBC20012 Computer Application students for Session II: 2021/2022. The questionnaires were distributed to 118 respondents using online mode. A total of 102 filled questionnaires were received.

The questionnaire consists of 2 sections. Section A collect demographic profile data. Section B collect the data related to construct under the study. The questionnaire was adapted and modified from Primanayagam and Seal (2021). The questionnaire was measured using 4 points Likert scale where 1 denote strongly disagree and 4 denote strongly agree. The data was analysed using Statistical Package for the Social Sciences (SPSS).

Correlation analysis was conducted to test the hypotheses developed in this study. The rule of thumb for interpreting the size of a correlation coefficient by Hair et al. (2010b) is used as guideline. The size of correlation 0.00 to 0.20 (-0.00 to -0.20) is interpreted as weak to no relationship, 0.21 to 0.40 (-0.21 to -0.40) interpreted as weak positive (negative) correlation, 0.41 to 0.60 (-0.41 to -0.60) interpreted as moderate positive (negative) correlation, 0.61 to 0.80 (-0.61 to -0.80) interpreted as strong positive (negative) correlation and 0.81 to 1.00 (-0.90 to -1.00) interpreted as very strong positive (negative) correlation.

3. Result and Discussion

The primary objective of this study is to identify factors influencing e-book acceptance. There were 102 respondents of this study. 28% (27) of the respondents were male and other 73% (74) of the respondents were female. In terms of age, 100% (102) of the respondents were 18-21 years old. DKB1 consist of 33% (32) of the respondents, DPM1 consist of 35% (34) of the respondents and DRM1 consist of 33% (34) of the respondents.

Table 1. Demographic profile

Items		Frequency	Percentage
Gender	Male	28	27
	Female	74	73
Age	18-21	102	100
	22 and above	0	0
Program	DKB1	33	32
	DPM1	35	34
	DRM1	34	33

Correlation analysis was employed to test the hypotheses. For *H_1: Performance expectancy has positive effect on behavioural intention to use e-book*; showed a significant strong positive correlation between these variables (r=0.650). Therefore, H_1 was accepted. It can be concluded that an increasing in performance expectancy will cause the increasing in behavioural intention to use e-book. This study indicates that students' belief that the e-book titled Lab Exercise: Microsoft Word, Excel, PowerPoint are valuable, useful and increases their productivity. It can substitute the printed book. The finding of this study is consistent with Chang et al., (2015); Foluke (2016); Bhimasta & Suprapto (2016); Hsu et al. (2017); Gengfu and Chotiyaputta (2019); Okocha (2019); Primanayagam and Seal (2021). However, PE has no positive impact on users' intentions to use e-books according to Lin (2019).

For *H_2: Social influence has positive effect on behavioural intention to use e-book*; showed a significant moderate positive correlation between these variables (r=0.596). Therefore, H_2 was accepted. It can be concluded that an increasing in social influence will cause the increasing in behavioural intention to use e-book. This study indicates that students may be easily influenced by people around them in their acceptance towards e-book. People around them are those important to them such as lecturer and friends. The ability of lecturers in engaging, utilizing, and promoting the e-book platform is important in students' acceptance of e-book (Arham et al., 2021). The finding of this study is consistent with Hsu et al. (2017); Gengfu and Chotiyaputta (2019); Okocha (2019); Primanayagam and Seal (2021). However, Chang et al., (2015); Foluke (2016); Lin (2019); found that SI has no positive impact on users' intentions to use e-books.

For *H_3: Effort expectancy has positive effect on behavioural intention to use e-book;* showed a significant strong positive correlation between these variables (r=0.708). Therefore, H_3 was accepted. It can be concluded that an increasing in effort expectancy will cause the increasing in behavioural intention to use e-book. It is found that the skill required to use e-book is easy for students. The e-book also easy to use, easy to learn on how to use it and the e-book is easily understanding. The finding of this study is consistent with Hsu et al. (2017); Foluke (2016); Okocha (2019); Primanayagam and Seal (2021). However, these findings differed from Chang et al., (2015); Yoo and Roh (2016); Primanayagam and Seal (2021) study in which effort expectancy did not influence intention to adopt electronic books.

For *H_4: Facilitating conditions has positive effect on behavioural intention to use e-book*; showed a significant strong positive correlation between these variables (r=0.664). Therefore, H_4 was accepted. It can be concluded that an increasing in facilitating condition will cause the increasing in behavioural intention to use e-book. This study revealed that the facilitating conditions such as high internet access and bandwidth is very important. It will make the e-book easily accessible. The finding of this study is consistent with Nasri & Abbas (2015); Foluke (2016); Hsu et al. (2017); Voravickositt (2017); Gengfu and Chotiyaputta (2019); Okocha (2019); Primanayagam and Seal (2021). However, there is no significant effect of FC on e-book acceptance according to study conducted by Chang et al., (2015); Arham, et al., 2021.

The finding of this study is consistent with Hsu et al. (2017) and Okocha (2019) that stated PE, EE, SI and FC influence the adoption of e-books.

This study confirmed the direct impact of behavioural intentions on students' usage of the e-book. This is in accordance with the study conducted by Piramanayagam and Seal (2021) and Martins et al., (2018).

Table 2. Correlation analysis

Items	1	2	3	4	5
Performance expectancy	1	0.657	0.531	0.621	0.650
Effort expectancy	0.657	1	0.575	0.669	0.708
Social influence	0.531	0.575	1	0.693	0.596
Facilitating conditions	0.621	0.669	0.693	1	0.664
Behavioural intention	0.650	0.708	0.596	0.664	1

4. Conclusion

This study concludes that the hypotheses stated were accepted; EE, PE, FC and SI positively influence behavioural intentions to use e-book. EE was the most influential factor. Followed by FC, PE and SI.

The respondents of this study were DBC20012 Computer Application students for Session II: 2021/2022 at Politeknik Ungku Omar. Therefore, the findings could not be generalized to other population from another institution. Different findings may be obtained when it is conducted at another institution. It is recommended for future research to include the population from another institution that offer DBC20012 Computer Application.

It is suggested that these elements which are EE, FC, PE and SI are included in e-book usage during DBC20012 Computer Application classroom. For example, the institution should provide good internet access. Besides that, lecturers should engage, utilizing, and promoting the e-book usage to minimized or eliminated the drawbacks of using e-book. Overall, the findings of this study could help to improve DBC20012 Computer Application course delivery via e-book in accordance with the preferences and capabilities of students.

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The BINTANG 2022 Programme's Effects on Students

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Abstract

This research aims to identify the implementation of *BINTANG* 2022 programme in Sabah, which involves polytechnic and community college students. In this study, the researchers will investigate the effects of implementing the *BINTANG* 2022 programme on students' personal development. Student personality development programmes are an essential component of the educational process that must be implemented to ensure that the goals of human personality development are met following the requirements of the National Education Philosophy. This survey study uses a descriptive and inference approach to analyse the level and implication of implementing the *BINTANG* 2022 programme. On September 28, 2022, 125 polytechnic and community college students participated in the programme. The internal consistency value of the adapted study instrument is α=.977. According to the findings, all three-study constructs, namely implementation, management, and program impact, received a high mean score of 4.433 (SD=.543). Evaluation of the speaker and presentation received a high mean score of 4.604 (SD=.481). Furthermore, data analysis reveals r=.864 (p=0.01) a strong correlation between levels and implications of implementing the *BINTANG* 2022 programme. Implementing the BINTANG 2022 programme has positive implications for developing student self-awareness, motivation, and readiness to improve student self-discipline.

Keywords: - Implementation, implications, self-development, polytechnic, college community, BINTANG 2022 program

1. Introduction

A student will gain a variety of personal and personalization experiences and skills while studying. The world of education is not only related to learning capacity, but also the formation of student personality. Success is dependent not only on knowledge and technical ability but also on generic skills. With the guidance of the National Principles (Rukun Negara), former country leader Tun Abdul Razak has formulated a national education policy to create a nation-state development vision, which is to create a dignified, virtuous, and polite society.

Personality development in students necessitates the use of specific learning strategies and skills. As a result, institutions of higher learning (IPT) should be alert about student self-development. Programs to implement character values can be achieved through learning, self-development, and educational institution culture. Furthermore, the globalisation of the education world requires that students expand their knowledge and skills (Miswandi & Alvina, 2020). Students should work on higher-level thinking, decision-making, and interpersonal skills. In addition, students' inherent and technical skills, using information and communication technologies.

The Department of Polytechnic Education and Community College (JPPKK) organised the *BINTANG* 2022 programme, which was coordinated by the Psychology Management Unit of Tawau Community College. The *BINTANG* 2022 programme is a large-scale student self-development and self-reliance program aimed at polytechnic and community colleges (PolyCC) students in Sabah state. The implementation of the *BINTANG* 2022 programme emphasizes the concept of enhancing students' potential for great mental, emotional, physical,

and spiritual growth to awaken them as high-performing students.

Educational institutions, whether schools or universities, play an essential role in implementing several activities that address critical components of motivation, self-awareness, and learning goals. The programme focuses on student self-development, a crucial part of human capital development in higher education institutions (Nurja et al., 2021). As a result, the following are the objectives of this research:

1. To obtain feedback on the implementation of the *BINTANG* 2022 programme;
2. Exploring the impact of the *BINTANG* 2022 programme on Sabah state PolyCC students;
3. Identifying the relationships between the *BINTANG* 2022 programme's implementation level and the effect of implementation.

2. Literature Review

School-based educators and the IPT are always available to improve the teaching and learning environment. Furthermore, the planning and implementation of student self-reliance development programmes have expanded to include strategies for improving positive behaviour both in and out of the classroom. According to Damayanti & Purworini (2018), the Self-Presentation Program at Mojogedang State High School in Indonesia boosts students' confidence to promote positive personalities in public or on social media. This study involved 264 respondents with introverted behaviour. The findings indicate that the Self-Presentation Program encourages self-awareness and that students' emotional and self-assessment abilities can assist students in feeling proud of themselves.

In addition, Yaacob & Ahmad (2019) explained that through the Interaction and Integrity programme (21CAMP) held for the teaching and learning module of Islamic Civilization and Asian Civilization (TITAS) at Sunway University Malaysia. Interaction and Integrity Program (21CAMP) This is an outdoor activity for TITAS courses. The programme aims to provide students with cultural and ethnic diversity in Malaysia. In addition, the programme has the objective of improving teamwork, tolerance, and cross-cultural interpersonal communication. The findings show that 80 per cent of respondents agree that this programme is suitable for students because of cultural and ethnic diversity. Therefore, the application of human skills in this programme is in line with the National Education Policy.

According to Islam, the discussion of human self-development cannot be divorced from the fundamental context of human creation, which includes spiritual and physical elements (Pa'ad, Kassim, & Rahman, 2020). Islam teaches Muslims to better themselves, to be happy in this world and the next. So, Pa'ad, Kassim, & Rahman (2020) investigated the efficacy of the Student Motivation Program (MAP) as one of the approaches and applications of religious motivation in the Youth Self-Development Module led by a non-governmental organization. The MAP programme was created to help the youth to develop themselves. It has been consistently implemented since 1995. The findings indicate that the religious motivation approach used in MAP is effective for adolescents' psychological conditions and needs. This result means that adolescent self-development interventions using the MAP approach are more comprehensive as they include psychological and religious elements of solidarity.

In addition to technical skills, generic skills should affect developing one's personality. According to Nurja & Mat (2020), lecturers must be creative in their teaching and learning strategies. Tawau Community College implemented the Mock Interview programme, which involves 110 students and aims to help students understand their career knowledge and information, master their work skills, and gain relevant experience in career development. The programme implementation objectives were met through data analysis because the programme implementation level was high with an overall mean score of 4.24. Furthermore, this Mock Interview programme improves human skills, marketability, and technical skills required for preparation when they enter the job market later (Nurja & Mat, 2020).

Devi, Chamidi, & Soleh (2023) conducted a study to determine the implementation stage of the Nahdlatul Scholars Youth Association (IPPNU) programme on students in Indonesia's Waluyo village district. This study included 158 colleges, high schools, and elementary school students. In this IPPNU programme, various phases and forms of religious and social activities were implemented to guide and develop a balanced personality between knowledge and skills. Based on the findings and discussions, implementing the IPPNU programme in student development was successful. The delivery of an interpersonal self-development programme such as *BINTANG* 2022 aims to improve the skills of student personality development. As a result, researchers will explain the implementation of the *BINTANG* 2022 programme and the implications for students who participate as programme participants in this study.

3. Methodology

This quantitative study was a survey with a questionnaire instrument distributed to all *BINTANG* 2022 programme participants. This research instrument was created by researchers and colleagues during the *BINTANG* 2019 program's implementation (Nurja et al., 2021). The instrument reliability value is high at α=.961 based on pilot studies conducted during the development process of this instrument. As a result, this instrument has a high degree of consistency in measuring the *BINTANG* 2022 programme implementation. The construct of this study was programme implementation, management, and impact using a 5-point Likert scale, as respondents indicated levels of agreement and disagreement with various statements about various attitudes, objects,

people, or events (Taherdoost, 2019). The following are the levels of agreement and disagreement used in this study:

i. Strongly agree (5 points)
ii. Agree (4 points)
iii. Not sure (3 points)
iv. Disagree (2 points)
v. Strongly disagree (1 point)

The 5-point Likert scale is also used to assess the programme speaker by participants:

i. Very good (5 points)
ii. Good (4 points) (4 points)
iii. Medium (3 points) (3 points)
iv. Not good (2 points)
v. Extremely bad (1)

The questionnaire was distributed to students following the implementation of the *BINTANG* 2022 programme, which runs from September 27, 2022, until September 28, 2022. This questionnaire was distributed via Google Forms. The questionnaire contains 30 items divided into three (3) sections: Part A (Demographics), Part B (Program Implementation, Management, and Impact), and Part C (Speaker Rating).

Statistical Package for Social Sciences v23 software was used to generate an analysis of the obtained raw data. The data were then analysed using descriptive and inference statistics which is Pearson's correlation test. Table 1 shows the mean score interpretation based on Pallant (2010), whereas Table 2 shows the correlation strength interpretation based on Sugiyono's study (2010).

Table 1. Interpretation of mean score (Pallant, 2010)

Mean Score	Interpretation
1.00 – 2.33	Low
2.34 – 3.67	Medium
3.68 – 5.00	High

Table 2. Pearson correlation coefficient interpretation (Sugiyono, 2010)

r Value	Interpretation
0.00 – 0.199	Very low
0.20 – 0.399	Low
0.40 – 0.599	Moderate
0.60 – 0.799	Strong
0.80 – 0.99	Very strong

4. Result and Discussion

4.1 Demographics

Fig. 1 depicts the gender distribution of survey respondents.

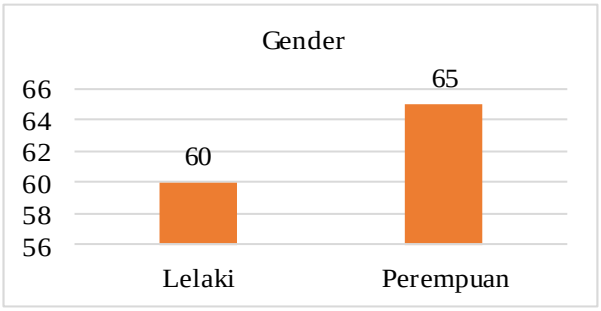

Fig. 1. Gender distribution of respondents

Fig. 1 shows the number of respondents by gender, with 60 men (48%) and 65 female respondents (52%). Fig. 2 also depicts the demographic distribution by the institution.

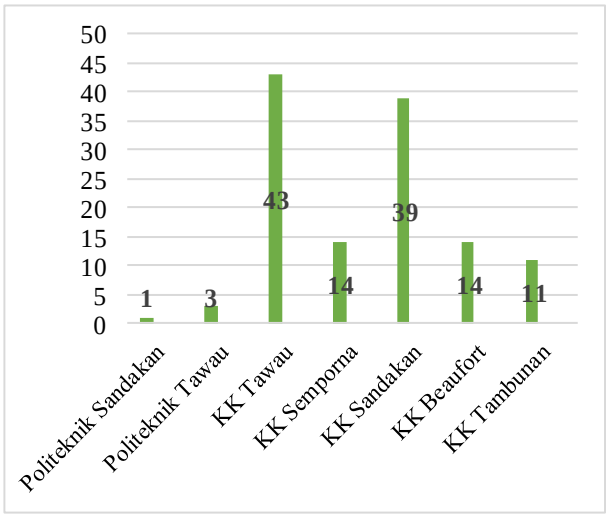

Fig. 2. Gender distribution of respondents

4.2 Level of Implementation of BINTANG 2022 Programme

Table 3 explains the level of implementation of the *BINTANG* 2022 programme in achieving the programme implementation objectives. The analysis data show that the mean implementation level for the study construct is very high, with the mean value of programme implementation at 4.454 (SP=.552) and the mean value of programme management at 4,404 (SP=.605). On the other hand, the overall mean score of these two constructs is very high. The result of this study is consistent with Guntol & Kutty's (2020) study to determine the level of implementation of the Mentor-Mentee programme in enhancing the self-concept of high school students in the Kapit Sarawak district. The study sample consisted of 306 fifth-grade students. This Mentor-Mentee programme guides and supports mentees, expresses appreciation for their abilities and highlights their strengths. So, the findings of this study show that the program's implementation level is high, with a mean value of 319.66 (SP=14.432), proving that the implementation of the

Mentee Mentor Program has positively impacted the students involved in their research.

Table 3. The mean score for stages of programme implementation (N=125)

Construct	Mean	SD	Stages
Programme implementation	4.454	.552	Very high
Programme management	4.404	.605	Very high
Overall Mean Score	**4.429**	**.554**	**Very high**

Furthermore, the study instrument provided an assessment of respondents' views on slots for each invited speaker. This feedback is critical for improving the speaker's delivery and the topic's current relevance. Table 4 shows how respondents rated the speakers for the *BINTANG* 2022 programme.

Table 4. The mean score for level of satisfaction for the speaker (N=125)

Slot	Mean	SD	Level of satisfaction
Star Personality	4.589	.502	Very high
Superstar	4.632	.505	Very high
Grab the Star	4.592	.522	Very high
Overall Mean Score	4.604	.481	Very high

With an overall mean score of 4.604 (SP=.184) based on the descriptive data analysis in Table 4, respondents are very pleased with the speakers in all three slots of the *BINTANG* 2022 programme. As a result, it can be concluded that speakers were able to effectively convey the essence of their talk content. The results of this study are congruent with those of Hamdani et al. (2021), who researched the implementation and implications of the Tutelage programme at the University of Islamic Sciences Malaysia (USIM). The Tutelage Program is a mentoring and mentee programme designed to assist students in need of academic, personal, and professional development. The outcomes of the interviews with respondents found that each panel of speakers in the programme was knowledgeable about the topics or slots discussed with students. Furthermore, the exchange of experiences between speakers and students adds value to science in the field of preaching.

4.3 The Impact of Programme Implementation

Table 5 illustrates the benefits of implementing the *BINTANG* 2022 programme in terms of exposing students' personalities, tendencies, and potentials. Implementing this programme resulted in a high overall mean score of 4,442 (SP=.566). It explains that the *BINTANG 2022* programme implementation among PolyCC students in the state of Sabah is high in terms of recognising personal personality and developing self-esteem in a better way. The result of this study is consistent with the findings of Khaidzir et al. (2019), who concluded that the 'Salam Ad-Dhuha' programme held at Segamat Community College in Johor has significant implications. According to the study findings, 68.5% of respondents strongly agreed and 30.1% agreed on the positive implications of implementing the "Salam Ad-Dhuha" programme for self-development and spiritual development for students and staff at the Community College of Johor.

Table 5. The mean score for programme implications (N=125)

Item No.	Implications	Mean	SD	Stages
C10	My understanding of programme content improved after participating in the programme.	4.360	.640	Very high
C11	I am confident in applying what I have learned in this programme.	4.360	.734	Very high
C12	Overall, the programme was a success.	4.610	.566	Very high
	Overall Mean Score	**4.442**	**.566**	Very high

4.4 Relationships Between the BINTANG 2022 Implementation Stages and The Implications of The Program

Table 6 displays the study's findings, which show that the Pearson's correlation coefficient between the mean of the *BINTANG* 2022 implementation level and the implications is significant with a value of r =.864 (p=0.01). This correlation test analysis reveals a significant and strong positive relationship between the levels and implications of implementing the *BINTANG* 2022 programme. The outcomes of Pearson's correlation test are consistent with the research results of Wan Mukhtar et al. (2022). Professional Mukmin programme implementation at MARA Professional College (KPM) in Malaysia is high in the formation of human leadership character among students. Management and environmental support are the driving forces behind the development of final-year leadership qualities.

Table 6. Correlation of Levels and Programme Implementation and Implications

		Implications of the *BINTANG 2022* programme
Stages of implementation	*Pearson Correlation*	.864**
	Sig	0.01
	N	125

5. Conclusion

Implementing the *BINTANG* 2022 programme has positive implications for the development of student self-awareness, motivation, and readiness, as well as for improving student self-discipline in everyday life. Students who are passionate about noble personalities can benefit from self-reliance development programmes like *BINTANG* 2022. Meanwhile, the implementation of the self-development programme should take spirituality as a measure of self-esteem among students into account

(Abdullah, Maamor & Wahab, 2021). The findings of this study can be presented to PolyCC's top management to achieve the mission of producing holistic graduates through continuous improvement in student achievement.

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UNIT PENYELIDIKAN
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