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**INTERNATIONAL
MULTIDISCIPLINARY
POSTGRADUATE
CONFERENCE 2020 (IMPC20)**

9 & 10 DECEMBER 2020

BUSINESS AND MANAGEMENT
COMPUTER AND INFORMATION TECHNOLOGY
EDUCATION AND SOCIAL SCIENCE
BIOTECHNOLOGY AND LIFE SCIENCES
ENGINEERING

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(IMPC20)

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UNIVERSITI SELANGOR

MALAYSIA

BUSINESS AND MANAGEMENT

COMPUTER AND INFORMATION TECHNOLOGY

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BIOTECHNOLOGY AND LIFE SCIENCES

ENGINEERING

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PREFACE

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

Assalamualaikum warahmatullahi wabarakatuh

Alhamdulillah. All praise is due to Allah (SWT) for His blessing and love that enable us to be together in this conference.

It's my pleasure to welcome all of you to the INTERNATIONAL MULTIDISCIPLINARY POSTGRADUATE CONFERENCE 2020 (IMPC20) organized by the Centre for Graduate Studies (CGS), Universiti Selangor. Congratulations and well done to the organizing committees for their diligent work to make this conference a successful one.

The main objective of this international conference is to provide an excellent platform for knowledge exchange between postgraduates, researchers, scientists and academicians. I would like to thank all the participants for sharing their valuable experience, knowledge and ideas. It is essential to bring together experts in the field of science, technology, education and business in this conference.

I am convinced that this international conference that gathers professionals and scholars all around the world will be able to elevate and uphold the name of Universiti Selangor and indirectly establish the Centre for Graduate Studies as well as the University in the research areas.

In a nutshell, I hope the conference will provide benefiting exposure to our postgraduates and researchers that will directly give a very useful impact to the University.

Thank you.

Best regards,

PROF DATO' DR. MOHAMMAD REDZUAN BIN OTHMAN
President and Vice Chancellor
Universiti Selangor



Welcoming speech from the Dean of CGS

السَّلَامُ عَلَيْكُمْ وَرَحْمَةُ اللَّهِ وَبَرَكَاتُهُ

Alhamdulillah. Indeed, all praise is due to Allah. We praise Him and seek His help and forgiveness. We seek refuge in Allah from our souls' evils and our wrong doings. He whom Allah guides, no one can misguide; and he whom He misguides, no one can guide.

It is my pleasure to welcome all participants to the INTERNATIONAL MULTIDISCIPLINARY POSTGRADUATE CONFERENCE 2020 (IMPC20) of Centre for Graduate Studies, Universiti Selangor, Malaysia. I would also like to welcome the keynote speakers from Malaysia, Indonesia, Bangladesh and Turkey who are going to share their ideas, research updates and experiences in related tracks virtual rooms. In this occasion as well, I would like to express my gratitude to reviewers, chairpersons for the parallel sessions and all committee members who constantly support us.

All respected participants,

IMPC20 provides a platform for us to present our research results, development activities and share our experiences and ideas about all aspects. Moreover, we can also discuss the practical challenges encountered, especially during this pandemic, and the solutions adopted. As a multidisciplinary conference, IMPC20 managed to gather participants from various fields, including business, management, education, social sciences, life sciences, and engineering. With this, possible collaboration and cooperation can be carried out in the future to enhance and improve the quality of postgraduate students.

Lastly, I sincerely apologize for knowingly or unknowingly shortcomings, or any inconveniences that might occur throughout this conference. I wish everyone a successful and fruitful conference.

Thank you.

Wassalam.

Best regards,

ASSOC. PROF. DR. SETYAWAN WIDYARTO
Dean
Centre for Graduate Studies (CGS)
Universiti Selangor





From the desk of Program Director

Assalamualaikum and a very good day to every one

It is with great pleasure that I welcome you to the INTERNATIONAL MULTIDISCIPLINARY POSTGRADUATE CONFERENCE 2020 (IMPC20). This is the first conference that we are conducting VIRTUALLY as we face the challenges that COVID-19 has placed upon us. Alhamdulillah, here we are.

Ladies and gentlemen,

IMPC20 is organized to gather postgraduates, researchers and scientists from all over the world to share their latest finding in research. As this conference highlighted the MUTLIDISCIPLINARY research, we have come out with dedicated track for each main discipline.

Track A for Technology, Engineering and Life Sciences
Track B for Business and Management, and
Track C for Education and Social Science

It is essential to bring together experts in the field of science, technology, education and business into this conference. Various thoughts on various field can be discussed or argued, which might expand the idea, thus enhance the quality of postgraduate students.

Finally, I would like thank all parties for the continuous support in making this program a success.

Regards,

ASSOC. PROF. DR. SALINA MUHAMAD
Co-General Chair/Program Director
IMPC20





BACKGROUND

The International Multidisciplinary Postgraduate Conference 2020 (IMPC20) is the first conference organized by the Centre for Graduate Studies (CGS). IMPC20 provides a platform for postgraduates from all over the world to present their research results, development activities and share their experiences, and new ideas about all aspects. They can also discuss the practical challenges encountered, especially during this pandemic, and the solutions adopted.

All postgraduate students are invited to share their latest research findings to this conference. The papers on original works are solicited on a variety of topics, including but not limited to the following conference tracks:

- Track A: Technology, Engineering and Life Sciences
- Track B: Business and Management
- Track C: Education and Social Science

PROGRAM'S OBJECTIVES

- ❖ Establish a platform for experience and knowledge sharing among postgraduates, researchers, scientist and academicians all over the world
- ❖ Cultivate research integrity
- ❖ Encourage research publication



KEYNOTE SPEAKERS



PROF. DR. MOHD HASANUR RAIHAN JOARDER
School of Business & Economics
United International University (UIU), BANGLADESH

“Quality Education at Private Higher Educational Institutions in Bangladesh: Faculty Perspectives.”



PROF. IR. DR. RIZA SULAIMAN
Senior Research Fellow, Institute IR4.0
Universiti Kebangsaan Malaysia, MALAYSIA

“Industrial Revolution 4.0 and Society 5.0 : Enterprise Computing Poise Ready”



ASSOC. PROF. DR. ABUL BASHAR BUIYAN
Faculty of Business and Accountancy
Universiti Selangor, MALAYSIA

“Emerging Issues in the area of Business Research and Publication: Postgraduate Student Perspectives”



DR. ABDUL HAMID BUSTHAMI NUR
Education and Modern Language, UUM College of Arts and Science,
Universiti Utara Malaysia, MALAYSIA

"Enhancing Teaching and Learning by Leveraging an Apps-based Curriculum in The Covid 19 Pandemic Era: Design Milestones."



PROF. DR. MUSTAFA NAZIROGLU
Director of Neuroscience Research Center,
Medical Faculty, Suleyman Demirel University, Isparta, TURKEY

"Modulator Role of Selenium on Cisplatin-induced Mitochondrial Oxidative Stress, Apoptosis, and Calcium Signalling in Peripheral Pain"



PROF. IR. DR. ISMAIL MUSIRIN
Professor of Power System
Faculty of Electrical Engineering, Universiti Teknologi MARA,
Shah Alam, Selangor, MALAYSIA

“Integrated Artificial Intelligence Technique for Distributed Generation Planning in Power System”

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SIMULATION OF MICROALGAE PHOTOSYNTHESIS ELECTRON TRANSFER WITH MAGNETIC ENERGY INFLUENCING

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Abstract – A mathematical modelling is applied to illuminate and predict the mechanism of electron transfer in microalgae photosynthesis. A magnetic field reaction can be accelerated by decreasing the frequency of reverse reactions in the radical pair mechanism. The significant effect of magnetic field (MF) changes K_{ISC} represents an internal energy which affects the process of electron transfer. This often leads to an increase in temperature which causes the induction effect towards the presence heat energy. The highest value of ΔG_2^* occurs at 8 miltesla magnetic exposure with internal energy value of 1.08 eV.

Keywords : electron transfer; magnetic field; microalgae; internal energy

1. INTRODUCTION

Light is transferred into chemical energy via photo induced electron transfer reaction in algae photosynthesis. The whole process consists of two consecutive phases - light and dark. The energy of the radiation is converted into the energy of the excited electrons by oxidoreduction of macroergic compounds such as adenosine triphosphate (ATP) as the source of chemical energy and nicotinamide adenine dinucleotide phosphate (NADPH) as the reduction of agent. The total energy ΔG is the summation of ΔH^0 and ΔS^0 correspond to temperature (kelvin) in which if one treats the excited state of chlorophyll in microalgae is exposed to the MF, then the main part of radical pair mechanism took place [1]. Therefore, the overall Gibbs free energy equation for the chlorophyll system are given as,

$$\Delta G = \Delta H - T\Delta S = hv_0 - T\Delta S \quad (1)$$

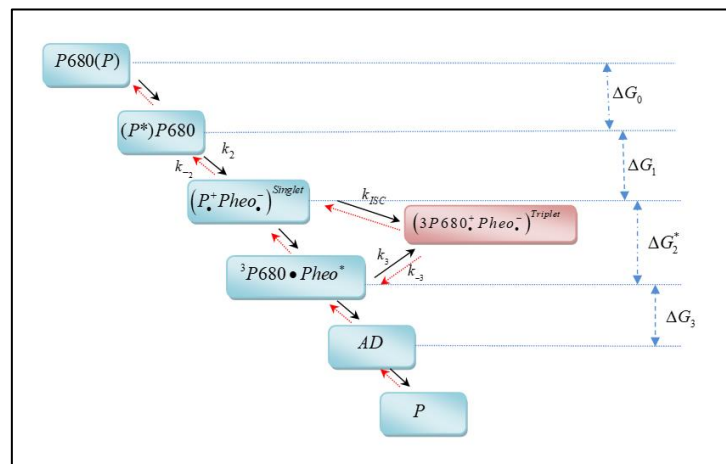


Figure 1 The energetic and kinetics of radical pair states in PSII

2. METHODOLOGY

The energy of excited state in PSU I and II as shown in Figure 1 is obtained from photons and converted to free energy in the chlorophyll structure. Then, the internal energy of the photosystem is defined as enthalpy H^0 , then $\Delta H^0 = hv_0$ [2]. The parameter ν stands for frequency (in reciprocal seconds that is written by s^{-1} or Hertz (Hz) in which $1Hz = 1 s^{-1}$, h is Planck's constant with the value of 6.626×10^{-34} J.s, with the assumption of "one photon absorbed per chlorophyll per second is for full sunlight"[2]. By taking ~ 20 ns for natural lifetime of chlorophyll excited state $P680(P^*)$ with the reaction rate of $P680(P^*)/P680(P) \approx 2 \times 10^{-8}$, then the application of the electron transfers concept at the radical pair mechanism with the influence of MF, can be represented by,

$$\left[\frac{(P^+)Pheo^-Q_A}{(P^+)PheoQ_A^-} \right] \geq \frac{k_{ISC}}{k_{-2}} = \exp\left(\frac{\Delta G_1 - \Delta G_2^*}{K_B T}\right) \quad (2)$$

with,

$$K_{ISC}(B) = \left(\frac{K_{-2} + 2K_3}{(K_{-2}/2 + K_3)^2 + (2J)^2} \right) \cdot \left(\frac{(\Delta\omega)^2 + (a/4)^2 + \gamma[(\Delta\omega)^2 - (a/4)^2]^2}{1 + \gamma[(\Delta\omega)^2 + (a/4)^2]} \right) \quad (3)$$

where, a is the hyperfine interaction constant (rad/s), J is the exchange interaction between the unpaired electron spin of the radicals' pair Δg which represents the difference between g-factors of two radicals. And, h is the reduction of plank constant and B is the magnetic force [3].

3. RESULTS AND DISCUSSION

The calibration rate of ΔG^*_2 as shown in Figure 1 resulting the values of K_{ISC} from Equation 3 via simulation is shown in Figure 2.

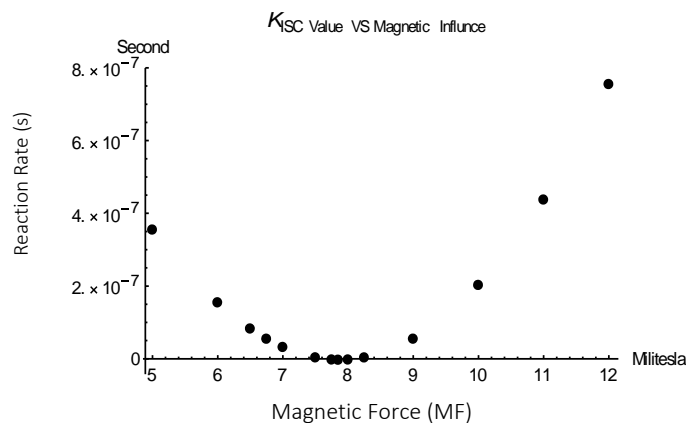


Figure 2 Simulation of K_{ISC} value

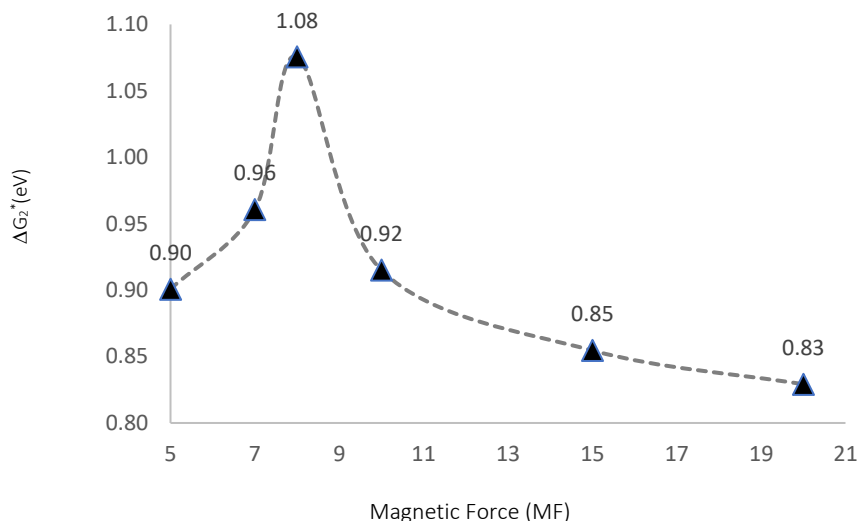


Figure 3 The value of Internal Energy ΔG_2^* with Rate of Radical Pair K_{ISC} with magnetic Effect

The reaction rate per second demonstrates the influences of applied MF at the range between 5mT to 10mT, in which the reaction rate indicates a decreasing in reaction time from 1×10^{-6} second to 1×10^{-10} second by increasing the energy value of applied MF (Figure 3). The effect of MF can also be seen by increasing the internal energy G whereby a radical pair mechanism is occurred. This can be explained by the presence of MF at a certain level that affects the process of electron transfer at a faster rate than usual leading to the formation of triplet magnetic state [4]. However, the presence of MF as an external energy affects the process of electron transfer. This often leads to an increase in temperature that causes the induction, and this effect can be overcome by the presence of heat energy. The highest value of ΔG_2^* occurs at 8 militesla magnetic exposure with the internal energy of 1.08 eV, compare to the other magnetic exposure for examples 0.83ev at 20miliesla and 0.90eV at 5militesla exposure.

4. CONCLUSION

The simulation is conducted by combining rates of electron transfer, K_{ISC} and internal energy at radical pair mechanism in algae photosynthesis. It demonstrates that there is a relationship between photosynthesis rate with the MF exposure. This model is used to predict distribution of internal energy at different magnetic. The result shows that there is a significant effect at a certain range of MF exposure (5-10 militesla). However, to get a perfect prediction of photosynthesis by the simulation, it is important to develop a comprehensive model considering all possible factors such as culture temperature, nutrient (nitrate and phosphate), light intensity, initial inoculum size, Ph. and other interferences factors that contribute to the microalgae growth.

REFERENCES

- [1] K. Mouloudakis and I. K. Kominis, "Quantum information processing in the radical-pair mechanism: Haberkorn's theory violates the Ozawa entropy bound," *Phys. Rev. E*, vol. 95, no. 2, pp. 1–9, 2017
- [2] R. C. Jennings, E. Engelmann, F. Garlaschi, A. P. Casazza, and G. Zucchelli, "Photosynthesis and negative entropy production," vol. 1709, pp. 251–255, 2005,
- [3] C. Eichwald and J. Walleczek, "Model for magnetic field effects on radical pair recombination in enzyme kinetics," *Biophys. J.*, vol. 71, no. 2, pp. 623–631, 1996
- [4] A. Yadav, "Effect of Temperature on Electric Current, Magnets and Electromagnet," *Int. J. Adv. Technol.*, vol. 07, no. 04, 2016

EFFECT OF SILVER NITRATE CONCENTRATION ON PRODUCTION OF SILVER NANOPARTICLES USING *Polygonum minus* EXTRACT AND ANALYSIS OF THEIR ANTIMICROBIAL PROPERTY

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Abstract – Green synthesis is the ability of organisms and organic compounds to reduce metal ions and stabilise them into nanoparticles (NPs). Among all metal nanoparticles, silver nanoparticles (AgNPs) have much attention due to the surface plasmon resonance (SPR), which can be easily observed by UV–visible spectrophotometer. In the present study, AgNPs were synthesized using *Polygonum minus* extract as a reducing agent and aqueous silver nitrate as a precursor. This study aims to investigate effect of silver nitrate (AgNO₃) concentrations (0.001 M, 0.01 M and 0.1 M) on the production of AgNPs as well as an antimicrobial activity of silver nanoparticles (AgNPs). Based on the observation, the colourless reaction mixture slowly changed from yellowish green to reddish brown and further confirmed by surface plasmonic resonance (SPR) band at 420 - 440 nm using UV–visible spectroscopy indicating of reduction of silver ion after several minutes of reaction. It was found that increased concentration of AgNO₃ resulted in increasing reaction time, production and decrease size of AgNPs. The morphological changes of bacterial cells treated with AgNPs were observed by FE-SEM and showed that the AgNPs has good antimicrobial properties against microorganisms. Thus, the ability of AgNPs to release Ag ions is a key to their antimicrobial.

Keywords : Silver Nanoparticles; *Polygonum minus*; green synthesis; antimicrobial

1. INTRODUCTION

Nanotechnology, which deals with biology, chemistry, physics and engineering, is a versatile subject. Being very small in size, nanoparticles have a high surface area to volume ratio, which means that nanoparticles exhibit very different properties than their bulk content, such as electrical, magnetic and optical properties [1]. Noble metal nanoparticles (NPs) have been studied extensively for applications such as optoelectronics, catalysis, sensing, medicine, etc. [2]. Silver nanoparticles (AgNPs) have been widely investigated among various metal nanoparticles. Silver nanoparticles are reported to possess anti-fungal, anti-inflammatory, anti-viral, anti-angiogenesis and antiplatelet activity [3]. Owing to their high antibacterial properties, silver nanoparticles is the most commonly used nanoparticles in antimicrobial studies. Metallic nanoparticles provide an attractive alternative to antibiotics in the pharmaceutical field by developing novel applications and the synthesis of nanomaterials of specific composition and size is a burgeoning area of materials science research.

In general, AgNPs have been produced by various chemical and physical methods that are very costly and potentially harmful to the environment. This requires the use of chemicals that are poisonous and harmful and are responsible for different biological hazards [4]. Thus, researchers have used biological synthesis, since this technique is environmentally friendly, low cost and shaped silver nanoparticles are stable and well distributed with minimal aggregation and good control of size [5,6].

2. METHODOLOGY

2.1 Preparation of Leaf Extract

15 g of *Polygonum minus* powder leaves were weighed and then 100 ml of double distilled water was added and boiled for 15 minutes at 100 °C. After cooling the extract was filtered using Whatman No. 1 filter paper and store at 4 °C for further use.

2.2 Green Synthesis and Characterization

In this study, silver nitrate (AgNO_3) was used as a precursor while *Polygonum minus* was used as the reducing agent respectively. The concentration of AgNO_3 was varied by 0.001 M, 0.01 M, and 0.1 M in order to observe the effect of these parameters especially on the size, production and morphology of the AgNPs produced. The synthesis of AgNPs was carried out by added of 20 ml *Polygonum minus* extract in 180 ml of aqueous AgNO_3 solution. The mixture solution was stirred and heated at 80 °C. The color change of the solution was observed and recorded. UV-Vis spectrophotometer was used for the spectrometric analysis to confirm the formation of AgNPs. To determine the time, point of maximum production of AgNPs, the absorption spectra of the sample was taken 300 – 700 nm using a UV-vis spectrophotometer (Thermo Fisher Scientific, Model Biomate 3 spectrophotometer). The deionized water was used as the blank.

2.3 Transmission Electron Microscopy (TEM) Analysis

The TEM analysis also perform to determine the morphology and size of AgNPs on the CM12 Phillip Model transmission electron microscopy (Holand).

2.4 Observing Bacterial Cells Through Field-Emission Scanning Electron Microscope (FE-SEM)

FE-SEM was used to directly observe the surface morphological changes of untreated or treated (with AgNPs) bacterial cells. Four bacteria such as *Staphylococcus aureus* (ATCC 43300), *Escherichia coli* (ATCC 25922), *Pseudomonas aeruginosa* (ATCC 15442) and *Bacillus Subtilis* (B29) were chosen to be tested in this study. The fixed cell was dried and gold-coated using an ion sputter. The pre-treated samples were observed by FE-SEM (SMT-SUPRA 40VP, Carl Zeiss AG, Oberkochen, Germany).

3. RESULTS AND DISCUSSION

The absorption of silver nanoparticles at 0.001 M shows the occurrence of the peak at approximately 420 nm and this peak slightly changed to 440 - 450 nm at 0.01 M and 0.1 M of silver nitrate (Figure 1). This redshift of 440 nm to 450 nm indicated the increasing particle size of silver nanoparticles. Interestingly, 0.1M and 0.01M concentration supported rapid formation compared to other concentrations on the basis of UV-Vis studies. The synthesis of silver nanoparticles increased with the increase in silver nitrate concentration. Increase in yield of silver nanoparticles was observed when metal salt concentration was increased from 0.001 M – 0.1 M as well as the intensity of SPR peak increases with increasing concentration of AgNO_3 due to the increase of AgNPs concentration. Hence, 0.1 M concentration of AgNO_3 was chosen for further experimentation.

Another important factor influencing the growth of silver nanoparticles is the contact time which is also known as reaction time. In this study, the formation of AgNPs was monitored by measuring UV-Vis spectra at different time intervals. The UV-Vis spectra showed a strong peak absorbance at 420 nm – 450 nm for all samples corresponding to the surface plasmon resonance (SPR) of AgNPs, which increased with the time of incubation of AgNO_3 for 5 min, 10 min, 15 min, 20 min, 30 min, 60 min (0.1 M and 0.01 M) and 24 hours (0.001 M) with the plants extract indicating increased amount of AgNPs produced from the mixture (Figure 2 (a)- (c)). An increase in absorbance was noted with an increase in interaction time of silver ions with extract, and the best synthesis was observed at 60 minutes of incubation (0.1 M and 0.01 M) while 7 hours of incubation (0.001 M). On the contrary, the control

experiment (AgNO_3) and the time point of 0 min showed no colour, indicating the absence of AgNPs but formation rate start gradually after 5 minutes (0.1 M, 0.01 M) and continued till 60 minutes (0.1 M, 0.01 M) while 7 hours (0.001M). After that no significant change in SPR means that the stability of the AgNPs colloidal solution within the reaction period.

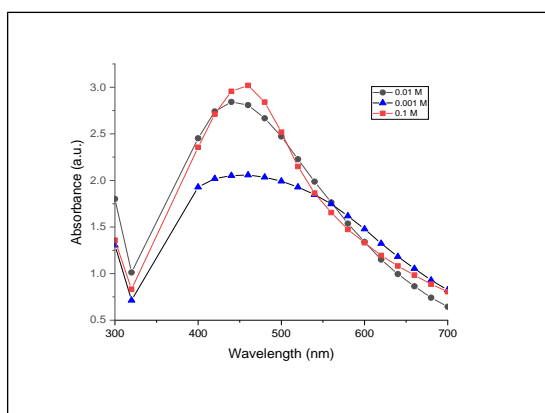


Figure 1 UV-Vis spectrum of silver nanoparticles with different silver nitrate concentration

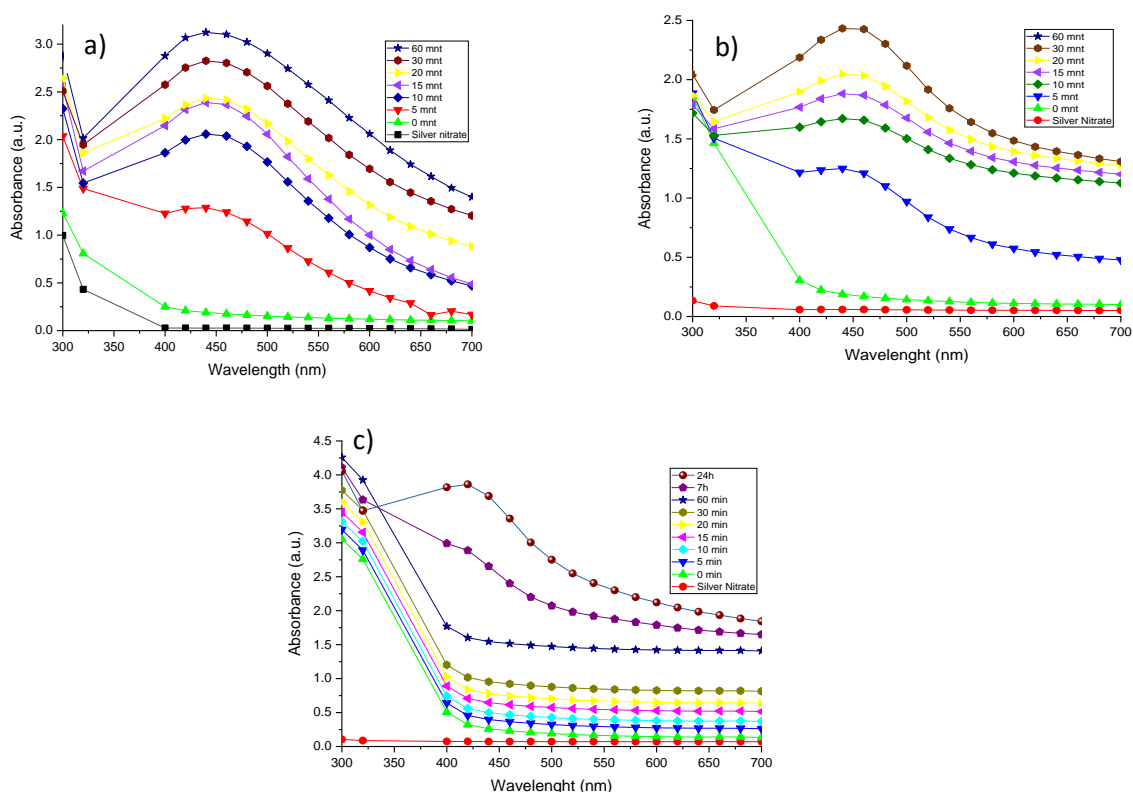


Figure 2 UV-Vis spectrum of AgNPs by *Polygonum minus* extract with a) 0.1 M, b) 0.01 M and c) 0.001 M silver nitrate concentration

The TEM result showed that the particle sizes decreased with an increase in silver nitrate concentration of up to 0.1 M. The rationale for the reduction in particle size with an increasing concentration of AgNO_3 . The reasoned that it could be due to AgNO_3 forming a coat on rising particles and preventing their aggregation and thus creating nanoscale size particles. While FE-SEM morphological showed destruction of bacterial cell of *S.aureus* was feeble than *E.coli*, *B. subtilis* and *P. aeruginosa*. Its happen due to the difference of the peptidoglycan layer of bacterial cell between Gram positive (*S. aureus*; *B. subtilis*) and Gram negative (*E. coli* ; *P. aeruginosa*) which is an essential

function of the peptidoglycan layer is to protect against antibacterial agents such as antibiotics, toxins, chemicals and degradative enzymes.

4. CONCLUSION

In this study, the synthesized AgNPs using *Polygonum minus* extract with AgNO₃ aqueous were successfully produced. The green approach has proven to be environmentally friendly and successful in synthesising AgNPs. UV-vis spectroscopy confirmed the formation of silver nanoparticles and increase particles sizes as well yields with increasing silver nitrate concentration. FESEM analysis showed that the AgNPs has good antimicrobial properties against microorganisms.

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REFERENCES

- [1] B. A. Lakkappa, S. C. Jasmith and M. G. Prabhuodeyara, “Effect of Concentration and pH on the Size of Silver Nanoparticles Synthesized by Green Chemistry”, *Organic & Medicinal Chem IJ*, vol.3 (5), 555622, 2017
- [2] Y. Z. N. Htwe, W. S. Chowa, Y. Sudab and M. Mariattia, “Effect of Silver Nitrate Concentration on the Production of Silver Nanoparticles by Green Method”, *Materials Today: Proceedings*, 17, pp 568–573, 2019
- [3] F. Benakashani, A. R. Allafchian and S. A. H. Jalali, “Biosynthesis of Silver Nanoparticles Using *Capparis spinosa* L. Leaf Extract and Their Antibacterial Activity”, *Karbala International Journal of Modern Science*, 2, pp 251-258, 2016
- [4] S. Ahmed, M. Ahmad, B. L Swami and S. Ikram, “A Review on Plants Extract Mediated Synthesis of Silver Nanoparticles for Antimicrobial Applications: A Green Expertise”, *Journal of Advanced Research*, 7, pp 17–28, 2016
- [5] S. Iravani, “Green synthesis of metal nanoparticles using plants”, *Green Chem.*, 13, 2638, 2011
- [6] S. J. Yong and S. K. B. Kim, “Rapid Biological Synthesis of Silver Nanoparticles Using Plant Leaf Extracts”, *Bioprocess and Biosystems Engineering*, vol. 32(1), pp 79-84, 2008

ISOLATION, IDENTIFICATION AND OPTIMIZATION OF THERMOPHILIC AMYLASE PRODUCING BACTERIA FOR PRODUCTION OF SHARIAH COMPLIANCE AMYLOLYTIC ENZYME USING BANANA PEEL WASTE DERIVED STARCH

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Abstract – The popularity and demand for Halal certified products have been rising as more consumers are looking for Shariah compliant; high quality, safe and ethical products recently. Enzymes are projected to be the fastest-growing segment, attracting several industries in developing Shariah compliant enzymes. Agro-wastes such as Banana Peel have been on the increase due to improved cultivation techniques and sophisticated processing conditions by allied industries resulting in arise of environmentally unfriendly impact. Moreover, high production cost of enzymes has been major issues for several industries. Therefore, this research work deals with isolation of thermostable Shariah compliant amylase producing bacteria using banana peel waste derived starch and identification of the culture conditions which support its production. Effects of different carbon and nitrogen sources were tested. Banana peel starch and peptone was found to be the best. Temperature, pH, agitation speed and incubation period were optimized. Highest enzyme activity was obtained when the strain was cultured for 48h in shaking incubator (200rpm) at 50°C and pH 8. Therefore, Banana Peel waste can be utilized as alternative carbon source as cheap, inexpensive and helps in solving the environmental pollution problem caused by the extensive disposal of nutrient rich Banana Peels into nature.

Keywords : Agricultural waste; amylase; banana peel; optimization; thermophiles

1. INTRODUCTION

The global enzyme industry is growing at a fast pace. Halal food market is predicted to contribute up to 17.4% of the world food expenditure by 2025 (Thomson Reuters, 2015). Therefore, enzyme manufacturers can have a great opportunity in profit-making business in the Halal market through producing Halal and Shariah compliance approved enzymes and finding alternatives to animal derived enzymes suitable for Halal food production [1]. Enzymes have been traditionally derived from plant, animal, and microbial sources using mainly extraction and fermentation techniques. Argument may occur which can potentially lead to major dissatisfaction among Muslims if the source is Haram or doubtful, since some of the enzymes are extracted from various animal sources such as stomachs. Hence, it is very crucial to ensure that all ingredients used in the food preparations is from Halal source. In analyzing the Halal status of the enzymes, three main aspects should be taken into consideration. These are: (i) whether the substances used as raw material (and their derivatives) or processing aid in enzyme manufacturing are forbidden or doubtful by Islamic law, (ii) if the enzymes are derived from haram animals and (iii) if the enzymes are derived from animals slaughtered not following the Islamic requirements.

Enzyme production could be improved through optimizing culture conditions. The main objective of this study is to evaluate a natural variant of *Flavobacterium thermophilum* strain, isolated from hot water spring from Dusun Tua Hot Spring (3.1339° N, 101.8336° E), Selangor, Malaysia for extracellular amylase production and optimization by utilizing banana peel wastes as alternative cheap source of starch as well as for Shariah compliance amylolytic enzyme production. Results obtained herein are more promising for the inexpensive production of amylase by using agro-industrial residue as cost-effective carbon source for biotechnological applications.

2. METHODOLOGY

2.1 Bacteria isolation and Molecular identification

A natural variant of *Flavobacterium thermophilum* strain, was isolated from hot water spring from Dusun Tua Hot Spring (3.1339° N, 101.8336° E), Selangor, Malaysia. The selected bacterial strain, was identified by performing 16S rRNA sequencing at the Macrogen, Malaysia for sequencing purpose. The resulting DNA sequence was evaluated through Basic Local Alignment Search Tool (BLAST) of the National Centre for Biotechnology Information (NCBI) [2].

2.2 Raw material preparation

Production of banana peel starch was done by treating the peels with 0.05 N of sodium hydroxide solution, sodium bisulfate solution and citric acid solution for alkaline, non-alkaline and acid extraction method respectively with slightly modified procedure [3].

2.3 Optimization on Physical and Nutritional Factors for the Growth of Shariah Compliant Amylase Producing Bacteria

A loopful of bacterial stock culture was inoculated and subculture into 100mL of nutrient broth (NB) supplemented with 2% (w/v) of starch followed by incubation for 24H, at temperature resembling to the isolation site [4]. The culture is then harvested and the supernatant obtained (crude enzyme) is kept for further enzyme assay.

3 RESULTS AND DISCUSSION

On screening, 20 bacterial strains were isolated. Out of 20, only 8 bacterial strain was identified to able to produce amylase enzyme by starch hydrolysing method. Out of these, isolate HL15 revealed the maximum and highest enzyme activity. In the microscopic examination, the isolate HL15 shows Gram negative, bacillus and rod in chain form. Presumptive identification results, from biochemical analysis indicates that bacterial isolate HL15 might belong to the genus '*Flavobacterium*' [2]. While, 16S rRNA sequence analyse by BLAST tool revealed that the organism phylogenetically belonged to genus *Flavobacterium* (unclassified Bacilli) which was closely related to the type strain [*Flavobacterium*] *thermophilum* strain G-21. The optimum temperature and pH for enzyme activity was found to be ranged between 55°C and pH of 8. Maximum amylase production was observed at agitation speed of 200 rpm, incubation period of 48 hours and with banana peel starch and peptone as carbon and nitrogen source (Table 1).

Table 1 Effect of physical and nutritional factors on enzyme production by thermophilic Shariah Compliant amylase producing bacteria.

Culture Conditions		Amylase Activity (U/mL) \pm SD
Temperature (°C)	40	0.609 \pm 0.09
	45	0.907 \pm 0.10
	50	1.125 \pm 0.04
	55	1.084 \pm 0.09
	60	0.975 \pm 0.14
	65	0.527 \pm 0.10
pH	5	0.427 \pm 0.05
	6	0.798 \pm 0.03
	7	1.122 \pm 0.02
	8	2.023 \pm 0.02
	9	1.764 \pm 0.00
	10	1.308 \pm 0.05

Agitation Speed (rpm)	140	0.427 ± 0.01
	160	0.798 ± 0.11
	180	1.122 ± 0.11
	200	1.125 ± 0.04
	220	0.109 ± 0.09
	240	0.103 ± 0.08
Incubation Period (Hours)	12	0.091 ± 0.05
	24	0.109 ± 0.08
	36	0.481 ± 0.08
	48	1.122 ± 0.04
	60	0.088 ± 0.07
	72	0.047 ± 0.04
Carbon Source	Banana Peel Starch	1.906 ± 0.16
	Starch	1.124 ± 0.25
	Glucose	0.262 ± 0.17
	Maltose	0.983 ± 0.10
	Lactose	0.506 ± 0.09
	Xylose	0.872 ± 0.26
Nitrogen Source	Casein	0.512 ± 0.15
	Peptone	1.284 ± 0.23
	Yeast Extract	1.139 ± 0.17
	Potassium Nitrate	0.618 ± 0.22
	Ammonium Sulphate	0.574 ± 0.19
	Ammonium Chloride	1.036 ± 0.25

*Data represent as mean for three replicates ± standard deviation

4 CONCLUSION

The present study showed the production of amylase enzyme by utilization of banana peel waste starch employing *Flavobacterium thermophilum* as the fermenting organism to produce Shariah Compliant amylolytic enzymes with low-cost carbon source was done. Results obtained from this study support the suitability of using banana peel waste as substrate for high production of amylase in conjunction to fulfil the Shariah Compliant requirement in production of Shariah Compliant amylolytic enzymes.

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REFERENCES

- [1] M.N. Riaz, and M.M. Chaudry, “The value of Halal food production. INFORM”, International News on Fats, Oils and Related Materials, 15(11), 698–700, 2004
- [2] M.A. Ashraf, M.I. Arshad, S.U. Rahman and A. Khan, “Characterization of Moderately Thermostable α -Amylase-producing *Bacillus licheniformis* from Decaying Potatoes and Sweet Potatoes”, BioResources, 13(3), 4931-4945, 2018
- [3] G.O. Olatunde, L.K. Arogundade and O.I. Orija, “Chemical, functional and pasting properties of banana and plantain starches modified by pre-gelatinization, oxidation and acetylation”, Cogent Food & Agriculture, 3(1), 1283079, 2017
- [4] P. Bernfeld, “Amylases a-and b-methods”, Enzymology, 1, 149-158, 1995

***Chlorella vulgaris* TRG 2A GROWTH IN CONWAY MEDIA SUPPLEMENTED WITH COMMERCIAL SOIL EXTRACTS AT DIFFERENT CONCENTRATIONS**

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Abstract – *Chlorella vulgaris* has been used commercially and extensively as a human health supplement, pharmaceutical, nutraceutical and cosmeceutical products, animal feed, biofuel and many more. However, a major problem of *C. vulgaris* large scale production is due to the high cost of media formulation to support their growth. Thus, there were demands to search for potentially low-cost growth enhancers which can be supplemented or re-formulated into the available formulated media. The soil extract with six different concentrations (2%, 5%, 10%, 15%, 20%, and 25%) were supplemented in the Conway media and tested, respectively. Ultimately, the growth of *C. vulgaris* was measured in absorbance value of microplate reader throughout the 14 days. It was observed that *C. vulgaris* TRG 2A had shown significantly different in growth pattern for each concentration tested. 15% concentrations of soil extract tested in this study was recognized as the optimum concentration to be supplemented in the Conway media since the growth of *C. vulgaris* TRG 2A is significantly high and most consistent. Hence, these preliminary findings had shown soil extracts have a great potential to be utilized for developing a new and cost-effective microalgae media formulation in the future.

Keywords : Autoclaved methods; *Chlorella vulgaris*; concentration; soil extract

1. INTRODUCTION

As photosynthetic plants, algae that existed for thousands of years are divided into two main types; macroalgae and microalgae. According to Bewicke and Potter [1], microalgae or phytoplanktons were among the earliest and most ancient forms of life on earth. The photosynthetic ability of microalgae because of its chlorophyll content found in most species made them suitable as oxygen producers and the basis of ecological food chains. In a group of green microalgae, *Chlorella* belongs to the Chlorophyta division. These unicellular and spherical shaped species are found primarily in fresh and brackish waters worldwide as well as in marine waters [2]. These species had existed on earth for more than 2.5 billion years and *Chlorella vulgaris*, *Chlorella ellipsoidea*, *Chlorella pyrenoidosa* and *Chlorella sorokiniana* were among the most known and commercially cultivated species [3].

Apart from their benefits, there are many different variations as to the preferred choice of media for culturing them conversely. Among the most common media used for the cultivation of *Chlorella* sp. are Bold's basal medium, Conway medium and f/2 medium. Conway medium has been used as the medium for the culture of *C. vulgaris* for many years because it requires high amounts of nitrogen and phosphorus in alkaline condition. The increased amounts of these nutrients cause the medium to become expensive and impractical for the large-scale production. The production of nutrients and media which requires the use of high energy and natural resources is the most cost-involving requirement for any microalgae growth [4].

Alternatively, researchers were focused to find low-cost materials or growth enhancers that can be supplemented in the available formulated media as consequences from the high-cost media problem. According to DeGomez et al. (2015), mineral is the largest component making up approximately 45%

to 49% of the total volume of soil [5]. They also stated in their study; there were approximately 1% to 5% levels of organic matters found in soils such as carbon, oxygen, hydrogen, phosphorus, nitrogen, potassium, calcium, sulphur, magnesium and many more. Thus, this study aims to investigate the optimum concentration of soil extracts that can enhance the growth rate of *Chlorella vulgaris* TRG 2A in the Conway media

2. METHODOLOGY

The target microalgal species used in this study were *Chlorella vulgaris* (TRG 2A) obtained from National Institute for Environmental Studies (NIES), Japan. Conway media was prepared from five basic solutions; mineral solution – 100 g of NaNO₃, 45 g of disodium EDTA (C₆H₁₆N₂O₈), 33.6 g of H₃BO₃, 20 g of NaH₂PO₄·4H₂O, 1.3 g of FeCl₃·6H₂O, 0.36 g of MnCl₂·4H₂O, and 1 mL trace metal solution in 1 L of Milli-Q water; trace metal solution – 0.21 g of ZnCl₂, 0.2 g of CoCl₃·6H₂O, 0.09 g of (NH₄)₆MO₇O₂·4H₂O, and 0.2 g of CuSO₄·5H₂O in 100 mL Milli-Q water; vitamin solution – 0.2 g of thiamine (B1), cyanocobalamin (B12) in 100 mL of Milli-Q water; silicate solution – 2 g of Na₂SiO₃ in 100 mL of Milli-Q water; and nitrate solution – 2 g of KNO₃ in 100 mL of Milli-Q water. The media were prepared by adding 1 mL of main mineral, silicate, and nitrate solution to the Schott bottle to prepare 1 L volume media. After autoclaving the prepared media, 1 mL of NH₄Cl and vitamin solution were added into the cooled medium to give a final medium concentration of 5.0 × 10⁻⁴ M. The cultures were grown at 25 ± 0.5 °C under a light intensity of 33.75 μmol photons m⁻² s⁻¹ on a 12 h light: 12 h dark cycle. The stock cultures were acclimatised to the experimental conditions prior to the experiment before the strains were tested on sludge extracts.

2.1 Preparation of Soil Samples

Soil sample was purchased from Sungai Buloh, Selangor. Firstly, the soil sample was spread on aluminium foil trays and air-dried in a fume hood for approximately 1-3 days or until completely dried. Next, the dried soil was sieved into fine powder using a standard tea strainer.

3. RESULTS AND DISCUSSION

3.1 Effect of *Chlorella vulgaris* Growth Rate in Conway Media Supplemented Soil Extracts at different concentrations

The effects of different concentrations of autoclaved soil extract (2%, 5%, 10%, 15%, 20%, and 25%) supplemented in Conway medium on the growth of *C. vulgaris* were measured based on its absorbance value using a microplate reader for 14 days. Based on the graph in Figure 1, it can be observed that *C. vulgaris* showed the highest growth at 15% soil extract concentration. The composition of soil extract which consists of nitrogen, sulphur, phosphorus, magnesium and calcium are the elements responsible for enhancing the biomass of *C. vulgaris* [6].

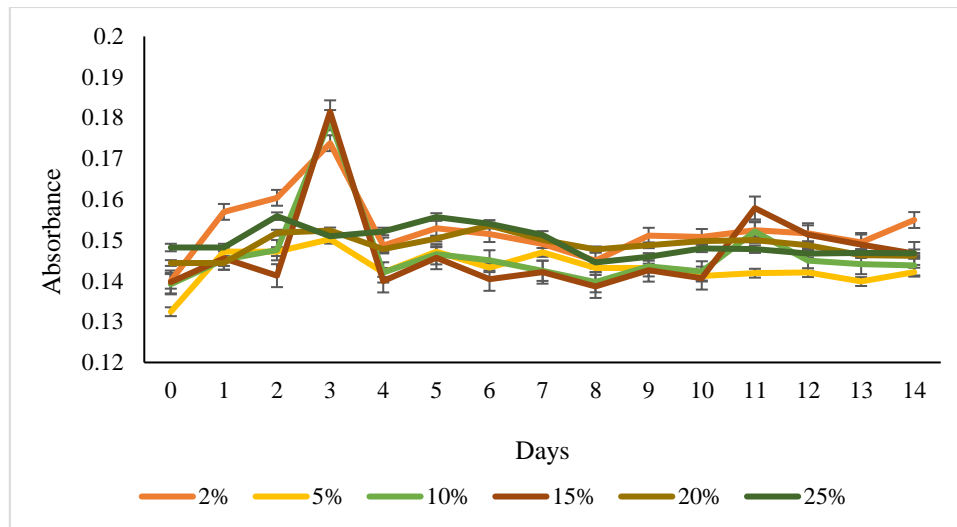


Figure 1 Growth profile of *C. vulgaris* TRG 2A in different concentrations of soil extract supplemented in Conway media. Error bars represent standard deviation ($n = 3$)

4. CONCLUSION

At 15% autoclaved soil extract concentration, *C. vulgaris* showed significant increase in growth as compared to 2%, 5%, 10%, 20% and 25% concentration. Previous studies indicated that the incorporation of soil extract in the culture of microalgae increases the microalgae growth rate.

ACKNOWLEDGEMENT

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REFERENCES

- [1] D. Bewicke and B. Potter, “*Chlorella: The Emerald Food*”, Berkeley, California: Ronin Publishing, 2009
- [2] A. Guccione, N. Biondi, G. Sampietro, L. Rodolfi, N. Bassi and M. R. Tredici, “Chlorella for protein and biofuels: from strain selection to outdoor cultivation in a Green Wall Panel photobioreactor”, *Biotechnology for Biofuels*, vol 7 (1), pp 84. 2014
- [3] S. Perumal, A. R. Thirunavukkarasu and P. Pachiappan, “Advances in Marine and Brackishwater” *Aquaculture*, pp 1–262, 2015
- [4] M. F. Blair, B. Kokabian and V. G. Gude, “Light and growth medium effect on *Chlorella vulgaris* biomass production”, *Journal of Environmental Chemical Engineering*, vol. 2 (1), pp 665–674, 2014
- [5] DeGomez, T., Kolb, P., and Kleinman, S.: *Basic Soil Components*: <http://articles.extension.org/pages/54401/basicsoil-components>, 2015
- [6] M. Atta, A. Bukhari, C. L. Teo and A. Idris, “Effect of Soil Extracts Concentration on Specific Growth Rate and Lipid Content of *Chlorella vulgaris* in Bolds Basal Medium”, *Malaysian Journal of Fundamental and Applied Sciences*, vol.10 (2), pp 96-100, 2014

ENHANCEMENT OF *C. Vulgaris* SPECIES GROWTH USING AQUACULTURE SLUDGE EXTRACTS

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Abstract – High-value microalgae have many useful substances that can be used for many applications. This study established the effect of the sludge extract (SE) on *C. vulgaris* species. Five different autoclave extraction parameters were assessed on SEs, i.e. 1-h at 105 °C, 2-h at 105 °C, 1-h at 121 °C, 2-h at 121 °C, and 24-h at room temperature (natural extraction). The SE obtained from the Sabak Bernam (SB) and Kota Puteri (KP) was supplemented with Conway media and checked using microplate incubation technique. Microalgae cultivation in control (media) and enriched (media + SE) samples were incubated for nine days at 25 °C with 33.75 $\mu\text{mol photons m}^{-2} \text{s}^{-2}$ light intensity on a 12-hour light: 12 h dark cycle. *C. vulgaris* (TRG 2A) and *C. vulgaris* (TRG6-B01) showed better growth in modified SE compared to control yet no significance differences ($p > 0.05$) were observed. The specific growth rate (SGR) of *C. vulgaris* (TRG 2A) showed significant differences ($p < 0.05$) between SB and KP SE while, *C. vulgaris* (TRG6-B01) showed no significant differences ($p > 0.05$). The organic matter contents in the SE and autoclave at extended high temperatures influences the microalgae growth.

Keywords : *C. vulgaris*; extraction parameters; sludge extract; specific growth rate

1. INTRODUCTION

Microalgae are a diverse group of autotrophic, unicellular species that are mainly photosynthetic. *Chlorella vulgaris* has indicate potential for many applications by its rapid growth rates, large number of biochemical compounds and adaptability to environmental stresses. Nutritional condition for microalgae development is significant as it can influence the development of microalgae. Artificial culture mediums which comprise of unadulterated synthetics are not sufficient to amplify certain algal development [1]. The supplements in compost based culture media can increase microalgae development at minimized expense contrasted with a similar supplement organization in artificial culture medium [2].

Aquaculture sludge from two ponds, Sabak Bernam shrimp pond (SB) and Kota Puteri fish pond (KP), were tried in this examination to determine their natural microalgae growth-promoting effects. The aim of this examination was to assess the development impacts of sludge extracts (SEs) on *C. vulgaris* species. More specifically, our point is to assess the potential of SE on high-esteem microalgae growth.

2. METHODOLOGY

2.1 Sludge extracts (SEs)

Sludge was gathered from two sorts of ponds, i.e., SB shrimp pond and KP fish pond. The samples were oven dried at 60 °C for multi week to eliminate dampness and afterward ground utilizing 700 g Swing Type Electric Herbal Powder Grinder (Weifang City, Shandong, China), sieved at 1 mm, and homogenized. The dried sludge samples had been treated with aqueous extraction. Five autoclave extraction treatments were done on the sludge samples: 1-h at 105 °C, 2-h at 105 °C (twice), 1-h at 121 °C, 2-h at 121 °C (twice), and no autoclave, 24-h at room temperature [3].

2.2 Microalgae

Microalgal species used in this study were *Chlorella vulgaris* (TRG 2A) and *C. vulgaris* (TRG6-B01). The microalgae cultures were grown on Conway media under a light intensity of $33.75 \mu\text{mol photons m}^{-2} \text{s}^{-1}$ at $25 \pm 0.5 \text{ }^\circ\text{C}$ on a 12-hour light: 12 h dark cycle. The microplate-incubation technique was performed for the two microalgae utilizing 96-well microplates in the five diverse SE extraction treatments. The biomass or microalgae growth was estimated by optical density (OD) at 680 nm per 24 h by incubating the microplates for nine days, utilizing the Infinite M200 PRO (Tecan, Austria) microplate reader.

3. RESULTS AND DISCUSSION

Both microalgae species demonstrated positive development patterns under all extraction treatments tested. Fig. 1 (A) showed that the development of *C. vulgaris* (TRG 2A) in all modified SE were higher contrasted with control. This microalga showed higher growth in media + $105 \text{ }^\circ\text{C}$ twice compared to control and other modified SE (Fig. 1 B) yet, no significant differences ($p > 0.05$) were seen between it. Hence, it showed that modified SE enhances microalgae growth more than control.

The development of *C. vulgaris* (TRG6-B01) in SB SE indicated higher growth in all modified SE than control (Fig. 2 A), yet no significant differences ($p > 0.05$) were observed between modified SE and control. In KP SE, the growth was higher in media + $105 \text{ }^\circ\text{C}$ twice and media + $121 \text{ }^\circ\text{C}$ contrasted with control (Fig. 2 B) but, it did not show any significant differences ($p > 0.05$) between it. Hence, it is proved that aquaculture sludge extracts have the essential elements needed to maximize microalgae growth. Previous studies include that *C. vulgaris* was cultivated for biomass production and nitrogen removal on certain number of wastewaters like municipal, industrial and agricultural sewage [4]. Therefore, it is possible to find promising waste water to replace artificial medium for cultivating algae. If the nutrients in wastewater were well balanced, then it could be an ideal supplement source for algae cultivation [5].

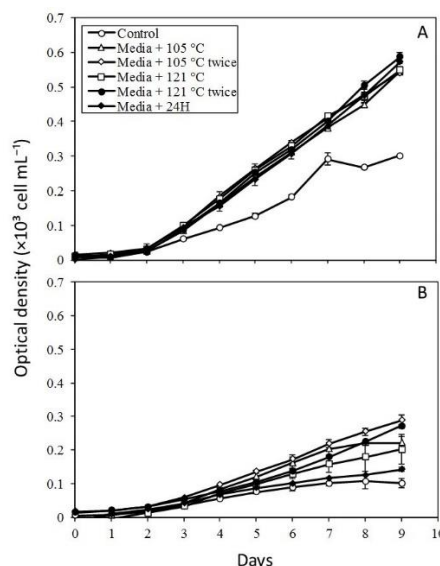


Figure 1 Optical Density at 680 nm of *C. vulgaris* (TRG 2A) in control, media + $105 \text{ }^\circ\text{C}$, media + $105 \text{ }^\circ\text{C}$ twice, media + $121 \text{ }^\circ\text{C}$, media + $121 \text{ }^\circ\text{C}$ twice and media + 24 hour at (A) SB SE and (B) KP SE. Error bars represent standard deviation ($n = 3$)

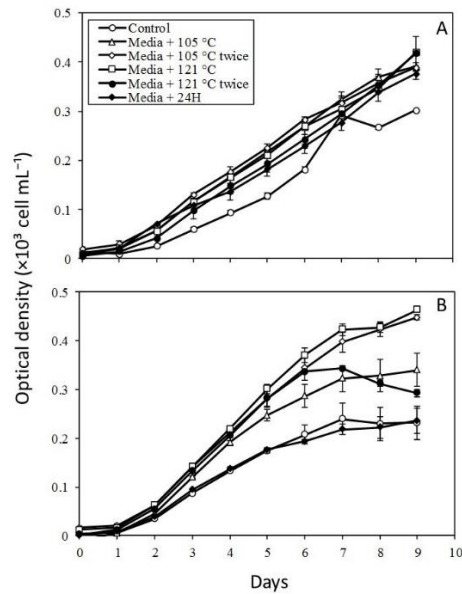


Figure 2 Optical Density at 680 nm of *C. vulgaris* (TRG 6- B01) in control, media + 105 °C, media + 105 °C twice, media + 121 °C, media + 121 °C twice and media + 24 hour at (A) SB SE and (B) KP SE. Error bars represent standard deviation (n = 3)

4. CONCLUSION

In conclusion, the study showed the possibility of enhanced microalgae growth with additional enrichment from treated sludge extracts. Autoclaving sludge for extended time at high temperatures could increase the microalgae growth.

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REFERENCES

- [1] M. Ashraf, M. Javaid, T. Rashid, M. Ayub, A. Zafar, S. Ali, & M. Naeem, "Replacement of expensive pure nutritive media with low cost commercial fertilizers for mass culture of freshwater algae, *Chlorella vulgaris*", International Journal of Agriculture & Biology, vol.13 (4), 2011.
- [2] M. A. Guzmán-Murillo, C. C. López-Bolaños, T. Ledesma-Verdejo, G. Roldan-Libenson, M. A. Cadena-Roa, & F. Ascencio, "Effects of fertilizer-based culture media on the production of exocellular polysaccharides and cellular superoxide dismutase by *Phaeodactylum tricornutum* (Bohlin)", Journal of Applied Phycology, vol.19 (1), pp 33-41, 2007
- [3] K. Arumugam, M. F. Ahmad, N. S. Yaacob, W. M. Ikram, M. N. Maniyam, H. Abdullah, ... & V. S. Kuwahara, "Enhancement of targeted microalgae species growth using aquaculture sludge extracts", Heliyon, vol.6 (7), pp e04556, 2020
- [4] H. Amini, Wang, Lijun, A. Shahbazi, "Effects of harvesting cell density, medium depth and environmental factors on biomass and lipid productivities of *Chlorella vulgaris* grown in swine wastewater", Chemical Engineering Science, vol.152, pp 403-412, 2016
- [5] Valverde-Pérez, E. Ramin, B. F. Smets, & B. G. Plósz, "EBP2R—an innovative enhanced biological nutrient recovery activated sludge system to produce growth medium for green microalgae cultivation", Water Research, vol.68, pp 821-830, 2015

BIODEGRADATION OF LOW-DENSITY POLYETHYLENE (LDPE) BY MALAYSIAN *Rhodococcus* spp.

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Abstract – As known, plastic accumulation worldwide is unbearable and becoming a huge environmental threat as they are very hard to be degraded. Low-Density Polyethylene (LDPE) is one of most common material used to produce plastic. This paper presents the investigation of the biodegradation ability of study of the capabilities of twenty-three Malaysian *Rhodococcus* isolates in degrading low-density polyethylene (LDPE) through weight reduction test. Shake-flask incubation was performed for the investigation. Through the study, all isolates have showed different capabilities to degrade the LDPE in which the *Rhodococcus* UCC0018 demonstrated the highest degradation with 8.69 %. This finding shows the promising potential to explore this bacteria strain as an agent for plastic waste biological treatment.

Keywords : Low-density Polyethylene (LDPE) microbial degradation; Malaysian *Rhodococcus* spp.; fermentation

1. INTRODUCTION

Low-Density Polyethylene (LDPE) is a thermoplastic that are commonly manufacturing plastics bags, trays containers and plastic wraps. Due to its benefits and low production cost, it becomes extremely popular in all the sectors of the industry [1,2]. However, the excessive use of LDPE has caused an enormous effect in the marine environment, food safety and quality, human health and contributes to climate change. This is because LDPE is not organic materials, and most bacteria cannot degrade them. Even with the help of UV light from the sun, it will take many years to break it down. There are many ways to degrade LDPE which are chemical degradation, photodegradation and biological degradation [3]. However, biological degradation is the most popular method because it does not cause harm to the environment.

The characteristic of polyethylene such as molecular weight, crystallinity, functional groups, mobility, substituent present in the structure and the additives added to the polymers play a significant role in its degradation [4]. The common media used during incubation of treatment are M1 [5], synthetic media (SM) [6] and liquid minimal salt medium [7] with some modifications (Orr, Hadar & Sivan, 2004). The main goal of this study is to investigate the Malaysian *Rhodococcus* abilities in degrading LDPE. These strains were chosen because of its broad catabolic versatility and unique enzymatic capabilities [8].

2. METHODOLOGY

2.1 Bacterial strain and culture conditions

The 23 Malaysian *Rhodococcus* isolates were obtained from Unisel Culture Collection maintained at the Institute of Bio-IT Selangor Laboratory. Nutrient agar (NA) and nutrient broth (NB) media were used to maintain the bacterial cultures. The liquid cultures (25 ml) were incubated in falcon tubes (50 ml) in an incubator shaker (150 rpm) at 30°C for 24 hours before treatment of polyethylene.

2.2 Pre-treatment of Polyethylene

The LDPE were cut into small strips, washed with 70% ethanol, distilled water and air-dried. The strips were grinded with crystalline NaCl by using mortar and pestle until become soft and ruptured strips. The mixture was transferred into a conical flask with the distilled water and mixed well in a shaker for 1 hour. The solution was filtered using Whatman no. 1 filter paper and air-dried.

2.3 Treatment of Polyethylene

The *Rhodococcus* isolates were inoculated individually in 25 ml of nutrient broth in the 50 mL of falcon tubes. The falcon tube containing only the nutrient broth acted as a control. After 24 hours, 1 mL of *Rhodococcus* inoculum was added into the 50 mL falcon tube containing 25 mL of nutrient broth and 0.2 g polyethylene. The treatments were incubated in incubator shaker at 150 rpm, 30°C for 24 hours. The treatments were conducted in triplicates.

2.4 Removal of bacterial biofilm from the polyethylene surface

The polyethylene strips were recovered from nutrient broth after 24 hours by filtering using Whatman No. 41 filter paper. The strips were washed with 2% aqueous sodium dodecyl sulphate (SDS) solution for 3 hours and finally rinsed with distilled water until the bubbles from SDS were gone. The washed polyethylene strips were dried overnight in drying oven at 50°C before weighing.

3. RESULTS AND DISCUSSION

Figure 1 show the percentage of microbial degradation studied using weight reduction test as suggested by [9]. It shows the weight reduction of LDPE by each of *Rhodococcus* isolates. The highest percentage was demonstrated by *Rhodococcus pyridinivorans* strain UCC0018 as registered in Genbank [10] with 8.69 % of weight reduction, followed by *Rhodococcus pyridinivorans* strain UCC0017 with 7.86 % in 24 hours of incubation.

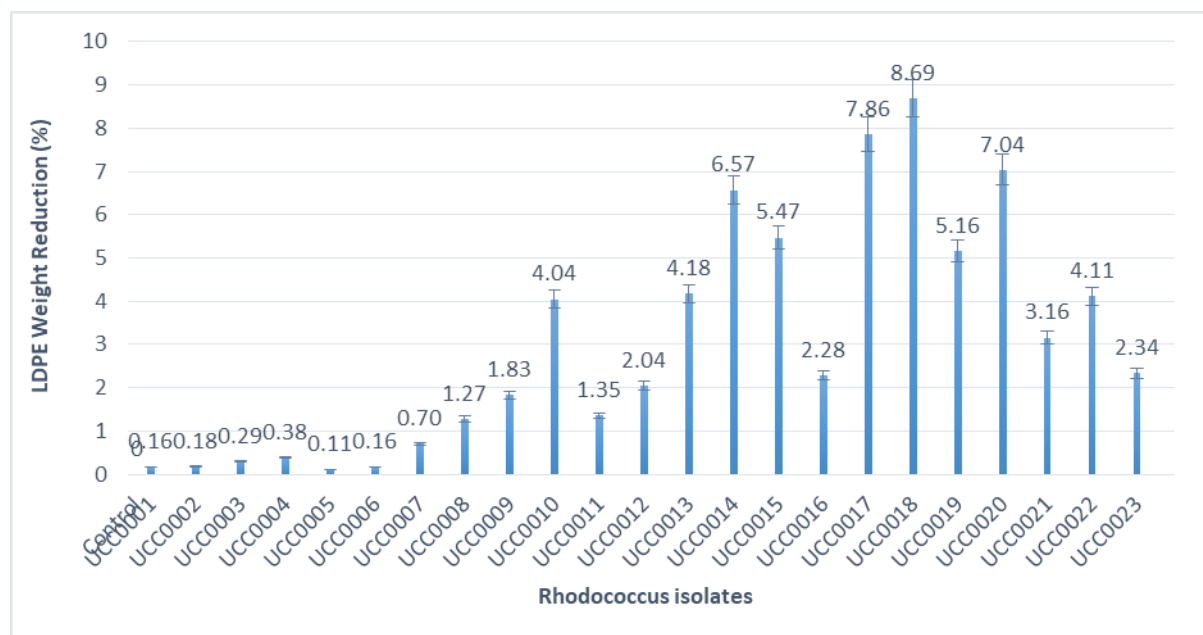


Figure 1 The result of LDPE degradation by 23 Malaysian *Rhodococcus* isolates measured using weight reduction method (Nanda and Sahu, 2010) at 30 °C for 24 hours incubation. The error bar are based on the standard deviation which are <0.05

4. CONCLUSION

This study has successfully demonstrated the ability of 23 Malaysian *Rhodococcus* isolates obtained from Unisel Culture Collection to degrade low-density polyethylene (LDPE). This finding shows the promising potential to explore this bacteria strain as an agent for plastic waste biological treatment.

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REFERENCES

- [1] Lee, Alicia and Mei Shan Liew, "Tertiary recycling of plastics waste: an analysis of feedstock, chemical and biological degradation methods", Journal of Material Cycles and Waste Management, pp 1-12, 2020
- [2] Z. Montazer, M. B. Habibi-Najafi, M. Mohebbi and A. Oromiehei, "Microbial degradation of UV-pretreated low-density polyethylene films by novel polyethylene-degrading bacteria isolated from plastic-dump soil", Journal of Polymers and the Environment, vol.26 (9), pp 3613-3625, 2018
- [3] J.M.R. Da Luz, S.A. Paes, D.M.S. Bazzolli, M.R. Totola, A.J. Demuner, M.C.M. Kasuya, "Abiotic and biotic degradation of oxobiodegradable plastic bags by *Pleurotus ostreatus*" PLoS ONE, 2014
- [4] J.D. Gu, T.E. Ford, D.B. Mitton, R. Mitchell, "Microbial corrosion of metals", In: Review (ed) The Uhlig corrosion handbook, 2nd edn. Wiley, New York, pp 915–927, 2000
- [5] M. Das and S. Kumar, "An approach to low-density polyethylene biodegradation by *Bacillus amyloliquefaciens*", 3 Biotech, vol.5 (1), pp 81-86, 2014
- [6] D. Hadad, S. Geresh and A. Sivan, "Biodegradation of polyethylene by the thermophilic bacterium *Brevibacillus borstelensis*", Journal of Applied Microbiology, vol.98 (5), pp 1093-1100, 2005
- [7] Y. Hadar and A. Sivan, "Colonization, biofilm formation and biodegradation of polyethylene by a strain of *Rhodococcus ruber*", Applied Microbiology And Biotechnology, vol.65 (1), 2004
- [8] M. Nallapan Maniyam, A. Hazeeq Hazwan, A. Hasdianty and Y. Nor Suhaila, "Malaysian *Rhodococcus* as Promising Biological Tool for Wastewater Treatment", A book chapter in Industrial Wastewater: Industrial Pollutants, Treatment and Disposal. Nova Book Series. ISBN: 978-1-53618-252-I, 2020
- [9] S. Nanda and S.S. Sahu, "Biodegradability of polyethylene by *Brevibacillus*, *Pseudomonas*, *Rhodococcus* spp.", New York Science Journal, vol.3 (7), pp 95-98, 2010
- [10] A. Hasdianty, Y. N. Suhaila, A. H. Hazwan, M. N. Maniyam, A. M. Fadzli and A. L. Ibrahim, "Inferring the evolutionary relationship of 23 Malaysian *Rhodococcus* isolates with potential as cholesterol degrading bacteria", Biocatalysis and Agricultural Biotechnology, 101840, 2020

COMPARING METAGENOMICS ASSEMBLER: WHICH IS BETTER IN ASSESSING SOIL MICROBIOME?

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Abstract - The increasing rate of metagenomic data generation represents a serious challenge to bioinformaticians where they must overcome limitation in computational resources, computing power, and appropriate processing pipelines. In this study, we compare two most popular metagenomic assembler MegaHit and metaSPAdes for assembling Whole Genome Sequencing data of Royal Belum soil microbe. Shotgun metagenomic sequencing was performed on Royal Belum soil samples by using the Illumina platform and undergone data pre-processing with Solexa QA++, contigs assembly before functionally analysed by MgRast server in order to extract the genetic repertoire of the microbiomes. Results for both assembly methods were compared in terms of total unique sequence assigned, predicted protein features, total number of bases generated and their α -diversity score. Assembly performance in terms of quality and quantity of data generated, shows that metaSPAdes performing consistently well when it produced nine time more predicted protein features compared with MegaHit approach. Overall, metaSPAdes managed to assemble 104,809,578 base pair high quality sequences from 28,918,900 short sequence whereas MegaHit just managed to assemble 18,012,213 base pair of DNA from the same data used.

Keywords : Metagenomics; assembly; binning; Royal Belum soil; annotation; MegaHit; metaSPAdes

1. INTRODUCTION

High throughput sequencing technology such as Shotgun Whole Genome Sequencing (WGS) by Illumina platform produces a large number of genome sequences data [1]. It requires fast and accurate assembly method to combine hundreds of millions of overlapping reads produced by the machine into longer contiguous sequences to become near complete genome of a microbe or at least recover entire gene sets [2]. This is essential to make the data useful in assessing the entire gene pool of a microbial community. Analysing a large number of sequences usually costs heavy computing resources and takes long time [3] for example, metaSPAdes [4] perform well on metagenomic data sets since it performs compound assemblies with varying overlapping lengths in different k-mer size but this approach need a very powerful computing power. In terms of memory requirement metaSPAdes is the most memory expensive where it requires 157 GB of RAM to run [5]. To shorten computation time and reduce requirements for computing resources, researchers introduced advanced algorithmic techniques and database optimization methods such as MegaHit. This assembler is considerably improved version over the previous generation of de novo assemblers in terms of performance and heavy computing power dependency where it considered as the most memory efficient assembler and just need 11 GB of RAM to run [5]. Thus this study was conducted to compare the efficiency between these two assembler in assessing the soil microbiome in Royal Belum Reserve Forest.

2. METHODOLOGY

2.1 Soils Bacterial Metagenome Extraction

The DNA samples extracted was performed within 24 h after sample collection according to the modified procedure elaborated for soil material as described by [6] by using DNeasy PowerSoil Kit and undergone three quality controls (QC) procedure by Nanodrop spectrophotometer at UV length A260/280, gel electrophoresis profiling and Qubit fluorescent dye to ensure the intactness of the DNA

samples. DNA samples that passed the QC were purified by using magnetic beads and agent court to remove tannin and undergone mechanical shearing procedure by using Covaris instrument to make sure all the DNA samples length are between 300bp to 350bp measured by Bioanalyzer. Samples were measured by Qubits to ensure the total recovery after purification is more than 70% and the total DNA per 50 μ L is 1 μ g before the adenylation of 3' end. Individual barcode of index adapter sequences was added to each DNA fragment during library preparation so that each read can be identified and sorted before the final data analysis in flow cells chip. Samples were sequenced by using Illumina NGS Paired-end technology and reads were aligned and gone through preprocessing phase in bioinformatics pipeline.

2.2 Gene Annotation and Sequence Analysis

The Raw sequence quality was checked and the reads were trimmed accordingly by using FastQC (Version 0.11.5 released); it is a tool provided by Babraham Institute which makes the quality control of high-throughput sequencing pipelines an easy matter. In Command Line Interface (CLI), SolexaQA++ was used [7] in DynamicTrim application where sequences were trimmed based on $Q_{\text{phred}} < 20$ and in LengthSort command sequences that were shorter than 50 bp were removed. The cleaned sequences were paired together and shuffled to produce high quality sequences before assembled using the metaSPAdes (version 3.13.0) and MegaHit (version 1.2.9). Functional annotation was conducted by aligning sequencing reads against KEGG database (Release 84.1) [8] using MEGAN6 software (Version 6.11.7) [9] with the parameter setting of blastp [10] based on the LCA algorithm. Finally, the gene read numbers for each sample were normalized based on median read number. The M5 non-redundant protein database (M5NR) was used for taxonomic annotation and the SEED database and Clusters of Orthologous Groups database for functional annotation. To identify the sequences, the best BLASTx hit was used with a minimum alignment length of 15 bp and an e-value cut-off of $e < 1 \times 10^{-5}$ and 95% confidence interval. Functional annotation of the most abundant taxa was performed using the filter option. The same was done for selection group of genes to reveal the responsible taxa. The shotgun metagenomics sequence data used in this study are deposited in the MG-RAST server [11] under project ID mgp94971 and mgp94737. Quality of the generated assemblies were assessed using MetaQUAST. This tool calculates basic assembly statistics, including number of contigs.

3. RESULTS AND DISCUSSION

Shotgun Whole Genome sequencing (WGS) of Royal Belum soil sample generated over 31 million paired-end reads, 101 bp in length. Ninety-three percent of raw reads (28 918 900) were retained after quality-trimming and aligned to the NCBI-NR protein database. From the trimmed data showed in Table 1, MegaHit(MH) managed to assemble 37 408 sequences that were successfully assigned to protein features whereas metaSPAdes (MS) assigned 342 811 protein features. MegaHit produced 18 million DNA base pair and metaSPAdes produced 105 million DNA base pair. Alpha diversity summarizes the diversity of organisms in a sample with a single number. The α -diversity of annotated samples can be estimated from the distribution of the species-level annotations. Annotated species richness is the number of distinct species annotations in the combined MG-RAST data set. Shannon diversity is an abundance-weighted average of the logarithm of the relative abundances of annotated species. The species-level annotations are from all the annotation source databases used by MG-RAST. The α -diversity of MS is 400 species and for MH is 343 species.

Table 1 WGS sequence processing details per sample.

Assemblies Predicted		Total of Contigs		Total No of Bases (bp)		α diversity (Mg-RAST)	
Protein Features		(sequence)		(Mg-RAST)			
MH	MS	MH	MS	MH	MS	MH	MS
37408	342811	36091	352246	18012213	104809578	343	400

Figure 1 below shows the rarefaction curve of annotated species richness. This curve is a plot of the total number of distinct species annotations as a function of the number of sequences sampled. On the left, a steep slope indicates that a large fraction of the species diversity remains to be discovered. If the curve becomes flatter to the right, a reasonable number of individuals is sampled: more intensive sampling is likely to yield only few additional species. Sampling curves generally rise very quickly at first and then level off toward an asymptote as fewer new species are found per unit of individuals collected. These rarefaction curves are calculated from the table of species abundance. The curves represent the average number of different species annotations for subsamples of the complete data set.

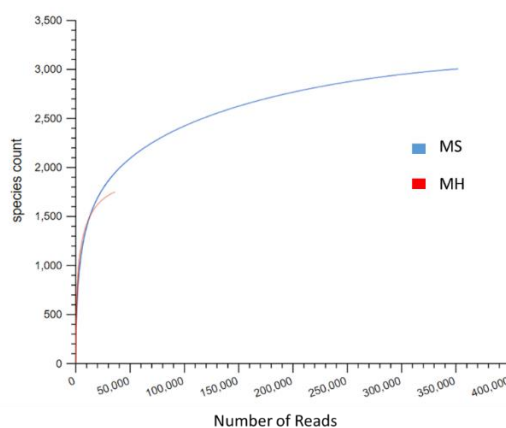


Figure 1 Rarefaction curve of annotated species richness from MH and MS assembly approaches.

4. CONCLUSION

MegaHit and metaSPAdes provided very large assembly spans with several pros and cons at different parts of applications. MetaSPAdes produced much more data than MegaHit and good assemblies with the most long and ultra-long contigs for the dataset. These are ideal characteristics that making it more applicable for microbial community profiling. While metaSPAdes produced the best assemblies in general, MEGAHIT performed comparably and emerged as a rapid and memory efficient alternative assembler. Consequently, we propose for the selection of an appropriate assembler, dictated on how deep the scientific research questions then by the computational resources available. In light of the above proposed framework, we urge researchers to carefully consider the assembler used (as well as the entire bioinformatics pipeline followed) while specifically bearing in mind their research question and what feature of the dataset they want to obtain.

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REFERENCES

- [1] A.T. Vincent, N. Derome, B. Boyle, A.I. Culley, “Charette SJ. Next-generation sequencing (NGS) in the microbiological world: how to make the most of your money”, *J Microbiol Methods*, vol.138, pp60-71, 2016
- [2] C. Simon and R. Daniel, “Metagenomic analyses: past and future trends”, *Appl Environ Microbiol*, vol.77 (4), pp1153-61, 2011
- [3] M.A. Peabody, T. Van Rossum, R. Lo and F.S. Brinkman, “Evaluation of shotgun metagenomics sequence classification methods using in silico and in vitro simulated communities”, *BMC Bioinformatics*, vol.16 (362), 2015
- [4] S. Nurk, D. Meleshko, A. Korobeynikov and P.A. Pevzner, “metaSPAdes: a new versatile metagenomic assembler”, *Genome Research*, vol.27 (5), pp 824–834, 2017
- [5] A. Van der Walt, M. van Goethem and J. Ramond, “Assembling metagenomes, one community at a time”, *BMC Genomics*, vol.18(521), 2017
- [6] J. K. Jansson and K. S. Hofmockel, “The soil microbiome-from metagenomics to metaphenomics”, *Current Opinion in Microbiology*, vol.43, pp162–168, 2018
- [7] V. Sevim, J. Lee and R. Egan, “Shotgun metagenome data of a defined mock community using Oxford Nanopore”, *PacBio and Illumina Technologies. Sci Data*, vol.6 (285), 2019
- [8] M. Kanehisa, S. Goto, “KEGG: Kyoto Encyclopedia of Genes and Genomes”, *Nucleic Acids Res*, vol.28, pp 27–30, 2000
- [9] D. Huson, S. Beier, I. Flade, A. Gorska, M. El-Hadidi, S. Mitra, H. Ruscheweyh and D. Rewati Tappu, “MEGAN Community Edition - Interactive exploration and analysis of large-scale microbiome sequencing data”, *PLoS Computational Biology*, vol.12 (6):e1004957, 2016
- [10] B. Buchfink, C. Xie, D.H. Huson, “Fast and sensitive protein alignment using DIAMOND”, *Nat Methods*. vol.12 (59), 2015
- [11] F. Meyer, D. Paarmann, M. D'Souza, R. Olson, E.M. Glass, M. Kubal, T. Paczian, A. Rodriguez, R. Stevens, A. Wilke, J. Wilkening and R.A. Edwards, “The metagenomics RAST server – a public resource for the automatic phylogenetic and functional analysis of metagenomes”, *BMC Bioinformatics*, vol.9 (386), 2008

EGG YOLK CHOLESTEROL BIODEGRADATION BY *Rhodococcus Ruber* STRAIN UCC0021

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Abstract - Eggs yolk is known to have high cholesterol content that has always been an inconvenience due to concerns about the relationship between dietary cholesterol and atherosclerotic cardiovascular risk. Microbial degradation of cholesterol content has been demonstrated over a decade ago and becoming the preferred method as it is considered as more natural and environmental friendly. Thus, this paper presents the current study of microbial cholesterol degradation by *Rhodococcus ruber* strain UCC0021. 500 μ L of egg yolk was incubated in a media containing the bacterium for 72 hours and the cholesterol content was measured using GC-FID. The cholesterol content was reduced from 62 mg/100g to 42 mg/100g (32 % of reduction) at the final hour of incubation. This study has successfully showed the ability of *Rhodococcus ruber* strain UCC0021 in degrading egg yolk cholesterol.

Keywords : Egg yolk; cholesterol biodegradation; *Rhodococcus spp.*

1. INTRODUCTION

Egg is a richly nutritive food, proteins and lipids of which possess excellent functional characteristics and biological activities [1]. Not only eggs are commonly taken in daily diet, they are also widely used as emulsifying agent in the food industry [2]. Conversely, due to its high content, many has been declining the egg consumption. One simple egg contains approximately 200 to 300 mg/100 of cholesterol which is almost equal to the dietary limit set by the American Heart Association of < 300 mg/day [3, 4, 5]. Due to the reason, egg is blamed as the biggest contributor of the dietary cholesterol intake and accused to be the cause for cardiovascular disease [6]. This negative concerns related to egg yolk cholesterol have hence triggered studies in lowering cholesterol level in egg yolk [7].

Studies on utilizing biological methods, either involving the whole cell or enzymatic degradation of cholesterol focused on the cholesterol oxidase. [8, 9, 10] reported on the reduction of cholesterol content in egg yolk using this enzyme. Hasdianty *et al.* [11] has showed the ability of Malaysian *Rhodococcus* isolates to degrade cholesterol in cholesterol selected agar. Therefore, this study was conducted to evaluate the capability one of the isolates, namely the *Rhodococcus ruber* strain UCC0021 to degrade cholesterol in egg yolk.

2. METHODOLOGY

Egg yolk is known to possess a high content of cholesterol, which is approximately 250 mg/yolk and commonly taken as daily diet. Therefore, to validate the concept of cholesterol degradation by *Rhodococcus ruber* strain UCC0021, egg yolk was chosen as the food sample. The degradation of cholesterol in egg yolk by this bacterium was conducted according to the method by [8] with a little modification.

Culture medium contained (g/L): NH₄NO₃, 1.0; K₂HPO₄, 0.25; MgSO₄.7H₂O, 0.25; FeSO₄.7H₂O, 0.001; yeast extract, 5; pH 7.0, was prepared and sterilized by autoclaving. 500 μ l of egg yolk from Nutriplus Egg was aseptically added into 10 mL culture medium in 50 ml centrifuge tube. 10 % (v/v) of inoculum was then added into the tube and inoculated with continuous shaking (150 rpm) at 37 °C for 24 hours. One ml of the sample was taken every 24 hour and the cholesterol content was measured using GC-FID based on the verified protocol JAOAC Vol 73, No.5, 1990 by ALS Technichem (M) Sdn Bhd.

3. RESULT AND DISCUSSION

The degradation of cholesterol content in egg yolk added to the culture medium inoculated with *Rhodococcus ruber* strain UCC0021 is shown in Figure 1. It can be seen from the result that the cholesterol content was decreased with the increase of incubation time. The cholesterol content was reduced from 62 mg/100g to 47 mg/100g within 24 hours of incubation which is equal to 24 % of cholesterol reduction in overnight. The degradation continued slightly until 72 hours of incubation. Cholesterol content was successfully reduced to 42 mg/100g (32 % of reduction) at the final hour of incubation. The reduction of cholesterol content was significantly faster than demonstrated by *Rhodococcus equi* No. 23 reported by Aihara *et al.* [8]. Slow reduction of cholesterol content was also demonstrated by *Bacillus coagulans* strain B1 within 48 hours of incubation.

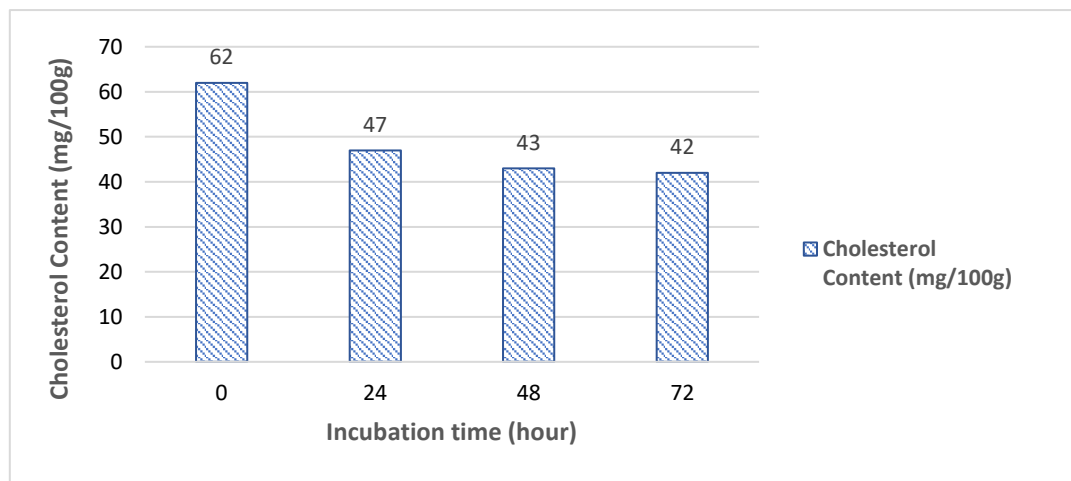


Figure 1 Cholesterol content reduction by *Rhodococcus ruber* strain UCC002 observed for 72 hours

4. CONCLUSION

This study has successfully showed the ability of *Rhodococcus ruber* strain UCC0021 to degrade cholesterol in egg yolk. This finding indicated the promising potential of this bacterium as agent for cholesterol reduction in the food industry.

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REFERENCES

- [1] N. Xiao, Y. Zhao, Y. Yao, N. Wu, M. Xu, H. Du and Y. Yu, "Biological activities of egg yolk lipids: A review", *J. Agric. Food Chem.*, vol.68, pp 1948– 1957, 2020
- [2] I. Marcet, S. Collado, B. Paredes and M. Diaz, "Rheological and textural properties in a bakery product as a function of the proportions of the egg yolk fractions: Discussion and modelling", *Food Hydrocolloids*, vol.54, pp 119-129, 2015
- [3] J.M. Miranda, X. Anton, C.R.Valbuena, P.R. Saavera, J.A. Rodriguez, A. Lamas, C.M. Franco and A. Cepeda, "Egg and egg-derived foods: Effect on human health and use as functional foods", *Nutrients*, vol.7, pp 706-729, 2015
- [4] J.D. Spence, D.J.A. Jenkins and J. Davignon, "Egg yolk consumption and carotid plaque", *Atherosclerosis*, vol.224, pp 469-473, 2012

- [5] Y. Sun, H. Yang, X. Zhong, L. Zhang and W. Wang, “Ultrasonic-assisted enzymatic degradation of cholesterol in egg yolk”, *Innovative Food Sci. Emerg. Technol*, vol.12, pp 505-508, 2011
- [6] V.W. Zhong, H.L. Van and M.C. Cornelis, “Associations of dietary cholesterol on egg consumptions with incident cardiovascular disease and mortality”, *JAMA*, pp 1081-1095, 2019
- [7] K.S. Lim, S.J. You, B.K. An, and C.W. Kang, “Effects of dietary garlic powder and copper on cholesterol content and quality characteristics of chicken eggs”, *Asian-Australian Journal of Animal Sciences*, vol.19 (4), pp 582-586, 2006
- [8] H. Aihara, K. Watanabe and R. Nakamura, “Degradation of Cholesterol in Egg Yolk by *Rhodococcus equi* No.23”, *Journal of Food Science*, vol. 53 (2), pp. 659-660, 1988
- [9] S. Christodoulou, T. V. Hung, M. A. Trehwell and R. G. Black, “Enzymatic degradation of egg yolk cholesterol”, *Journal of food protection*, vol.57 (10), pp 908-912, 1994
- [10] C. Lv, Y. Tang, L. Wang, W. Ji, Y. Chen, S. Yang and W. Wang, “Bioconversion of yolk cholesterol by extracellular cholesterol oxidase from *Brevibacterium* sp.”, *Food Chemistry*, vol.77 (4), pp 457–463, 2002
- [11] A. Hasdianty, Y. N. Suhaila, A. H. Hazwan, M. N. Maniyam, A. M Fadzli and A. L. Ibrahim, “Inferring the evolutionary relationship of 23 Malaysian *Rhodococcus* isolates with potential as cholesterol degrading bacteria”, *Biocatalysis and Agricultural Biotechnology*, vol.30, 101840, 2020

COMPARISON OF PHYSICOCHEMICAL PROPERTIES OF GELATINE EXTRACT FROM MARINE AND FRESHWATER FISH SPECIES: A REVIEW

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Abstract - Gelatine is an important functional biopolymer that is used extensively in food, cosmetic, photographic and pharmaceutical industries. Due to various religious beliefs and health concerns, the demand for alternate gelatine has been vastly increasing. Thus, there is an interest in the production of fish gelatine as an alternative source of gelatine. Fish gelatine can be obtained from the skin, scales, heads and bones of fish. This review focuses on comparison of various extraction treatments from different by-product of freshwater and marine species. Furthermore, the physicochemical properties in freshwater and marine water fish gelatine was compared in this review. The highest yield of gelatine extract was recorded in marine water skin from Rainbow trout (*Onchorhynchus mykiss*) at 90.45% and followed by Cobia (*Rachycentron canadum*) at 79.5%. The fish skin contains higher yield due to the fish skin has higher collagen containing tissue. The comparison of physicochemical properties shows that both marine and freshwater species are varied in all aspects, and also depends on the fish species. The fish skins are as suitable as an alternative source of gelatine production because it can be extracted with high yield at relatively moderate temperature. In the future, fish gelatine may become a competitive alternative biopolymer in the market.

Keywords : Gelatine; fish gelatine; fish skin

1. INTRODUCTION

Gelatine is a fibrous protein that is obtained from partially thermal denaturising of collagen, also by partial hydrolysis of collagen through destruction of cross-linkages between polypeptide chains of collagen along with some level of breakage of polypeptide bonds [11]. It is an important functional biopolymer that is used extensively in food, cosmetic, photographic and pharmaceutical industry because it is able to improve consistency, emulsifying, stability and elasticity of a product. According to Market Report of Global Gelatin Industry the global market of gelatine estimated at 516.8 thousand metric tons in the year 2020, despite the covid-19 crisis and it is expected to reach 691 thousand metric tons by 2027 [3]. Gelatine is commonly made from bovine and porcine bones, skin, hides and connective tissues. However, the acceptability of using bovine and porcine gelatine is vastly restricted due to health concern and religious reasons. Therefore, there is the demands in the production of fish gelatine as an alternative in the gelatine production [5]. Fish gelatine can be obtained from different fish by-products such as skin, scales, heads and bones of fish. About 30% of fish waste contains high collagen tissue that can be used to produce the gelatine especially from skin and bone [4]. The utilizing fish waste in producing gelatine product, we are able to minimize environmental pollution and has both economic and waste management benefits for the fish industry [2]. The physicochemical properties are varying due to the partial influence by living environments of the fish species which includes the temperature of environment, depth of habitat, types of food present in environment also the level of pollution. Furthermore, the optimization of gelatine extraction from both marine and fresh water species has been studied to ensure a better yield and a good quality gelatine was produced.

2. METHODOLOGY

Different extraction treatments were compared for both freshwater and marine water fish from published journals were reviewed. Table 1 shows the yield extraction and gelatine properties form various journals.

Table 1 Yield extraction and gelatine properties of fish gelatine between different water species.

Species	Yield extraction (%)	Melting point (°C)	Gel strength (g)	Extraction treatments	By-product	Reference
Freshwater species						
Channel Catfish (<i>Ictalurus punctatus</i>)	-	24	256	Acetic acid at 15 °C for 18 h.	Skin	[8]
Pangasius Catfish (<i>Pangasius sutchi</i>)	6.12	-	-	pineapple liquid waste for 56 h of pre-treatment and 5 h of extraction at a temperature of 75°C	Fish bone	[15]
Black Tilapia (<i>Oreochromis mossambicus</i>)	18.27	17.1	-	0.05 M NaOH at skin-to-NaOH ratio of 1:10 (w/v), extracted at 75 °C	Skin	[1]
Marine water species						
Powder Mackerel (<i>Scomberomorus Commerson</i>)	10.16	-	190.50	2% HCl concentration	Fish Bone	[9]
Rainbow trout (<i>Onchorhynchus mykiss</i>)	90.45	20.4	459	0.01–0.21 N, acetic acid at 7°C, heated at 50°C for 16 ± 2h	Skin	[14]
Cobia (<i>Rachycentron canadum</i>)	79.5	26.8°C	232	HCl solution (1:1 ratio, kg/L), for 15 min, heated at 52°C for 2h	Skin	[12]

3. RESULTS AND DISCUSSION

Table 1 shows that the highest yield of gelatine extract was recorded in marine water skin from Rainbow trout (*Onchorhynchus mykiss*) at 90.45% and followed by Cobia (*Rachycentron canadum*) at 79.5%. Since gelatine is extracted from degradation of the collagen, therefore fish skin has higher yield compared to other by-products due to it has higher collagen containing tissue. The extraction yield of fish gelatine also depends on the time and process of the extraction procedure [13]. The partial hydrolysis of collagen or the loss of collagen during the washing process can cause the low yield of fish gelatine. On the other hand, processing conditions such as solvent, time and temperature are required to produce the optimum yield of fish gelatine have been identified for specific types of raw material [10].

The yield of gelatine extracted will rise significantly as the extraction temperature rise [1]. The rise of temperature allows the enhanced of the breakdown of collagen fibre structure that binds with water to form more gelatine; thus, this will increase the higher yield. The low temperature will produce too low yield, though too high temperature will produce the poor quality of gelatine. Therefore, optimum temperature is required to maintain higher yield and the quality of the gelatine. The yield will be increase if the solubility of collagen is increased by prolong the extraction time or heating in water [11].

Meanwhile, the higher temperature will break more amino acid chains and this will increase the gel strength. While the ongoing hydrolysis of collagen will turn to gelatine and the remaining of short-chain of amino acid during this process will cause the low of gel strength. The lower interactions of the short-chain amino acids with water molecules unable it to form into gel. In addition, Jongjareonrak [7] found that the fish habitats can influence the gel strength. If the temperature during the extraction is higher,

the melting point value will be lower. High temperatures will disrupt the amino acid chain during protein hydrolysis, thus the ability to bind protein and water is weakened. The initial state of gel formation is another element that impacts the melting point. The gel will be less stable as the gel forms rapidly, and it melts faster. In addition, a higher melting point is normally due to gelatine that drying at higher temperatures.

4. CONCLUSION

The increasing demand for fish gelatine an alternate gelatine that is able to comply to the majority of consumer needs and able to help accommodate increasing global demands. The comparison of physicochemical properties shows that both marine and freshwater species are varied in all aspects, this also depends on the fish species of the gelatine. In addition, different marine species has different structural and physical properties of gelatine. It is also known that most of the properties are controlled by the molecular weight and size distribution. The fish skins are especially suitable as a source of gelatine because it is easily extracted with high yield at relatively moderate temperature. In the future, fish gelatine may become a competitive alternative biopolymer in the market.

REFERENCES

- [1] T. Chek-Chuan, A. K. Alias, U. Uthumporn and C. G. Farid, "Effect of Extraction Temperature on the Physicochemical Properties of Gelatine from the Skin of Black Tilapia (*Oreochromis mossambicus*)", Journal of Physical Science, vol. 30 (1), pp 1–21, 2019
- [2] S.S. Choi and J.M. Regenstien, "Physicochemical and sensory characteristics of fish gelatin", J Food Sci vol. 65 (2), pp 194–199, 2000
- [3] Global Gelatin Industry, Market Report, 2020
- [4] M.C. Gómez-Guillén, J. Turnay, Fernández, M.D. Diaz, N. Ulmo, M.A. Lizarbe and P. Montero, "Structural and Physical Properties of Gelatin Extracted from Different Marine Species: A Comparative Study", Food Hydrocolloids, vol.16, pp 25-34, 2002
- [5] M. Gudmundsson, "Rheological properties of fish gelatin", Journal of Food Science, vol.67, pp 2172-2176, 2002
- [6] M. Gudmundsson and H. Hafsteinsson, "Gelatin from cod skins as affected by chemical treatments", Journal of Food Science, vol.62, pp 37-39, 1997
- [7] A. Jongjareonrak, S. Benjakul, W. Visessanguan and M. Tanaka, "Skin gelatin from bigeye snapper and brownstripe red snapper: chemical compositions and effect of microbial transglutaminase on gel properties", Food Hydrocolloid, vol.20 (8), pp 1216–1222, 2006
- [8] H. Liu, D. Li and S. Guo, "Rheological properties of channel catfish (*Ictalurus punctatus*) gelatin from fish skins preserved by different methods", LWT-Food Science and Technology, vol. 41, pp 414-419, 2008
- [9] E. Mardawati, H. Sugandi, I. L. Kayaputri, Y. Cahyana, D. W. Wira, T. Pujianto and R. Kastaman, "Study and characterization of powder mackerel (*Scomberomorus commerson*) bone gelatin through hydrolysis of hydrochloric acid", AIP Conference Proceedings, 2018.
- [10] R.E. Norland, "Advances in fisheries and biotechnology for increased profitability", 1990
- [11] M. Sadowska, I. Kolodziejska and C. Niecikowska, "Isolation of collagen from the skins of baltic cod (*Gadus morhua*)", Food Chemistry, vol.81 (2), pp 257-262, 2003
- [12] R. S. G. Silva, S. F. Bandeira and L. A. A. Pinto, "LWT - Food Science and Technology Characteristics and chemical composition of skins gelatin from cobia (*Rachycentron canadum*)", LWT - Food Science and Technology, vol.57 (2), pp 580–585, 2014
- [13] L.H. Sperling, "Introduction of physical polymer science", New York: John Wiley and Sons. Voigt and Botta, J.K (Eds). Fish Gelatin, pp 325-333
- [14] H.S. Tabarestani, Y. Maghsoudlou, A. Motamedzadegan and A.R. Sadeghi Mahoonak, "Optimization of physico-chemical properties of gelatin extracted from fish skin of rainbow trout (*Onchorhynchus mykiss*)", Bioresource Technology, vol.101, pp 6207- 6214, 2010
- [15] Yoni Atma and Hisworo Ramdhani, "Gelatin extraction from the indigenous Pangasius catfish bone using pineapple liquid waste", Indonesian Journal of Biotechnology, vol.22 (2), pp 86-91, 2017

EFFECT OF *PIPER BETLE* EXTRACT SUPPLEMENTATION IN DIETARY FEED OF *PENEAUS MONODON* TOWARDS FEEDING BEHAVIOUR, MOULTING RATE AND BASIC WATER QUALITY FOLLOWING CHALLENGE WITH *VIBRIO PARAHEMOLYTICUS*

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Abstract – The effect of *Piper betle* extract supplementation into the dietary feed of *Peneaus monodon* was evaluated based on the feeding behaviour, moulting rate and basic water quality. The feeding behaviour was assessed through the observation during routine feeding, while moulting rate and basic water quality were analysed statistically. The crude extract of *Piper betle* was extracted using 80% methanol and incorporated into the commercial feed at different concentration (0%, 5%, 10% in 1000 g basal diet) for 8 weeks, and challenge infection with *Vibrio parahaemolyticus* ($\sim 2.80 \times 10^6$ cfu/ml) was conducted at week 4. The 5% and 10% treatment groups showed better feeding behaviour (good approach and quick response towards the medicated feed) even after the infection test and moulting rate was significantly higher ($p < 0.05$) at 65.16 ± 2.1425 and 54.55 ± 3.2173 respectively compared to the control (0%) group. Analysis of basic water quality demonstrated acceptable range of salinity and pH level ($p > 0.05$, salinity 25-30 ppt and pH 7.5-8.5) of all the experimental water tank. In conclusion, the supplementation of *Piper betle* extract at 5% was optimum to improve the feeding behaviour and moulting rates of *Peneaus monodon*, hence suggested as a promising feed attractant, growth promoter and immunostimulant.

Keywords : *Piper betle*; *Peneaus monodon*; feeding behaviour; moulting

1. INTRODUCTION

Tiger shrimp (*Peneaus monodon*) farming was documented as one of the most growing aquaculture industries that meet global demand for seafood. Despite of its high value, maintaining sustainable production of tiger shrimp had become a major challenge by the industry. Production of tiger shrimp was significantly reduced in ten years back due to disease outbreak. Early mortality syndrome (EMS) has been identified as a major threat that affect global production of tiger shrimp. [1]. A preventive measure using natural and eco-friendly compound to enhance feed intake [2], the potential role as feed attractant [3], improve growth performances [4,5], and enhance pond water quality [6] has been reported. The assessment towards the feeding behaviour, nutrient intake, growth performances, water quality and identification of disease symptoms are among of the important indicator in the early detection of diseases. Appropriate preventive measures could be employed in order to bring a good and successful shrimp production. Thus, the present study was aimed to evaluate the beneficial properties of *Piper betle* extract in *Peneaus monodon* through the supplementation into the dietary feed of the experimental *Peneaus monodon*.

2. METHODOLOGY

2.1 Preparation of *Piper betle* extract and experimental feed

Plant samples were cleaned, dried in an oven at 40°C and blend into powder form. Then, the crude extract of *Piper betle* were extracted with 80% methanol using sample to solvent ratio 1:5 and incubated on a rotary shaker for 3 days. The extracts were then collected, vacuum filtered at 60°C, dried in an oven at 40° C until the consistent weight was obtained and final extract was stored at 4°C in airtight bottle.

The *Piper betle* extract at different concentrations (0%, 5% and 10%) was then incorporated into the commercial feed (Blanca) which first grinded into powder form and re-pellet to form a dough by the addition of water. A pelletizer was used to turn the dough into a small size of feed and then were air-dried and placed in oven at 40°C for 24 hours to remove the moisture content. The feeding routine was given at 4% of body weight and fed two times daily (0830 am and 1630 pm).

2.2 Rearing condition of experimental shrimps and challenge infection test

The experimental shrimps (23.40 ± 0.2938 gram) were randomly distributed into an experimental tank at a stocking density of 30 shrimp/tank (duplicate experimental tank per treatment). Moults, faeces and dead shrimps were daily monitored and 50% of water in each tank was exchanged daily.

The infection challenge test with pathogenic strain of *Vibrio parahaemolyticus* were done at week 4 by injection of the bacteria via intramuscular injection with LD 50 of 100µl of bacterial suspension, ($\sim 2.80 \times 10^5$ cfu/ml) into the abdominal segment. The experimental shrimps were fed with the same medicated diet at two times daily for another 4 weeks.

2.3 Feeding behaviour, moulting rates and basic water quality analysis

The feeding behaviour was assessed through the behavioural actions during feeding regime based on the approach, attractiveness, consumption, tendency to pick the feed provided, and no response towards feed. Moulting rate was observed and recorded daily, while the analysis on water quality was conducted on salinity level by using refractometer and pH level by using pH meter.

3. RESULTS AND DISCUSSION

The *Piper betle*-supplemented group at 5% and 10% demonstrated good feeding behaviour and significantly higher ($p < 0.05$) moulting rates at 65.16 ± 2.1425 and 54.55 ± 3.2173 respectively compared to control group, 0%. Both 5% and 10% groups demonstrated quick approach, higher attractiveness towards feed and fully consumed the feed even after the challenge infection test, notably observed that control group demonstrated low feeding behaviour after week 4 until week 8. Analysis of basic water quality demonstrated acceptable range of salinity and pH level ($p > 0.05$, salinity level 25-30 ppt and pH level 7.5-8.5) of all the experimental water tank. The incorporation of *Piper betle* extract into the dietary feed of *Peneaus monodon* are able to enhance the feed intake of shrimps thus suggesting the ability to act as feed attractant and appetite stimulant, which subsequently influence the growth performances, metabolism of enzymes and hormonal secretion. Kawamura et al. [3] recommend *Piper betle* as feed enhancer for *Litopenaeus vannamei* culture. Samadi et al. [7] stated there was a clear correlation between growth and moulting, while Wang et al. [8] revealed that the growth of shrimp was correlated to feed, digestion and absorption of food, and the moulting was related with the secretion of hormone.

Table 1 Feeding behaviour, moulting rates (%), and basic water quality observed from experimental *Peneaus monodon* culture. *, **, and *** denotes for low, moderate, and good response respectively

Treatment properties	Control	5%	10%
Approach	**53.33 %	***100.00%	***100.00%
Attractiveness	**53.33 %	***100.00%	***100.00%
Consumption	**53.33%	***100.00%	***100.00%
Tendency to pick (combination control + medicated feed)	80.00%	0.00%	0.00%
No response	13.33%	0.00%	0.00%
Moulting rates (%)	$43.56^a \pm 2.0435$	$65.16^b \pm 2.1425$	$54.55^{ab} \pm 3.2173$
Salinity	$26.23^b \pm 0.9795$	$25.31^a \pm 0.5407$	$25.21^a \pm 0.4946$
pH	$8.14^a \pm 0.2019$	$8.23^a \pm 0.2098$	$8.17^a \pm 0.2140$



Figure 1 The old exoskeleton/exuvia of experimental *Peneaus monodon* subsequent moulting stage

4. CONCLUSION

The supplementation of *Piper betle* extract at 5% was found optimum to improve the feeding behaviour and moulting rates of *Peneaus monodon*, hence suggested as a promising feed attractant, growth promoter and immunostimulant.

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REFERENCES

- [1] H. M. Santos, C. Y. Tsai, K. R. A. Maquiling, L. L. Tayo, A. R. Mariatulqabtiah, C. W. Lee and K. P. Chuang, "Diagnosis and potential treatments for acute hepatopancreatic necrosis disease (AHPND): a review", *Aquaculture International*, vol.28, pp 169-185, 2020
- [2] I. V. Kaleo, Q. Gao, B. Liu, C. Sun, Q. Zhou, H. Zhang, F. Shan, Z. Xiong, L. Boa and C. Song, "Effects of *Moringa oleifera* leaf extract on growth performance, physiological and immune response, and related immune gene expression of *Macrobrachium rosenbergii* with *Vibrio anguillarum* and ammonia stress", *Fish and Shellfish Immunology*, vol.89, pp 603–613, 2019
- [3] G. Kawamura, A. S. K. Yong, H. L. Au, A. Doison, S. Y. Ooi and L. S. Lim. (2019). "Malaysian herbs as feeding attractants and enhancers for the giant freshwater prawn (*Macrobrachium rosenbergii*) and the whiteleg shrimp (*Litopenaeus vannamei*)" *Borneo Journal of Marine Science and Aquaculture*, vol.3(2), pp 57 – 67, 2019
- [4] M. N. Chandran, S. Moovendhan, A. M. Suganya, A. Tamilselvi, G. Bebin Immanuel and A. Palavesam, "Influence of polyherbal formulation (AquaImmu) as a potential growth promotor and immunomodulator in shrimp *Penaeus monodon*" *Aquaculture Reports*, vol.4, pp 143–149 2016
- [5] R. M. Kumar, C. S. Rao, A. N. Daggula, G. Guguloth, B. Y. Das and A. Indhuri. "Growth promoter effect of ginger, garlic and fenugreek on Pacific White Leg Shrimp (*Litopenaeus vannamei*)", *International Journal of Current Microbiology and Applied Sciences*, vol.8 (2), pp 2993-3001, 2019
- [6] E. R. Rao, C. H. Venkatrayulu and V. Venkateswarlu, "Effect of herbal feed supplement Phytozoi on Running Mortality Syndrome in white leg shrimp *Litopenaeus vannamei* (Boone,1931) farming", *International Journal of Fisheries and Aquatic Studies*, vol.5 (3), pp 365-368, 2017
- [7] L. Samadi, Z. Nasim, S. M. Mousavi and Z. Mohammad, "Effect of dietary garlic extract on growth, feeding parameters, hematological indices and body composition of *Litopenaeus vannamei*" *Journal of the Persian Gulf (Marine Science)*, vol.7 (24), pp 29-41, 2016
- [8] F. Wang, S. L. Dong, S. S. Dong and G. Q. Huang, "Effects of photoperiod on the molting and growth of juvenile Chinese shrimp *Fenneropenaeus chinensis*" *Journal of Fishery Sciences of China*, vol.11, pp 354–359, 2004

ASSESSING THE POTENTIAL OF DUCKWEED AS PROTEIN SOURCE FOR THE ESTABLISHMENT OF HALAL FISH FEED

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Abstract – Establishment of fish feed which is free from non-halal ingredients is necessary to fulfil demand among the Muslim consumers. Substitution of fish meal with plant-based protein such as duckweed meal would able to reduce the production cost of fish feed. Hence, the present study was aimed to formulate and develop fish feed by incorporating duckweed as protein source. The feed formulation was optimized based on recommended basic formulation of fish feed for *Tilapia* spp. Modification was made by replacing fish meal with duckweed meal at various concentration. Proximate analyses were conducted to analyse the nutritional value of the formulated feed. The quality of formulated feed were determined through microbiological analysis based on total bacterial count, porcine DNA detection by polymerase chain reaction (PCR) and screening of heavy metals. The formulated feed which contained duckweed demonstrated high amount of protein, fat, fibre and moisture. PCR analysis of the selected formulated feed demonstrated no detection of porcine DNA. However, screening of heavy metals indicated presence of arsenic in the formulated feed that contain high proportion of duckweed. As a conclusion, duckweed has a potential to be adopted as protein source in the establishment of halal fish feed for *Tilapia* spp.

Keywords : Fish feed; protein; duckweed; halal

1. INTRODUCTION

Fish farming has become one of the major activities in aquaculture industry that have significant impact to the economy worldwide. The farmed fish are depending on the commercial fish feed as major food resources which contained the essential nutrients required for the fish growth [1]. The main issue in formulating feed is to meet the protein and essential amino acids (EAAs) requirements of the species [2]. Fish meal is generally the preferred protein source because of the high quality of the protein and its EAA profile. However, fish meal is generally expensive and is not always available. As for alternative, aquatic plant such as duckweed species can be employed as a good source of protein as it has been proven to be high in amino acids that are required for the growth of fish [3]. Duckweed can be explored as an alternative source of protein to reduce dependency towards fishmeal as the major protein source in fish feed. A specific legislation addresses the halal issue on animal feed is currently not available. The animal feed is considered as uncertified product which does not require halal certification. As for alternative, there is a need for the establishment of halal fish feed which contain ingredients that fulfil the shariah compliance [4]. Therefore, the present study was aimed to assess the potential of duckweed as protein source for the establishment of halal fish feed.

2. METHODOLOGY

2.1 Preparation of duckweed as plant-based protein

Samples of duckweed (*Lemna minor*) were collected from brackish water located at Bukit Badong, Ijok, Selangor. Duckweed was brought back to the laboratory and transferred into a rectangular container containing tap water and placed at open space area. The plants were harvested and washed several times with tap water. Then the cleaned duckweed was transferred into a clean tray and dried at the room temperature. The dried duckweed was grinded into powdered form and used for preparation of fish feed. Microbiological analysis was conducted to determine the presence of bacteria in dried duckweed.

2.2 Optimization of halal fish feed formulation

Feed formulation was optimized based on the recommended basic formulation of fish feed for *Tilapia* spp. The feedstuffs used in this study were consist of fish meal, wheat meal, soybeans meal, corn meal and multivitamins. Powdered duckweed at concentration of 0% (C1 & C2), 10% (T1), 20% (T2) and 30% (T3) were incorporated in the feed by replacing the fish meal component. Modification on the ingredients was made by replacing fish meal with powdered duckweed at concentration of 0%, 10%, 20% and 30%. The ingredients were obtained from the authorized manufacturer.

2.3 Proximate analysis of formulated feed

Proximate analysis was conducted to analyse the nutritional value of the formulated fish feed in comparison with the commercial fish feed in the market. The formulated feed was analysed to determine the composition of protein, fat, moisture, fibre and ash. Three samples of commercial feed were also analysed for the same parameters.

2.4 Microbiological analysis, screening of heavy metals and halal assessment of formulated feed

Microbiological analysis of formulated fish feed was conducted by determination of total bacterial count on Nutrient Agar (NA). Selected samples of fish feed (C1, T1 and T3) were subjected for heavy metals screening (lead (Pb), cadmium (Cd), chromium (Cr), arsenic (As) and mercury (Hg)) and analysed for the presence of porcine DNA through polymerase chain reaction (PCR).

3. RESULTS AND DISCUSSION

Preliminary screening of bacteria in powdered duckweed demonstrated presence of bacterial colonies (<100 counts) on Nutrient Agar. Gram staining analyses indicated that majority of the bacteria are Gram negative with either bacillus or coccobacillus morphology. Based on this analyses, dried duckweed contained small amount of bacteria from *Enterobacteriaceae* family. According to previous study [5], duckweed that was dried and analysed for bacteria content was found to be perfectly safe to be used as a feed for animals.

Five types of experimental feed were developed based on the standard feed formulation for tilapia species. The formulated feed was analysed to determine the composition of protein, fat, moisture, fibre and ash. Three samples of commercial feed were also analysed for the same parameters. The formulated feed containing 10%, 20% and 30% of duckweed demonstrated high in protein, fat, fibre and moisture content in comparison with the commercial pellet as shown in Table 1.

Table 1 Proximate analyses of commercial and formulated fish feed containing duckweed at various concentrations

Feed samples	Composition				
	Moisture	Fat	Protein	Fibre	Ash
T1	5.30 ± 0.0000	5.9444 ± 0.0029	41.4673 ± 0.1007	24.2514 ± 0.0008	10.0273 ± 0.0227
T2	5.20 ± 0.0000	5.9607 ± 0.0025	42.0779 ± 0.0504	24.0164 ± 0.0019	9.3575 ± 0.0200
T3	5.20 ± 0.0000	5.9967 ± 0.0012	42.9212 ± 0.0000	23.0135 ± 0.0019	9.0630 ± 0.0145
C1	5.10 ± 0.0000	5.8274 ± 0.0185	43.0528 ± 0.0000	22.8621 ± 0.0534	8.7929 ± 0.0110
C2	5.10 ± 0.0000	5.8932 ± 0.0050	43.3865 ± 0.0504	22.3501 ± 0.0513	8.3466 ± 0.0882
R1	5.00 ± 0.0000	5.9494 ± 0.0029	32.5581 ± 0.0316	23.0117 ± 0.0006	10.3032 ± 0.0200
R2	5.10 ± 0.0000	5.9607 ± 0.0025	31.8790 ± 0.0616	17.9407 ± 0.1443	10.6205 ± 0.0145
R3	5.10 ± 0.0000	5.5341 ± 0.0065	32.0455 ± 0.0504	19.6302 ± 0.0537	7.7371 ± 0.0392

Indicator: T1=Treatment 1; T2=Treatment 2; T3=Treatment 3; C1=Control 1; C2=Control 2; R1=Commercial feed 1; R2=Commercial feed 2 and R3=Commercial feed 3

Total plate count analyses demonstrated the formulated feed designated as T1 have the lowest number of bacterial count as shown in Table 2. T1 contain the lowest composition of duckweed (10%) and fish meal (20%) as compared with other feed samples which may contribute to the smaller number of bacterial colonies. Analyses of heavy metals in selected feed samples (C1, T1 and T3) demonstrated detection of arsenic at high concentration in T3 feed sample which contain 30% of duckweed. Presence of arsenic in T3 feed sample might due to the ability of duckweed that can absorb nutrients including heavy metals from the environment [6]. On the other hand, porcine DNA was not detected in all selected feed samples (C1, T1 and T3). The formulated feed designated as T1 could be considered as the best feed recommended for freshwater fish such as *Tilapia* spp. based on high protein composition, low bacterial count, less heavy metal residues and free from non-halal elements.

Table 2 Total number of bacterial colonies isolated from different formulated fish feed

Dilution	Control 1	Control 2	Treatment 1	Treatment 2	Treatment 3
10 ⁻¹	TNTC	TNTC	TNTC	TNTC	TNTC
10 ⁻²	TNTC	3.25 x 10 ⁻¹	4.0 x 10 ⁻¹	TNTC	TNTC
10 ⁻³	1.94 x 10 ¹	0.25 x 10 ⁻¹	3.5 x 10 ⁻²	0.5 x 10 ⁻¹	3.5 x 10 ⁻²
10 ⁻⁴	1.3 x 10 ⁻²	4 x 10 ⁻³	2.5 x 10 ⁻³	3.5 x 10 ⁻³	1.5 x 10 ⁻³
10 ⁻⁵	2.5 x 10 ⁻⁴	5 x 10 ⁻⁵	0	1 x 10 ⁻⁴	1 x 10 ⁻⁴

*TNTC=Too numerous to count

4. CONCLUSION

Duckweed can be considered as an alternative protein source for development of formulated fish feed which is free from non-halal element and safe to be consumed by freshwater fish at appropriate concentration.

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REFERENCES

- [1] S. Craig, L. A. Helfrich, D. Kuhn and M. H. Schwarz, “Understanding fish nutrition, feeds, and feeding”, Virginia Cooperative Extension, 2017
- [2] N. Danial, “A review on replacing fish meal in aqua feeds using plant protein source”, International Journal of Fisheries and Aquatic Studies, vol.6 (2), pp 164-179, 2018
- [3] M. Mwale, and F. R. Gwaze, “Characteristics of duckweed and its potential as feed source for chickens reared for meat production”, Scientific Research and Essays, vol.8 (18), 689-697, 2013
- [4] N. Saidin, and F. Abdul Rahman, “Halal Feed for Halal Food: An Exploratory Study of the Malaysian Legal and Regulatory Framework on Animal Feed”, In Proceeding of Contemporary Issues and Development in the Global Halal Industry, pp 141-151, 2016
- [5] Bio-Tech Waste Management Pty Ltd. “Duckweed: A potential high protein feed source for domestic animals and fish”, 1998
- [6] M. K. Daud, S. Ali, Z. Abbas, I. E. Zaheer, M. A. Riaz, A. Malik, and S. J. Zhu, “Potential of Duckweed (*Lemna minor*) for the phytoremediation of landfill leachate”, Journal of Chemistry, pp 1-9, 2018

EFFECT OF DIFFERENT INTENSITY OF ABIOTIC FACTOR TOWARDS GROWTH OF *Desmodesmus sp.*

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Abstract - The aim of the research was to find the best conditions for selected microalgae species, *Desmodesmus. sp* in term of growth productivity in different pH, temperature and intensity of light. *Desmodesmus. Sp* (TRG-D01) was isolated from Setiu Wetlands, Terengganu and cultured using Bold Basal Media (BBM). The species was incubated under different selected parameters for nine days using microplate reader technique through Optical Density (OD) measurement. From the experiment, *Desmodesmus. sp* showed variety of growth pattern. Incubation under different pH, light intensity and temperature showed specific growth rate ranging from 0.21 to 0.47 d⁻¹ (maximum OD 0.67–0.93), 0.33 to 0.43 d⁻¹ (maximum OD 1.12) and 0.12 to 0.42 d⁻¹ (maximum OD=1.18) respectively. *Desmodesmus. sp* was optimum in were observed when incubated under pH in between 7 to 9, 56 to 91 μmol m⁻²s⁻¹ of light intensity and optimum temperature between 23°C to 27°C.

Keywords : *Desmodesmus sp.*; optical density; specific growth rate; pH; light intensity

1. INTRODUCTION

Single celled green algae are photosynthetic microorganism that have ability to produce biomass from solar energy, CO₂ and nutrients. Nowadays, microalgae become an asset to consumers and industries especially from food industries, aquaculture and pharmaceutical. These products become interest for researcher for deeper understanding due to high nutritional value and potential that can be used in biodiesel, bioremediation human and animal nutrition. Depending on the species, microalgae able to adapt variety of environment including pH, temperature and nutrient availability. Hence, the productivity of microalgae really dependent on how microalgae been cultured especially abiotic factor to maximize the production and quality in term of biological and chemical to design efficient photobioreactor [1]. This experiment was conducted to find out what are the best culture conditions for selected species in the matter of pH, light intensity and temperature. This work should be the one of first step for monitoring the best growth conditions before application into biomass production.

2. METHODOLOGY

2.1 Microalgae Samples

Identified microalgae, *Desmodesmus. sp* (TRG-D01) was isolated from Setiu Wetlands and donated by University Malaysia Terengganu (UMT) in broth stock culture. Media used to revive the strain was Bold Basal Media (BBM) and incubated under controlled environment using climate chamber, Memmert HPP110. The initial condition of culture media was adjusted to pH 7 and inside climate chamber was set at temperature 25°C, 40 μmol m⁻²s⁻¹ of light intensity with 12H:12H of light and dark cycle.

2.2 Growth Analysis

Growth of *Desmodesmus. Sp* was monitored through Optical Density (OD₆₈₀) at 680 nm using Microplate reader Tecan M200 for every 24 hours in 9 days. The incubation test started with inoculation of 20 μL of microalgae (10% of total volume per well) taken during exponential phases into 180 μL of cultured media. The total volume per well would be 200 μL. The analysis was conducted using 96 transparent with flat-bottom wells and microplate was divided into several zones. During 9 days of

incubation, the pipetting (mixing) process all well containing microalgae have been conducted for efficient use of light and nutrients. After the process, the microplate was covered and wrap with parafilm to prevent contamination and evaporation. For each recorded absorbance on each well, sensitive mean value (SMV) was applied using following formula:

$$SMV = \frac{OD_{tot} - OD_{max} - OD_{min}}{4} \quad (1)$$

where,

OD_{tot} = Sum of absorbance at OD_{680} from 6 wells

OD_{max} = Maximum absorbance at OD_{680} from 6 wells

OD_{min} = Minimum absorbance OD_{680} from 6 wells

Average OD_{680} of wells containing microalgae were subtracted with well containing media only (control) to obtain exact OD_{680} of microalgae. Meanwhile, the specific growth rate was measured during exponential phases of growth.

3. RESULTS AND DISCUSSION

Figure 1 shows the overall growth curve of all parameter tested on *Desmodesmus sp.* Among the studies of pH range of cultured media, it was observed that the microalgae favour the neutral to alkaline state, 7 to 9 pH. Within this range, optical density recorded ranging from 0.67 to 0.93 with specific growth rate of 0.39 to 0.40 d⁻¹. According to reported study [2], both isolated *Scenedesmus sp.* showed optimum growth at pH 7 to 9 in term of biomass productivity and lipid yield. Highest cell density of *Scenedesmus* species WC-1 can be observed in buffered cultured media with pH 7.4 and 9.3 [3] and Nutrient uptake was rapidly efficient and released as ammonia during this condition (pH 8.2) most likely to be the reason for the significant increase in the alkaline state for growth [4].

Different light intensities of climate chamber were carried out under 5 different levels: (105 $\mu\text{mol m}^{-2}\text{s}^{-1}$, 91 $\mu\text{mol m}^{-2}\text{s}^{-1}$, 73 $\mu\text{mol m}^{-2}\text{s}^{-1}$, 56 $\mu\text{mol m}^{-2}\text{s}^{-1}$ and 40 $\mu\text{mol m}^{-2}\text{s}^{-1}$). Based on Figure 3, all level of light intensity showed significant growth of *Desmodesmus* species. Result of study revealed that with maximum light intensity observed the exponential phases at day 4 with maximum OD_{680} at day 9 was 1.12 and specific growth rate of 0.43 d⁻¹. Incubation under different light intensity in relation with growth rate can be applied in repeated batch cultures and relate the output to those large culture vessels and suitable for screening purposes [5]. Based on previous literature, both *Scenedesmus* species exhibit maximum biomass productivity when uniform increased of light intensity from 27 $\mu\text{mol m}^{-2}\text{s}^{-1}$ to 81 $\mu\text{mol m}^{-2}\text{s}^{-1}$. Increasing light intensity beyond 81 $\mu\text{mol m}^{-2}\text{s}^{-1}$ caused the biomass productivity became limited at 91 $\mu\text{mol m}^{-2}\text{s}^{-1}$ [2]. However, the author found out the lipid content achieved highest as light intensity increased.

At temperature at 27°C notified highest OD_{680} , 1.18 with specific growth rate of 0.42 d⁻¹ and the exponential phase could be observed at day 4 (Figure 4). Compared to other temperature points, the specific growth rates were ranging from 0.12 to 0.37 d⁻¹ and the OD_{680} measured in between 0.34 to 1.09. Subsequently, the exponential phases of these temperature could be seen towards day 5 to day 6. However, at 20°C, the growth slowly increased at day 7 and the maximum OD_{680} was 0.34 only till day 9. *Scenedesmus acutus* showed maximum growth and biomass productivity (0.42 g L⁻¹ d⁻¹) at 30°C and in between 25°C to 30°C, the biomass productivity does not have significant variation [6].

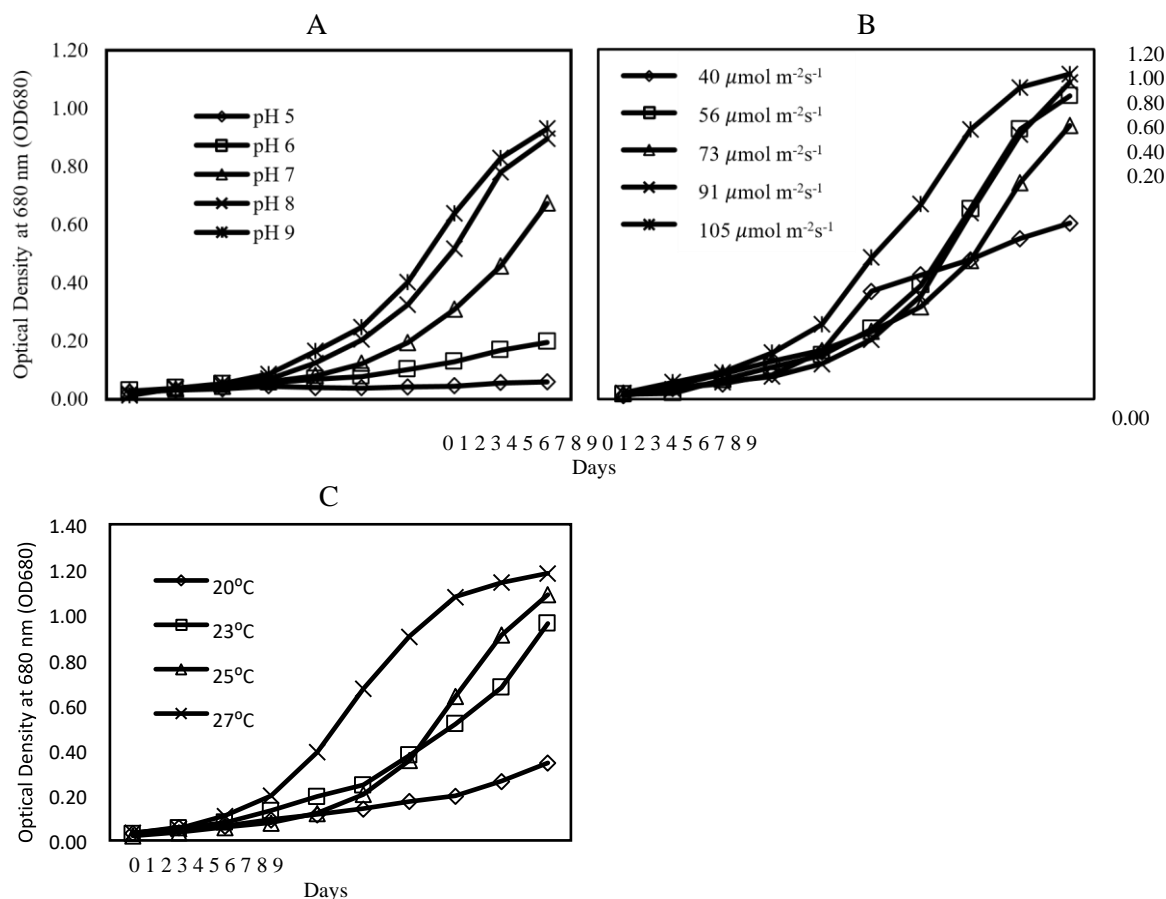


Figure 1 Growth curve of *Desmodemus sp.* from different parameters based on optical density at 680 nm (A= different pH of cultured media; B= different light intensity; C= different temperature)

4. CONCLUSION

Desmodemus sp. (TRG-D01) able to grow in different conditions, at least in the experiment conducted. Present experiment clearly observed that the species favours in alkaline state (pH 8 and 9) of cultured media, irradiance levels in between 56 $\mu\text{mol m}^{-2}\text{s}^{-1}$ to 105 $\mu\text{mol m}^{-2}\text{s}^{-1}$, and the temperature ranging from 23°C to 27°C give the steady increased of growth in term of optical density. This groundwork could be useful as a first step towards biomass production.

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REFERENCES

- [1] R. Munoz and B. Guieysse, "Algal–bacterial processes for the treatment of hazardous contaminants: a review", *Water research*, vol.40 (15), pp 2799-2815, 2006
- [2] A. Difusa, J. Talukdar, M. C. Kalita, K. Mohanty and V. V. Goud, "Effect of light intensity and pH condition on the growth, biomass and lipid content of microalgae *Scenedesmus* species", *Biofuels*, vol.6 (1-2), pp 37-44, 2015

- [3] R. Gardner, P. Peters, B. Peyton and K. E. Cooksey, “Medium pH and nitrate concentration effects on accumulation of triacylglycerol in two members of the chlorophyte”, *Journal of Applied Phycology*, vol.23 (6), pp 1005-1016, 2011
- [4] R. Eisele and W. R.Ullrich, “Effect of glucose and CO₂ on nitrate uptake and coupled OH⁻ flux in *Ankistrodesmus braunii*”, *Plant physiology*, vol.59 (1), pp 18-21, 1977
- [5] J. Van Wagenen, S. L. Holdt, D. De Francisci, B.Valverde-Pérez, B. G. Plósz and I. Angelidaki, “Microplate-based method for high-throughput screening of microalgae growth potential” *Bioresource technology*, vol.169, pp 566-572, 2014
- [6] Z. Demirel, F. F. Yilmaz, G. Ozdemir and M. C. Dalay, “Influence of Media and Temperature on the Growth and the Biological Activities of *Desmodesmus protuberans* (FE Fritsch & MF Rich) E. Hegewald”, *Turkish Journal of Fisheries and Aquatic Sciences*, vol.18 (10), pp 1195-1203, 2018

PRELIMINARY STUDY ON PROTEIN HYDROLYSATES EXTRACTED FROM BYCATCH FISH *Rastrelliger Kanagurta*

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Abstract - This study focused on the extraction of protein hydrolysate from by-catch fish, *Rastrelliger kanagurta* as an approach to exploit the underutilized fish to develop high-values products. *R. kanagurta* was bought from fishing jetties at Sekinchan Selangor. The objective of this study was to determine the proximate composition of extracted fish protein hydrolysate through acidic and alkaline hydrolysis. The proximate composition, protein concentration, potential properties of hydrolysate and control samples were characterized by standard protocols. The results of this study reveal that the protein hydrolysate obtained from both hydrolysis showed that protein hydrolysate extracted using pH 3 and pH 12 have highest protein concentration. The proximate analysis results showed the composition on lipid at pH 3 is 2.5 ± 0.1 and pH 12 is 10.0 ± 0.2 , much lower in hydrolysed samples compared to unhydrolyzed samples. Commercial peptone and the extracted fish peptone were compared in terms of the ability to provide protein source in the culture medium for the growth of lactic acid bacteria, *Lactobacillus* species.

Keywords : Protein hydrolysate; chemical hydrolysis; protein hydrolysate culture media

1. INTRODUCTION

Fish is an important source of nutritional compounds for the world's population. Among the various commercial industries, the fisheries occupy a major place in promoting the socioeconomic development of the country. Moreover, about 38.5 million tons of species of the global marine fish captures are known to be by-catch and discarded due to low market value [1]. One of the species which found as bycatch fish at fishing jetties in Sekinchan is *Rastrelliger kanagurta*. *R. kanagurta* well known as *ikan kembung* is the most popular marine fish in Malaysia due to its abundance, year-round availability, low cost and high polyunsaturated fatty acid (PUFA) content. Fish protein hydrolysate (FPH) is very useful in microbial growth media in fermentation industry. However, there are lack of study in the production of potentially FPH with from *R. kanagurta*. Hence, this study is focused on the extraction of protein hydrolysate from *R. kanagurta* through chemical hydrolysis process and to characterize the properties of protein hydrolysate.

2. METHODOLOGY

2.1 Preparation of Raw Fish

The fish *R. kanagurta* were bought from fishing jetties at Sekinchan, Selangor about 5kg. Each kg of *R. kanagurta* were washed, mixed with 1L of distilled water and minced twice using blender until homogenize and the sample mixtures were frozen at -10°C . The frozen homogenates were hydrolysed by alkaline hydrolysis using NaOH which at pH 12 meanwhile for acidic hydrolysis using HCL which pH value at pH3. Each set of pH were prepared in triplicate in conical flask and then placed in incubator shaker with 200 rpm, 70°C for 90 minutes. The reactions were terminated by adjusting the pH into 7 using HCl and NaOH. The filtered supernatants were stored in falcon tube in deep freezer for -80°C .

2.2 Proximate Composition and Culture Medium Ingredients

The total protein content, lipid, ash, and moisture in raw materials were determined for extracted protein hydrolysate. The moisture content was measured by the total weight loss during drying process. The

calculation of proximate composition was based on [2]. The broth media was prepared for extracted fish protein hydrolysate and commercial peptone according to [3]. Both broth media were inoculated with *Lactobacillus* species and incubated in the incubator shaker with 150 rpm at 30°C. The absorbances were read at 600nm for 0, 2, 4, 6, 8 and 10 hours for every culture. The growth curve of *Lactobacillus* in the broth media was plotted with absorbance against time. Figure 1 shows the whole process.

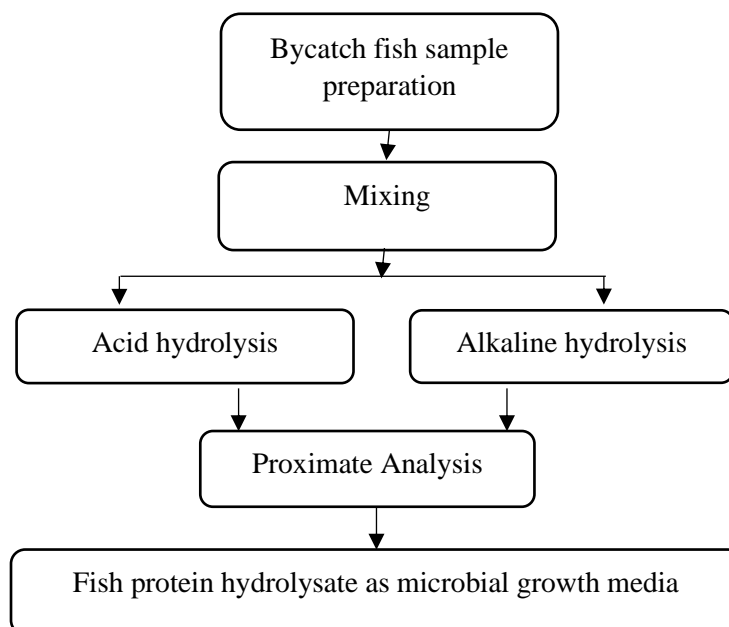


Figure 1 Preparation process

3. RESULTS AND DISCUSSION

In this study, proximate composition of unhydrolyzed raw material and hydrolysate protein extracted in chemical hydrolysis process is shown in Table 1. Based on the results, it revealed that the *R. kanagurta* has the potential to be used as raw material to produce protein hydrolysate because it has a high protein content with low lipid content. The result agrees with previous studies where the protein content 83.62 ± 1.05 and lipid 0.07 ± 0.01 as reported in [4]. Level of lipid low in hydrolysed sample ($2.57 \pm 0.1\%$) when compared to unhydrolyzed raw sample ($25.4 \pm 0.1\%$) mainly due to the interference of acid hydrolysis. Most lipids are accessible to solvent in acidic hydrolysis due to free lipids cross-linked to proteins and as well break-up protein particles.

Table 1 Proximate Composition (% ml) of control and Fish Protein Hydrolysate Sample^a (Different pH)

Composition	Control	Fish Protein Hydrolysate
pH 3		
Protein	45.0±0.3	64.1±0.2
Lipid	25.4±0.1	2.5±0.1
Moisture	12.6±0.2	8.9±0.1
Ash	17.0±0.1	24.5±0.1
pH12		
Protein	43.0±0.1	50.5±0.1
Lipid	27.4±0.1	10.0±0.2
Moisture	15.6±0.2	15.6±0.02
Ash	15.0±0.1	23.9±0.1

^a Values represented mean±SE (n=3). FSH: Fish protein hydrolysate, SE: Standard error

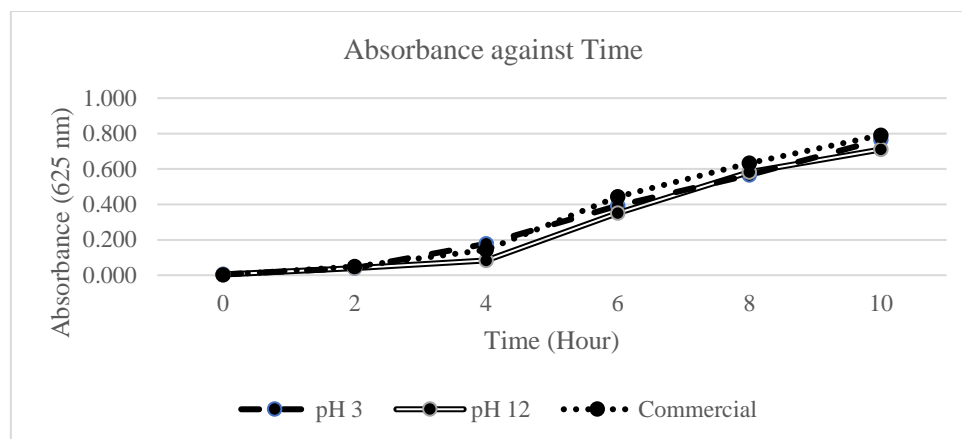


Figure 2 Growth curve of *Lactobacillus* on broth medium containing the commercial peptone and fish protein hydrolysate

Lactobacillus sp. showed similar growth rate on the broth medium containing commercial peptone and fish protein hydrolysate. As shown in Figure 2, the lag phase of *Lactobacillus* sp. was shorter in the commercial peptone broth and fish protein hydrolysate pH3 compared to fish protein hydrolysate pH12. The exponential phase happened at 6 hrs (from 4 hrs to 10 hrs) for all the tested media broth as same as reported from previous study [4].

4. CONCLUSION

In conclusion, the bycatch fish *R. kanagurta* has the potential to be used as raw material to produce fish protein hydrolysate because it has a high protein content with low lipid content. This study revealed the optimum hydrolysis method of protein hydrolysate from *R. kanagurta* is acid hydrolysis at pH 3. The culture of *Lactobacillus* in fish protein hydrolysate broths showed the growth of bacteria is promising and can be used as medium components with further optimization and improvement.

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REFERENCES

- [1] J. Prabha, S. Vincent, S. Joseph and J. Magdalene, "Bioactive and Functional Properties of Fish Protein Hydrolysate from *Leiognathus bindus*", Asian Journal of Pharmaceutical and Clinical Research. vol.9, Issue 5, 2016
- [2] A.N. Muhammad, T. Sara and G. Amara, "Proximate composition of head and scales in wild and farmed *Ctenopharyngodon idella* under different weight categories", Journal of Global Innovations in Agricultural and Social Sciences, vol.2 (4), pp 171–174, 2015
- [3] A.J. Abdul, S. Dwi, S. Y. Hefti, D. P. Mohammad, W. W. E. Dian Dinda, H.Nurul, "Characteristics of peptones from grouper (*Epinephelus fuscoguttatus*) and parrotfish (*Scarus javanicus*) head by-products as bacterial culture media", Journal of Biotech Research, vol.11 (1-12), ISSN: 1944-3285, 2020
- [4] D. Saputra, T. Nurhayati and S. Purwaningsih, "End post-rigour phase Yellowstripe scad fish (*Caranx leptolepis*) peptones and its application for bacteria's growth media", Food Research, vol. 4 (2), pp 413 – 420, 2020

ELIMINATION OF RED SEAWEED (*Kappaphycus spp.*) ODOUR AND ITS EFFECT ON ANTIOXIDANT ACTIVITY.

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Abstract - *Kappaphycus spp.* is highly demanded as raw material for kappa-carrageenan. However, the strong fishy odour of this species may limit its application in the industry. The use of chemical to remove the odour might possess hazard to the human and environment. The use of natural solution such as lemon, tamarind, rice flour and vinegar might be an interesting alternative since it is simple and environmental friendly. In this study, different varieties of *Kappaphycus spp.* (*K.alvarezii* var. *Giant* (WG), *K.alvarezii* var. *Giant* (PG) and *K.striatum* var. *Green flower* (GF)) were treated with lemon, tamarind extract, rice flour and vinegar at different concentration in order to investigate its effect on the odour and antioxidant activity. Based on the findings obtained, the highest DPPH radical scavenging activity (63.322%) and FRAP value (2.877 mM/g) were observed in GF sample treated with 5% tamarind extract. Sensory analysis showed that samples treated with lemon and tamarind extract obtained the lowest score for fishy odour. The findings suggested that the treatment using 5% and 3% tamarind extract shows a promising benefit in reducing the fishy odour and at the same times, increasing the antioxidant activity.

Keywords : *Kappaphycus spp.*; DPPH radical scavenging activity; FRAP value

1. INTRODUCTION

The most seaweed that being cultivate in Malaysia are *Kappaphycus spp.* Red algae species or also known as elkhorn sea moss which can be found abundant in tropical and temperate oceans. It can be found abundantly and been grow commercially in Malaysia as stated by [1].

It has been used as food ingredients, fertilizers, animal feeds and one of the most important commercial sources of carrageenan, a gel forming, and viscosifying polysaccharides agents that been used as emulsifying, thickening and stabilizing agents stated by [2]. The main reason for these finding is to increase the palatability and the profitability to eradicate the poverty by economically among the farmers for the smaller scale industries. However, *K.alvarezii* are characterized by strong fishy odour which limits its utilization. Some method must be used to remove this unwanted odour in order to be applied in small and large scales industry such as food and pharmaceuticals [3].

Recently, the studies have shown the effectiveness of using natural solution such as rice water, tamarind extract, vinegar and lemon juices in removal of odour and microbial spoilage in fish as stated by [4]. However, there are few studies on the effectiveness of these natural solution in removing the fishy odour from *Kappaphycus spp.* and therefore, this research would exploring the possibility of using these natural solution in eliminating the strong fishy odour from *K.alvarezii* and at the same time, enhancing its activity and will not reduce its antioxidants activity.

2. METHODOLOGY

2.1 Sample preparation

Samples used in this study are obtained from Tawau, Sabah, Malaysia. Samples preparation was done according to the method of [5].

2.2 Odour elimination treatment

Odour elimination treatment was performed according to the method of [6].

2.3 Extraction of phenolic compound

The extraction of the compound was performed according to [7] with some modifications.

2.4 DPPH free radical scavenging activity determination

DPPH free radical scavenging activity determination was performed according to the method stated by Norakma et al. [8] with modifications.

2.5 Ferric reducing antioxidant power (FRAP) analysis

FRAP analysis was conducted according to the method described by [9] with modifications.

2.6 Sensory analysis

Sensory analysis was conducted according to [10] with modifications. Hedonic scale was used to tabulate the scoring data.

3. RESULTS AND DISCUSSION

3.1 DPPH radical scavenging activity and FRAP value

The highest DPPH radical scavenging activity was observed in GF sample even before odour elimination treatment were conducted as shown in Table 1. The treatment with 5% tamarind extract showed the highest DPPH radical scavenging activity (63.222 %) with 37.4% of increment while the highest FRAP value (2.877 mM/g) was also observed in GF sample treated with 5% tamarind extract as tabulated in Table 2.

Table 1 DPPH radical scavenging activity (%) of *Kappaphycus* spp. in different concentration of natural solution.

Seaweed Solution		PG	WG	GF
Vinegar	1%	31.519 ± 0.140	37.302 ± 0.035	41.609 ± 0.055
	Control	15.986 ± 0.108	35.374 ± 0.008	46.088 ± 0.072
Lemon juice	1%	46.372 ^a ± 0.077	43.481 ^{ab} ± 0.057	46.882 ^a ± 0.020
	3%	51.417 ^a ± 0.031	43.481 ^{ab} ± 0.046	40.420 ^a ± 0.024
	5%	43.594 ^{ab} ± 0.047	48.243 ^a ± 0.017	42.120 ^a ± 0.006
	Control	15.986 ^b ± 0.108	35.374 ^b ± 0.008	46.088 ^a ± 0.072
Tamarind extract	1%	47.676 ^a ± 0.030	47.109 ^b ± 0.060	52.268 ^a ± 0.024
	3%	61.451 ^a ± 0.016	54.308 ^{ab} ± 0.030	52.041 ^a ± 0.012
	5%	46.088 ^a ± 0.011	62.358 ^a ± 0.050	63.322 ^a ± 0.030
	Control	15.986 ^b ± 0.108	35.374 ^c ± 0.008	46.088 ^a ± 0.072
Rice flour	1%	18.821 ^a ± 0.041	39.683 ^b ± 0.020	31.576 ^b ± 0.021
	3%	22.959 ^a ± 0.0191	32.120 ^c ± 0.038	52.721 ^a ± 0.024
	5%	10.658 ^a ± 0.051	50.680 ^a ± 0.015	11.054 ^c ± 0.020
	Control	15.986 ^a ± 0.108	35.374 ^{bc} ± 0.008	46.088 ^{ab} ± 0.072

Table 2 FRAP value (mM/g) of *Kappaphycus* spp. in different concentration of natural solution.

		PG	WG	GF
Vinegar	1%	2.519 ± 0.010	2.519 ± 0.028	2.840 ± 0.020
	Control	2.512 ± 0.009	2.496 ± 0.007	2.821 ± 0.005
Lemon juice	1%	2.513 ^a ± 0.010	2.514 ^b ± 0.005	2.836 ^b ± 0.007
	3%	2.511 ^a ± 0.005	2.517 ^b ± 0.007	2.839 ^b ± 0.005
	5%	2.510 ^a ± 0.010	2.513 ^b ± 0.008	2.821 ^a ± 0.007
	Control	2.512 ^a ± 0.009	2.496 ^a ± 0.007	2.821 ^a ± 0.005
Tamarind extract	1%	2.510 ^a ± 0.001	2.512 ^{ab} ± 0.005	2.832 ^a ± 0.035
	3%	2.544 ^a ± 0.058	2.512 ^b ± 0.005	2.830 ^a ± 0.010
	5%	2.529 ^a ± 0.028	2.520 ^b ± 0.019	2.877 ^b ± 0.010
	Control	2.512 ^a ± 0.009	2.496 ^a ± 0.007	2.821 ^a ± 0.005
Rice flour	1%	2.867 ^a ± 0.010	2.520 ^b ± 0.008	2.861 ^b ± 0.008
	3%	2.510 ^a ± 0.001	2.520 ^b ± 0.013	2.824 ^a ± 0.024
	5%	2.516 ^a ± 0.003	2.516 ^b ± 0.008	2.851 ^b ± 0.009
	Control	2.512 ^a ± 0.009	2.496 ^a ± 0.007	2.821 ^a ± 0.005

3.2 Sensory analysis

Based on Table 3, using 1% lemon juices on PG, WG treated with 1% lemon juices and GF treated with 5% lemon had the lowest score for the fishy odour while the untreated (control) retain the highest score for the fishy odour.

Table 3 Sensory score for fishy odour of control and treated samples

Seaweed Solution		PG	WG	GF
Control		5.000 ± 4.320	4.735 ± 2.670	4.735 ± 2.504
Vinegar	1%	3.889 ± 2.848	4.735 ± 2.120	3.889 ± 2.088
Lemon juice	1%	3.889 ± 1.900	3.889 ± 1.364	4.375 ± 2.560
	3%	4.735 ± 1.408	4.375 ± 1.598	3.889 ± 2.205
	5%	3.889 ± 2.315	4.375 ± 1.506	3.889 ± 1.833
Tamarind extract	1%	5.833 ± 3.971	3.889 ± 2.315	7.000 ± 3.082
	3%	3.889 ± 2.088	3.889 ± 2.147	4.375 ± 2.446
	5%	4.111 ± 2.977	3.889 ± 1.537	4.375 ± 2.925
Rice flour	1%	5.833 ± 3.189	3.889 ± 1.764	5.000 ± 5.164
	3%	5.833 ± 4.262	3.889 ± 2.088	5.000 ± 5.228
	5%	5.000 ± 4.397	4.500 ± 2.070	5.833 3.869

4. CONCLUSION

In conclusion, the application of 5% and 3% tamarind extract can be considered as odour eliminating agent and at the same times, enhancing the antioxidant activity of seaweed

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REFERENCES

- [1] Datu Razali Datu Eranza, Arsiyah Bahron, James Alin, "Sustaining Seaweed Farming in Malaysia", ISSN 2321 –8916, 2015
- [2] Norhidayu Mohamed and Aminah Abdullah, "Comparison of Total Phenolic Content and Antioxidant Activity of *Kappaphycus alvarezii* from Langkawi and Semporna. Sabah", vol.11 (5), pp 324-330, 2016
- [3] S. K. Sharifah Habibah, W. M.Wan Aida, M. Mohamad Yusof, L. Seng Joe, "Effects of deodorisation methods on volatile compounds, chemical properties and antioxidant activities of fucoidan isolated from brown seaweed (*Sargassum* sp.)", Algal Research, vol.25, pp 507–515, 2017
- [4] P. Selvam, S. I. Mokhtar, N. Aziz and S.B Mokhtar, "Traditional method of fish treatment, microbial count and palatability studies on spoiled fish", Malaysian Journal of Microbiology, vol.9, pp 135-139, 2012
- [5] W. M. Siah, A. Aminah and A. Ishak, "Optimization of soaking conditions for the production of seaweed (*Kappaphycus alvarezii*) paste using response surface methodology", International Food Research Journal, vol.21, pp 471-477, 2014
- [6] X. G. Keyimu and A. Aminah, "Elimination of seaweed odour and its effect on antioxidants activity", AIP conference proceedings. vol.1614 (1), pp 399-403, 2014
- [7] R. A Zuhair, A. Aminah, A. M. Sahilah and H. M. Khalid, "Effect of gum arabic on quality and antioxidant properties of papaya fruit during cold storage", International Journal of Chem. Tech. Research, vol.5, pp 2854-2862, 2013
- [8] M.N. Norakma, A.H. Zaibunnisa, L.W. Lai, R. Givitha, W. A. R. Wan Razarinah, "Optimization of Solid-State Fermentation Condition to Increase Total Phenolic Content and Antioxidant Activity in Seaweed (*Kappaphycus alvarezii*) Extract", International Journal of Engineering & Technology, vol.7 (4.14), pp 257-262, 2018
- [9] I. F. F. Benzie and J. J. Strain, "The Ferric Reducing Ability of Plasma (FRAP) as a Measure of "Antioxidant Power": The FRAP Assay", Analytical Biochemistry, vol.239 (1), pp 70–76, 1996
- [10] P. M. A Le, J. Grua and M. Demaimay, "Effect of two storage conditions on the odour of an edible seaweed, *Palmaria palmata* and optimization of an extraction procedure preserving its odour characteristics", Sensory and Nutritive Qualities of Food, vol.67, pp 3135-3139, 2002

MARKOV CHAINS TO PREDICT MARKET TRENDS OF VEHICLES

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Abstract – This paper discusses about prediction market trends of vehicles for unstable distribution by use Markov chains method. The prediction probability of future market condition of vehicles for unstable distribution to stable distribution is obtained. In this paper also obtain the likelihood of future market condition of vehicles.

Keywords : Markov Chain; unstable distribution; market trend

1. INTRODUCTION

The Markov chain model is one of the most widely used probabilistic models because of its simplicity on the one side and great ability to model various types of phenomena evolving in time on the other side. In the basic form we have a set of states and a process that takes exactly one state at each time step. The probabilities of taking a state at the next step only depend on the state that the process takes at the moment. Given those probabilities, several interesting properties of the process can be deduced, such as the probabilities that the process will end up in a certain state after a very large number of steps. These problems can be solved mostly using common matrix computations, by [1].

Suppose that such a system changes with time from one state to another and at scheduled times the state of the system is observed. If the state of the system at any observation cannot be predicted with certainty, but the probability that a given state occurs can be predicted by just knowing the state of the system at the preceding observation, then the process of change is called a Markov chain.

Modern probability theory studies chance processes for which the knowledge of previous outcomes influences predictions for future experiments. In principle, when we observe a sequence of chance experiments, all of the past outcomes could influence our predictions for the next experiment. Thus, the objectives of this paper is to predict the probability of future market condition of vehicles for unstable distribution to stable distribution and to predict the likelihood of future market condition of vehicles.

2. METHODOLOGY

2.1 Stochastic Process

Williams [3] stated that stochastic process is important in the study of random phenomena where the exact outcomes are not known but probabilities can be determined. If the outcome of an event is sure to occur, the probability of that outcome is 1. On the other hand, if it will not, the probability is 0. **Definition 2.1** [3], A stochastic matrix is a square matrix where elements are probabilities and whose columns add up to 1.

2.2 Discrete-Time Markov Chains

Definition 1. A discrete-time discrete-state stochastic process $\{X_n : n \geq 0\}$ with a state space $S \subseteq \{0, 1, 2, \dots\}$ is called a discrete-time Markov chain (or only a Markov chain) if and only if it has a Markov property

$$P(X_{n+1} = j | X_n = i, X_{n-1} = i_{n-1}, \dots, X_0 = i_0) = P(X_{n+1} = j | X_n = i) \quad (1)$$

for all $n \geq 0, i, j, i_0, i_1, \dots, i_{n-1} \in S$ (the probability of the next state given the current state and the entire past depends only on the current state). The Markov property (2.1) is a constraint on the memory of the process: knowing the immediate past means the earlier outcomes are no longer relevant.

2.3 Market Trends of Perodua, Honda and Proton

Data sales of vehicles are collected from the Malaysian Automotive Association (MAA). For this topic, the data will be chosen based on highest value of each year with the three different vehicles and different years as in Table 1.

Table 1 Market Trends of Perodua, Honda and Proton from year 2015, 2016 and 2017

Year	2015	2016	2017	Total
Brand	Perodua	Honda	Proton	
Perodua	213307	207110	204887	625304
Honda	94902	91830	109511	296243
Proton	102174	72290	70991	245455
Total	410383	371230	385389	1167002

3. RESULTS AND DISCUSSION

3.1 Markov Chains to Predict Market Trends of Perodua, Honda and Proton for Unstable Distribution

It is assumed that the market information is distributed equally among vehicles and that products produce randomly in fair markets. This means that every vehicle has equal access to information such that no vehicles have an upper hand due to inside-information. Table 2 shows the probability of Perodua, Honda and Proton for year 2015, 2016 and 2017.

Table 2 Probability table from year 2015, 2016 and 2017

From \ To	2015	2016	2017
	Perodua	Honda	Proton
Perodua	0.34	0.33	0.33
Honda	0.32	0.31	0.37
Proton	0.42	0.29	0.29

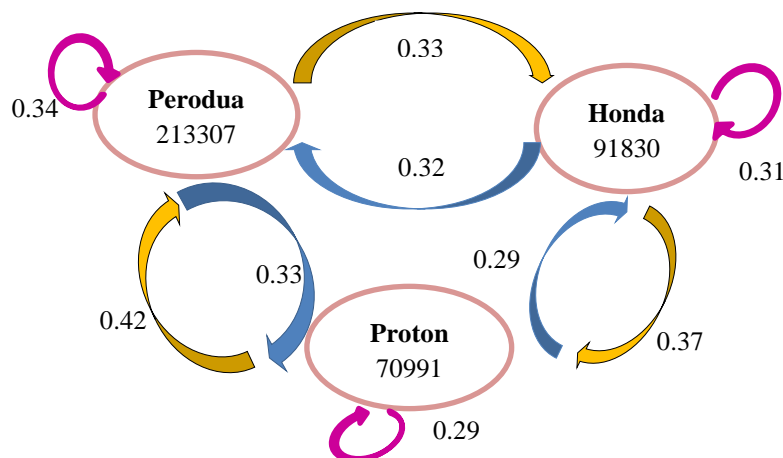


Figure 1 Transition diagram

3.2 Computation of Predict Market Trends of Perodua, Honda and Proton for Unstable Distribution

Table 3 Probability Table of Markov Chains

From \ To	Perodua	Honda	Proton	Total
Perodua	0.34	0.33	0.33	1.0
Honda	0.32	0.31	0.37	1.0
Proton	0.42	0.29	0.29	1.0
Total	1.08	0.93	0.99	
	≠1	≠1	≠1	

Since the total probability of first column, second column and third column is not equal to 1, then the Table 3 above is called unstable distribution. From probability Table 3, transition matrix A is as follows:

$$Let A = \begin{pmatrix} 0.34 & 0.33 & 0.33 \\ 0.32 & 0.31 & 0.37 \\ 0.42 & 0.29 & 0.29 \end{pmatrix}$$

Let $X_n = (Perodua \quad Honda \quad Proton)$

So, the matrix of products vehicles (the total of Vehicles =376128) is denoted by,

$$X_1 = (131645 \quad 120361 \quad 124122)$$

When the future state become same with initial state, the chain should be stopped. This means that the distribution become stable. The n^{th} value is depends on the situation to get stable distribution matrix. The stable distribution matrix shows that new state value that will be selling on the following year. In this case, the distribution stabled at 3rd attempt by multiplying probability and state value of $n=2$. The distribution will get value of next state exact same as before. Now, the state matrix begins to converge.

4. CONCLUSION

The probability of future market condition of vehicles for unstable distribution to stable distribution can be seen in Table 2 and Table 3. For the likelihood of future market condition of vehicles, it can be found that the probabilities will converge to a steady state, $n \rightarrow \infty$, meaning that 36% of Perodua, 31% of Honda and 33% of Proton. The probabilities of this Markov chain do not depend upon the initial state. In this case, the distribution stabled at 3rd attempt by multiplying probability and state value of $n=2$. Thus, it can be concluded that Markov chains can be used to predict those selected parameters.

REFERENCES

- [1] Damjan Škulji, “Discrete time Markov chains with interval probabilities”, International Journal of Approximate Reasoning, vol.50, pp 1314–1329, 2009
- [2] S. J. Leon, Linear Algebra with Applications (2nd ed.). United States of America: Prentice Hall.1998
- [3] Williams, G. Linear Algebra with Applications. (7th edn.). Canada: Pearson Education, 2011

DELIGNIFICATION AND JUICE CLARIFICATION BY FUNGI XYLANASE FROM TWO DIFFERENT CARBON SOURCES: RICE STRAW AND OIL PALM LEAF

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Abstract - Microbial enzyme which is xylanase plays an important role as biocatalyst in many reactions of industrial applications purposes. The xylanase can be produced by *Aspergillus niger* via solid state fermentation system using agricultural waste as substrate. Xylanase is an industrially important class of enzyme that degrades xylan. There are two objectives of this study, firstly, to produce xylanase from rice straw and oil palm leaf via solid state fermentation by *Aspergillus niger* and secondly, to compare its efficacy with commercial xylanase on two different kinds of application, namely, delignification of sugarcane bagasse and clarification of citrus microcarpa juice. The results presented in this study revealed that commercial xylanase was more efficient in both applications. However, xylanase extracted from OPL was capable to have nearly same effective with commercial xylanase for bagasse delignification and clarification of citrus microcarpa juice compared to xylanase from rice straw. In consequence, it is suggested that the *Aspergillus niger* xylanase is more effective in respective applications by using oil palm leaf as substrate compared to rice straw.

Keywords : Xylanase; delignification; juice clarification

1. INTRODUCTION

According to Siti and Abdullah [1], one of the most abundant agricultural residues available in the world is rice straw with the capacity of 20.9 million tons from Africa, 667.6 million tons from Asia, 3.9 million tons from Europe, 37.2 million tons from America and 1.7 million from Oceania. Most farmers are practising open burning of these materials and this activity is of pollution concerns. On top of that, Norazlina et al. [2] highlighted among all agricultural wastes, the oil palm industry forms the economic backbone of Malaysia with total contribution of 49.5 % of global production and 64.5 % of exports which makes Malaysia is the largest palm oil producer in the world. The accumulation of agriculture wastes generally in the environment has caused pollution problems and most of the wastes are disposed by burning, which is a practice that is considered as a major factor in global warming. The management of these wastes must be given highest priority in the country in ensuring not only in reducing the damaging impact of the waste to the environment, but most prominently in the conversion of these wastes into useful raw material for the production of added value commodities of industrial commercial potentials [3]. Xylanase is an industrially important hydrolytic enzymes which catalyses the hydrolysis of xylan to xylo-oligosaccharides and pentose sugar (xylose) that has been used in many applications, specifically, energy generation, waste treatment, production of chemicals, clarification of juices, and paper manufacture. In addition, xylanase has potential for use in the production of xylooligosaccharides, ethanol, and other useful substances [4]. The aims of this research are to obtain the fungus xylanase from two different carbon sources which were rice straw and oil palm leaf as cost-effective substrates via solid state fermentation. Next, both obtained crude xylanase from rice straw and oil palm leaves respectively, will be compared to investigate their efficacy with commercial xylanase in sugarcane bagasse delignification and juice clarification.

2. MATERIALS AND METHOD

2.1 Lignin Content Determination

Two milliliters of 72% H₂SO₄ (v/v) and 0.2g of dried sugarcane bagasse that was treated with enzyme was added in 100ml of flask. The mixtures were stirred for 60 minutes at room temperature. Then, 56ml of distilled water was added into the flask and autoclaved at 120 °C for 15 minutes. After that, the

mixtures were filtered by using glass microfiber filter. The residue was washed with hot water until pH 7 and dried at 100 °C overnight (TAPPI).

3. RESULTS AND DISCUSSION

3.1 Delignification of Sugarcane Bagasse

The delignification process was conducted by hydrolyzing the sugarcane bagasse with sufficient amount of crude xylanase from different sources (rice straw and oil palm leaf) and commercial xylanase in different concentration such as 0.5g/L, 1.0g/L, 1.5g/L, 2.0g/L, 2.5g/L and 3.0g/L.

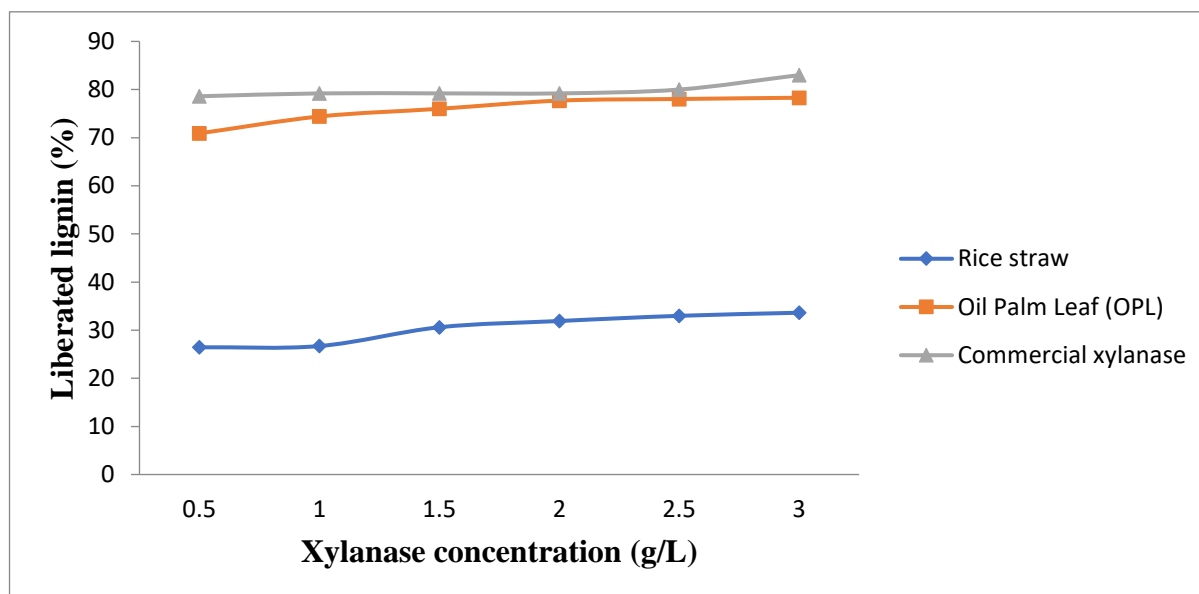


Figure 1 Effectiveness of crude xylanase from different sources (rice straw and oil palm leaf) and commercial xylanase on sugarcane bagasse delignification.

Figure 1 shows the effect of crude xylanase from different sources (rice straw and oil palm leaf) and commercial xylanase on delignification of sugarcane bagasse. As shown in Figure 3.1, commercial xylanase shows more efficient than the crude enzymes from RS and OPL. This is because the higher percentage of lignin liberated from bagasse was achieved by the commercial xylanase. In comparison between the OPL and RS crude xylanase, it is evident that xylanase from OPL was more efficient than the xylanase from rice straw as higher percentage of lignin liberated from bagasse than crude xylanase extracted from rice straw.

4. CONCLUSION

The production of xylanase from OPL and RS by solid state fermentation (SSF) is the alternative way for better waste biomass management due to its inexpensive and readily available materials. In conclusion, the xylanase from OPL has better ability in sugarcane bagasse delignification and juice clarification compared to crude xylanase from RS.

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REFERENCES

- [1] Siti Maftukhah and Abdullah Abdullah, “Cellulase enzyme production from rice straw using solid state fermentation and fungi *Aspergillus niger* ITBCC L74”, MATEC Web of Conference, 156, 01010, 2018
- [2] I. Norazlina, K.H. Ku Halim and F.A.M. Shareena, “Effect of carbon and nitrogen ratio, mineral solution and inoculum size in the production of xylanase using oil palm leaf”, Advance Materials Research, vol.1113, pp.273-278, 2015.
- [3] I. Norazlina, (PhD Dissertation) “Production of Xylanase by *Aspergillus niger* ATCC 16404 using Oil Palm Oil Leaf as Substrate” 2016.
- [4] A. K. Ajjolakewu, C.P. Leh, W.N. Wan Abdullah, C.K. Lee, “Optimization of production conditions for xylanase production by newly isolated strain *Aspergillus niger* through solid state fermentation of oil palm empty fruit bunches”, Biocatalysis and Agricultural Biotechnology, vol.11 (3), pp 239-247, 2017.

VITELLOGENIN QUANTIFICATION BY ENZYME-LINKED IMMUNOSORBENT ASSAY IN THREE CATFISH SPECIES

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Abstract – Vitellogenin (Vtg) or egg yolk precursor protein is consistently correlated with reproductive status in fish to imply levels of ovarian development. The protein has different molecular weights in different species of fish and has led to questions about how to detect Vtg in three different species of catfish using antibody recognition. In this study, an enzyme-linked immunosorbent assay (ELISA) was used to quantify Vtg in blood plasma from three closely related catfish species. The electrophoretic pattern of blood plasma shows a high molecular weight of major polypeptide corresponding to 130 kDa in *Hemibagrus wyckiodes*, *Pangasius pangasius* and 100 kDa in *Clarias gariepinus* and the existence of Vtg has been confirmed. Prior to quantification of Vtg, the use of antigen captures and purified *Hemibagrus nemurus* Vtg as standard was validated for detection of Vtg and further used for detection of Vtg in plasma of *H. wyckiodes*, *P. pangasius* and *C. gariepinus*. The result revealed presence cross-reactivity between *H. wyckiodes* and *H. nemurus* and other group of catfish. The Vtg present in the three species of catfish is specific to the antibody of *H. nemurus*. The present study provides better understanding of Vtg with suggestion that the immunosorbent test enhances identification and quantification of Vtg for the assessment of reproductive status in closely related species of catfish.

Keywords : Vitellogenin; *Hemibagrus nemurus*; catfish; immunosorbent assay

1. INTRODUCTION

Vitellogenesis is a mechanism that contributes to the synthesis and deposition of yolk in all female oviparous species. In females, Vtg is transmitted to the ovaries in the circulatory system, where it is incorporated as yolk in the developing ovarian follicles. There is no evidence of Vtg development in males because their endogenous estrogens are poor but they can synthesise and secrete Vtg in the blood due to external estrogen stimulation [3].

The structure of Vtg differs significantly between fish species that belong to different families and differentiate in their biochemical properties [8]. However, various types of Vtg have a dimeric molecule comprising of identified monomers, and certain regions of the gene are strongly conserved. Thus, antibodies from close related species have reactive across species because the Vtg have some conserve region. In order to evaluate the polyclonal antiserum that is already develop in *H. nemurus*, multi-species cross-reactive epitopes can be achieved by competitive ELISA. The aim of the study was to characterize the blood plasma of three species of catfish and to evaluate antigenic cross-reactivity in red tail catfish (*H. wyckiodes*), river catfish (*P. pangasius*) and African catfish (*C. gariepinus*).

2. METHODOLOGY

2.1 Samples collection and blood sampling

Adults *P. pangasius* (body weight; 1.36 ± 0.21 kg) and *H. wyckiodes* (body weight; 0.73 ± 0.10 kg) were purchased from the Pahang fish farm where each type of catfish species has seven samples, five females and two males (as control). For adults *C. gariepinus* with body weight range of 0.6 kg to 2.0 kg and immature *C. gariepinus* with a body weight range of 0.1 kg to 0.3 kg was purchased at a local fish farm near Bestari Jaya. The fish were brought to the Aquaculture Laboratory, Faculty of Science and Biotechnology, Universiti Selangor and acclimatised for two weeks prior to the experiment. The fish were anaesthetized for blood collection from the caudal tail vein using 5 mL syringes.

2.2 Protein assay and Sodium Dodecyl Sulphate-Polyacrylamide Gel Electrophoresis (SDS-PAGE)

Using Bovine Serum Albumin BSA (Biorad) as standard, a dye-binding procedure [6]; [9] was used to measure the concentration of protein in the blood samples. The crude protein samples (200 μ L, unknown concentration) was diluted 1:1 to 1:7 in the Bradford reagent. The assay was measured using Microplate Reader (Biochrom Asys UVM340, UK) with an absorbance wavelength of 595 nm. SDS-PAGE was run based on the technique proposed by Laemmli, [10] for electrophoresis gel BioRad Mini-PROTEAN II (Biorad, USA). Samples were diluted in the SDS sample buffer at a ratio of 1:1 and heated to 95 ° C for five minutes prior to application in Thermomixer comfort 1.5 mL (Eppendorf). The gel was filled with a 20 μ L samples and the molecular weight standards (Thermo Scientific PageRuler Plus Prestained Protein Ladder; 10-250 kDa) were used as reference.

2.3 Vitellogenin quantification and data analysis

A competitive ELISA method was applied for Vtg quantification in the three species of catfish. The Vtg *H. nemurus* was used as an antigen capture. The plates were blocked for 45 minutes at 37 °C with a blocking buffer to reduce non-specific binding. Samples (dilution ranged from 1:100 to 1:000000) and standards (31.2, 62.5, 125, 250, 500 and 1000 ng / mL) were diluted in an assay buffer (1% skimmed milk in PBST). The primary antibody against Vtg in *H. nemurus* and secondary antibody horseradish peroxidase (HRP) conjugated goat anti-rabbit IgG were used for biorecognition assessment. For visualisation, Tetramethylbenzine (TMB) substrate solution was supplemented with 0.05 M sulphuric acid. The 450 nm absorbance was read using the ELISA microplate reader. Data analysis was performed using One Way Variance Analysis (ANOVA) followed by Tukey's post-hoc test using IBM SPSS statistic 19.0 software and the significance was calculated at $P < 0.05$.

3. RESULTS AND DISCUSSION

The total protein concentration in plasma samples of the three species of catfish was measured using spectrophotometrically by dye binding method and the BSA was used as standard. Table 1 shows the concentration of plasma proteins in males and females of three species catfish. One of the proteins in plasma is Vtg and has been confirmed as a precursor to the main protein in egg yolk [7]. However, other variables that have affected protein concentrations in three species of catfish are distinct due to variations in body weight, diet, feed supplements and the environment [1]. Health of fish can be affected by ecological components (stress), nourishment and pathogens. Specific examination is required to ensure that the fish is suitable for spawning purposes.

The molecular weight of the three species of catfish was evaluated between the male and female fish to distinguish the Vtg protein and demonstrate the Vtg present only in female fish using SDS-PAGE gel. The specificity of anti-*H. nemurus* Vtg serum against Vtg in females of three species of catfish was evaluated. The standard length, body weight and concentration of Vtg for three species of catfish was shown in Table 1. The result showed a cross-reaction between the blood plasma of female fish *C. gariepinus*, *H. wyckiodes* and *P. pangasius* and anti-*H. nemurus* Vtg. The absence of the anti-*H. nemurus* Vtg binding towards any protein in normal mature and immature male fish and non-vitellogenic females clearly indicates that the antibody is Vtg-specific. By competitive ELISA, each antiserum was highly reactive with its specific antigen, and polyclonal antibodies typically recognise cross-reactive epitopes between related species [5]. However, there was also a lack of cross-reactivity between unrelated species in previous research by Covens et al., [4]. Plasma Vtg concentration in mature female *P. pangasius*, *H. wyckiodes* and *H. nemurus* are significantly different $p < 0.05$ demonstrated that fish have different seasonal profiles and different reproductive strategies [2]. Other factors that affect this are the period of the vitellogenic process and size of the Vtg reached by the oocytes during the growing phase.

Table 1 The standard length, body weight and vitellogenin concentration in plasma for female *Clarias gariepinus*, *Pangasius pangasius*, *Hemibagrus wyckiodes* and *Hemibagrus nemurus*

Catfish species	Body Weight (g)	Standard Length (cm)	Total protein concentration (mean± SE) (mg/mL)	Plasma vitellogenin concentration (µg/mL)
<i>Pangasius pangasius</i>	1400±200 ^c	46.64±2.46 ^c	0.1029±0.0074 ^{ab}	26.02±23.79 ^{ab}
<i>Hemibagrus wyckiodes</i>	685±57.66 ^{ab}	36.3±0.57 ^{ab}	0.1044±0.0039 ^{ab}	21.56±9.28 ^{ab}
<i>Clarias gariepinus</i> (matured)	1560±178.19 ^c	55.4±5.81 ^d	0.0987±0.0052 ^a	7.52±9.14 ^a
<i>Clarias gariepinus</i> (immature)	234±72.66 ^a	30.3±4.02 ^a	0.1175±0.0081 ^{ab}	7.84±11.81 ^a
<i>Hemibagrus nemurus</i>	1168±831.25 ^{bc}	38.00±7.42 ^b	0.1240±0.0200 ^b	84.36±100.63 ^b

Note: Means with the same superscript letter within column are not significantly different $p > 0.05$ by Duncan's new multiple range test

4. CONCLUSION

The findings of this study provide a better understanding of Vtg and indicate that the ELISA test strengthens the identification and quantification of Vtg in order to evaluate the reproductive status. In addition, the quantification of Vtg can be used to apply in the different environments, diets and hormonal status that can lead to the reproductive success of these species.

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REFERENCES

- [1] D. A. Higgs, J.N Sutton, H. Kim, J.D Oakes, J. Smith, C. Biagi, M. Rowshandeli and R.H Devlin, "Influence of dietary concentrations of protein, lipid and carbohydrate on growth, protein and energy utilization, body composition, and plasma titres of growth hormone and insulin-like growth factor-1 in non-transgenic and growth hormone transgenic coho salmon, *Oncorhynchus kisutch* (Walbaum)", *Aquaculture*, vol.286 (1), pp 127–137, 2009
- [2] D. Zhang, H. Xiong, J.A Mennigen, J.T Popesku, V.L Marlatt, C.J Martyniuk, K.Crump, A.R Cossins, X. Xia and V.L Trudeau, "Defining Global Neuroendocrine Gene Expression Patterns Associated with Reproductive Seasonality in Fish", *PLOS ONE*, vol.4 (6) p. e5816, 2009
- [3] G. Soliman, M. Abdelaziz, A. E. Eissa, N. Elias, and M. Moustafa, "Impacts of natural and experimental phenol pollution on the reproductive performance, vitellogenin synthesis and pathological alterations of male *Oreochromis niloticus*", *Egypt. J. Aquat. Biol. Fish.*, vol.24 (4) pp 479–495, 2020
- [4] M. Covens, L. Covens, F. Ollevier and A. De Loof, "A comparative study of some properties of vitellogenin (Vg) and yolk proteins in a number of freshwater and marine teleost fishes", *Comp. Biochem. Physiol. B*, vol.88 (1), pp 75–80, 1987
- [5] M. Watts, N. W. Pankhurst, A. Pryce, and B. Sun, "Vitellogenin isolation, purification and antigenic cross-reactivity in three teleost species," *Comp. Biochem. Physiol. B Biochem. Mol. Biol.*, vol.134 (3), pp 467–476, 2003

- [6] N. P. Bonjoch and P. R. Tamayo, "Protein Content Quantification by Bradford Method", in Handbook of Plant Ecophysiology Techniques, M. J. Reigosa Roger, Ed. Dordrecht: Springer Netherlands, pp 283–295, 2001
- [7] R. G. Deeley, D.P. Mullinix, W. Wetekam, H.M Kronenberg, M. Meyers, J.D Eldridge and R.F Goldberger", Vitellogenin synthesis in the avian liver. Vitellogenin is the precursor of the egg yolk phosphoproteins", J. Biol. Chem., vol.250 (23), pp 9060–9066, 1975
- [8] S. Sawaguchi, H. Kagawa, N. Ohkubo, N. Hiramatsu, C. V. Sullivan, and T. Matsubara, "Molecular characterization of three forms of vitellogenin and their yolk protein products during oocyte growth and maturation in red seabream (*Pagrus major*), a marine teleost spawning pelagic eggs", Mol. Reprod. Dev., vol.73 (6), pp. 719–736, 2006
- [9] T. Spector, "Refinement of the Coomassie blue method of protein quantitation: A simple and linear spectrophotometric assay for ≤ 0.5 to 50 μg of protein", Anal. Biochem., vol.86 (1) pp142–146, 1978
- [10] U. K. Laemmli, "Cleavage of Structural Proteins during the Assembly of the Head of Bacteriophage T4", Nature, vol. 227 (5259), Art. no. 5259, 1970

CHEMICAL SENSOR DEVELOPMENT USING INTERDIGITATED ELECTRODE

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Abstract –A change in permittivity tends to produce electric fields which in turn affects the capacitance value. This study consists of designing Interdigitated Electrodes (IDE) using AutoCAD. The IDEs design were based on different types of parameters such as length, width, space between electrodes, total number of electrodes and sensing area. The IDEs were fabricated on FR4 using photolithography techniques. The IDEs were then experimentally presented as sensing element for characterization of chemical solvents such as tap water, distilled water, ethanol and methanol. The impedance measurement was collected and analyzed using Microsoft Excel. From the experiment conducted, it is identified all the parameters affects the impedance value of the chemical solvents.

Keywords : Sensor; interdigitated electrode; chemical solvents

1. INTRODUCTION

In recent years, there has been an increasing interest in the development of chemical and biomolecule sensors which plays an importance role in many industries such as biomedical, food analysis, agriculture and many more [1]. Therefore, Interdigitated Electrode (IDE) is introduced to fill the demands in providing high sensitivity and selectivity, fast response, and low-cost sensor [2]. Since each material has its own relative permittivity, ϵ_r , this technique basically based on general equation of capacitance plate

$$C = \frac{\epsilon_r \epsilon_0 A}{d} \quad (1)$$

where ϵ_0 permittivity of vacuum, A is the area of the plate and d is the distance between the plates. By applying the concept of capacitive sensing, the Interdigitated Electrode (IDE) is composed of two parallel plates with two positive and negative connections tracks [3]. These two plates can generate a capacitive sensing field and able to measure the changes of dielectric material. One of the common designed in biomolecular sensing is planar interdigitated electrode [4]. One of the potential benefits of this type of IDE is the ability to integrate with other instruments to develop autonomous, lab on chip measurement systems [5]. Currently, they have been widely used for the detection of capacitance, dielectric constant and bulk conductivity in biological mediums. Therefore, planar IDE was chosen in this project due to low cost and a simple fabrication process that suits the capability of fabrication equipment in our laboratory.

2. METHODOLOGY

The proposed structure of 2D Interdigitated Electrodes (IDEs) were designed using AutoCAD software. The designed were then transferred to FR-4 printed circuit board for fabrication processed. Figure 1 depicts the photographs of the fabricated sensor.

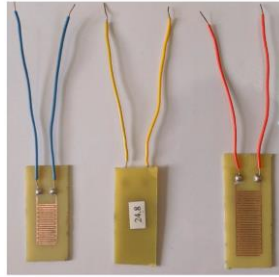


Figure 1 Photograph of fabricated sensor

Figure 2 shows the outline of the experimental setup. During the experiment, those sensors were immersed in a beaker full of liquid substances as material under test. The response of the sensor is then observed and documents upon introducing with the variation of liquid materials. Here, by introducing several materials at the sensing area, the capacitance value between the electrodes is compromised.

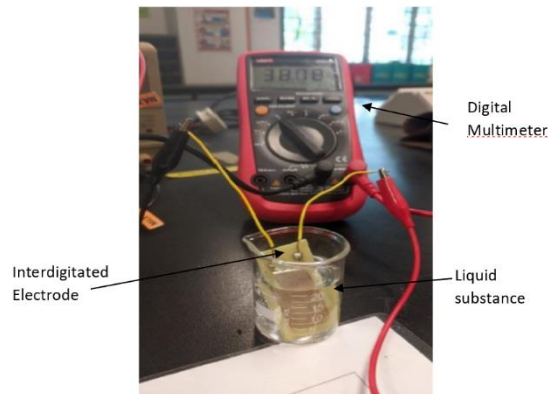


Figure 2 Experiment set up

3. RESULTS AND DISCUSSION

The graph for each IDEs that have been tested with liquid substances was described and analyzed. The analysis is based on the design of IDEs and the impedance values obtain when the sensors were being tested with liquid material. There are three designs of IDE with different length and space between electrodes and were tested using tap water, distilled water, methanol and ethanol. Table 1 shows the specification of the proposed sensors, while Figure 3 shows one of the results of the proposed sensors.

Table 1 Specification of Sensors

No.	Width of electrodes, mm	Length of electrodes, mm	Space between electrodes, mm
1	0.4	8.4	0.4
2	0.4	10.4	0.6
3	0.4	12.4	0.8

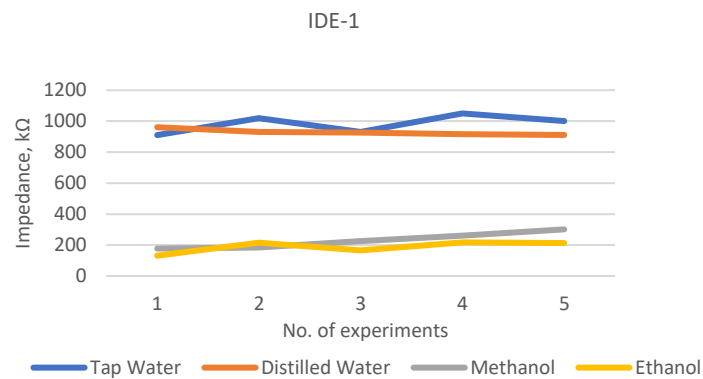


Figure 3 Impedance results of the first type of IDE design

The results show that, the proposed sensor was able to distinguish the presence of the liquid under test. The difference in impedance value shows the different permittivity of the liquid itself. The experiment was then carried out with different design of IDEs and yet it still shows significant different of impedance value when the IDEs is tested.

4. CONCLUSION

By exploiting the special relationship of capacitance and impedance value, an Interdigitated Electrode is able to act as a sensor to detect the presence of liquid material under test. The proposed sensor showed an observable value of impedance when the highest permittivity value of the liquid material was being tested. In addition, each of the parameters involved in designing the sensors gives significant impact to the sensitivity of the proposed sensor.

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REFERENCES

- [1] K.N Khamil and C.K. Yin, "An analysis of lard by using dielectric sensing method", *Journal of Telecommunication*, vol. 8(9), pp 131-137, 2016
- [2] A.Z. Murad, "Interdigitated electrodes as impedance and capacitance biosensors: A review", *AIP Conference Proceeding*, vol. 1885(1):020276, 2017
- [3] E. Kostal, S. Kaseman, C. Dincer, ad S. Partel, "Impedimetric characterization of interdigitated electrode arrays for biosensor applications", *Proceedings 2018*, vol. 2 (899), pp 2-6, 2018
- [4] M.A. Farehanim, U. Hashim, N. Azizah, M.F. Fatin and A.H. Azman, "Fabrication of interdigitated electrode using basic conventional lithography for pH measurement", *AIP Conference Proceedings*, vol. 1808:020029, 2017
- [5] S. Partel, S. Kaseman, V. Matylitskaya, C. Thanner, C. Dincer and G. Urban, "Microelectronic engineering: A simple fabrication process for interdigitated electrode arrays with nanogaps for lab-on-chip applications", *Microelectron. Eng.*, vol. 173, pp. 27-32, 2017

PREDICTING FAILURE OF BEAM DUE TO VIBRATION USING ARTIFICIAL NEURAL NETWORKS

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Abstract – This study aims to predict the crack location and depth using an artificial neural network (ANN) of I-section beam under clamp boundary condition. Several finite element analyzes have been carried out for the training and testing of the ANN model using MODAL analysis in ANSYS software. The I-section beam is modelled in solid structural beam. The natural frequencies were found through analyzes made using finite element analysis (FEA) software. The ANN model was developed using the algorithm Cascade-forward Back Propagation (CFBP). The validity of the method designed is verified by the determination coefficient (R). It was found that the R^2 (R: coefficient of determination) values are 0.998 for train and test data, respectively. The result showed that the backpropagation training algorithm was capable of predicting the crack depth and location of solid I-section beam. To evaluate the capability and efficiency of the developed ANN model, the results predicted by ANN are in excellent agreement with the results of the finite element analysis (FEA). Generally, this study is useful and contributes significance knowledge to understand the prediction of crack location and depth of I-beam using the ANN model.

Keywords : Crack detections; finite element analysis; ANN

1. INTRODUCTION

Cracks are among some of the principal causes of structural failure, and they develop in the structures due to various reasons such as fatigue, temperature variation, excessive load, cyclic load, environmental effects, impact loading etc. Thus, structural health monitoring is necessary to avoid risks, damages and failures. So, to avoid a major failure or accident, the early prognosis of structural cracking is required. Visual inspection and some non-destructive testing (NDT) methods for detection of crack are difficult as it requires time, expenses and are quite inefficient. So, the alternative methods are motivated to be developed. Damage detections have gained more attention among scientific and engineering communities to ensure structural safety and integrity. Several crack detections had been presented in vibration-based or guided wave-based damage detection techniques. For example, is the method for crack detection in beam structures using the concept of defect mode of phononic crystals [1]. In addition, the prediction of failure rectangular beam using ANN [2] and S.Li et al. [3] proposed an image-based crack detection of the concrete method using a deep convolutional neural network (CNN). Based on the literature reviewed, it is clear that the predicting failure of the beam using ANN is still not well understand. This paper for the first time to predict the crack location and crack depth of I-section beam using ANN due to vibration analysis. Moreover, the new technique and data and generated in this study could be used by other researchers for validation, comparison or reference.

2. METHODOLOGY

The finite element analysis and simulation were performed using the commercially available FE software package, (Ansys Student 2019 R3) with built-in failure criteria functions. ANSYS was used owing to its simplicity, and its ability to provide all the necessary functions for structural analysis of layered composite structures and Artificial Neural Network using model ANN package in MATLAB Software. The I-beam model made of steel with the dimension of 100 mm (length), 25 mm (width), 50 mm (height), 3.5 mm (flange thickness), and 3.5 mm (web thickness) were modelled. The present studies were systematically divided into two numerical stages which perform FEA simulation using ANSYS, convergence and validation ANN and design Artificial Neural Network (ANN) using MATLAB.

3. RESULTS AND DISCUSSION

The first five relative natural frequencies (f_1, f_2, f_3, f_4 and f_5) are taken as an input parameter; relative length (l) and relative depth (d_l) are taken as output parameters. The various functions used are: Levenberg Marquardt (trainlm) is taken as Training function, and LEARNGDM is taken as learning adaption method, Mean square error (MSE) taken as performance function and Sigmoid function (tansig) as a transfer function. Figure 1 shows the neural network architecture of Cascade-forward backpropagation. It contains five input and two output with eight number of the hidden neuron. Figure 2 shows the prediction results using ANN compared with simulated data from ANSYS of crack locations.

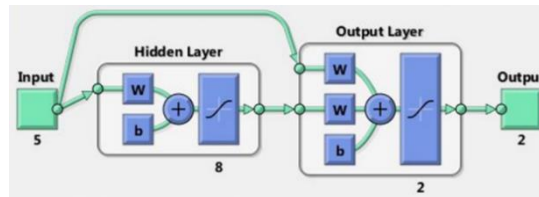


Figure 1 Neural network architecture

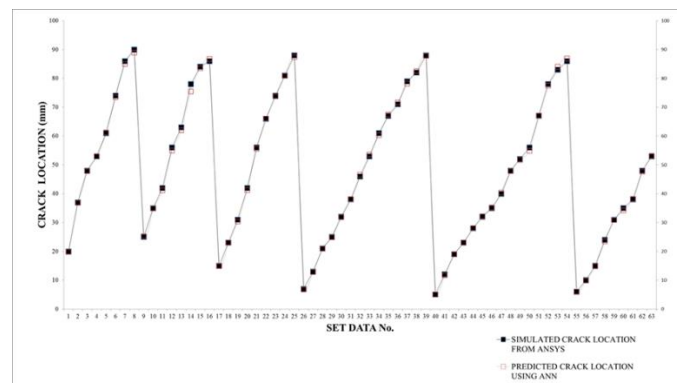


Figure 2 Prediction results compared with simulation data (Ansys) of crack locations

4. CONCLUSION

This study presents the prediction ANN model of crack location and crack depth on I-section beam. The ANN modelling has significantly given good predicted of crack depth (CD) and crack location (CL) using MATLAB software. The difference error between prediction and simulation has below 5% error. Due to this finding, it can conclude that the current study is useful and has contributed knowledge about understanding the predicting failure of beam due to vibration using artificial neural networks.

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REFERENCES

- [1] K.-C. Chuang, Wang, D.-F. Wang, X. Fang, Y.-H. Wang , and Z.-L. Hang, “Applying bandgap defect modes to crack detection in beams using periodic concentrated masses”, Journal of Sound and Vibration, vol. 477:115308, 2020
- [2] P. Behera, “Vibration analysis of a beam using neural network technique”, B.Tech Thesis, Department of Mechanical Engineering,” Department of Mechanical Engineering, National Institute of Technology Rourkela, 2015
- [3] S.Li and X.Zhao, “Image-based concrete crack detection using convolutional neural network and exhaustive search technique”, Advances in Civil Engineering, vol. 2019, pp. 1-12, 2019

PRELIMINARY INVESTIGATION INTO THE DESIGN OF A MATHEMATICAL CONTROL MODEL FOR GROUND EFFECT AND THE FLYING AIRBOAT

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Abstract – Despite the rapid evolution of technology in both the mechanical and aviation fields, one area that remains largely unexplored is the Ground Effect and its potential implication on land, sea and air vehicles of the future. To this regard, the development and implementation of Wing-in-Ground (WIG) crafts have particularly been lagging behind. WIG crafts are essentially vessels which are operated within the ground effect whereby, an improved lift-to-drag ratio is considered as a major enabling factor for improved aerodynamics. Because of the unique properties within the ground effect, WIG crafts are inherently energy-efficient and performance-oriented vessels. They are also amphibious and their versatility makes them ideal for a wide range of applications encompassing both military and civilian use. The flying airboat is an example of a WIG craft that utilizes these characteristics and seeks to add the benefit of Vertical Take-Off and Landing (VTOL). The VTOL capabilities would increase its versatility and maneuverability, especially in applications that require virtually no build-up or deceleration distances for takeoffs and landings. In this investigation, the approach adopted involves designing the mathematical control model for the maneuverability of the Flying Airboat. The modeling of the control is based upon an already established general design for the Flying Airboat including geometric specifications and parameters for the desired performance. The findings from the analysis indicate that the controllability of a VTOL model of a WIG craft, such as the Flying Airboat is indeed possible and mostly reliant on the fundamental equations of motion. Incorporation of span dominated ground effect (SDGE) into the control model substantially improves the lift-to-drag ratio and therefore the overall performance of the WIG. The investigation concludes that the implementation of a maneuverability control model for the flying airboat is viable with minor changes to the presented physical design.

Keywords : Flying airboat; lift-to-drag ratio; ground effect; mathematical control; wing-in-ground (WIG) crafts

1. INTRODUCTION

Ground Effect is a phenomenon experienced when a mobile object is in close proximity within the earth surface either over the sea or land. This effect of the earth surface plane changes the airflow patterns, and influences various aerodynamic characteristics during the process [1]. The result of ground effect is that there is enhanced body motion due to an increase of lift forces, and an enhanced power-to-weight ratio that increases overall performance. Ground Effect Vehicles (GEVs) or Wing-in-Ground Crafts are vessels that are especially developed and designed to travel within the ground effect. In the modern transportation design, GEVs and WIG crafts continue to be implemented in various forms including Air Cushion Vehicles (ACVs), which are commonly known as hovercrafts, that employ the use of inflated skirts to travel over both sea and difficult land surface terrains. It is however worth noting that the various forms of crafts that operate within the ground effect each have their shortcomings. The majority of GEVs and WIG crafts currently being tested have a relatively high cruise speed which requires prolonged contact with the ground surface during the initial (take-off) and last (landing) stages of their flights [2] This can significantly limit the scope of their runway and maneuver operations. Current limitations of Integrating Vertical Take-Off and Landing maneuvers into WIG crafts and the relevant ground effect can be improved. The combination of the VTOL properties with ground effect creates a more maneuverable craft. VTOL properties are therefore evidently necessary in creating more versatile and practical crafts.

The Flying Airboat is an example of a WIG craft that seeks to integrate VTOL into its maneuvers. This is achievable through the implementation of a design that uses twin ducted fans to provide thrust in combination with a tubing system underneath the craft that creates pressure differentiation to provide vertical lift. This paper, therefore, seeks to demonstrate the framework behind the integration of Vertical Take-Off into WIG crafts manifested in the design of the flying airboat.

2. METHODOLOGY

In this investigation, the approach adopted involves designing the mathematical control model for the maneuverability of the Flying Airboat. The modeling of the control is based upon an already established general design for the Flying Airboat, which includes its geometric specifications and parameters for the desired performance. There are a number of theories applied to come up with the ideal control design framework for the concept including aerodynamic theory, ground effect theory and Feedback control theory.

2.1 Aerodynamic Theory

The aerodynamic theory is one of the frameworks for the control design of the Flying Airboat and involves the concept's reliance upon dynamic pressure and the free air stream for the achievement of motion and lift. The lift, drag, thrust and weight forces acting on the Flying Airboat are thus mathematically derived as components of the concept's maneuverability.

2.2 Ground Effect Theory

The ground effect theory is a major component of the research since it hypothesizes the Flying Airboat's projected capabilities to operate within the predetermined conditions and achieve its intended objectives. The theory entails Chord-dominated and Span-dominated ground effect (CDGE & SDGE). The research concentrates on Span-Dominated Ground Effect as a means of reducing drag and necessitating ideal aerodynamic characteristics for flight of the Flying Airboat close to the ground surface. Within the ground effect, the aspect ratio of the Flying Airboat is increased significantly therefore increasing its lift producing capabilities [3]. This thus enables the concept to achieve lift and maneuverability within the ground effect.

2.3 Control Theory

The research also applies control theory to determine the methodologies that will be applied to effectively maneuver the Flying Airboat. Among the control methodologies explored include open loop, feedback loop and PID Control. Because feedback and a diminished error are considered as primary requirements in the maneuverability of the Flying Airboat concept, PID Control provides an ideal platform for the execution of its control design.

3. RESULTS AND DISCUSSION

The theories identified above are applied as mathematical computations in combination with the Flying Airboat's design parameters on the MATLAB/Simulink platform, to come up with a control design. Preliminary results reveal that there is a significant improvement of the Flying Airboat's performance when operating within the ground effect. To this regard, the Flying Airboat's lift coefficient significantly increases whereas its drag coefficient diminishes thus improving its lift to drag ratio. An increased wing span also increases the Flying Airboat's stability, thus improving its maneuverability and handling qualities.

4. CONCLUSION

The incorporation of Ground Effect into the design and control of the Flying Airboat has the potential to give it Short Takeoff and Landing (STOL) and Vertical Takeoff and Landing (VTOL) capabilities. In the research it is realized that operating within the ground effect gives the Flying Airboat improved aerodynamic properties therefore making it more efficient and suitable for versatile roles such as sea search and rescue operations. The implementation of a PID control system further makes the maneuverability and handling characteristics of the Flying Airboat more robust and suitable for the advancement in the design of the concept.

REFERENCES

- [1] Ghafoor, Abdul, Raha Shabani, and Kemal Leblebicioğlu, “Mathematical modelling and pitch attitude hold design for a wing-in-ground (WIG) effect vehicle”, in *Bu çalışmanın ilk versiyonu TOK 2015 Kongresinde yayınlanmıştır*, pp. 1-18, 2015
- [2] T. Dakhrabadi, M. and Seif, M. S, “Hydro-aerodynamic mathematical model and multi-objective optimization of wing-in-ground effect craft in take-off”, *Proceedings of the Institution of Mechanical Engineers, Part M: Journal of Engineering for the Maritime Environment*, vol. 232 (4), pp 421-433, 2018
- [3] Bennett, L., Frank, A., McLoughlin, T., Moreton, R., Randell, S., and Wong, S. “Wing in ground effect (WIG) aircraft aerodynamics.” *University of Adelaide, Australia*, vol. 15, pp 769–792, 2007

A REVIEW OF SINGLE ITERATION EXPLICIT APPROXIMATIONS OF COLEBROOK'S EQUATION

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Abstract – This paper reviews the common single iteration of explicit equations for estimating the friction factor in pipes. The friction factor values were computed using Microsoft Excel. Using Absolute error, Relative percentage error, Mean Absolute Error (MAE), Mean Square Error (MSE) and Root Mean Square Error (RMSE), the Colebrook equation comparison was expressed. The best equation to estimate the friction factor was Beluco-Schettini when looking at the average error, MSE and RMSE. In contrast, of all the equations, the Haaland equation is the most consistent.

Keywords : Darcy friction factor; Colebrook's equation

1. INTRODUCTION

Colebrook's equation (1) or sometimes also known as Colebrook-White equation developed in 1939 to solve problems related to friction in pipes [1]. The development of the equation was considered a good achievement at the time. The main disadvantage of this equation is because of its implicitness, making the equation considered as difficult to solve. It requires the advanced mathematic level to solve the equation.

$$\frac{1}{\sqrt{f}} = -2 \log \left(\frac{\frac{\varepsilon}{D}}{3.7} + \frac{2.51}{Re \sqrt{f}} \right) \quad (1)$$

From the 1930s until now, there are several equations developed by researchers as an alternative for the Colebrook's equation. In this paper, only explicit with a single iteration is reviewed. Table 1 shows the equation used in this paper, together with the range of validity of the equation.

Table 1 Various single iteration explicit approximations of the Colebrook's equation

Equation No	Equation Validity Range	Author [Reference]
(2)	$f = \left[-1.8 \log \left(\frac{\varepsilon}{D} + \frac{7}{Re} \right) \right]^{-2}$ Not specified	Altshul [2]
(3)	$f = \left(-2 \log \left(\frac{\frac{\varepsilon}{D}}{3.715} + \frac{15}{Re} \right) \right)^{-2}$ Not specified	Eck [3]
(4)	$f = \left[-1.8 \log \left(0.135 \frac{\varepsilon}{D} + \frac{6.5}{Re} \right) \right]^{-2}$ $0 \leq \varepsilon/D \leq 5 \times 10^{-2}$ and $4 \times 10^3 \leq Re \leq 10^8$	Round [4]
(5)	$f = \left[-1.8 \log \left(\left(\frac{\varepsilon}{D} \right)^{1.11} + \frac{6.9}{Re} \right) \right]^{-2}$ $10^{-6} \leq \varepsilon/D \leq 5 \times 10^{-2}$ and $4 \times 10^3 \leq Re \leq 10^8$	Haaland [5]

(6)
$$f = \left[-1.8229791 \log \left(\left(\frac{\varepsilon}{D} \right)^{1.0954} + \left(\frac{5.9802}{Re} O^{0.9695} \right) O \right) \right]^{-2}$$

Beluco - Schettini
[6]

$10^{-6} \leq \varepsilon/D \leq 5 \times 10^{-2}$ and $4 \times 10^3 \leq Re \leq 10^8$
 $0 \leq \varepsilon/D \leq 9 \times 10^{-2}$ and $3 \times 10^3 \leq Re \leq 9 \times 10^8$

(7)
$$f = \left[1.805 \log \left(\frac{\left(\frac{\varepsilon}{D} \right)^{1.108}}{4.267} + \frac{5.164}{Re^{0.966}} \right) \right]^{-2}$$

Azizi – Homayoon - Hojjati
[7]

$10^{-6} \leq \varepsilon/D \leq 0.05$ and $2 \times 10^3 \leq Re \leq 10^8$

2. METHODOLOGY

The data were calculated for the Reynolds number, Re between 4,000 to 1×10^8 . The number of nodes calculated is stated in Table 2, which mean the Reynolds number was calculated at 43 points as tabulated in Table 2. While for relative roughness, ε/d the range was set between 0 to 0.10. The number of nodes calculated is stated in Table 3, which mean the relative roughness was calculated at 47 points as tabulated in Table 3. The total number nodes will be 2021 as the data then were compared with the Colebrook equation.

Table 2 Number of nodes for Reynolds numbers

Reynolds Number, Re	Step	Nodes
4,000-10,000	1,000	7
20,000-100,000	10,000	9
200,000-1,000,000	100,000	9
2,000,000-10,000,000	1,000,000	9
20,000,000-100,000,000	10,000,000	9
Total Nodes		43

Table 3 Number of nodes for relative roughness, ε/d

Relative roughness, ε/d	Step	Nodes
0.000000 - 0.000009	0.000001	10
0.00001 - 0.00009	0.00001	9
0.0001 - 0.0009	0.0001	9
0.001 - 0.009	0.001	9
0.01 - 0.10	0.01	10
Total Nodes		47

All the friction factor value calculated from the equation then being compared with the Colebrook equation. Absolute error, Relative percentage error, Mean Absolute Error (MAE), Mean Square Error and Root Mean Square Error are parameters used to compare the accuracy of the equation.

3. RESULTS AND DISCUSSION

Summary of statistical analysis was shown in Table 4, the data without considering the validity range of the equation. From table 4, Altshul equation (2) is the worst equation giving the highest value of error regardless type of statistical measurement. Beluco-Schettini (6) is the best equation giving the lowest error but should be used with care at rough and low Reynolds number turbulent region.

4. CONCLUSION

Equation such as Altshul (2), Eck (3) and Round (4) should be avoided. These three equations give a huge error in the calculation. The best equation by comparing all the parameter are Beluco-Schettini (6), Azizi-Homayoon- Hojjati (7) and Haaland (5).

Table 4 Statistical parameters for observed equations without considering the validity range

Author (year)	$\delta_{ae,max}$ ($\frac{\epsilon}{D}$, Re)	δ_{max} ($\frac{\epsilon}{D}$, Re)	δ_{avg}	MAE	MSE	RMSE
Altshul (1952)	0.1866 (9×10^{-2} , 1×10^8)	194.0611 (9×10^{-2} , 1×10^8)	63.6476	0.0296010403	0.0030348662	0.0550896198
Eck (1973)	0.0035 (9×10^{-2} , 4000)	9.6240 (0, 1×10^8)	2.1868	0.0004862699	0.0000005983	0.0007735178
Round (1980)	0.0118 (9×10^{-2} , 1×10^8)	12.3462 (9×10^{-2} , 1×10^8)	3.9305	0.0015650430	0.0000099711	0.0031577002
Haaland (1983)	0.0009 (9×10^{-2} , 4000)	1.4205 (2×10^{-4} , 100000)	0.4398	0.0001182578	0.0000000265	0.0001627311
Beluco-Schettini (2016)	0.0007 (9×10^{-2} , 4000)	3.2883 (0, 1×10^8)	0.2989	0.0000664139	0.0000000095	0.0000976483
Azizi-Homayoon-Hojjati (2018)	0.0006 (9×10^{-2} , 4000)	4.9948 (0, 1×10^8)	0.3996	0.0000672067	0.0000000104	0.0001020932

REFERENCES

- [1] C. F. Colebrook, "Turbulent flow in pipes, with particular reference to the transition region between the smooth and rough pipe laws", J. Inst. Civ. Eng., vol. 11(4), pp 133–156, 1939
- [2] B. B. Nekrasov, "Hydraulics for aeronautical engineers", Moscow: Peace Publisher, 1969.
- [3] H. K. Winning and T. Coole, "Explicit friction factor accuracy and computational efficiency for turbulent flow in pipes", Flow, Turbul. Combust., vol. 90(1), pp 1–27, 2013
- [4] G. F. Round, "An explicit approximation for the friction factor Reynolds's number relation for rough and smooth pipes", Can. J. Chem. Eng., vol. 58, pp 122–123, 1980
- [5] S. E. Haaland, "Simple and explicit formulas for the friction factor in turbulent pipe flow" J. Fluids Eng., vol. 105(1), pp 89–90, 1983
- [6] A. Beluco and E. Beatriz Camano Schettini, "An improved expression for a classical type of explicit approximation of the Colebrook white equation with only one internal iteration", Int. J. Hydraul. Eng., vol. 5(1), pp 19–23, 2016
- [7] N. Azizi, R. Homayoon, and M. R. Hojjati, "Predicting the Colebrook-white friction factor in the pipe flow by new explicit correlations," J. Fluids Eng. Trans. ASME, vol. 141(5), pp. 1–8, 2019

AN ANALYSIS OF ECONOMIC LOAD DISPATCH WITH RAMP RATE LIMIT CONSTRAINTS USING OPTIMIZATION TECHNIQUES

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Abstract – The Economic Load Dispatch (ELD) plays an important role in power system operation and control. The losses that occur in power system must be reduced in order to boost its overall performance. This study is to meet the objectives for solving ELD considering ramp rate limit constrain in order to reduce the cost of generating unit and obtain optimal solution at each generating units. The ramp rate limit will ensure the generating units working at optimum to dispatch enough power in order to fulfil the load demands. This study shows successful implementation of two evolutionary algorithms, namely Particle Swarm Optimization (PSO) and Particle Swarm Optimization with Inertia Weight Factor Approach (PSOIWA). The effectiveness of the proposed method was implemented in case studies for different test system; IEEE-30 Bus System, IEEE-24 Bus System and IEEE-62 Bus System. Both algorithms have been used for each case study. The minimum fuel cost of each algorithm is compared for each case. Therefore, the main objective of this study is to compare the performance of the purposed method, PSO and PSOIWA. The viability of the purposed methods is analyzed and compared based on its minimum fuel cost obtain and robustness of the convergence rate.

Keywords : Economic load dispatch; PSO; PSOIWA

1. INTRODUCTION

Economic Load Dispatch (ELD) is one of the fundamental issues in power plant. The objective of ELD is to minimize the overall cost of generation [1]. The objective function of problems in the ELD has been approximated as quadratic functions. M. S. Hillier and F. S. Hillier [2] stated that the modern power generation units are always non-linear and discrete in nature. In solving the ELD problems, there is a lot of defects in using the conventional method because of its simple algorithms. Hence, the conventional method is no longer suitable for solving ELD problems.

In order to optimize the algorithm used to solve ELD, few constraints need to be considered such as ramp rate limit, multi-fuel options and others as previous study [3]. These constraints formulate the problem of economic load dispatch (ELD) to find the optimal combination of the output power of all online generating units that minimizes the total cost of fuel, thus meet a constraint on equality and a set of inequality constraints.

The algorithms that approached in this paper are Particle Swarm Optimization (PSO) and Particle Swarm Optimization with Inertia Weight Approach (PSOIWA). For simplicity of objective function, only ramp rate limit is considered. The losses are also neglected.

2. METHODOLOGY

The implementation of PSO and PSOIWA methods in ELD problem divided into two general flowcharts which consist of general flowchart of PSO and flowchart of case studies of IEEE Bus System. The IEEE-24 bus system case study consists of ten generator units [4], IEEE-30 bus system case study is equip with six generator units [5] and IEEE-62 bus system case study included with 19 generator units [6]. Case studies then run in simulation of MATLAB and compare result from both techniques in terms of total cost, time and unit of each power output. In simulation, population size is equal to 100, while the maximum iteration is up to 500 [7]. Limitation range of maximum and minimum of ramp rate constraints is also considered.

3. RESULTS AND DISCUSSION

The simulations were performed in case studies for different test system; IEEE-30 Bus System, IEEE-24 Bus System and IEEE-62 Bus System with different numbers of generating units, and comparisons are performed between PSO and PSOIWA. The findings affirmed the minimum optimal cost, total power dispatch and time taken in seconds for CPU to run simulation of the coding as well as its robustness and fast convergence of the proposed method over other existing technique.

Case Studies: IEEE – 30 Bus System, IEEE- 24 Bus System and IEEE- 62 Bus System

According to the findings as per tabulated in Table 1 for IEEE- 30 Bus System, PSOIWA dispatched more power compared to PSO. PSOIWA produced minimal fuel cost less than PSO as minimum fuel cost produced. Next, time taken by CPU to process the programming of PSO greater than the time taken by PSOIWA in seconds. The results for the other two case studies resume the same finding.

Table 1 Optimal power dispatch and optimal ramping rate for IEEE-30 bus system

Power Dispatch (MW)	PSO	PSOIWA	Optimum Ramping Rate (MW)	PSO	PSOIWA
P1	439.05	440.00	P1	117.31	118.25
P2	169.21	170.00	P2	85.89	86.68
P3	200.00	200.00	P3	98.42	103.47
P4	152.20	150.00	P4	84.35	82.15
P5	187.00	190.00	P5	85.88	83.09
P6	109.28	110.00	P6	88.28	87.46
Total Power Dispatch (MW)	1256.74	1260.00			
Fuel Cost (RM/hour)	79041.85	75771.20			
CPU Time (sec)	271.02	199.15			

Based on convergence characteristic for IEEE- 30 Bus System, PSOIWA produced the least cost fuel compare to PSO. PSO converges at iteration 14 while PSOIWA converges at iteration number six as shown in Figure 1. PSO started to converge at iteration 14 while PSOIWA converges at iteration number seven for IEEE-24 Bus System. Moreover, for IEEE-62 Bus System, PSO started to converge at iteration 18 while PSOIWA converges at iteration number 17.

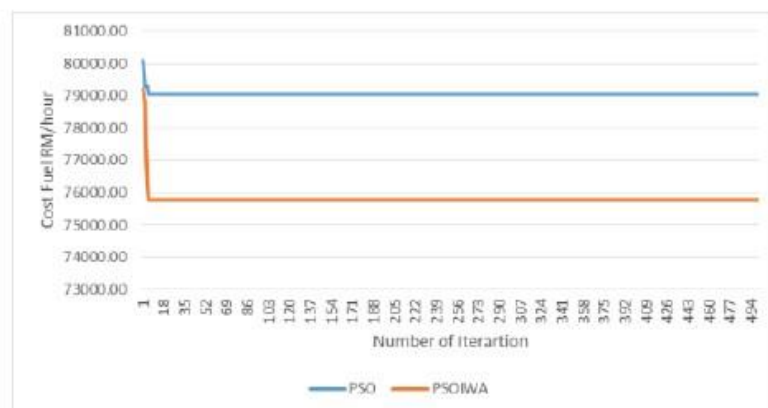


Figure 1 Convergence characteristics of PSO versus PSOIWA method for IEEE-30 bus system

Other than that, PSOIWA method more stable in robustness characteristics compared to PSO as show in Figure 2 for IEEE- 30 Bus System. This also validates for the other two case studies. PSOIWA

produces good optimal solutions improving in general, the best solutions better than PSO for three case studies.

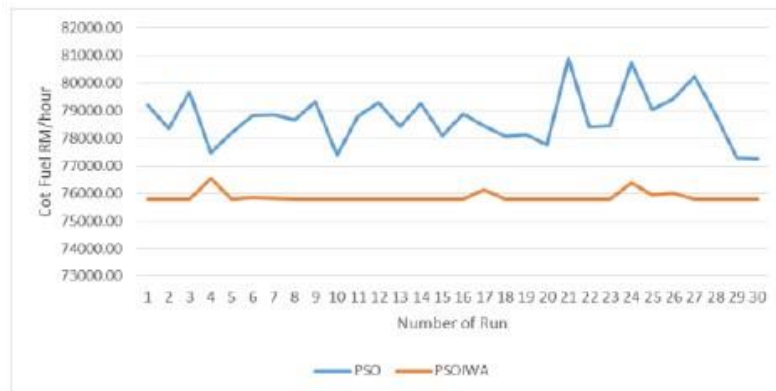


Figure 2 Robustness characteristics of PSO versus PSOIWA method for IEEE-30 bus system

4. CONCLUSION

The performances of the proposed methods were tested using MATLAB programming on three different case studies for IEEE-24 Bus System, IEEE-30 Bus System and IEEE-62 Bus System. The comparisons were carried out based on the minimum cost fuel achieved, convergence of the optimum cost fuel and robustness characteristics. It was shown that PSOIWA approach had demonstrated to have superior features, including high quality solution, stable convergence characteristics and high efficiency at generator system compared to PSO. Moreover, the graph convergence and robustness characteristics of PSOIWA were improved compared to PSO. Thus, the results were improved as the system complexity increases. Therefore, in all electrical power firms, solving the ELD problem is a critical challenge in order to obtain the lowest generating cost that helps to make profit.

REFERENCES

- [1] S. Gnanasekaran, "An efficient ITA algorithm to solve economic load dispatch with valve point loading effects", *International Journal of Printing, Packaging & Allied Sciences*, vol. 5(1), 2017
- [2] M. S. Hillier and F. S. Hillier, "Chapter 1 Conventional optimization techniques", *Evolutionary Optimization (International Series in Operations Research & Management Science)*, eBook ISBN: Print ISBN: 0-306-48041-7 0-7923-7654-4, 2000
- [3] Y. S. Brar, "Economic load dispatch problem using Heuristic gravitational search algorithm", *International Journal For Research In Applied Science*, vol. 2, pp 318–323, 2014
- [4] M. González and J. Miguel, "An updated version of the IEEE RTS 24-bus system for electricity market and power system operation studies," *Technical University of Denmark*, 2016
- [5] O. Alsac and B. Stott, "Optimal load flow with steady state security", *IEEE Trans, on Power Systems*, vol. 93, pp 745-751, 1974
- [6] S. Malival, "Study of power system security in Indian utility 62 bus system", *International Journal of Engineering Research and Development (IJERD)*, pp. 36-45, 2015
- [7] K. Dasgupta, "Economic load dispatch with prohibited zone and ramp rate limit constraints", *IEEE International Conference on Control, Measurement and Instrumentation (CMI)*, pp. 26–30, 2016

ALKALINE TREATED TEXTILE WASTE FIBRE POLYMER COMPOSITES: IMPACT AND TENSILE PROPERTIES

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Abstract – Interfacial bonding is one of the critical issues addressed in fabricating natural fibre polymer composite. Thus, alkaline treatment is one of the methods to improve adhesion bonding. This study was conducted to investigate the optimum concentration of alkali solution that affected textile waste fibre polymer composites' mechanical properties under impact and tension loading. Textile wastes are treated with an alkali solution (NaOH) with different concentrations (1, 3, and 5 wt %). Composite specimens were fabricated using a compression moulding method. The low-velocity impact test (ASTM D7136) and tensile test (ASTM D3039) were conducted to analyze the tensile and impact properties of untreated and treated composite specimens. The tensile strength and impact resistance result improved when textile waste fibres were treated with 1wt% NaOH solution based on the tensile and impact test results.

Keywords : Alkaline treatment; textile waste; tensile; impact

1. INTRODUCTION

Cotton fibre reinforced composites have recently increased attention because they offer advantages such as biodegradability, good physical properties and low cost compared to manmade or inorganic fibres used in composites [1]. However, one of the critical issues in developing natural fibre composites is the interfacial bonding between fibres and the polymer matrix. One of the solutions been introduced is by a chemical modification, which is alkali treatment. Treating fibre with alkali will result in high moisture absorption of the fibres, which causes swelling that affects dimensional stability in natural fibre composites [2]. The fibres' damage may exceed any benefit achieved by the high alkaline treatment concentration [3]. Many researchers used different weight percentages of alkaline solutions with various lengths of immersion time to treat natural fibres [4].

In this study, textile waste from cotton fibre reinforced polymer composites was prepared via the compression moulding method. This study focuses on the alkaline treatment of pre-consumer textile waste with different NaOH concentrations on assessing impact resistance and tensile properties of cotton fibre reinforced polymer composites.

2. METHODOLOGY

The materials used in this study are cotton fibres from pre-consumer textile wastes, Miracast 1517 epoxy resin system, and sodium hydroxide (NaOH). Cotton fibres were treated using NaOH solution (alkaline treatment) at various 1, 3, and 5 wt% concentrations. The compression moulding method was carried out to fabricate the composites with a 6% cotton fibres content. A low-velocity impact test and tensile test were conducted to investigate the tensile and impact properties of composite specimens, according to ASTM D7136 [5] and ASTM D3039 [6], respectively.

3. RESULTS AND DISCUSSION

3.1 Tensile properties of textile waste reinforced polymer composites

Figure 1(a) shows that 1wt% NaOH composite specimen reaches the optimal tensile strength with the value of 4.43 MPa. This value is a 57.4% improvement compared to the untreated fibres. However, the

value reduced to 2.52 MPa after 5wt% of NaOH treatment, which was 10.5% lower than the untreated fibre. Referring to Figure 1 (b), the specific modulus against specific strength was obtained based on the density values of each composite specimens. The value of specific strength for the 1wt% NaOH composite specimen appears to be 52% higher than the untreated composite specimen's specific strength. For the specific modulus value, the 1wt% NaOH composite specimen recorded a 7% increment compared to the untreated composite specimen.

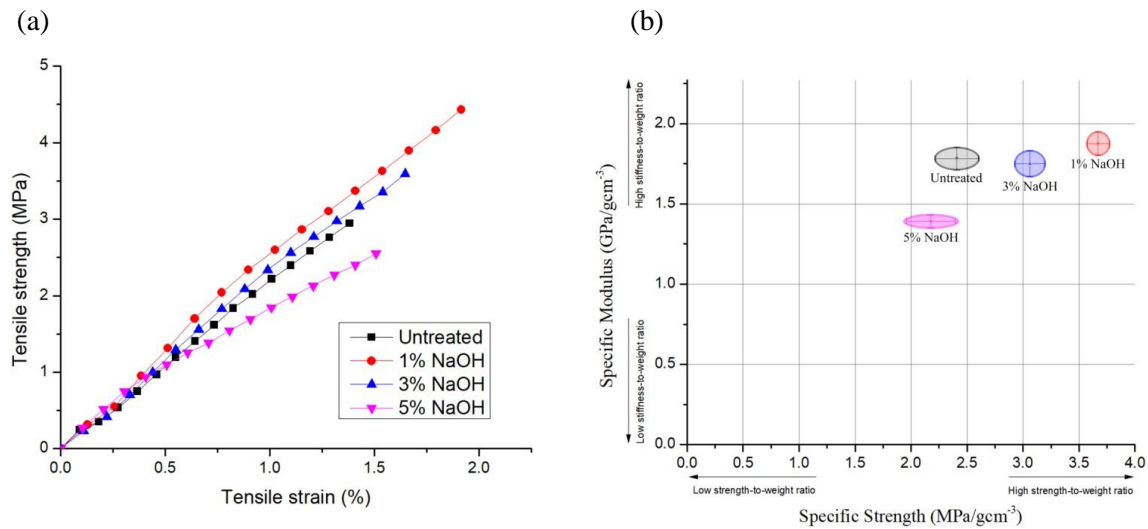


Figure 1 (a) Typical stress-strain graph for textile waste reinforced polymer composites, (b) The specific strength versus specific modulus of textile waste reinforced polymer composites

3.2 Impact properties of textile waste reinforced polymer composites

According to Figure 2(a), the highest damaged load was observed from 1wt% of NaOH composite specimens at 1.246 kN. Figure 2(b) reveals the specific impact strength against specific total energy absorbed as acquired from the density test. The analysis made shows that high strength to weight ratio and high energy to weight ratio was recorded for 1wt% of NaOH compared to untreated specimens.

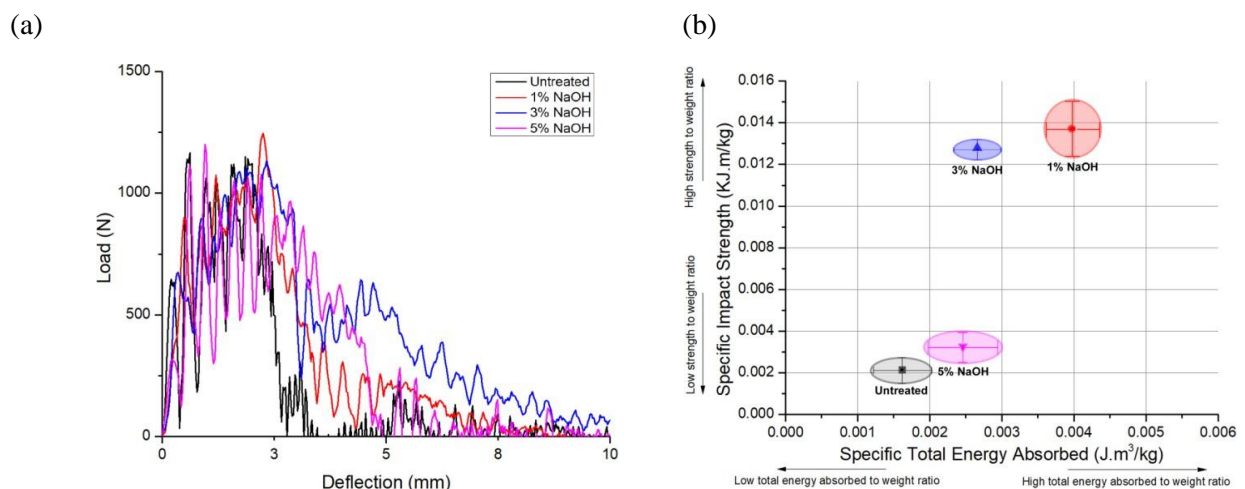


Figure 2 (a) Typical load versus deflection curve, and (b) The specific impact ratio strength versus total energy absorbed

4. CONCLUSION

The alkaline treatment of cotton fibres improved their mechanical interlocking between the fibres and the epoxy matrix. The tensile strength and tensile modulus increased by up to 57.4% and 7%, respectively, at 1wt% NaOH, which optimal concentration of alkaline treatment for cotton fibre. Improvement in loading capability and the toughest characteristic displayed on 1wt% of NaOH composite specimens such as higher value in peak load, maximum initiation energy, high impact strength, high strength to weight ratio and high total energy absorbed weight ratio.

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REFERENCES

- [1] W. Gindl-altmutter, J. Keckes, J. Plackner, F. Liebner, K. Englund, and M. Laborie, "All-cellulose composites prepared from flax and lyocell fibres compared to epoxy – matrix composites," *Compos. Sci. Technol.*, vol. 72(11), pp 1304– 1309, 2012.
- [2] R. M. Rowell, A. Sanadi, Rod Jacobson, and Dan Caulfield, "Properties of kenaf/polypropylene composites," in *Kenaf Properties, Processing and Products*; Mississippi State University, Ag & Bio Engineering, pp 381-392, 1999
- [3] D. Jones, G. O. Ormondroyd, S. F. Curling, C.M. Popescu, and M.C. Popescu, "Chemical compositions of natural fibre," *Adv. High Strength Nat. Fibre Compos. Constr.*, vol. 1, pp 36, 2017.
- [4] M. Koyuncu, M. Karahan, N. Karahan, K. Shaker, and Y. Nawab, "Static and dynamic mechanical properties of cotton/epoxy green composites," *Fibres Text. East. Eur.*, vol. 24(4), pp 105–111, 2016.
- [5] ASTM International, "ASTM D3039/D3039M–00 Standard test method for tensile properties of polymer matrix composite materials," 2000.
- [6] ASTM International, "ASTM D7136/D7136M–12 Standard Test Method for Measuring the Damage Resistance of a Fiber-Reinforced Polymer Matrix Composite to a Drop-Weight Impact Event," 2012.

NON-LINEAR SYSTEM CONTROLLER DESIGN USING SLIDING MODE CONTROL

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Abstract – Throughout the years, many researchers have problems in stabilizing non-linear, uncertain system. One of the methods used to design a robust state feedback controller for an uncertain system is variable structure control (VSC) system. In sliding mode control, VSC systems are designed to drive the system states to a sliding surface in the state space. The controller structure around the plant is intentionally changed by using a viable high-speed switching feedback control to obtain the desired plant behaviour or response. In this paper, the problem of designing a VSC law for uncertain system, Electrohydraulic control system is considered. Using LMI approach, an alternative design method of a linear sliding surface which is linear to the state is developed. A sufficient condition for the existence of linear sliding surface is given, and an explicit formula of linear sliding surfaces guaranteeing the quadratic stability of the reduced-order equivalent system dynamics restricted to the sliding surfaces is derived. The sliding mode controller is then applied to an Electrohydraulic servo system. The simulation works were performed using MATLAB/SIMULINK software. A comparison for the controller design using LMI approach method with and without the sliding mode control shows that LMI approach with a sliding mode control method produces a better performance response.

Keywords : sliding mode control; LMI approach; electrohydraulic system; uncertain system; variable structure control (VSC)

1. INTRODUCTION

Electrohydraulic control system is a complex system with regard to nonlinearity. The linearization-based method has been suggested as an effective way of using the nonlinear model of the system in the control law. However, the linearized model is an approximation of the real system dynamics. The latter having uncertainties, the sliding mode controller (SMC) is then preferred because of its robust character and superior performance.

SMC design involves two crucial steps; the first phase is to design a set of sliding manifolds so that the system state restricted to them have desired dynamics, which is of lower order than the original systems. The second phase is to design switching feedback control so that the system state trajectories can be attracted to the designed sliding manifold in finite time and maintain on the manifold [1]. By applying the proposed controller, the perturbed sliding surface equation is enforced to zero and by an appropriate choice of this surface, the tracking error tends asymptotically to zero in finite time and with no chattering problems.

2. METHODOLOGY

The method used to complete this project is according to the following stages:

- (a) Decomposition of the complete model of the Electrohydraulic system complete model into an uncertain model comprising the nominal values and bounded uncertainties [2].
- (b) Determination of the system dynamics during Sliding Mode.
- (c) Design of the Sliding Mode Controller for the uncertain system based on LMI approach [3].
- (d) Perform the simulation of the Electrohydraulic system with the proposed controller using MATLAB/SIMULINK software to see the robustness of the resulting system.

2.1 System Description

Consider the following uncertain system that can be represented by the following dynamical equation:

$$\dot{x}(t) = (A + \Delta A(x, t))x(t) + Bu(t) + F(\omega, t) \quad (1)$$

where

$x(t) \in \mathfrak{R}^n$	is the system state,
$u(t) \in \mathfrak{R}^m$	is the control input,
$A \in \mathfrak{R}^{n \times n}$	is the system characteristic matrix,
$B \in \mathfrak{R}^{n \times m}$	is the input matrix with full rank m ,
$\Delta A(x, t)$	is the uncertainty of the system
$F(\omega, t)$	is the nonlinearity, disturbance of the system

the uncertainties can be lumped, and the system (1) can be rewritten as:

$$\dot{x}(t) = Ax(t) + B[u(t) + g(\omega, t)] \quad (2)$$

where the $g(\omega, t)$ is the lumped uncertainties.

3. RESULTS AND DISCUSSION

In Sliding Mode Control (SMC) design, the first step is to parameterize the sliding surface such that the system constrained to the sliding surface exhibits desired system behaviour. As covered by Decarlo et al. [4] under the SMC, once the system slides on the designed surface, the order of the system is reduced. This can be demonstrated by treating $g(\omega, t)=0$ in (2). For the Electrohydraulic control system model, the system then becomes:

$$\begin{bmatrix} \dot{X}_1 \\ \dot{X}_2 \\ \dot{X}_3 \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -a_{31} & -a_{32} & -a_{33} \end{bmatrix} \begin{bmatrix} X_1 \\ X_2 \\ X_3 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ b_{31} \end{bmatrix} u(t) \quad (3)$$

3.1 Simulation of Sliding Mode Controller using LMI approach

Based on the matrices values, values of K and S, and the controller, the SIMULINK output waveform is shown in Figure 1.

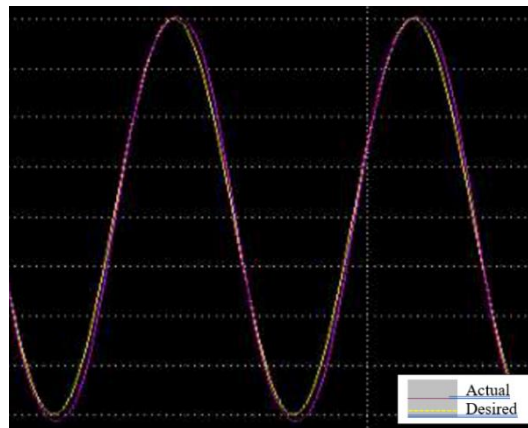


Figure 1 Actual and desired angular position responses vs time

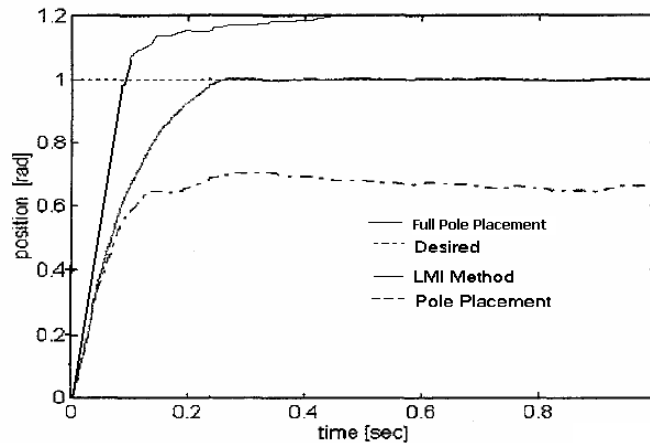


Figure 2 Angular position for a unit step input for a different method

4. CONCLUSION

Sliding Mode Control design involves two crucial steps; the first phase is to design a set of sliding manifolds so that the system state restricted to them have desired dynamics. The second phase is to design switching feedback control so that the system state trajectories can be attracted to the designed sliding manifold in finite time and maintain on the manifold [5]. By applying the proposed controller, the perturbed sliding surface equation is enforced to zero, and by an appropriate choice of this surface, the tracking error tends asymptotically to zero in finite time and with no chattering problems.

REFERENCES

- [1] Spurgeon, S.K. and Edwards, C, "Sliding mode control: Theory and applications", Taylor and Francis, London. 1998
- [2] Fung, Rong-Fong and Yang R-T., "Application of VSC in position control of a nonlinear electrohydraulic servo system", Pergamon, vol. 66(4), pp 365-372, 1997
- [3] Xiang, Ji, Su, Hongye, and Chu, Jian, "Robust sliding mode output feedback control design using LMI approach", Proceedings of the American Control Conference, pp 4078-4083, 2005
- [4] Decarlo, A. Raymond, Zak, H. Stanislaw, and Matthews, P. Gregory, "Variable structure control of nonlinear multivariable systems: A tutorial", IEEE Transactions- Automatic Control, vol. 76(3), pp 212 – 232, 1998
- [5] Choi, Han Ho, "An explicit formula of linear sliding surfaces for a class of uncertain dynamic systems for a class of uncertain dynamic systems with mismatched uncertainties", Automatica, vol. 34(8), pp 1015 – 1020, 1998

ANALYSIS ON LOW CONDUCTIVITY OF GREEN SYNTHESIS SELENIUM NANOPARTICLES

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Abstract –The widespread applications of nanoparticles, especially selenium nanoparticles (Se NPs) call for synthesis routes involving eco-friendly procedures as an alternative method to the expensive and toxic chemicals previously used. Thus, this study was conducted to synthesize and analyze Se NPs using Polygonum minus leaves extract. The produced Se NPs were characterized using Field Emission Scanning Electron Microscope (FESEM), UV-Visible Spectroscopy (UV- Vis) and IV measurement to analyze the electrical conductivity. The morphology of the produced Se NPs were in spherical-shape within the diameter range of 60 nm – 90 nm, while the peak of absorbance was at 22.5%, showing the low absorbance of Se NPs. Resistance and resistivity of Se NPs showed 338.4 ohm and 16.92 ohm.cm respectively. Electrical conductivity of Se NPs reached the low conductivity which was 0.059 S/cm. This study successfully showed that Se NPs can be produced through green synthesis and having low conductivity for future electrical and electronic applications.

Keywords : Selenium nanoparticles; green synthesis; *polygonum minus*; electrical conductivity

1. INTRODUCTION

Selenium nanoparticles (Se NPs) have increasingly drawn more considerations because of their promising applications in the fields of catalysis, electronics and sensing [1]. For most applications, the properties of Se NPs are established by their size, shape, composition, and structure. It is of great significance to prepare superior quality of Se NPs with low electrical conductivity. Size, shape, and functionality are the key features for the tenability of nanoparticles. Controlling these parameters using confined environments is vital in developing new nanostructures. However, the existing synthesis is using chemical reaction that led to severe environmental pollution. Moreover, it is expensive and not suitable for small scale production. Hence, this research is conducted to synthesize and analyse the Se NPs using Polygonum minus leaves extract. Then, the electrical properties of Se NPs will also be investigated due to their great potential applications in electrical and electronic field.

2. METHODOLOGY

2.1 Preparation of Leaf Extract

Leaves extract was prepared by placing 20 g polygonum minus leaves powder with 200 ml of distilled water in the 250 ml beaker. It was then placed on hot plate at 100 °C. Centrifuging process took place for each 50 ml tube at 10,000 rpm for 30 minutes. Then, the leaves extract was filtered to remove impurities particles.

2.2 Synthesis of Se NPs

240 ml deionized was mixed with sodium selenite and ascorbic acid. At 80 °C, 60 ml leaves extract was added into the solution. The colour change is observed. 50 ml of the solution was centrifuged at 10,000 rpm for 30 minutes in a first round. The supernatant was carefully discarded, and the brick-red sediments were suspended in double distilled water. This cycle was repeated two times with 10 minutes for each cycle to remove the unwanted product. The collected Se NPs were then characterized.

3. RESULTS AND DISCUSSION

Figure 1(a) shows a UV-Visible spectrum for five samples of different time interval. This observation revealed the absorbance maximum (λ_{max}) is at 300 nm with 2 - 2.5%, showing the low absorbance of produced Se NPs. Figure 1(b) shows the FESEM images of Se NPs in the form of agglomerated spherical particles within the diameter range of 60 nm to 90 nm. It has been suggested that nanoparticle aggregation is dominant over the process of reduction and primary nucleation of reduced atoms [2]. This might be related to the larger number of functional groups bind with ascorbic acid [3].

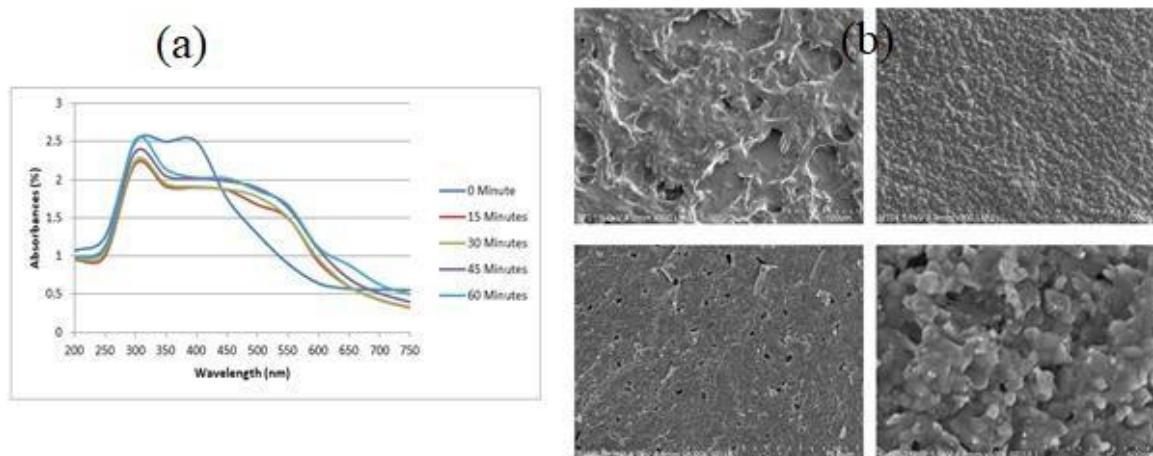


Figure 1 (a) UV-Visible spectrum of produced Se NPs; (b) FESEM images of produced Se NPs

Table 1 shows the resistance, resistivity and electrical conductivity from the measured sample. It shows that the conductivity measured is 0.059 S/cm, showing the low conductivity of the sample, lower than those reported previously [4].

Table 1 Electrical conductivity of Se NPs

Resistance; Ω (ohm)	Resistivity, ρ (Ω .cm)	Electrical Conductivity, σ (S/cm)
338.4	16.92	0.059

4. CONCLUSION

A low conductivity (0.059 S/cm) of green synthesis Se NPs was successfully produced by using *polygonum minus* leaves extract, which acted as a good reducing agent. This green synthesis is ecofriendly, promoting the application of green technology for the production of Se NPs.

REFERENCES

- [1] S. Chaudhary and S. K. Mehta, "Selenium nanomaterials: applications in electronics, catalysis and sensors," J. Nanosci. Nanotechnol., vol. 14(2), pp 1658–1674, 2014
- [2] C. Kim, J. Hong, and J. W. Park, "Synthesis and thermoelectric properties of selenium nanoparticles coated with PEDOT:PSS," Polymers (Basel), vol. 11(6), pp 1-9, 2019
- [3] A. Sood, V. Arora, J. Shah, R. K. Kotnala, and T. K. Jain, "Ascorbic acid-mediated synthesis and characterization of iron oxide/gold core-shell nanoparticles," J. Exp. Nanosci., vol. 11(5), pp 370–382, 2016
- [4] Prathna. T.C., L. Mathew, N. Chandrasekaran, A. M. Raichur, and A. Mukherjee, "Biomimetic Synthesis of Nanoparticles: Science, Technology & Applicability", in Biomimetics Learning from Nature, InTech, 2010

MODELING THE STEADY STATE AND DYNAMIC CONDITIONS OF AN ONSHORE THREE PHASE LINEAR GENERATOR

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Abstract – Sea wave is an alternative renewable energy source that can meet excessive demand for energy throughout the country. The sea waves have high potentials for harvesting wave energy. A three-phase linear generator (TPLG) is an electromechanical energy converter driven by a reciprocating prime mover. It has a simple design and has less mechanical interface. It is used as a device to convert sea waves energy into electrical energy. The core of this paper is to model the steady state and dynamic conditions of an onshore TPLG. Two models of the TPLG are analyzed, TPLG-6 and TPLG-18. The performances of the TPLG operation are analyzed in steady state and in dynamic conditions using MATLAB simulation. These graphs of the output terminal voltage, output power, input power, phase current and induced emf are presented. Under the steady state conditions, the efficiencies for TPLG-6 and TPLG-18 are 85% and 94% respectively. However, in dynamic conditions, the efficiencies are 83% and 93% respectively. Finally, the TPLG-18 provides higher efficiency than the TPLG-6.

Keywords : Three Phase Linear Generator (TPLG)

1. INTRODUCTION

Sea wave is an alternative renewable energy source that can meet excessive demand for energy throughout the country. The sea waves have high potentials for harvesting wave energy. A three phase linear generator (TPLG) is an electromechanical energy converter driven by a reciprocating prime mover. It has a simple design and has less mechanical interface. It is used as a device to convert sea waves energy into electrical energy. The core of this paper is to model the steady state and dynamic conditions of an onshore TPLG. The performances of the TPLG have been examined.

2. METHODOLOGY

Two models of the TPLG are examined, TPLG-6 and TPLG-18. The parameters of the resulting per-phase equivalent circuit of the generators are determined by using FEMM software. The performances of the TPLG operation are analyzed in steady state and in dynamic conditions using MATLAB simulation. In steady state condition, the generator parameters have been calculated. These parameters are phase resistance, synchronous inductances, length of the coil, and turns per phase. These parameters also have been used for dynamic conditions. Each model has been connected to a load resistor. The load resistor for TPLG-6 is 5 Ω and for TPLG-18 is 7.5 Ω . The flowchart is shown in Figure 1. The input parameters for steady state operation and dynamic operation are shown in Table 1 and Table 2 respectively. The generator efficiency can be obtained with the assumption that the power losses in the primary core and mechanical losses are ignored:

$$Eff = \frac{P_{out}}{P_{inp}} \times 100\% \quad (1)$$

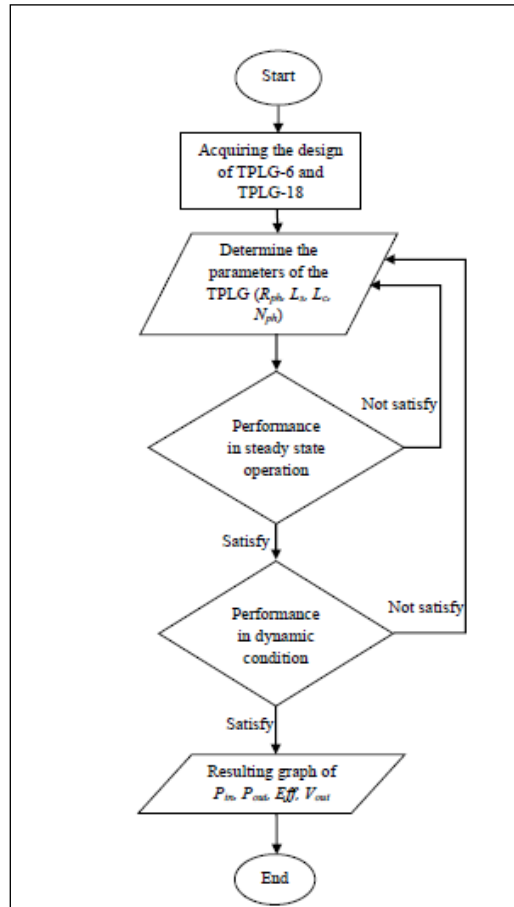


Figure 1 Flowchart of the whole process

3. RESULTS AND DISCUSSION

In this analysis, the range of load resistor is varied from 0 Ω to 20 Ω . When the load resistance exceeds 7.5 Ω , the output power, input power, and current decreases. As the TPLG begins to move along the z-axis, it is noticeable that the TPLG begins to generate power. The TPLG-18 has higher efficiency as compared to TPLG-6 even though TPLG-6 produce more input power and output power than TPLG-18. However, TPLG-18 produce more output voltage than TPLG-6.

Table 1 Performance characteristics at steady state conditions

Parameters	TPLG-6	TPLG-18
Input power, P_{in} (kW)	13.9	11.3
Output power, P_{out} (kW)	11.8	10.6
Efficiency, Eff (%)	85	94
Phase current, I_a (A)	25	22
Output voltage, V_{out} (V)	157	164
Load resistance, R_L (Ω)	5.0	7.5

Table 2 Performance characteristics at dynamic performance

Parameter	TPLG-6	TPLG-18
Input power, P_{in} (kW)	18.2	15.3
Output power, P_{out} (kW)	15.1	14.3
Efficiency (%)	83	93
Induced emf (V)	162	512.2
Terminal voltage (V)	142	356
Phase current (A)	7.1	26.7

4. CONCLUSION

Both TPLG models are studied and analysed in steady state and dynamic conditions. Under the steady state conditions, the efficiencies for TPLG-6 and TPLG-18 are 85% and 94% respectively. However, in dynamic conditions, the efficiencies are 83% and 93% respectively. Each model has been connected to a load resistor. This efficiency is calculated when the three-phase linear generator is connected to a load resistance. The TPLG-18 provides higher efficiency than the TPLG-6. Finally, the objectives are achieved and it gives sufficient results.

REFERENCES

- [1] A Muetze and J. G. Vining, "Ocean wave energy conversion - A survey," *Ind. Appl. Conf. 2006. 41st IAS Annu. Meet. Conf. Rec. 2006 IEEE*, vol. 3, pp 1410–1417, 2006
- [2] R. Sinnadurai, C. M. Ting, N. Hisyam, and M. Zani, "Analysis and optimization of a three phase linear generator using finite element method magnetics (FEMM)," *IEEE Student Conf. Res. Dev.*, pp 1–6, 2016
- [3] T. H. Oh, "Carbon capture and storage potential in coal-fired plant in Malaysia - A review," *Renew. Sustain. Energy Rev.*, vol. 14(9), pp 2697–2709, 2010
- [4] H. Y. Chong and W. H. Lam, "Ocean renewable energy in Malaysia: The potential of the Straits of Malacca," *Renew. Sustain. Energy Rev.*, vol. 23, pp 169–178, 2013
- [5] O. Yaakob, F. E. Hashim, K. Mohd Omar, A. H. Md Din, and K. K. Koh, "Satellite-based wave data and wave energy resource assessment for South China Sea," *Renew. Energy*, vol. 88, pp 359–371, 2016
- [6] R. Parthasarathy, "Linear PM generator for wave energy generation," MSc. Thesis, Louisiana State University and Agricultural and Mechanical College, May, 2012
- [7] S. Ahmad, M. Z. A. A. Kadir, and S. Shafie, "Current perspective of the renewable energy development in Malaysia," *Renew. Sustain. Energy Rev.*, vol. 15(2), pp 897–904, 2011
- [8] *Malaysia Energy Statistics Handbook 2017*, Suruhanjaya Tenaga, Putrajaya, Malaysia, pp 86, 2018

EFFECT OF ADDITIVE ON THE STRUCTURE AND PERFORMANCE OF PVDF HOLLOW FIBRE MEMBRANE ON PHOSPHORUS REMOVAL

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Abstract – Excessive nutrients in water body will lead to a phenomenon called eutrophication. There are several methods in treating nitrogen and phosphorus. Conventionally, a combination of biological Current industries are using hollow fibre membrane ultrafiltration as one of the method to treat phosphorus but still hard to achieve the standard discharge limit set by the Department of Environment, Malaysia [1]. Hollow fibre membranes are thin and porous semi-permeable layer of material in hollow shape that able to separate contaminants from water when a driving force is applied. Nanofiltration membrane need to be achieve in order to treat phosphorus as the phosphorus molecules are in nano size. This study observes the effect of TiO₂ as additive on the structure and performance of PVDF hollow fibre membrane for phosphorus removal. A comparative study between 0 wt% and 0.5 wt% of TiO₂ with a 16 wt% and 84 wt% of polymer and solvent respectively are used in designing and fabricating the hollow fibre membrane. The morphology, water contact angle and pure water flux were being observed. From these results, both membranes formed nano pore size but membrane with TiO₂ formed 0.32 nm pore size smaller compared to membrane without TiO₂. It is also having lower water contact angle which is 51.18° as the addition of TiO₂ nanoparticles increase the hydrophilicity of the membrane and also enhanced the performance of pure water flux of the membrane which is 7.14 L/m².hr. The presence of nanoparticles as additive in membrane enhance the structure and performance of the hollow fibre membrane by forming more porous structure, nano pore size for nanofiltration, increase the permeability and hydrophilicity nature, increase pure water flux and increase fouling resistance that capable to remove phosphorus in waste water treatment.

Keywords : Hollow-fibre membrane; phosphorus; PVDF; additive; membrane structure

1. INTRODUCTION

Hollow fibre membranes are thin and porous semi-permeable layer of material in hollow shape that able to separate contaminants from water when a driving force is applied. In a membrane process, fluid is passed through a barrier [2]. Hydrophobic is a characteristic of membrane's layer that does not allow water molecules to pass through the membrane which make the water molecules attached on the outside layer of the membrane and caused fouling. While, hydrophilic is a characteristic of membrane's layer that allow water molecules to diffuse easily through the membrane [3]. Nowadays, government is very concern and aware of the phenomena of the eutrophication or algae blooms cause by excessive phosphorus in wastewater [4]. Phosphorus is a nutrient, usually in the form of phosphates with ionic radius of 1-10 nanometres (nm) [5]. It is not only produced in agricultural activities, but it is also present in industrial and domestic wastewater. Excessive phosphorus in wastewater causes eutrophication and further induces to negative environmental effects. For treating phosphorus, nanofiltration (NF) provide high separation efficiency as it has a porous membrane filtration process, made from thin film layer composite of polymer that uses nanometer sized through pores that pass through the membrane. Nanofiltration membranes have pore sizes from 0.1 until 10 nm [6]. In order to overcome this issues, hollow fiber membrane nanofiltration which is a portable wastewater treatment is being studied by designing and fabricating the membrane with polymer, solvent and additive to observe the characteristic and also the performance of hollow fiber membrane in treating phosphorus in wastewater.

2. METHODOLOGY

The dope was prepared with control without the additive and the formulation including the additive. Hollow fibre spinning machine was used to produce the hollow fibre membrane. The water bath (bore fluid) and 500 ml of dope solution were then extruded from the spinneret to form hollow fibre membrane. All the fabrication parameters were adjusted using the controller of the hollow fibre spinning machine. During the process, the hollow fibre membrane were immersed into water bath to solidify the membrane. This process takes about 1 hour to complete the production of hollow fibre membrane for 500 ml of dope solution. Then, the hollow fibre membranes were immersed in the water bath for 1 day for more solidification process. The hollow fibre membranes were then immersed with glycerol for 30 minutes to avoid the membranes from stick to each other. Finally, the hollow fibre membranes were dried in the drying oven for 1 day to remove residual solvent on the membrane before membrane characterization for analysis.

Scanning electron microscopy (SEM) was used to observe the structure and cross-section, pore size of surface and thickness of membrane. For cross-section analysis, each membrane was prepared two samples and need to dipped in the liquid nitrogen for 10 seconds so that the membrane will be hard and easy to fractured them by using knife for getting proper hollow shape of membrane.

3. RESULTS AND DISCUSSION

Scanning electron microscope (SEM) was used to observe the morphology of the membrane which are pore and porosity of the membrane surface, cross-sectional of hollow fibre membrane and structure of hollow fibre membrane. Based on Figure 1, From the observation, surface membrane with TiO_2 is more porous than the surface membrane without TiO_2 . The addition of TiO_2 increases the porous structure of the hollow fibre membrane which will create better performance for the water permeation and pure water flux. This will increase the ability of the hollow fibre membrane to filter the phosphorus in wastewater. By comparing with previous research [7], the addition of the TiO_2 increases the porous structure of the membrane same with this result.

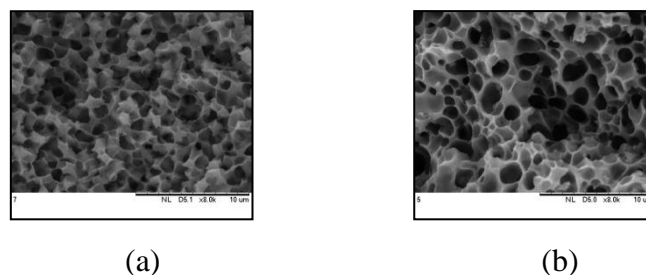


Figure 1 Pores structure of the surface membrane of (a) PVDF/DMF and (b) PVDF/DMF/ TiO_2

4. CONCLUSION

PVDF hollow fibre membrane with DMF as the solvent and TiO_2 as an additive and also another PVDF hollow fibre membrane without additive were successfully designed and fabricated. The effect of TiO_2 as additive on the structure and performance of the hollow fibre membranes such as the membrane morphology, the water contact angle measurement and the pure water flux performance have been studied and evaluated. The present of TiO_2 nanoparticles as an additive effect the structure and morphology of the hollow fibre membrane as the wall of the membrane became thinner, the porosity of the membrane's surface increased and formed nano pore size for nanofiltration process to remove

phosphorus in wastewater treatment. Finger-like structure were formed at the outer layer and sponge-like structure were formed at the inner layer of the membrane and have asymmetric structure.

The effect of additive increased the hydrophilicity of the membrane as hollow fibre membrane with TiO_2 has lower measurement of water contact angle as the permeability of membrane's surface increased. The addition of additive improved the hydrophilicity of the PVDF membrane and increase the fouling resistance on the membrane's surface.

REFERENCES

- [1] Ali Hussein Sabeen, Norzita Ngadi, Zainura Zainon Noor, Ademola Bolanle Raheem, Farid Agouillal, Abubaker Ali Mohammed, and Bala Isah Abdulkarim, "Characteristic of the effluent wastewater in sewage treatment plants of Malaysian urban areas", *Chemical Engineering Transaction*, vol. 63, 2018
- [2] Xu, Z., Wu, T., Shi, J., Teng, K., Wang, W., Ma, M., Fan, J. "Photocatalytic antifouling PVDF ultrafiltration membranes based on synergy of graphene oxide and TiO_2 for water treatment", *Journal of Membrane Science*, vol. 520, pp 281–293, 2016
- [3] Gao, J., Thong, Z., Yu Wang, K., and Chung, T. S., "Fabrication of loose inner selective polyethersulfone (PES) hollow fibers by one-step spinning process for nanofiltration (NF) of textile dyes", *Journal of Membrane Science*, vol. 541, pp 413–424, 2017
- [4] Dos Santos, C., Ribeiro, A., and Ribau Teixeira, M., "Phosphorus recovery from waters using nanofiltration", *Desalination and Water Treatment*, vol. 55(5), pp 1308–1315, 2015
- [5] Zeng, Z., "Phosphorus removal by ceramic tight ultra-filtration (CTUF) membranes for RO pre-treatment", MSc. Thesis, Department of Water Management, Faculty of Civil Engineering and Geosciences, Delft University of Technology, pp 1–72, 2012
- [6] Wang, T., Zhao, C., Li, P., Li, Y., & Wang, J., "Effect of non-solvent additives on the morphology and separation performance of poly(m-phenylene isophthalamide) (PMIA) hollow fiber nanofiltration membrane", *Desalination*, vol. 365, pp 293–307, 2015
- [7] Abdullah, N., Ayodele, B. V., Mansor, W. N. W., & Abdullah, S., "Effect of incorporating TiO_2 photocatalyst in PVDF hollow fibre membrane for photo-assisted degradation of methylene blue", *Bulletin of Chemical Reaction Engineering & Catalysis*, vol. 13(3), pp 588–591, 2018

A STUDY OF COMPRESSIVE AND FLEXURAL STRENGTH OF CONCRETE K-225 WITH THE ADDITION OF OPEFB FIBERS FOR MECHANICAL EQUIPMENT

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Abstract – This preliminary study was done to see the effect of adding 1cm to 4cm fibers of oil palm empty fruit bunches of K-225 concrete strength under normal condition. While the percentage of addition is made to the sample by 1% with a weight of 75 grams for samples of cube-shaped, 125 grams for cylindrical-shaped, and 330 grams for beam-shaped, with a test done after the sample is 3 days old. What is the effect after the addition of oil palm empty fruit bunches on the strength of K-225 concrete under normal conditions? The results showed that the cube-shaped sample has a compressive strength of 45.42 kg/cm², cylindrical-shaped have a compressive strength of 3.11 MPa, and beamshaped has a flexural strength of 13.45 MPa. Based on the comparative analysis of the test results on the normal conditions of K-225 quality concrete, the addition of 1% natural fiber of oil palm empty fruit bunches does not increase the compressive strength and flexural strength of K-225 quality concrete. Therefore, further studies will be conducted on the test sample with a fiber percentage of 5% to 10% of the sample weight, to approaching the properties of mechanical equipment.

Keywords : Fibers of OPEFB; K-225 quality concrete; flexural strength; compressive strength

1. INTRODUCTION

Oil Palm Empty Fruit Bunches (OPEFB) are solid waste from the processing of palm fruit into palm oil. The amount of OPEFB produced per ton ranges from 23% out of 35% to 40% of the amount of fresh fruit bunches processed [1]. Thus, it was found that 23% of the 6,150,819 tons of fresh fruit bunches production used; around 77% per ton of fresh fruit bunches were EFB (Empty Fruit Bunches) which had not been fully utilized by the factory. Physically, OPEFB has around 60% water content and a maximum of 2.5% oil content and 23% to 35% fiber [2]. Potential OPEFB can be utilized, if it is processed, it can produce fiber [3].

Concrete is a structural element which consists of aggregate particles attached to a paste made of Portland cement and water [4]. Where the synthetic polypropylene fiber can increases compressive and flexural strength of concrete [5]. The strength of concrete construction is greatly influenced by the type of material used [6]. Concrete can be easily formed according to the construction needs, heavy loading, and resistance to high temperatures [7]. While the weakness of concrete is that its shape is difficult to change, and the execution of its work requires high precision [8]. This preliminary research is considered necessary to use EFB fiber as an additive to the K-225 concrete type in the application of machine engineering equipment.

2. METHODOLOGY

The methodology used in this research is experimental, where the natural OPEFB from the factory is dried and cut into 1 - 4 cm. The percentage of additional samples is 1% with a weight of 75 grams for cube-shaped samples, 125 grams for cylindrical samples, and 330 grams for K-225 beam-shaped concrete. Then a strong pressure test is performed after the sample is 3 days old. The test results were then compared to the normal conditions of K-225 quality concrete and connected to properties on the type of equipment of the same mechanical engineering field.

3. RESULTS AND DISCUSSION

The results showed that the cube-shaped sample has a compressive strength of 45,42 kg/cm², where the pressure under normal condition is 225 kg/cm² at the age of 28 days. Cylindrical-shaped samples have a compressive strength of 3,11 MPa, where the compressive strength in normal conditions is 15 MPa to 30 MPa at 28 days of age. While the beam-shaped sample has a flexural strength of 13,45 MPa, where the flexural strength of the normal condition is 18,68 MPa at the age of 28 days. Based on the comparative analysis of the test results on the normal conditions of K-225 quality concrete, the addition of 1% natural fiber of oil palm empty fruit bunches does not increase the compressive strength and flexural strength of K-225 quality concrete. This condition is influenced by the difference in the age of the test sample with the test result of the existing normal condition, as shown in Figure 1.

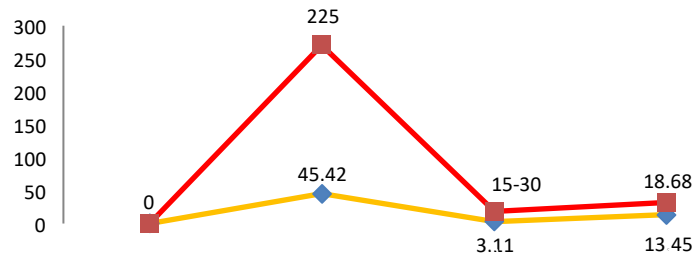


Figure 1 Comparison diagram of K-225 concrete strength conditions

4. CONCLUSION

Based on the comparative analysis of the test results on the normal conditions of K-225 quality concrete, the addition of 1% natural fiber of oil palm empty fruit bunches does not increase the compressive strength and flexural strength of K-225 quality concrete. Where the cube-shaped sample only has a compressive strength of 45.42 kg/cm², cylindrical-shaped samples have a compressive strength of 3.11 MPa, and the beam-shaped sample has a flexural strength of 13.45 MPa. Therefore, further studies will be conducted on the test sample age of 28 days, with a fiber percentage of 5% to 10% of the sample weight, to attain that the addition of natural fibers of oil palm empty fruit bunches to K-225 quality concrete can be applied in mechanical engineering.

REFERENCES

- [1] Joko Prayitno Susanto, "Palm Solid Wastes Potential Calculation for Renewable Energy with LCA Method", *Jurnal Teknologi Lingkungan*, vol. 18(2), pp 165-172, 2017
- [2] Erwinsyah, "Potensi Dan Peluang Tandan Kosong Sawit Sebagai Bahan Baku Pulp Dan Kertas Studi Kasus Di Indonesia", *Jurnal Selulosa*, vol.5(2), pp 79 -88, 2015
- [3] Fitri Citra Murdani, "Pengolahan Tandan Kosong Kelapa Sawit (Tkks) Sebagai Alternatif Material Tekstil Dengan Teknik Rekarakit Tekstil", *e-Proceeding of Art & Design*, vol. 4, pp 1188-1206, 2017
- [4] Kim S Elliott, "Precast Concrete Structures", CRC Press, 2017
- [5] F. Shi, T. M. Pham, H. Hao, Y. Hao, "Post-cracking behaviour of basalt and macro polypropylene hybrid fibre reinforced concrete with different compressive strengths", *Construction and Building Materials*, vol. 262, pp 120108, 2020
- [6] Z. Chang, G. C. Long, John L. Zhou, Cong M, "Valorization of sewage sludge in the fabrication of construction and building materials: A review", *Resources, Conservation and Recycling*, vol. 154, pp 104606, 2020
- [7] Vinh Duy Cao, "Microencapsulated Phase Change Materials For Enhancing The Thermal Performance of Portland Cement Concrete And Geopolymer Concrete For Passive Building Applications", *Energy Conversion and Management*, vol. 133, pp 56-66, 2017
- [8] P. Huthwohl, R. Lub, I. Brilakis, "Multi-classifier for reinforced concrete bridge defects", *Automation in Construction*, vol. 105, pp 102824, 2019

ERGONOMICS HAZARD IDENTIFICATION AND RISK ASSESSMENT OF VISUAL INSPECTION PROCESS IN A SEMICONDUCTOR MANUFACTURING INDUSTRY

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Abstract – This research deal with the ergonomics hazard in semiconductor manufacturing industry. The lacking of ergonomics safety often causes the presence of hazards to the workers. The purpose of hazard identification and risk assessment in this study is to highlight the critical operations of tasks that pose significant risks to the health and safety of workers as well as highlighting those ergonomics hazards pertaining to working conditions or activities performed. In order to assess the hazards present, its risks and its preventive measures, Hazard Identification, Risk Assessment and Risk Control (HIRARC) assessment was done. The results of risk assessment that presented in a risk matrix are essential to make decision on risk control. The results show that the final process, which was checking on the bonded unit under microscope and destroyed the reject unit by using tweezers, the risk level was classified as extreme risk level. This shows that ergonomics safety is an essential aspect that needs to be prioritized as it can produce productive workers.

Keywords : Ergonomics; hazards; HIRARC; risk; likelihood; severity

1. INTRODUCTION

The manufacturing industries in Malaysia are facing problem of high workplace accident rate which may reflect the way they handle risk management system in their organizations [1]. Risk management consists of various activities and strategies that an organization can use for protection from situations, circumstances, or events that may encounter its security. It is a process of thinking systematically about all possible risks, problems or disasters before they occur and setting up procedures that will avoid the risk, or minimize its impact, or cope with its impact. In order to obtain a safe workplace in manufacturing industries, an efficient and appropriate system of safety and health is considered as utmost importance. Therefore, the use of Hazard Identification, Risk Assessment and Risk Control (HIRARC) is effective in identifying, assessing, managing and mitigating the hazards faced by employees. In order to achieve the objectives of Occupational Safety and Health Act (OSHA) 1994, it is needed to look into HIRARC which is the basis of occupational safety and health [2]. Visual inspection provides a means of detecting and examining a variety of surface flaws, such as corrosion, contamination, surface finish, and surface discontinuities on joints, such as welds, seals, and solder connections. Visual inspection is also the most widely used method for detecting and examining surface cracks that are particularly important because of their relationship to structural failure mechanisms. Even when other inspection techniques are used to detect surface cracks, visual inspection often provides a useful supplement. For example, when the eddy current examination of process tubing is performed, visual inspection is often performed to verify and more closely examine the surface disturbance.

2. METHODOLOGY

2.1 Observation

This observation method added with an informal interaction with the operators and supervisor to identify the frequent problems happened.

2.2 Hazard Identification, Risk Assessment and Risk Control (HIRARC)

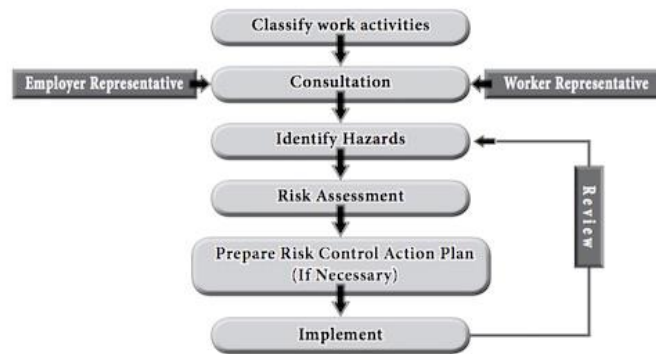


Figure 1 Flowchart of HIRARC Process

3. RESULTS AND DISCUSSION

Table 1 HIRARC Result for Final Visual Inspection Task

Hazard Identification				Risk Analysis			Risk Control Measure
No .	Task	Hazard	Body parts involved	Likelihood	Severity	Risk	Recommended Control Measure
1.	Start to check the bonded unit under microscope and destroy the reject unit by using tweezers.	<p>Longer sitting time</p> <p>Bending forward</p> <p>Less space at workbench</p> <p>Uncomfortable placement of microscope on the work bench</p> <p>Uncomfortable chair</p> <p>All the sharp edges equipment placed nearer.</p>	<p>Shoulder</p> <p>Arm</p> <p>Fingers</p> <p>Knee</p> <p>Head</p> <p>Neck</p> <p>Wrist</p>	5	4	20	<p>1.Admin should allow operators to do light stretching exercise every at least two hours.</p> <p>2.Keep shoulders aligned with the rest of the body</p> <p>3.Design suitable chair and workbench at where the measurements are coherent with body dimensions of the operators.</p>

4. CONCLUSION

The three main sections of HIRARC have been successfully conducted in the visual inspection department of a semiconductor manufacturing industry. The results show that the final process, which was checking on the bonded unit under microscope and destroyed the reject unit by using tweezers, the risk level was classified as extreme risk level. This shows that ergonomics safety is an essential aspect that needs to be prioritized to produce productive workers. The main recommendation is to develop the workstation design if it is not ergonomically good and suitable. It is only can be done by the management of the company itself. Besides, workers must perform their tasks according to the correct Standard Operating Procedures (SOP) in order to prevent risk factors. The visual inspection department needs to assess the risk not only for the risk and control measures, but it will be conducted for cost if occurred accidents and near miss incidents at the workstation. Hazard identification, risk assessment and control are an on-going process. Therefore, regularly review the effectiveness of hazard assessment and control measures is needed.

REFERENCES

- [1] Agwu, M. O., “The effects of risk assessment (HIRARC) on organisational performance in selected construction companies in Nigeria”, *British Journal of Economics Management & Trade*, vol. 2(3), pp 212-224, 2012
- [2] Ahmad, A. C., Nianti, I., Zin, M., Othman, M. K., & Muhamad, N. H., “Hazard identification, risk assessment and risk control (HIRARC) accidents at power plant”, *MATEC Web of Conferences* 66, pp 00105, 2016

OFF-RIVER STORAGE (ORS) AS AN ALTERNATIVE RAW WATER RESOURCES: AN INTEGRATED PHYSICAL-CHEMICAL PARAMETER ANALYSIS

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Abstract – The nature of water crisis in Selangor has become a topic of concern. The government of Selangor has encouraged the water authority by use of abandoned mining ponds as an alternative to additional raw water resources. The concept of the off-river storage (ORS) is to accept water from nearby stream frequently when stream is high and may return water to the stream when it is low. In addition, ORS has numerous functions including water supply, flood mitigation and agricultural. To ensure the quality of water stored and supplied, a random monitoring of ORS 1 Kampung Hang Tuah, Bestari Jaya has been selected to access the impacts of the water quality through assessment of physical, chemical parameter and trace metals using Standard and Hach. Method. Three different locations were chosen for sampling and one location from Sungai Darah. The mean concentration levels of TSS, Fe, and Mn are within the reference standard limit while the concentration of COD readings is high. In conclusion, it was found that the quality of water in ORS was well below as the recommended guideline and it safe to be used as portable water source.

Keywords : Off-river storage; water quality; physical parameter; ferum; mangan

1. INTRODUCTION

Population growth, urbanisation, climate change, improved living standards and the limited availability of water from conventional supply sources are contributing to increasing water scarcity in many parts of the world [1]. Water is one of the most abundant compounds found in nature, covered approximately three-fourths of the surface of the earth. However, several factors serve to limit amount of water due to accelerated of development in industry and growth of population. Selangor is one of the states that experienced water interruption; in this manner, the authority making an effort by using water alternatives from ex-mining ponds [2].

Pollution has forced Selangor water treatment plant to shut down several times this year. Developments of advanced treatment technologies and alternatives mean to supply clean water have improved the safety and reliability of potable reuse in Selangor. Off-river storage represents a significant and has many uses. These incorporate water supply for urban, industrial, flood mitigation, recreation, and fish production.[3] In addition, this storage accepts water from adjacent stream ordinarily when streams are high and may return to the stream when stream is lower. In these circumstances, the storage can be major importance to both agricultural land-use and flood damage mitigation [3-4].

Many studies have been related with overwhelming heavy metals accumulation in water however less consideration has been given on the potential use of water from abandoned mining ponds as elective raw water resources due to safety issue [4-6]. This study is to analyse the quality of water in the existing ORS and it is of ex-mining ponds. Iron is one of the metals found in mining ponds. It can be a troublesome chemical in water supplies. As little as 0.3 mg/l can cause water to turn a reddish brownish in colour. Iron is mainly present in water in two forms: either the soluble ferrous iron or the insoluble ferric iron. Water containing ferrous iron is clear and colourless because the iron is completely dissolved. When exposed to air in the pressure tank or atmosphere, the water turns cloudy and a reddish-brown substance begins to form. This sediment is the oxidized or ferric form of iron that will not dissolve in water. Iron exists along with certain kinds of bacteria; a smelly biofilm can form. To survive, the bacteria utilise iron, leaving behind a reddish-brown slime.

2. METHODOLOGY

The samplings were carried out at three different locations in ORS 1, as shown in Figure 1. This ORS was chosen as the approval from Lembaga Urus Air Selangor for its easy access instead and safety reasons. Each sampling session will include three sampling points. Three points (one-point at the inlet, outlet and centred) were selected at ORS to get a better interpretation of results. The sampling activities were carried out every alternate day, except on weekends for five weeks.

The water quality parameters include the chemical oxygen demand (COD), total suspended solid (TSS) and iron (Fe) were analysed in the faculty laboratory. The analysis is following the APHA Standard Method (1999), the accepted reference details conduct of water and wastewater can be found (Company, 2007) and HACH method. Measurements of the parameter are expressed in the physical unit of milligrams per liter (mg/L). The trace concentration is usually expressed as microgram per liter ($\mu\text{g/L}$).



Figure 1 Layout of ORS 1 (study area)

2.1 The analysed parameter

The analysed water quality parameter is shown in Table 1. The COD analysis is using the HACH Digestion Method, TNT Plus High Range. While the total suspended solid is using the standard APHA method. Iron has been selected as one of the parameters as the lake was an abundant tin mining pond.

Table 1 Water quality parameter and the methods

Parameter	Method	Units
Chemical Oxygen Demand (COD)	Method 8000 Reactor Digestion Method TNT Plus; HR (TNT822,20-2500mg/L) – (Hach Method)	mg/L
Total Suspended Solid (TSS)	Glass Microfibre Filter Paper (Standard Method)	mg/L
Iron (Fe)	Method 8157 FerroZine Method; Ferro zine Reagent Solution Pillows – For water & wastewater (0.009 to 1.400mg/L) – (Hach Method)	mg/L

3. RESULTS AND DISCUSSION

The COD concentrations of water samples are noticed to be within the standard limit (50 mg/L) at all points, except for Day 2 and Day 7, which gave the average values of 78.6 mg/L and 82.3 mg/L, respectively. These high values could be attributed to the seepage from soil and bridge construction that operate near the sampling site as it was raining in the morning. It shows that the lower COD indicates a low level of pollution while the high level COD points out the high level of pollution of water in the study area. Figure 2 shows the reading of chemical oxygen demand (COD) at three sampling point for 15 days of sampling.

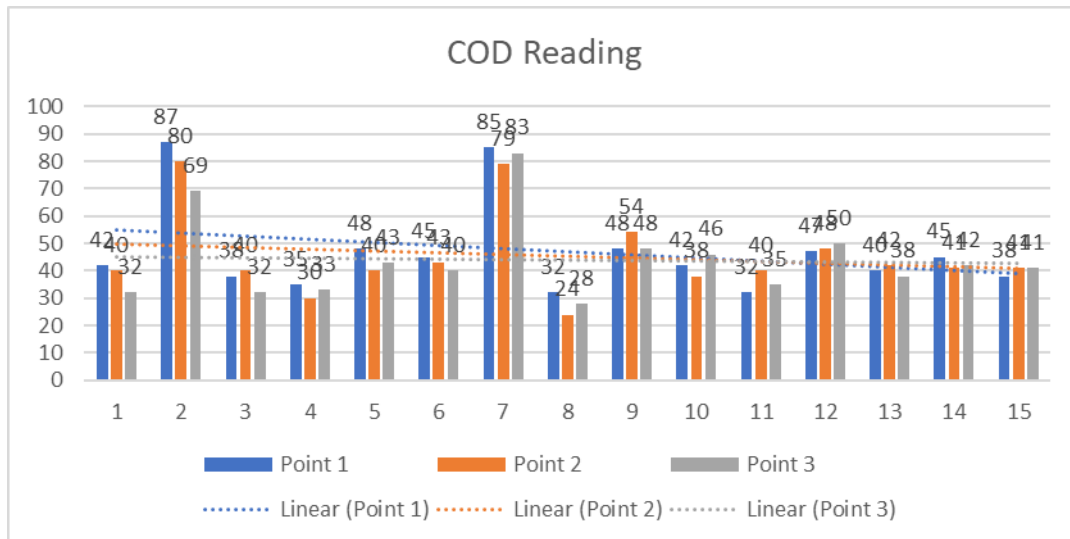


Figure 2 Chemical oxygen demand concentration

The concentration total suspended solids in mg/L of water samples at ORS 1 within reference standard limit with a maximum of 20 mg/L at point A and 25 mg/L. Normally, the highest TSS is suspected due to the turbulence by rainfall water which also added the mineral content in it. During the sampling, some of it contained silt and particles from nearby construction site which caused high in TSS value for sampling day one and three at ORS. Figure 3 shows the concentration of the total suspended solids in ORS1.

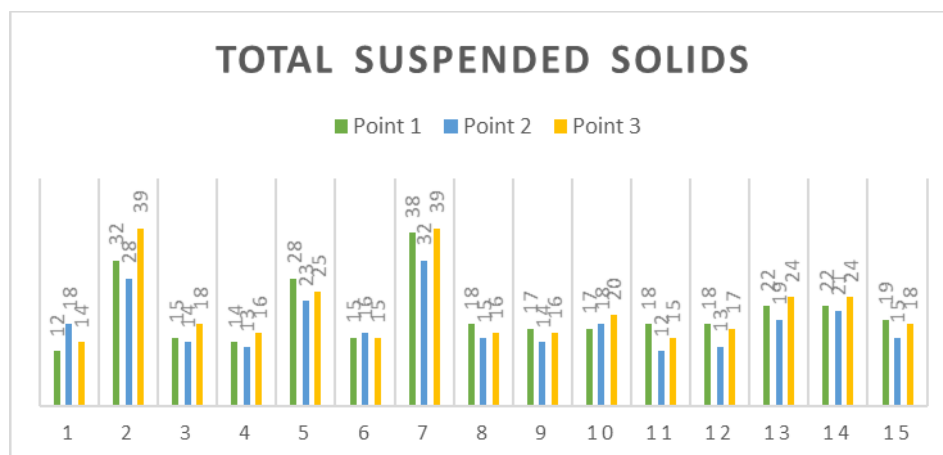


Figure 3 Total suspended solids in ORS

The concentration of iron at all three points of ORS is within the recommended acceptable standard limit in the range of 0.24 to 1.0 mg/L. Compare with the reading of Fe at the river its shows that the

reading higher in concentration and above the limit. There is no standard pattern of iron reading during the period of observation. Figure 3 illustrate the reading of iron concentration in ORS1.

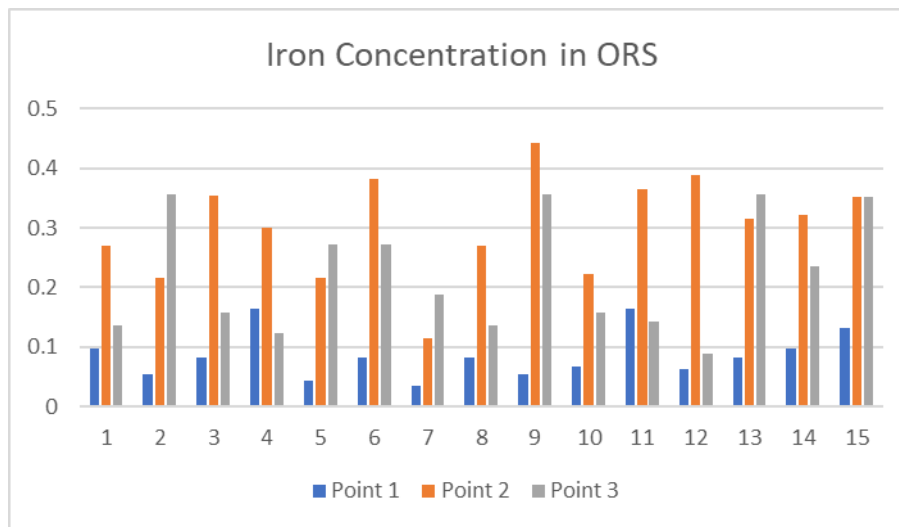


Figure 4 Iron concentration (mg/L)

4. CONCLUSION

The seasonal effect is significant especially during rainy days where the TSS and COD readings are noted to increase due to surface runoff in ponds. ORS also shown the significant of trace metals in it. Iron and manganese were noted to be within the limit stated in the NAHRIM standard. In general, can be concluded that, the water quality of the ORS are within the MOH recommended acceptable limits for untreated raw water, therefore a better quality would be normal after the treatment. Even though it sources partly from the abandoned mining ponds, the main concern is the final discharge that will be consumed for portable water use. Based on this study, it was discovered that the overall water quality in the ORS is treatable, and it is safe to be used as a raw water resource.

REFERENCES

- [1] Hadjikakou, M., Stanford, B. D., Wiedmann, T., Rowley, H. V., Kobayashi, Y., Ishii, S., Khan, S. J., "A flexible framework for assessing the sustainability of alternative water supply options", *Science of The Total Environment*, vol. 671, pp 1257–1268, 2019
- [2] Air Selangor, "Air Selangor Performance Report for 2015," Selangor, Malaysia, 2015
- [3] R. J. Higgins, "Off-river storages as sources and sinks for environmental contaminants", *Regul. Rivers Res. Manag.*, vol. 5(5), pp 401–412, 1990
- [4] F. M. Kusin, M. S. M. Zahar, S. N. Muhammad, N. D. Mohamad, Z. M. Zin, and S. M. Sharif, "Hybrid off-river augmentation system as an alternative raw water resource: the hydrogeochemistry of abandoned mining ponds," *Environ. Earth Sci.*, vol. 75(3), pp 1–15, 2016
- [5] F. M. Kusin, M. S. M. Zahar, S. N. Muhammad, Z. M. Zin, and S. M. Sharif, "Assessing the potential use of abandoned mining pools as an alternative resource of raw water supply," *Water Sci. Technol. Water Supply*, vol. 16(2), pp 410–417, 2016
- [6] K. H. Low, I. B. Koki, H. Juahir, A. Azid, S. Behkami, R. Ikram, H. A. Mohammed and S. M. Zain, "Evaluation of water quality variation in lakes, rivers, and ex-mining ponds in Malaysia (review)," *Desalin. Water Treat.*, vol. 57(58), pp 28215–28239, 2016

MNO₂ THIN FILMS: POTENTIAL FOR SMART WINDOW COATING

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Abstract – Today, an increasing number of high-glass faced buildings are now being designed for residential and commercial purposes. Thus, reducing heat transfer between the indoor and outside environments becomes vital, especially for windows as part of the buildings' critical component to avoid energy loss. Moreover, organic dirt and bacteria pose health risks to residents either from an indoor or outdoor environment. Besides, window glass cleaning requires massive labour and costs a vast sum of money. Hence, to decay the pollutants and improve the atmospheric air quality in the building sector, photocatalysis can be successfully applied for the smart glass industry. Here, the thin layer of manganese oxide (MnO₂) was deposited on the glass substrate via a two-stage chemical bath deposition method. The solar-driven photocatalytic performance of the MnO₂ thin film was evaluated by the decolorization of methylene blue (MB) solution. The results of this work show promising material to be used by local authorities for smart window applications.

Keywords : Deposition; thin films; catalyst

1. INTRODUCTION

In recent years research into the smart window or glass has attracted considerable attention because of the technology that helps define the industries of architecture, automotive, interior, and product design [1,2]. Many of these are smart window technologies that can modify the amount of light transmitted by usually transparent materials, allowing them to appear bright, translucent, or opaque. Manganese oxides (MnO₂) are various materials with significant advantages, including abundant resources, excellent structural flexibility, and high theoretical capacitance. The way in which that MnO₆ octahedral units in MnO₂ share their facets resulting in different polymorphic forms occurs, such as α -MnO₂, β -MnO₂, γ -MnO₂, δ -MnO₂, and ϵ -MnO₂. Nanostructured MnO₂ has broad application value in many fields of catalysis, environmental remediation, biosensors, molecular adsorption, energy storage, and electrode materials for batteries [3, 4].

The low-temperature chemical solution path has always been preferred as a reasonable alternative user-friendly approach. Here, the two-stage chemical bath deposition (CBD) method was applied to form MnO₂ thin film on the glass substrate. The photocatalytic performance of the thin films was evaluated by the photodegradation of methylene blue (MB) dye solution.

2. METHODOLOGY

MnO₂ thin films were grown on soda lime microscope slide glass substrate using a two-stage CBD method. The glass substrates were scribed into 1.5 cm x 2 cm dimension using diamond scribe. Analytical grade potassium permanganate (KMnO₄, Sigma-Aldrich) and 99.8% ethanol (C₂H₅OH, Friendemann Schmidt) were used as received without any further purification.

The initial solution was prepared by dissolving 0.05 M KMnO₄ in 50 mL of distilled water. The glass substrates were cleaned using ethanol and distilled water (DW) beforehand. 2 ml ethanol (reducing agent) were added into the 50 mL KMnO₄ solution before that solution transferred to a glass vial where the glass substrate was immediately placed and kept into a water bath for 20 min at 85°C. Permanganate-treated glass substrates then thoroughly rinsed in DW ahead of 10 min ultrasonication. This step is considered as the initial stage deposition. For the two-stage deposition, the same initial stage deposition solution was prepared. This time only deposition times (5 min, 10 min, 15 min, and 20 min, respectively) were varied while the rest of the parameters and procedure remained the same as the initial stage deposition steps.

The film morphology was studied using a field-emission scanning electron microscope (FESEM, Hitachi SU8030) after sputtering the samples with a thin layer of Platinum (Joel JEC-3000FC) to remove some of the excess charging. The photocatalytic degradation study of MB dye using MnO_2 thin films was performed in a quartz vessel containing 25 ml dye solution (10 mg L^{-1}). The thin film was dipped into the dye solution, where a LED 30 W was used as a visible light source. UV-VIS spectroscopy of the solution as a function of the irradiation time was performed separately using Shimadzu UV-2600.

3. RESULTS AND DISCUSSION

Figure 1 shows the particle length of MnO_2 was controlled by the reaction time and subsequently affected the size of the material. All samples showed the formation of nanoparticles having a size in the range of less than 100 nm. Only 20 min of two-stage CBD thin film indicates more spherical, unlike any other thin films which resemble more flakes in shape.

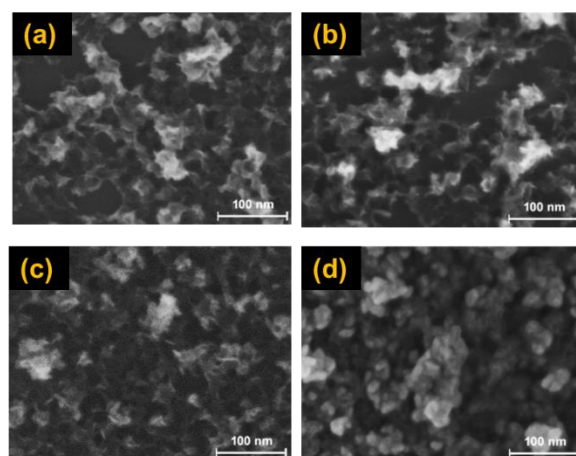


Figure 1 FESEM images of MnO_2 thin films at 200k magnification a) 5 min deposition, b) 10 min deposition, c) 15 min deposition and d) 20 min

The XRD patterns of the MnO_2 thin films are shown in Figure 2. Only one prominent diffraction peak of MnO_2 is observed at around 23° , corresponding to the crystal planes (002) of birnessite-type MnO_2 ($\delta\text{-MnO}_2$). The low and broad XRD peaks of MnO_2 indicates the poor crystallinity nature of MnO_2 . However, the single-stage CBD exhibits a more intense diffraction peak compared to all other two-stage CBD. Photocatalytic activity of MnO_2 showed a higher photodegradation in Figure 3 for thin films less than 10 min of two-stage CBD compared to others, yielding around 97% of MB degradation with 0.0148 min^{-1} rates. It is also worth mentioning that all two-stage of CBD thin films exhibiting a slight improvement in MB degradation. However, photocatalytic activity for all thin films takes about 240 min to achieve more than 95% degradation of MB. The main reason is due to the agglomeration particles become visible for the two-stage CBD at longer deposition time as the concentration of the two-stage CBD solution decreased.

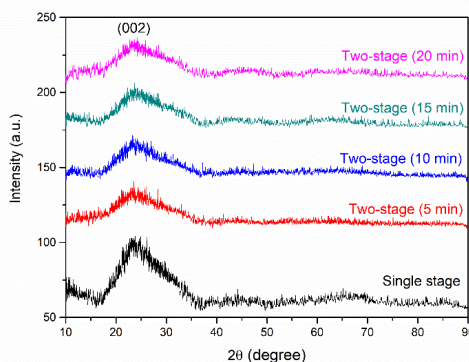


Figure 2 XRD pattern of MnO₂ thin films

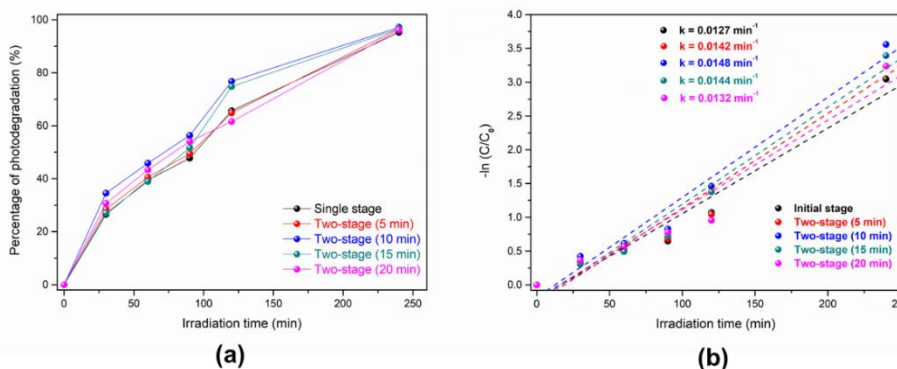


Figure 3 The variation of MB percentage photodegradation as a function of irradiation time (a) photodegradation efficiency and (b) reaction rate

4. CONCLUSION

MnO₂ thin film was successfully deposited using the two-stage CBD process. The thin film with 10 minutes on the two-stage CBD showed the highest MB degradation rate (0.0148 min⁻¹), with a degradation efficiency of 97 % in 240 minutes compared with other systems calculated. Furthermore, the morphology of MnO₂ thin film is growing as flakes, but gradually becoming spherical over the reaction time, which showed the thin film in the 20 min. Further studies on optical films will further lead to optical and surface chemistry applications.

ACKNOWLEDGEMENT

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REFERENCES

- [1] W. S. E. Bahlol, "Smart Glazing Systems for Low Energy Architecture", Proc. SB10: Sustainable Architecture and Urban Development, pp 149-165, 2010
- [2] N. R. Chodankar, G. S. Gund, D. P. Dubal, and C. D. Lokhande, "Alcohol mediated growth of α -MnO₂ thin films from KMnO₄ precursor for high performance supercapacitors", RSC Advances, vol. 4(106), pp 61503-61513, 2014
- [3] M. Azzi, R. Slim, K. Houry, S. Loquai, B. Baloukas, and L. Martinu, "Thermochromic VO₂ films for smart windows application", MATEC Web of Conferences, vol. 261, pp 05004, 2019
- [4] K. Midtdal and B. P. Jelle, "Self-cleaning glazing products: A state-of-the-art review and future research pathways," Solar energy materials and solar cells, vol. 109, pp 126-141, 2013

UNISEL'S LIBRARY MANAGEMENT SYSTEM BASED ON Li-Fi TECHNOLOGY

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ABSTRACT – Library users encounter problems in finding, localizing, queuing, and so forth. To overcome these obstacles, this paper presents our ongoing work on developing an Universiti Selangor (UNISEL) library management system based on Li-Fi technology for reaching optimal performance in the process of simple design. Using low-cost passive tags in libraries reduces the cost of modernization significantly. As such, integrating Li-Fi into a library management system makes both the library users and staff's task easy, smart, convenient, and practical. The methodology and software tool is based on Li-Fi technology and apps system that can be used to find the location of the book rack in the library. The Li-Fi system was integrated with the sensor at book rack and also apps by using a smartphone that defines communication between the Li-Fi and the smartphone. This concept model focuses on Visible Light Communication (VLC) based on experimental implementation and performance evaluation of the system. A reconfigurable, software defined protocol visible light, including designing apps, is being implemented in the system to enable the operating of the integrated system. The suitable Light Emitting Diode (LED) lamps were used for light and at the same time, act as a communication for the system. The system hardware, including a VLC transmitter and a receiver is designed in focusing on the illumination, brightness, signal synchronization, detection range and accuracy. With the proposed system, the mobile receiver is provided with the location information on the display screen. In this project briefly introduce the infrastructure, functions, and enabling technologies of the system implementation, performance evaluation and also a proof-of-concept implementation of the VLC technology.

Keywords : Visible light communication; light fidelity

1. INTRODUCTION

In this generation, the most commonly used technology in worldwide communication technology is using Wi-Fi. Wi-Fi has invaded virtually all facets of human society from the domestic setting and business, to basic government services such as ICT and transportation [1]. Due to this heavy dependence on Wi-Fi, many are stuck on this concept as the best mode of wireless communication. For this reason, people seem to remain unfamiliar with a similar concept known as Li-Fi even though the concept has been around for many years [1]. By emerging light fidelity (Li-Fi) technology refers to visible light communication systems using light from light-emitting diodes (LED) as a medium for delivering networked, mobile, high-speed communication similar to Wi-Fi [2]. As a complement to the existing wireless or wired network infrastructure, Li-Fi can be used to offload data from existing Wi-Fi networks to provide capacity for greater downlink demand.

Li-Fi was invented by Prof Harald Haas from the University of Edinburgh, Scotland back in 2011, when he demonstrated for the first time that by flickering the light from a single LED, he could transmit far more data than a cellular tower [3]. The concept he gave about this Li-Fi technology is known as "data by lighting". Li-Fi could lead to the Internet of Things, which is all electronic connections to the Internet, whereby the LED lights on the electronics are used as internet access points. The light waves are unable to penetrate walls, which makes hacking a much shorter range compared to Wi-Fi, though more secure.

University of Selangor (UNISEL) is one of the universities in Malaysia with a growing number of students each year. For example, in the library, students have to queue in public computers to search catalogue books using the WEB OPAC system, which has only two computers provided. Students spent

more time in a busy class schedule and at the same time finding the books. Hence, a system to assist book searching in the library needs to be developed.

2. METHODOLOGY

2.1 Project Development

This project covered various systems to implement at each part of the system, such as the physical system, communication system, and system programming. The physical system contains hardware items such as mobile phones, light sensor, LED lamps, and Li-Fi components for receiver and transmitter. The communication system contains mobile phone applications, Android Studio, and Tera Term Software. System programming focusing on developing programs, address number for data transmission, Indoor Positioning System, and Li-Fi communication.

2.2 Mobile Application Design

Mobile application development on location searching for books is just an intriguing idea which can be implemented in the future. Mobile Application is the main parts of this project because it is the first step in system activation. It is involved in communications system part, which is transmitting data information and receiving data from another source. Designing an application may contain the front page as an inter-phase application. Android Studio software was used in this project where android mobile used in this project system.

2.3 Li-Fi Analyze Data Information

Li-Fi Board has a transmission board (Tx) and Receiving board (Rx). Li-Fi will be programmed on Java application to make its own identity and act as memory application to analyze data received from others, as shown in Figure 1.

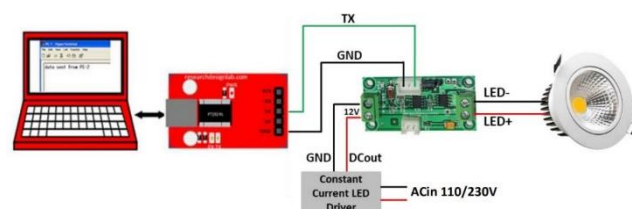


Figure 1 Transmitter circuit diagram

3. RESULTS

The main purpose of our project is to provide a library user alternative method to search bookcase or book selection catalogue in the library without queuing. The mobile application was developed by using android's studio software. Figure 2 shows a front page of Li-Fi mobile phone application.

The transmission of Li-Fi was receiving data at the receiver thru dongle via photodiode. Data information transmits by LED lamp, and at the receiver, it shows that the data had received. By adjusting and observe changing data receive on receiver dongle, it still is resulting a "U" to show that data receive. Therefore, the best conditions for receiving and transmitting data via light communication are at the rate of 1.5m to 2.0m light location.

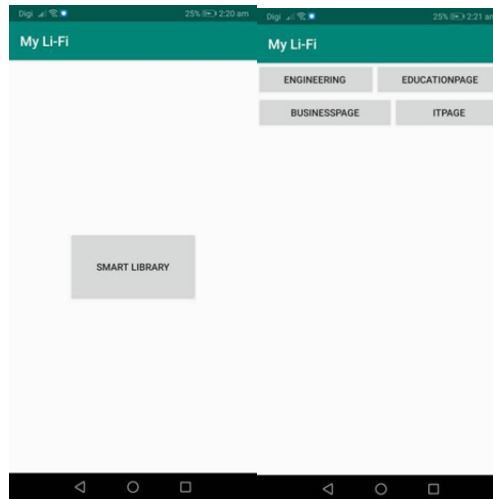


Figure 2 Front page display

4. CONCLUSION

Li-Fi system is an important part of the smart library management system that can be applied through a smartphone application. This paper proposed the integration of passive Li-Fi technology into a library management system. This integration makes the library users task easy, smart, convenient, automated and practical. It successfully implemented and the manner of functioning of Li-Fi using a smartphone that can be employed in Unisel Library. The proposed system shows that receiver detection successfully could be operated on a smartphone. Accuracy of detection receiver is very high if it below than 3.0 meters, which is very suitable on the library ceiling level. However, it still has a limited range of detection receiver due to the sensitivity of light detection. The design of the system is open and modular that can be extended for additional functionalities and upgrading purposes.

ACKNOWLEDGEMENT

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REFERENCES

- [1] J. H. Bhut, D. N. Parmar, and K. V Mehta, "LI-FI Technology – A Visible Light Communication", *International Journal of Engineering Development and Research*, vol. 4(2), pp 25–28, 2014
- [2] S. K. Binu Siva Singh, S. Vignesh, and M. Athiban Maha Mathi, "A survey on methodologies for LI-FI (Light Fidelity) technology", *J. Chem. Pharm. Sci.*, vol. 8(2), pp 415–417, 2015
- [3] S. Vicky, "Li-Fi the Best Alternative to Overcome the Existing Technologies", *International Journal of Computer Science and Information Technology Research*, vol. 2(2), pp 208–212, 2014

ZnO COATED ON TAPERED OPTICAL FIBER FOR METHANE GAS SENSING

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Abstract – Zinc Oxide (ZnO) is one of the semiconductor materials used as a sensing layer for various detection purpose and one of them is to detect methane gas. In this work, an optical fiber sensor coated with ZnO was developed to detect methane (CH₄) gas. The ZnO layer was synthesized and deposited onto tapered optical fiber via drop cast method. The characterization of synthesized ZnO was performed via SEM and EDX to verify the material properties. The developed sensor with 750 nm thickness of coated ZnO is then tested towards 0.5%, 0.75% and 1.0% concentration of methane gas at room temperature. The absorbance response observed during the sensing is corresponding to the change of methane gas concentration. It was found that the sensor showed the highest sensitivity when exposed to 1% concentration and the lowest sensitivity for 0.5% of methane gas. The response and recovery time for 1% methane gas exposure was recorded to be around 2.0 minutes and 3.0 minutes, respectively. The developed ZnO sensor using optical fiber has showed sensitivity towards CH₄ gas at certain level of concentration.

Keywords : Zinc oxide; sensing material; methane gas; optical sensors

1. INTRODUCTION

Methane gas when mixed with air can be highly volatile and could trigger explosion due to its inflammability properties. Continue monitoring methane is important especially in a confine and hot places such as coalmines and other field dealing with methane emission [1]. Currently, electrical sensor with semiconductor metal oxide for gas sensors is rapidly growing for such application. However, this type of sensor easily susceptible to electrical noise, unsuitable for volatile environment and has poor selectivity. On the other hand, optical based sensor using fiber optic offers better properties such as low cost, robust, sustainability in volatile and flammable environment and also resistance in electromagnetic interference. By coating optical fiber with a layer of sensitive material for gas detection, any changes of its properties will also alter the evanescent light passing through the layer [2]. Zinc Oxide (ZnO) has been used for solar cells, chemical sensors, electrical and acoustic devices and luminescent purpose. Previous work reported mostly on electrical based sensor. For instance, ZnO was doped with Aluminium detecting trimethylamine gas [3]. Very few works demonstrate ZnO coated on optical fiber for methane detection, which makes its potential as gas sensor can be explored further. In this paper, tapered optical fiber coated with ZnO thin film has been successfully developed for methane gas detection. The sensor has shown optical (absorbance) response towards high concentration of methane at room temperature.

2. METHODOLOGY

For this work, the multimode optical fiber from a standard of 125-um diameter was tapered, to waist diameter of 40-um, 2-mm up/down taper and 10-mm in length. Figure 1 illustrates tapered optical fiber with sensing layer coated onto the tapered region. Preparation of ZnO using sol-gel method follows accordingly. Zinc Nitrate (Zn(NO₃)₂) of 0.01 M in aqueous solution was mixed with 0.01 M of Hexamethylenetetramine (HMTA-C₆H₁₂N₄) in a 100 ml of deionized (DI) water. To coat ZnO, simple procedure of drop cast method was performed. To inspect the morphology of the ZnO coating, characterization was carried out via Scanning Electron Micrograph (SEM). The CH₄ gas testing setup is illustrated in Figure 2.

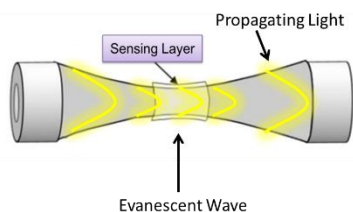


Figure 1 Tapered optical fiber

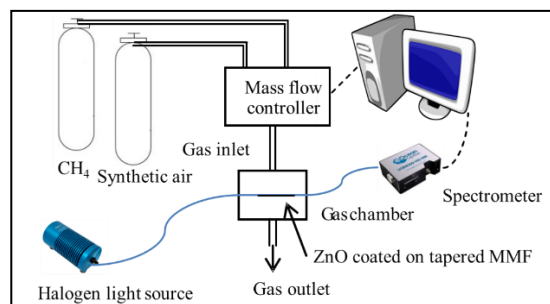


Figure 2 Gas sensing experimental setup

3. RESULTS AND DISCUSSION

The surface morphologies of ZnO deposited onto tapered optical fiber was inspected using SEM, as demonstrated in Figure 3. From the images, it was found that the ZnO thin film deposited was an amorphous structure. The layer appeared to be dense, compact and has a uniform coating. The thickness measured was averagely about 750 nm. Edx measurement showed that the synthesized ZnO exhibits peak Zn and O.

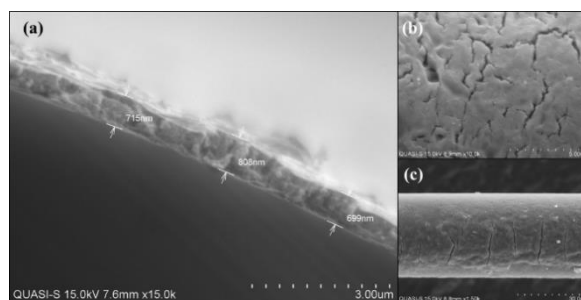


Figure 3 SEM image of a) Cross-sectional image of ZnO coated, (b) surface morphology of ZnO, (c) ZnO coated on the tapered optical fiber

Figure 4 presents the absorbance response of ZnO coated tapered optical fiber towards different concentration of CH₄ at room temperature. At 0.5% concentration of CH₄, there was no absorbance change spotted but at 0.75% of CH₄, there was a slight increase in the absorbance spectrum between 500 nm to 800 nm range. The significant change of absorbance can be seen when 1.0% of CH₄ was exposed to the ZnO sensor. The absorbance difference observed can be explained through this mechanism. The oxygen molecule attracts an electron from the conduction band of ZnO and forms O₂⁻ at room temperatures. These O₂⁻ ions get adsorbed on the ZnO surface forming ZnO:O₂⁻ species through strong ZnO-O₂ interaction. When the analyte CH₄ breaks down into C-H₃ and H⁺, this hydrogen radical reacts with the adsorbed O₂⁻ producing H₂O and by product CO₂ [4]. This process has changed the electrical properties of the ZnO and altered the absorption of light, hence the change in absorbance magnitude. During the recovery process, the sensing layer of ZnO was exposed with synthetic air. The adsorbed oxygen along with the desorbed H⁺ ions in/out of the sensing layer hence the absorbance spectrum returns to its original baseline [5].

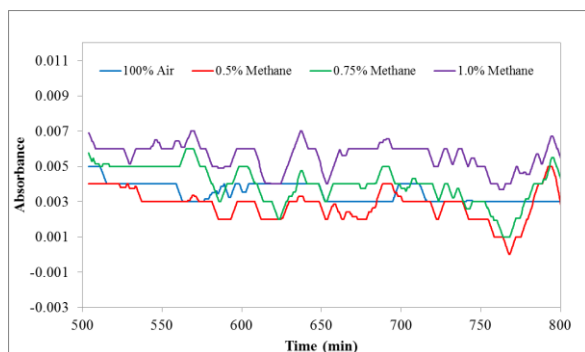


Figure 4 Absorbance response versus wavelength when exposed to CH₄ gas at room temperature

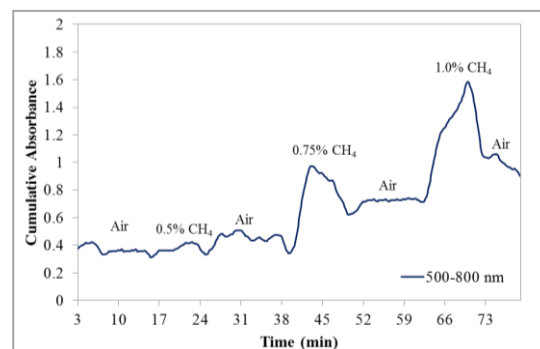


Figure 5 Dynamic response of ZnO sensor when exposed to 0.5%, 0.75% and 1.0% concentration sensor exposed to CH₄ at room temperature

Figure 5 shows the dynamic response of ZnO coated tapered optical fiber sensor when exposed to 0.5%, 0.75% and 1.0% concentration of CH₄. It was found that the absorbance changes only occur when exposed to 0.75% and 1.0% of CH₄ concentration. At 0.5% of CH₄, there is no change detected at all. It is believed that due to ZnO amorphous structure that is dense with no porosity has made active surface area of the ZnO to react with the analyte became less. On the other hand, when the CH₄ concentration is increase, molecules of H⁺ from the broken bond of CH₄ surpluses on the surface and reacted to the chemisorbed oxygen on the surface of ZnO [6]. The response and recovery time recorded for 1% exposure of CH₄ are 2.0 minutes and 3.0 minutes, respectively.

4. CONCLUSION

CH₄ gas sensing using ZnO coated on tapered optical fiber have been successfully presented in this paper. From the SEM and Edx characterization, the ZnO coating layer exhibit uniform thin film amorphous structure with thickness of 750 nm averagely. The sensor response was detected at room temperature for higher concentration (0.75% and 1.0%) of CH₄ gas compared to the lower concentration (0.5%). This sensor has shown potential gasochromic properties for CH₄ gas sensing application.

REFERENCES

- [1] P. Bhattacharyya, P.K. Basu, H. Saha, S. Basu, "Fast response methane sensor using nanocrystalline zinc oxide thin films derived by sol-gel method", *Sensors and Actuators B: Chemical*, vol. 124(1), pp 62-67, 2007
- [2] S. Pishdadian, M. Shariati, Ghaleno, "Influences of annealing temperature on the optical and structural properties of manganese oxide thin film by zn doping from sol-gel technique", *Acta Physica Polonica A*, vol. 123, pp 741-745, 2013
- [3] H. Nanto, H. Sokooshi, T. Usuda, "Smell sensor using aluminium doped zinc-oxide thin-film prepared by sputtering technique", *Sensors and Actuators B*, vol. 10, pp 79-83, 1993
- [4] T. Allsop, V. Kundrat, K. Kalli, G. B. Lee, R. Neal, P. Bond, B. Shi, J. Sullivan, P. Culverhouse and D. J. Webb, "Methane detection scheme based upon the changing optical constants of a zinc oxide/platinum matrix created by a redox reaction and their effect upon surface plasmons", *Sensors and Actuators B: Chemical*, vol. 255, pp 843-853, 2017
- [5] N. A. M. Yahya, M. R. Y. Hamid, B. H. Ong, N. A. Rahman, M. A. Mahdi, M. H. Yaacob, "H₂ Gas Sensor Based on Pd/ZnO Nanostructures Deposited on Tapered Optical Fiber", *IEEE Sensors Journal*, vol. 20 (6), pp 2982-2990, 2020
- [6] Y. Yang, X. Wanga, G. Yi, H. Li, C. Shi, G. Sun, Z. Zhang, "Hydrothermally synthesized ZnO hierarchical structure for lower concentration methane sensing", *Materials Letters*, vol. 254, pp 242-245, 2019

INTERNET OF EVERYTHING (IOE) - INPUT BASED MACHINE LEARNING MODEL FOR BATTERY MODULE LONGEVITY OPTIMIZATION AND FAILURE PREDICTION

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Abstract –Battery storage plays a vital role in smoothing out the fluctuations in energy demand and generation from distributed renewable sources. Batteries are susceptible to various factors such as a change in temperature, charging cycles, etc. Power storage batteries are expensive; therefore, various measures should be taken to make sure it is working in the optimal conditions, these batteries also fail during operations thus affecting the power demands. The project will investigate various machine learning approaches to optimize battery operations in domestic applications (Modules Longevity and failure predictions). Machine learning can help predict battery failure and optimize battery life by using reinforced learning, it is possible to make optimal battery charging and discharging decisions. The research will involve extensive simulations and building machine learning models. The machine learning models are trained to capture a battery's state of health and to predict its remaining lifetime. Furthermore, a high-estimation accuracy model translates into a lifetime extension of battery packs, since it allows for a Battery Management System that can identify and protect weak cells. This research leads to the development of a cost-effective and highly reliable and safe energy storage solution.

Keywords : Machine learning; battery optimization; failure prediction

1. INTRODUCTION

Currently, in Malaysia battery power storage information monitoring systems were only used to monitor the power and battery voltage current stage throughout its service. Batteries' health is merely predicted by using only the voltage level [1]. Battery cells do fail throughout their service without notice, this could lead to unwanted downtime and replacement cost. By identifying the cell which would fail can eliminate downtime by introducing preventive maintenance (replacing affected cells/modules).

Scientific advancements based on the electricity, as a way to transfer energy, are fundamental in our understanding of different types of complex energy deliveries. There has been an energy transition underway since the start of this millennium, comprised primarily of a push towards replacing large, fossil-fuel plants with renewable and distributed generation [2]. On the other hand, one part of scientific communities relying on some electricity concept was able to build the first artificial (brain-like) network [3]. So far, both types of networks (e.g. electric battery and neural networks) are composed of many interconnected layers [4]. From a theoretical perspective, we tried to bring closer the future electric battery and artificial intelligence for their mutual benefits [5].

Energy is a limited resource which faces additional challenges due to recent efficiency and decarbonization goals worldwide. The actual transition of electric grid towards a sustainable, efficient and flexible electricity network requires more and more complex methods [6]. Moreover, urbanization and electrification trends show that the total energy demand will increase in the future, while at the same time the total electrical consumption in the world is increasing and the penetration of energy from renewable sources is increasing as well [7]. Consequently, from literatures the investigation of future smart batteries capabilities in order to have a system that can monitor, predict, schedule, learn and make decisions regarding local battery energy consumption and production in real-time [8–9]. This challenging problems in batteries, where confined to more fundamental research problems, such as: (1) how to obtain a more accurate prediction method; (2) how to find an optimal scheduling when is performed an online learning task; and (3) how to learn multiple-tasks in a more automatic way.

Machine learning is a data analysis technique in which computers are taught to make decisions based on experience [10]. The algorithms improve their performance adaptively as the number of available samples increases [11]. With the increase in the amount of Big Data, machine learning has become a crucial technique to solve problems. It involves two methods: supervised learning, which trains a model with previously known input and output data to predict future outputs and unsupervised learning, which finds hidden patterns and intrinsic structures within the input data [12].

2. METHODOLOGY

2.1 Framework

Phase 1:

1. Purchase rechargeable batteries (Panasonic NCR18650B 3.7V 3400 mAh Li-ion Rechargeable Cells) and assemble to a 24V pack with optimal configuration.
2. Construct a mini solar farm using Monocrystalline Solar PV 200W 24V panels 5kW solar output with the maximum output capacity of 5kWp, 24V - 48V. Coupled with EPEVER UP5000-M6342 (48V-220V) Pure Sine Wave Hybrid Inverter & 60A Mppt Solar Charge Controller (4kW).
3. Review and investigate the existing methods to evaluate battery life and optimization.

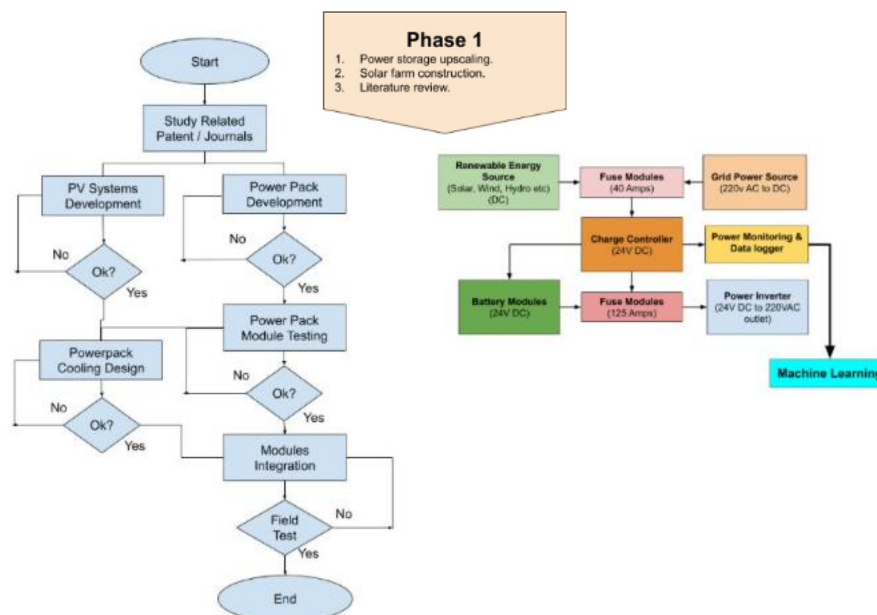


Figure 1 Phase 1 of the research

Phase 2:

Data collected and gathered are (voltage, capacity, current, temperature). This is time series data collected from sensors through data pipeline (bigdata). To ensure that the data obtained are in good fit, data cleaning would probably be required. Cleaned data will then be used to build the algorithm model.

Phase 3:

Classification Machine Learning converts failure signals into “label classification” to develop the Machine Learning model. This algorithm will predict which battery model would fail. When a battery module actually fails, that is the final label (failure data). An algorithm will be selected, a data pipeline is built, and after applying the algorithm, we’ll have a model. While Regression Machine Learning techniques convert degrade signals into unique labels. This algorithm will find/estimate the lifespan/longevity of the battery and predict what is the remaining life of the battery, it will develop a deep learning model where we have a final failure and the sensor data. Data at various places, like for

example, how the signal was looking at 20% life, at 40% life, at 60% life, etc. is used to get the accurate model.

Phase 4:

Optimization will use reinforced learning to apply iteration algorithms from either classification or regression models (or possibly combining both models). The algorithm will be deployed to optimize & real-time SOH monitoring.

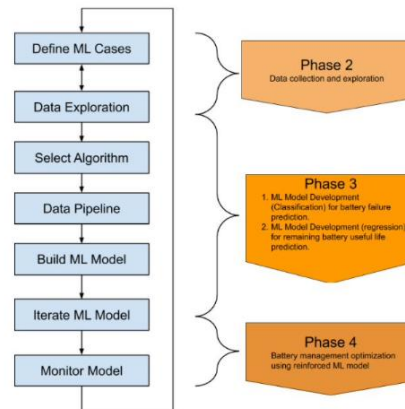


Figure 2 Phase 2 to Phase 4 of the research

3. CONCLUSION

This research has expected to enable the predictive control/maintenance of Li-ion batteries applications. Employing a machine learning approach with IOE application will be used to build predictive models for battery modules failure prediction. The approaches and tools will provide greater transparency into the current and future health of an operating battery cell, more cost-effective maintenance/control (M/C) strategies and improved safety, and opportunities for life extensions. The platform, if successfully implemented, will potentially lead to the development of a cost-effective, and highly reliable and safe energy storage solution.

ACKNOWLEDGEMENT

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REFERENCES

- [1] R. Marom, S. F. Amalraj, N. Leifer, D. Jacob, and D. Aurbach, "A review of advanced and practical lithium battery materials", *J. Mater. Chem.*, vol. 21, pp 9938-9954, 2011
- [2] International Renewable Energy Agency (IRENA), "Electricity storage and renewables: Costs and markets to 2030", pp 1-132, 2017.
- [3] H. T. Lin, T. J. Liang, and S. M. Chen, "Estimation of battery state of health using probabilistic neural network", *IEEE Trans. Ind. Informatics*, vol. 9(2), pp 679-685, 2013
- [4] G. Dong, X. Zhang, C. Zhang, and Z. Chen, "A method for state of energy estimation of lithium-ion batteries based on neural network model", *Energy*, vol. 90(1), pp 879-888, 2015
- [5] T. A. Ocran, J. Cao, B. Cao, and X. Sun, "Artificial neural network maximum power point tracker for solar electric vehicle", *Tsinghua Sci. Technol.*, vol. 10(2), pp 204-208, 2005
- [6] R. Garcia-Valle and J. A. P. Lopes, "Electric vehicle integration into modern power networks", Springer, New York, 2013

- [7] D. Keiner, M. Ram, L. D. S. N. S. Barbosa, D. Bogdanov, and C. Breyer, "Cost optimal self-consumption of PV prosumers with stationary batteries, heat pumps, thermal energy storage and electric vehicles across the world up to 2050", *Sol. Energy*, vol. 185, pp 406-423, 2019
- [8] B. G. Kim, S. Ren, M. Van Der Schaar, and J. W. Lee, "Bidirectional energy trading and residential load scheduling with electric vehicles in the smart grid", *IEEE J. Sel. Areas Commun.*, vol. 31(7), pp 1219-1234, 2013
- [9] B. G. Kim, S. Ren, M. Van Der Schaar, and J. W. Lee, "Bidirectional energy trading for residential load scheduling and electric vehicles", in *Proceedings - IEEE INFOCOM*, pp 595-599, 2013.
- [10] S. Ichi Amari, "Machine Learning", in *Information Geometry and Its Applications. Applied Mathematical Sciences*, vol. 194, Springer, Tokyo, 2016
- [11] T. C. Silva and L. Zhao, "Machine learning in complex networks", Springer, Cham., 2016
- [12] S. B. Kotsiantis, "Supervised machine learning: A review of classification techniques," *Informatika (Ljubljana)*, vol. 31, pp 249-268, 2007

TAHAP KESEDIAAN SYARIKAT PENGURUSAN FASILITI DALAM PELAKSANAAN SISTEM PENUAIAN AIR HUJAN (SPA) DI BANGUNAN INSTITUSI PENDIDIKAN

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Abstrak – Sistem Penuaian Air Hujan (SPA) adalah kaedah penggunaan semula air hujan sebagai sumber bekalan air kedua untuk kegunaan aktiviti harian, selain makan dan minum. SPAH diiktiraf sebagai salah satu alternatif bagi mengurangkan penggunaan bekalan air utama. Kini, masalah kekurangan air bersih dan kekerapan catuan air di Malaysia adalah di tahap membimbangkan. Statistik Kementerian Perumahan dan Kerajaan Tempatan Tahun 2019 menunjukkan pelaksanaan SPAH di bangunan institusi pendidikan adalah di tahap rendah. Kajian ini bertujuan mencadangkan amalan baik dalam pelaksanaan SPAH di bangunan institusi pendidikan. Kajian ini menggunakan kaedah kualitatif menerusi temubual berstruktur bersama profesional daripada syarikat pengurusan fasiliti. Hasil kajian mendapati bahawa tahap kesediaan sesebuah syarikat pengurusan fasiliti untuk melaksanakan SPAH adalah dipengaruhi oleh tiga faktor utama; 1) faktor kewangan yang kukuh, 2) faktor pengetahuan mengenai SPAH yang baik, dan 3) faktor penyediaan infrastruktur yang lengkap. Selain daripada itu, penemuan baharu mendapati bahawa tempoh pulangan balik (ROI) dan kesediaan pihak pemegang taruh juga perlu di ambil perhatian sebagai salah satu faktor di dalam mengenalpasti tahap kesediaan syarikat pengurusan fasiliti melaksanakan SPAH. Oleh itu, kajian ini mengesyorkan agar faktor-faktor kesediaan diambil kira sebelum pemasangan SPAH di bangunan institusi pendidikan khususnya dan seterusnya dapat menyokong hasrat pembangunan lestari negara.

Kata kunci : Sistem Penuaian Air Hujan; bangunan institusi pendidikan; pengurusan fasiliti

1. PENGENALAN

Sistem Penuaian Air Hujan (SPA) adalah sistem yang mengumpul dan mengguna semula air hujan [1] untuk kegunaan harian selain makan dan minum sekaligus sistem ini dapat mengatasi masalah berkaitan kekurangan bekalan air bersih dan terawat dan seterusnya dapat menampung keperluan bekalan air awam semasa krisis serta mengurangkan risiko banjir kilat [2].

Sekitar tahun 1990-an, Malaysia telah mengalami banyak krisis air yang membawa kepada kemerosotan dan kerugian ekonomi sehingga kerajaan terpaksa menanggung kos kerugian yang besar. Perkara ini membuatkan masyarakat mula berfikir untuk mencari alternatif bagi mengatasi krisis air di Malaysia [2]. Selain itu, tarif air yang semakin meningkat turut menyebabkan peningkatan kos bil air [1]. Menurut Md Lani et al. [1], pelaksanaan SPAH di bangunan besar seperti bangunan komersial dan institusi lebih menguntungkan kerana permintaan terhadap sumber air yang tinggi berbanding kawasan perumahan. Justeru itu, pemasangan SPAH di bangunan institusi pendidikan adalah satu cadangan yang penting. Walaupun kerajaan telah melaksanakan program SPAH di kebanyakan tempat [1], namun statistik bangunan institusi pendidikan yang melaksanakan SPAH masih rendah [3].

Kajian ini merangkumi tiga objektif dimana untuk mengenalpasti faktor-faktor kesediaan syarikat pengurusan fasiliti dalam melaksanakan SPAH, untuk menganalisa tahap kesediaan syarikat pengurusan fasiliti dalam melaksanakan SPAH dan mencadangkan amalan baik terhadap syarikat pengurusan fasiliti di dalam melaksanakan SPAH.

Pengurusan Fasiliti merupakan pihak yang bertanggungjawab untuk menguruskan SPAH di bangunan seliaan. Sebagai langkah permulaan untuk mengenalpasti tahap kesediaan syarikat pengurusan fasiliti dalam melaksanakan SPAH di bangunan tertentu, kajian ini menggariskan tiga faktor utama yang mempengaruhi pencapaian matlamat utama kajian ini iaitu faktor pengetahuan,

keuangan dan infrastruktur. Pernyataan ini disokong kajian Nousiainen & Junnila [4], di mana pemilik bangunan memerlukan pengurus fasiliti yang berpengetahuan dalam menyediakan perkhidmatan berkaitan dengan persekitaran dan tenaga. Shahrul Annuar [5] juga turut menyatakan kurangnya subsidi dan insentif kewangan dari pihak kerajaan merupakan penghalang utama dalam melaksanakan SPAH. Berdasarkan pindaan Undang-Undang Kecil10, di bawah Undang-Undang Kecil Bangunan Seragam1984 (UKBS), menyatakan bahawa bangunan yang sesuai melaksanakan SPAH adalah bangunan yang mempunyai keluasan bumbung sama atau melebihi 100 meter persegi.

2. METODOLOGI KAJIAN

Kajian ini menggunakan pendekatan kualitatif bagi mencapai objektif yang dinyatakan. Kaedah temubual berstruktur telah digunakan sebagai instrumen pengumpulan data. Seramai empat orang responden telah terlibat di dalam temubual ini, dan responden memberikan input-input yang signifikan bagi mencapai objektif kajian. Responden yang terlibat adalah terdiri daripada pengurus fasiliti yang pakar di dalam bidang kajian.

3. HASIL KAJIAN DAN PERBINCANGAN

Jadual 1 di bawah menunjukkan latar belakang responden yang terlibat di dalam kajian ini. Majoriti responden bersetuju dengan faktor-faktor yang mempengaruhi tahap kesediaan dalam pelaksanaan SPAH iaitu faktor pengetahuan, faktor kewangan dan faktor infrastruktur.

Jadual 1 Latar belakang responden

Syarikat Pengurusan Fasiliti	Lokasi Institusi Pendidikan	Responden	Tempoh Berkhidmat
BMES Maintenance Services Sdn Bhd	ILD, Nilai	R1	5 tahun ke atas
	UiTM, Seremban	R2	5 tahun ke atas
	UiTM, Rembau	R3	Kurang dari 2 tahun
	UiTM, Puncak Alam	R4	Kurang dari 2 tahun

Jadual 2 merumuskan bahawa majoriti Pengurus Fasiliti di bangunan institusi pendidikan belum bersedia dari aspek kewangan untuk melaksanakan SPAH disebabkan modal permulaan yang tinggi.

Jadual 2 Analisa tahap kesediaan syarikat pengurusan fasiliti dalam melaksanakan SPAH

Faktor	R1	R2	R3	R4
Pengetahuan	/	/	/	/
Infrastruktur	/	/	/	/
Kewangan	X	X	X	X

Jadual 3 menunjukkan cadangan amalan baik dalam pelaksanaan SPAH dikalangan responden.

Jadual 3 Analisa dapatan kajian bagi objektif ketiga

Responden	Jawapan
Apakah amalan baik yang boleh dicadangkan bagi melaksanakan SPAH?	
R1	Faktor kewangan yang stabil dan pengetahuan yang tinggi
R2	Faktor kewangan yang stabil
R3	Infrastruktur yang lengkap dan kewangan yang stabil
R4	Kos, ROI dan kesediaan pihak Pemegang Taruh

Melalui maklumbalas R1&R4, kos permulaan yang tinggi merupakan halangan utama manakala kefahaman pihak klien turut menjadi faktor halangan utama di dalam pelaksanaan SPAH.

4. KESIMPULAN

Kesimpulan daripada hasil kajian mendapati bahawa amalan baik bagi persediaan melaksanakan SPAH di institusi pendidikan adalah dengan memastikan faktor kewangan yang kukuh diikuti dengan faktor pengetahuan mengenai SPAH yang baik seterusnya penyediaan infrastruktur SPAH yang lengkap. Selain itu, penemuan baharu yang diperolehi daripada hasil temubual mendapati tempoh pulangan balik (ROI) serta kesediaan pihak pemegang taruh terhadap pelaksanaan SPAH juga perlu diambil perhatian sebagai faktor amalan di dalam pelaksanaan SPAH di bangunan institusi pendidikan.

PENGHARGAAN

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RUJUKAN

- [1] Md Lani, N. H., Yusop, Z., & Syafiuddin, A., "A Review of Rainwater Harvesting in Malaysia", *Water*, 10(4), 506, 2018
- [2] Shareh Musa, S. M., Wan Husin, H., Md Yassin, A., & Shafii, H., "Aplikasi sistem penuaian air hujan di kawasan perumahan", *Journal of Techno Social*, 9(2), 1–18, 2018
- [3] Azlina, N., "Statistik Pelaksanaan Sistem Penuaian Air Hujan Dalam Projek Pembangunan PBT", 2019
https://www.data.gov.my/data/ms_MY/dataset/statistik-pelaksanaan-sistem-penuaian-air-hujan-dalam-projek-pembangunan-pbt
- [4] Nousiainen, M., & Junnila, S., "End-user requirements for green facility management", *Journal of Facilities Management*, 6(4), 266, 2008
- [5] Shahrul Annuar, S., "Tuaian hujan bantu atasi gangguan bekalan air", *Berita Harian*, 2016

CONTEXUALIZED PROJECT MANAGEMENT PRACTICES: POTRAIT OF CURRENT PROFESSIONAL GOOD PRACTICE

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Abstract – Globalization causes high competition in the market that influence the development of IT projects. However, in 2019 the Standish Group reported 64% of IT project are partially or completely fail. The high failure rate shows that IT professionals are experiencing project failures quite often. Their experiences become a source of indispensable information for others to learn, unlearn and relearn IT project management good practices. Therefore, research has been devised to find out the good practices of managing IT projects from the perspective of IT professionals. Data were collected using purposive sampling survey and semi-structured questionnaire. The quantitative data were subjected to descriptive statistics using ranking and frequencies analysis. It reveals and suggests the most common good practices for more effective project management that fall into four dimensions namely planning; organizing, leading; and controlling. These findings could assist other project managers to take better control of their projects through sharing good practices on how those projects are managed. It also could be used by the project team members to focus their training or skills enhancement efforts.

Keywords : Project management; good practices; IT projects

1. INTRODUCTION

A project was defined as: “a temporary endeavour undertaken to create a unique product, service, or result with start and finish dates to achieve an objective conforming to specific requirements, including constraints of time, cost and resources” [1]. It also means that projects are temporary organisations, established to achieve desired goals and objectives [2], resulting in project teams being also temporary, redundant or reassigned after the completion of the project. Managing this temporary organization is very demanding. One has to effectively and efficiently managing the resources, tasks and activities, within the associated timelines. There are many surveys conducted globally and cross industry lines to give an overall view of the rate of project successes and drivers of project failure. IT projects have a quite high failure rate. According to studies by The Standish Group [3] 64% of IT projects are partially or completely fail. Associated to this, there are studies in management literature that focused on learning from failure on the individual where IT professionals learn from failed projects and leverage the gained knowledge in future projects [4,5]. In addition, Badewi [6] stated that project management practices are required to ensure project success. Therefore, several organizations in different industries have begun to understand the benefits they can get when applying project management practices.

This study aims to make a contribution to help organizations identify the practices mostly used by similar organizations (as a benchmark) and define, based on this knowledge, priorities for selecting practices that can be implemented at their own organizations. It is also to highlight the project management good practices with an aim to contribute to today’s knowledge and practices existing on the area of IT based project in particular. IT project success is fundamental question for most governments and private organizations in this millennium era. It is very crucial to never stop looking for ways of contribution for the improvement of IT project management success.

2. METHODOLOGY

This project utilized a survey for data collection. The survey with 5-Likert scale questions with objectives to find the best practices that fall under the four main dimension of project management was devised. Based on the literature done, all possible factors under each dimension were listed out and were pre-tested by three experts (personnel involved more than 3 years in project management

activities) and minor amendments were made. An open-ended question was also asked for respondents to provide answers that were different from the options provided.

The feedback of the questionnaire was based on the respondents' experiences and practices. The target population was the project stakeholders who had experience managing IT projects and were based in Malaysia, Bangladesh, Czech Republic and the United Kingdom. The respondents comprised of project directors, project managers, programme managers and project decision-makers for a number of organizations ranging from IT consulting firms, IT and telecommunication companies, banks, public service agencies, business services organization, education, healthcare, broadcasting, automotive, oil and gas companies to national security agency.

Using the purposive sampling technique, data from 60 people who have a minimum of 3 years' experience in managing IT project with some experience and knowledge of the project management practices within their organizations, based on their job position or function, were collected. Table 1 shows 60% of the respondents are male while another 40% respondents are female. Most of the respondents' age are between 30 years old to 49 years old with minimum of bachelor's degree qualification. Only 5 respondents have diploma qualification but all of them are professional project management certified. While 13% of the respondents have more than six years' experience as Programme or Project Director.

Table 1 Demographics

Category	Sub category	PhD	Master	Degree	Diploma with Professional Cert	Total
Male	Age group: 50 years & above		1		1	
	Age group: 40 - 49		2	1	1	
	Age group: 30 - 39	2	6	12	3	
	Age group: 25 - 29			7		
	Total	2	9	20	5	36
Female	Age group: 50 years & above		1			
	Age group: 40 - 49	2	4	4		
	Age group: 30 - 39		3	8		
	Age group: 25 - 29			2		
	Total	2	8	14	0	24
		4	17	34	5	60

3. RESULTS AND DISCUSSION

After the survey was carried out, 14 questions that were categorized based on the dimensions were analysed. The factors were ranked according to the frequency measured based on the scale. The results also show the emergence of three new factors that were pointed out from the survey and mentioned more than once by different respondents. These factors were not written exactly in the same manner; thus, they need to be interpreted and grouped into categories accordingly. An expert was engaged to validate the coding. Table 2 depicts all the 17 practices within four dimensions related to good practices in IT project management.

Table 2 Good practices sort by dimensions

GOOD PRACTICES GROUPED BY DIMENSION	RANKING
PLANNING	
Develop proper project plan that decides which people, resources and budget are required to complete the project.	90%
Understand project objective, define project scope and verify it with stakeholders to avoid scope creeps away.	88%
Adapt proper project management methodology, one with clear tools and techniques.	87%
Establish clear roles and responsibilities by using tools to plan and assign responsibilities.	87%
Define project deliverables properly and avoid unrealistic milestone.	87%
ORGANIZING	
Manage team workload by setting a realistic limit based on the difficulty and duration of each task.	88%
Split long projects into shorter sub-projects to reduce the complexity and increase the chances of success.	75%
Enabled virtual workspace through technological platforms that allow engagement and interactivity.	**
Establish clear process and documentation of project handover and transition activities.	**
LEADING	
Develop collaborative leadership competencies alongside technical competencies.	80%
Encourage cultural awareness among virtual team members to improve communication and trust.	77%
Build effective project governance structure to align organization vs project direction and monitor project performance.	**
CONTROLLING	
Track and report project progress periodic and appropriately.	90%
Maintain consistent communication with a regular meetings and encourage effective communication.	87%
Manage project change effectively - expect and accommodate change requests by having change management policy.	87%
Establish risk response team to mitigate and manage project risks properly.	82%
Hold project conclusion meeting to let everyone knows ahead of time what will be covered in the meeting and what to expect.	82%

** new element stated by the respondents

4. CONCLUSION

This study concluded by listing 17 good project management practices according to their ranks based on the industry practitioners' experiences. Apart from 14 good practices that were benchmarked, three new good practices emerged. These good practices could help guide the project managers in making their project successful. Needless to say, the success of the IT project plays an important role in an

organization's overall success. With the increased competition in millennium era, companies are expecting the project teams to perform consistently and at a rapid pace. In project management, project managers plan, organize, lead and control resources to maximize the productivity and efficiency of the team. Therefore, through good project management practices, the project team is expected to become more productive and efficient to attain the project's goals. Furthermore, it is recommended that future study on this subject should be done considering the new norm of managing IT project in accordance with the disruptions that occurred during the Covid-19 pandemic outbreak.

ACKNOWLEDGEMENT

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REFERENCES

- [1] Project Management Institute, "A Guide to the Project Management Body of Knowledge (PMBOK Guide)", 6th ed., Project Management Institute, 2017
- [2] J. R. Turner, Project Success Criteria, pp 32-33, 2002
- [3] Standish Group, "Chaos Report 2018", The Standish Group International, 2018
- [4] Shepherd, D.A., Haynie, J.M., and Patzelt, H., "Project failures arising from corporate entrepreneurship: Impact of multiple project failures on employees' accumulated emotions, learning, and motivation", *Journal of Product Innovation Management*, vol. 30(5), pp 880-895, 2013
- [5] Shepherd, D.A. and Cardon, M.S., "Negative emotional reactions to project failure and the self-compassion to learn from the experience", *Journal of Management Studies*, vol. 46(6), pp 923-949, 2009
- [6] Badewi, A., "The impact of project management (PM) and benefits management (BM) practices on project success: Towards developing a project benefits governance framework", *International Journal of Project Management*, vol. 34(4), pp 761-778, 2016

EDUCATION-ADVENTURE GAME ADAPTIVE MODEL FOR GAME ARCHITECTURE LEARNING PROCESS

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Abstract – Game architecture is an important topic in game development. Even though there are several learning strategies framework to learn game, there is a lack of adaptive model that focuses on how education adventure-games aid in learning game architecture. Thus, the main objective of this research is to develop Adaptive Model: Education-Adventure Games for Game Architecture Learning Process (EDUADV Framework). This research conducted a survey to investigate students' perception of game and its importance in game architecture learning process. EDUADV Adaptive Model has been developed based on literature review and analysis. This model is derived from the comparison of components from two game architecture frameworks and 22 elements of game architecture. Quasi-experiment which involved thirty-three Diploma in Game Design students was employed to verify the model. Pre-test was conducted with Control and Treatment Group after several weeks of learning the game architecture theory. The Treatment Group were then taught using Education Adventure Games while the control group continued learning theoretically. The results of the study revealed the Post Test Result for the Control Group and Treatment Group where the pass percentage for understanding all elements was more than 70% while the understanding of several elements for Control Group was below 70%. This showed that Education-Adventure Game has brought benefits towards increasing the students' understanding of game architecture development.

Keywords : Adventure EduGame; educational game; game architecture; game learning process

1. INTRODUCTION

A number of lecturers stated that the idea of merging technology in learning is able to improve students' mentality, knowledge and focus. However, it was found that many university and college are still using traditional teaching method. Most studies also show that 'learnt through play' [1] has proven to be a successful learning experience. Game architecture is an important subject in developing game. Hence, Diploma in Game Design students should master the game architecture and game design subjects. However, the students face difficulties in understanding the implementation of game architecture concepts ending up did not have the skills required for game development. The objective of this study is to investigate the elements of game-based learning and validate Adaptive Model for game architecture learning process.

2. METHODOLOGY

This research can be divided into 4 phase, 1)Problem Formulation, 2)EduAdv Framework Development, 3) Eduadv Framework Validation. In Phase 1: Problem formulation phase, a literature review and survey were conducted. In Phase 2: EduAdv Framework Development, the researcher compared existing framework, identify game-based learning success criteria, develop EduAdv Game Framework and develop EduAdv Games to teach games architecture based on the framework produced. In Phase 3: 33 students of Diploma in Game Design were then taught Game Architecture and were further divided into Control Group and Treatment Group. Both groups were pre-tested. Control group were then taught using theoretical learning method while the Treatment Group were using game-based learning method. Post-test was then conducted with both the Control Group and Treatment Group. User Acceptance Test was also conducted with all the respondents.

3. RESULTS AND DISCUSSION

EDUADV Adaptive Model (refer Figure 1) is developed based on literature review and comparison of the existing framework, Game Object Model Version II and Framework of Flow in Computer Environments. This model is derived from comparing components from the two game architecture frameworks and 22 elements of game architecture.

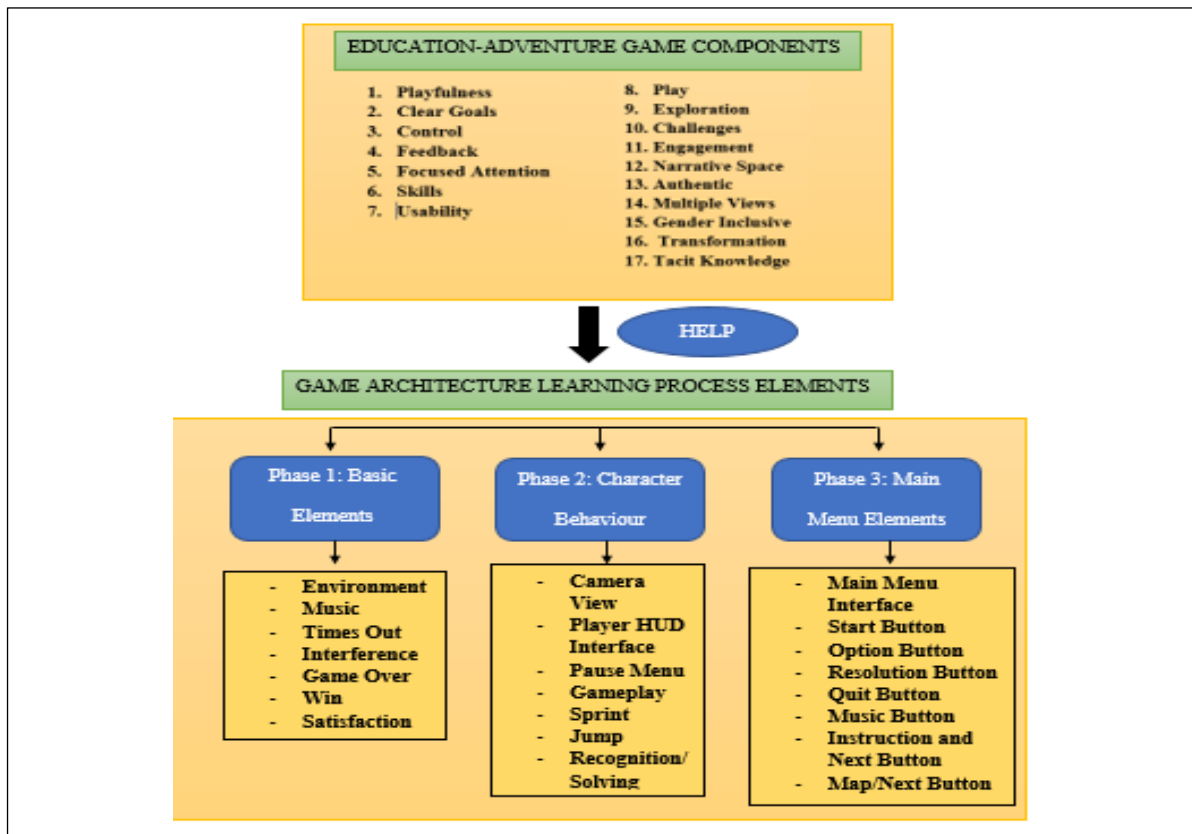


Figure 1: EduAdv Game Adaptive Model

Based on the survey conducted, 97% of the respondents love to play games while 3% of them did not have interest in game. The comparison of the result between pre-test and post-test for Treatment Group can be seen in Table 1. Based on the index of percentage above it can be concluded that Educational-Adventure Game increased the performance of students in terms of game knowledge. Based on the comparison of the Post Test Result for the Control Group and Treatment Group, the pass percentage for understanding all elements was more than 70% while the understanding of several elements for Control Group was below 70%. The elements below 70% for Control Group were quit button, player Hud interface, sprint, jump, picking up the letter, if get caught by enemies, game over, win the game and satisfied playing this game. The performance of Treatment Group was better than the Control Group. Overall, it can be inferred that the students were able to implement the terms of education and adventure game genre and merge them to create a good performance game.

4. CONCLUSION

Based on the EduAdv Game Adaptive Model, it can be concluded that the components under both frameworks gave a positive behaviour when emended with the elements of game architecture. From the developed adaptive model, it showed that Educational-Adventure Game increased the performance of students in terms of game knowledge. The performance of Treatment Group was better than the Control Group. As the Education Adventure Game Adaptive Model will help in game architecture learning

process, the two main focus will be the components of both framework and elements of Game Architecture. Under these components, there will have two framework components. Once we create the components, then we will create the elements of Game Architecture. Under Game Architecture, we will have 22 elements. In order to validate the adaptive model, this research use quasi-experiment method. Thirty-three students of Diploma in Game Design student had been teaching game architecture theory. The thirty-three students had been divided into Control Group and Treatment Group and they took the Pre-test to check their understanding of the game architecture.

Table 1 Comparison of the result between pre-test and post-test for Treatment Group

User Acceptance Test (UAT)	Learning Process (Achievement Test)				
	(Pre-Test) Treatment Group		(Post-Test) Treatment Group		Increased/Decreased of Pass Percentage
	Pass	Fail	Pass	Fail	
Basic Elements					
Main Menu Interface	100%	0%	90.9%	9.1%	-9.1%
Start Button	72.72%	27.28%	81.81%	18.18%	+9.1%
Options Button	72.72%	27.28%	90.9%	9.1%	+18.2%
Resolution Button	90.91%	9.09%	90.9%	9.1%	+0%
Quit Button	81.82%	18.18%	81.81%	18.18%	+0%
Music Button	81.82%	18.18%	90.9%	9.1%	+9.1%
Instructions and Next Button	64.64%	36.36%	90.9%	9.1%	+26.3%
Character Behavior Elements					
Camera View	63.64%	36.36%	90.9%	9.1%	+27.3%
Player Hud Interface	72.72%	27.28%	81.81%	18.18%	+9.1%
Pause Menu	81.82%	18.18%	90.9%	9.1%	+9.1%
Game Play	100%	0%	72.72%	27.72%	-27.3%
Sprint	63.64%	36.36%	81.81%	18.18%	+17.54%
Jump	72.72%	27.28%	81.81%	18.18%	+9.1%
Picking Up the Letter	45.45%	54.55%	90.9%	9.1%	+45.45%
Main Menu Elements					
The Environment	63.64%	36.36%	72.72%	27.72%	+9.1%
Music	45.45%	54.55%	72.72%	27.72%	+27.3%
If Time runs out	45.45%	54.55%	81.81%	18.18%	+35.73%
If Get Caught by the Enemies	63.64%	36.36%	72.72%	27.72%	+9.1%
Game Over	27.27%	72.73%	90.9%	9.1%	+63.63%
Win the Game	36.36%	63.64%	90.9%	9.1%	+54.54%
Satisfied Playing this Game	100%	0%	90.9%	9.1%	-9.1%

REFERENCES

- [1] Adam, T., "The Effects of Learning through Play on Postsecondary Student Engagement", Master Thesis, Royal Road University, 2018
- [2] Amory A, Seagram R., "Educational game models: conceptualization and evaluation", South African J High Educ., vol. 17(2), pp 206-217, 2004
- [3] Amory A, Naicker K, Vincent J, Adams C., "The use of computer games as an educational tool: identification of appropriate game types and game elements", Br J. Educ. Technol., vol. 30(4), pp 311-321, 1999

SMART ATTENDANCE MANAGEMENT SYSTEM FOR CLASSROOM

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Abstract – Facial recognition technologies have made improvements and using widely nowadays. The concept of Smart Attendance Management System for educational institutions where attendance plays an important role. As parents and lecturers are concerned about the regularity of students' attendance in order to ensure better academic performance. The most practicing methods of marking attendance are roll call, sign on paper, and fingerprint, which is inauthentic and time-consuming. Hence, there is a requirement for Smart Attendance Management System which will assist lecturers in marking and manage attendance automatically. The system will be able to identify and recognize faces in images that are being captured through a surveillance camera. Three steps of the system are image acquisition, face detection, and recognition and use Principal Component Analysis (PCA) method. This paper describes the method that will use to implement this system, which is highly efficient, less time taken, authentic, and eliminates proxy attendance caused by facial recognition. The aim of implementing this project to gain the lecturer's appreciation of better experiences and helping hand to easily manage classroom activity.

Keywords : Face recognition; attendance system; Principal Component Analysis (PCA)

5. INTRODUCTION

Smart Attendance Management System (SAMS in short) is a concept for lecturers and classroom, using the internet of things (IoT), artificial intelligence (AI) [1]. Will be a Desktop Application based on a relational database. This project in the classroom will bring a new wave of change, that will bring new possibilities and opportunities for the improvement of teaching as well as the learning process. Wherewith using AI system will automate student attendance marking systems via facial recognition. Information about the number of students being present in class will key-in all information and saved in the system automatically. To do those above-mentioned steps manually is a time-consuming process and far difficult to recognize student face. Whereby the system is more natural, less time taken, and highly efficient [2]. Education played an important in all spheres of life and society's progress. It is a demand for continuing betterment of the academic or educational system. The use of such an advanced system will modernize the class activity at various levels. As a result, the implementation of such a type of smart classroom application in educational institutions will have a great impact on enhancing the teaching experience. It will be an application working as a helping hand to teachers.

6. METHODOLOGY

Principal Component Analysis, or PCA, is a dimensional-reduction method that is often used to transform a large set of variables into a smaller one that still contains most of the information in the large set. Reducing the number of variables of a data set naturally comes at the expense of accuracy, but the trick in dimensional reduction is to trade a little accuracy for simplicity. Because smaller data sets are easier to explore and visualize and make analyzing data much easier and faster for machine learning algorithms without extraneous variables to process [3].

The system working is explained in brief below:

1.Capture Image: By using an Installed Camera in the classroom capture the face of the student. The camera in the classroom has to be a suitable place where it could capture all the student's images in the classroom effectively. This camera has to be interfaced with the system for further processing through a wireless network [4].

2. **Image Processing:** Facial recognition algorithm is applied for the captured image. The image is cropped and stored for processing. The function recognizes the images of the student's face which have been registered manually with their names and ID in the database. The process requires the following steps [4]:

- i) **Train Database:** Take facial images of the numbers of students. All the cropped image of the face is resized to a 240 X 300 image and stored in the database to use later for facial recognition algorithm.
- ii) **Feature Extraction:** It is applied to both for training and testing images. Feature Extraction used to extract the features of the image. It is done using the principal component analysis (PCA) Algorithm. In Face recognition, PCA is used for finding patterns. Eigenfaces approach is a PCA method that is used to describe the variation between face images and its learning capability, speed, and simplicity [5].

3. **Face Recognition:** For recognition, the feature locations are refined and the face is normalized with eyes and mouth in fixed locations. Images from the face tracker are used to train a frontal Eigenspace, and the leading three eigenvectors are retained. The projection coefficients of all images of each person are modeled as a Gaussian distribution and the face is classified based on the probability of a match [4,6,7].

4. **Record Attendance:** Excel spreadsheet will be used to store the recorded attendance for the easy-to-use output format, which is also the software that is familiar to the majority of the institution staff. Using the formatting in Excel can effectively retrieve the information effectively [4].

2.1 Framework

The framework used to develop the smart attendance management system is the Rational Unified Process which is also known as RUP (Figure 1). RUP is a software development process from Rational, a division of IBM. It divides the development process into four distinct phases that each involve business modeling, analysis and design, implementation, testing, and deployment.

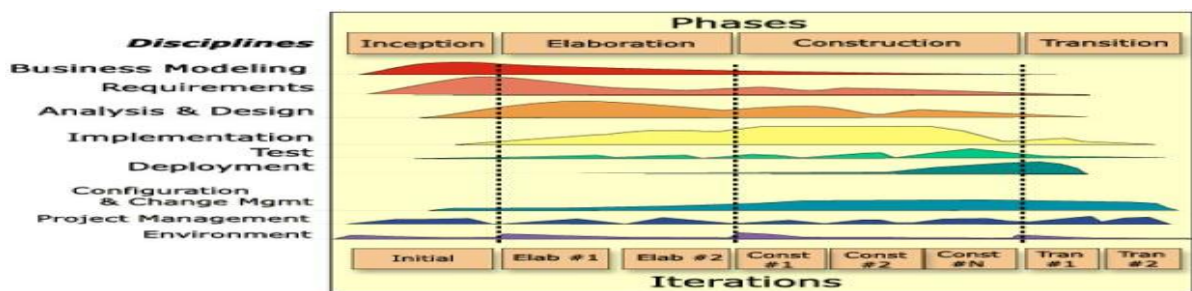


Figure 1 Rational Unified Process (RUP) phase

RUP is a very suitable software development method because the end-user is able to participate in the developing process so that the end-user able to tell the developers about their opinion.

7. RESULTS AND DISCUSSION

To complete the system process installed a camera in the classroom at a suitable place where it could capture all the student's images in the classroom effectively. By using an Installed Camera in the classroom capture the face of the student. This camera has to be interfaced with the system for further processing through a wireless network. The function recognizes the images of the student's face which have been registered manually with their names and ID. Figure 2 shows the system flowchart.

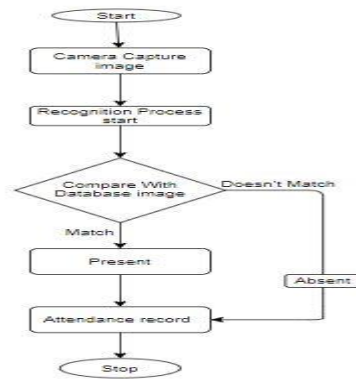


Figure 2 Smart attendance management system flowchart

The main working principle of the system is that the captured image compared with the face database, detect and recognize it. Further, the recognized image of the student is record attendance as a present, else the system marks as absent.

```

6
2 face(s) detected from Image "6.jpg"
Person '4163002531' is identified for face in: C:\images\4176300641\6.jpg - 597b1c5a-c069-45ef-9029-9473d6d6afa5, confidence: 0.96093.
Person '4176300641' is identified for face in: C:\images\4176300641\6.jpg - 5c8be9d9-b0ea-43c6-b741-54c0aac85959, confidence: 0.92436.
recognition_03
images\4176300641\
C:\Users\WUKTADIR\source\repos\FaceRecognition\bin\Debug\netcoreapp3.1\FaceRecognition.exe (process 14468) exited with code 0.
To automatically close the console when debugging stops, enable Tools->Options->Debugging->Automatically close the console when debugging stops.
Press any key to close this window . . .
    
```

Figure 3 Result of face recognition testing

There was consisted of approximately 100 images in the database, which was used in our experiments. The face recognition results shown in Figure 3. The ratio of the identification confidence was 92 to 96 percent. The average correct recognition ratios were 92% and 96% for the training set and the testing set, respectively. Figure 4 shows the example of admin dashboard.

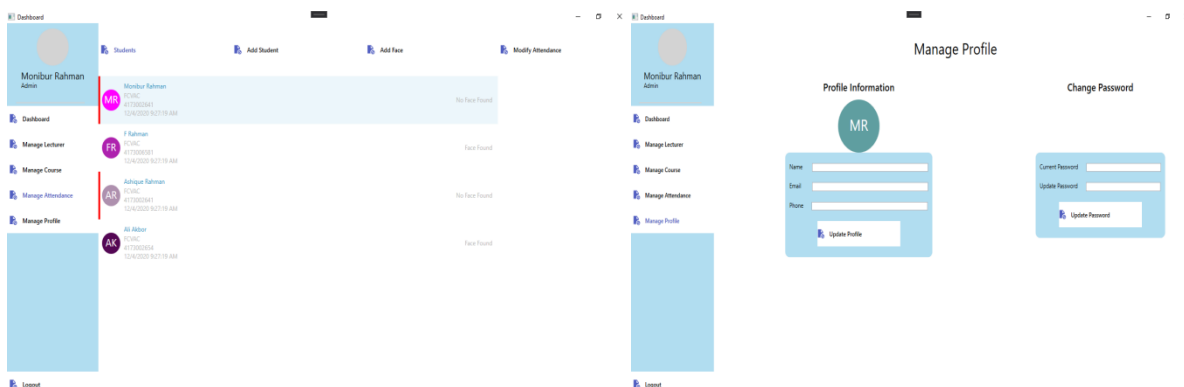


Figure 4 Admin dashboard

8. CONCLUSION

A smart attendance management system helps to get an accurate attendance of students in the classroom of each class and reduces the effort of the lecturer. As a result, the implementation of this application in educational institutions will have a great impact on enhancing class activity to the next level. It will be a helping hand to teachers and This system will be a cost-effective choice for educational institutions. Thus, the environment of a classroom changes to smart.

REFERENCES

- [1] Li-Shing Huang, Jui-Yuan Su and Tsang-Long Pao, “A Context Aware Smart Classroom Architecture for Smart Campuses” *Appl. Sci.*, 9, 1837, 2019
- [2] Sarath Chandu Gaddam and N. V. K. Ramesh, “Attendance Management and User Security System’s based on Eigen Faces Algorithm using Raspberry pi 2 and Ethernet”, *Indian Journal of Science and Technology*, Vol 9(17), DOI: 10.17485/ijst/2016/v9i17/92978, May 2016
- [3] Rajath S Bharadwaj, Tejus S. Rao, Vinay T. R., “Attendance Management Using Facial Recognition”, *International Journal of Innovative Technology and Exploring Engineering (IJITEE)* ISSN: 2278-3075, Volume-8 Issue-6, April 2019
- [4] Chetan.R, Rajesh Nayak, Rajashree Nambiar, Vrunda Adkar, Shashikala.R, “Automated Attendance System Based on Facial Recognition”, © 2017 IJRTI | Volume 2, Issue 6 | ISSN: 2456-3315
- [5] D. Nithya “Automated Class Attendance System based on Face Recognition using PCA Algorithm” *International Journal of Engineering Research & Technology (IJERT)*, ISSN: 2278-0181, Vol. 4 Issue 12, December-2015
- [6] Mu-Chun Su, Yi-Jwu Hsieh, And De-Yuan Huang, “A simple approach to facial expression recognition”, *Proceedings of the 2007 WSEAS International Conference on Computer Engineering and Applications*, Gold Coast, Australia, January 17-19, 2007
- [7] ChinjuPaul, Amal Ganesh, Sunitha, “AN IoT Based Smart Environment For Classrooms”, Volume 119 No. 16 2018, 239-245 ISSN: 1314-3395 (on-line version) url: <http://www.acadpubl.eu/hub/>
- [8] Nandhini R, Duraimurugan N, S.P.Chokkalingam, “Face Recognition Based Attendance System”, *IJEAT*-ISSN: 2249 – 8958, Volume-8, Issue-3S, February 2019

THE CLUSTERING DATA ANALYSIS FOR VALIDATION CLOUD FACTOR ADOPTION

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Abstract - In adoption to the cloud computing a factor adoption are needed to determine and recognize the effectiveness of the factor proposed. The validation is one of the important processes in ensuring the factor proposed is the suitable factor adoption. A few important factor adoptions were defined from the data analysis survey. Then the factor adoption getting needs to validate to ensure the successful factor adoption. Leaving the validation process can cause the acquired adoption factor cannot guarantee the effectiveness factor for cloud computing adoption. Therefore, before proposed the actual factor adoption the identifying the data analysis survey and the adoption of the validation process needs to be conducted. The purpose is to ensure the factor adoption meet the need as a factor adoption. In the validation process, the view and opinions from the expertise were analysed. The clustering analysis for the comment and opinion from the expertise was conducted. The cluster word similarity was analysed by grouping the words that have a similar opinion. The purpose is to visualize whether the opinion given by the experts have a similar result for the other expertise. Thus, the outcome of the study was shown the result of clustering data analysis defined is the important factor that contributed for the successful adoption for cloud computing network environment. Onward can be a benchmark for using the factor for adoption a cloud computing.

Keywords : Cloud computing; adoption; validation

1. INTRODUCTION

The validation of the information retrieval related to adoption factor at the survey analysis study is one of the difficulties in determining either the factor is a suitable factor used as an adoption factor [1]. The analysed from the survey analysis was conducted to identify the factor adoption from the group of the respondent survey. The factor needs to be verified by the expertise in getting the opinion and comment [2]. The factor adoption from the survey analysis needed to be compared with the opinion of the expert to get the appropriate factor. To help with this aspect, the validation of the factor is needed to get an accurate factor adoption, where it needs to be conducted to the experts that have experiences in using Cloud computing. The opinion of the experts was collected to identify the corrected factor received from the survey document analysis.

2. METHODOLOGY

The method for the validation process starts with designing the verification form. The purpose is to enable the expert to write a broad explanation factor adoption. Expert validation was conducted between experts that have experience in handling cloud computing. The ideal size of the focus group was selected because it is easy to control and more opportunity to share insights and observation [3]. The validation process was conducted using face to face where the opinion and comment gathered from different experts. Thus, after completing the expert validation review, the data analysis was conducted. The data analysis was using the clustering word similarity analysis is used to understand the main factor adoption in using cloud computing in real life. To generate realistic evidence from the validation data analysis regarding the weightage of the influence factors reviewed by the experts, the clustering word similarity is performed at the validation process. By using the clustering word similarity for the adoption of a cloud computing, the data were analysed using data validation analysis software which is the most suitable software tool for validation data analysis [4]. Besides, the validation data analysis software enables the code of the collection of data, create and organize the relationship [5].

3. RESULTS AND DISCUSSION

The result of data analysis was measure using Pearson’s Correlation matrix. The result was measurement using the strength of the association. The relationship between the factors can be assumed from strong to weak or none. The value of score on one factor helps to answer the score of the second-factor adoption. Thus, the result was shown the strong relationship between opinion of the expert. The result is shown if the value is +0.50 to +1.00, it shows a strong positive relationship. The analysed by grouping the nodes that have similar words, were conducted using cluster word similarity. The purpose is to visualize whether the opinion given by the experts have a similar result using Pearson correlation coefficients values between the opinions given by the experts. Pearson correlation coefficient (r) showed if the value is nearest to 1, it means the word is the most similar and have a positive correlation [6]. The analysis showed the value of Pearson correlation coefficients near to 1. Thus, the result shows that the expert validation has a similar opinion about the factor stated in the survey analysis.

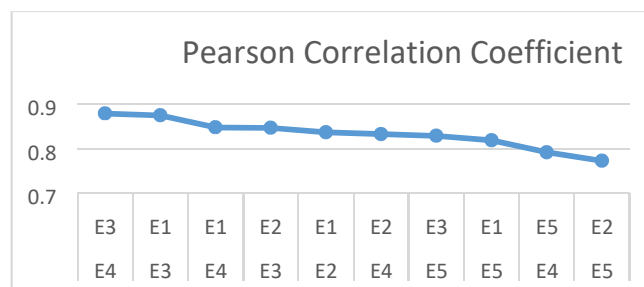


Figure 1 Pearson correlation

The result can be transformed using the Pearson correlation coefficient graph. The result shows the curve of the graph showing the value of the Pearson correlation coefficient was nearing to 1 means that the expert validation has the same opinion and agree of the factor adoption stated at the survey analysis.

4. CONCLUSION

The proper validation process can help in identifying factors that should be used in the adoption of cloud computing. It can also help on how the factor adoption was described in the real experience in adoption to cloud computing. By using word clustering, it can show the appropriate adoption factor where it is done by applying the importance of factor as a true assumption. Next, the factor can be used as a factor adoption in adopting cloud computing.

REFERENCES

- [1] M. D. Zio, N. Fursova, T. Gelsema, S. Gießing, U. Guarnera, J. Petrauskienė, L. Q. Kalben, M. Scanu, K.O. ten Bosch, M. V. D. Loo, K. Walsdorfer, “Methodology for data validation 1.0”, Essnet Validat Foundation, pp. 0–75, June 2016
- [2] P. Denise and T. Chery, “The content validity index: Are you sure you know what’s being reported? Cretique and Recommends”, *Res. Nurs. Health*, vol. 29(5), pp 489–497, 2008
- [3] D. W. Steward and P. N. Shamdasani, “Participants in a Focus Group”, *Focus Groups participants*, vol. 20, pp 63–84, 2014
- [4] T. Ahmad, “Cloud computing adoption issues and applications in developing countries: A qualitative approach”, *Int. Arab J. E-Technology*, vol. 4(2), pp 84– 93, 2015
- [5] Odeh and Warwick, “Cloud computing adoption at higher education institutions in developing countries: A qualitative investigation of main enablers and barriers”, *International Journal of Information and Education Technology*, vol. 7(12), pp 921-927, 2017
- [6] N. J. Gogtay and U. M. Thatte, “Statistics for researchers’ principles of correlation analysis,” *J. Assoc. Physicians India*, vol. 65, pp 78–81, 2017

THE IMPORTANCE OF HUMAN ERROR TAXONOMY IN UNINTENTIONAL INSIDER THREAT

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Abstract – The organisation develops an information security program to guide the users in handling their data and systems. Human errors are one of the major distractions in information security. This research aims to understand human error taxonomy, which is closely related to human error activities and factors that pose a high risk of information leakage organisations. In order to study the activities and the factors that can cause a human error, a systematic literature review is conducted by outlining human error that contributes to an organization's information security culture. This paper has identified and classified human error activities with the contributing factors through this method by using human error taxonomy guidance. This identification and classification will help employees and organisations deeply understand the importance of human error taxonomy to prevent unintentional insider threats and improve their information security.

Keywords : Unintentional insider threat; human error; information security; human error factors

1. INTRODUCTION

An unintentional insider threat occurred when an authorised insider accidentally carries out any action to disrupt an organisation's information technology infrastructures without the purpose of replacing malicious attacks in those organisations [1]. Without realising it, an insider may inadvertently reveal the sensitive data to the outside world. Some insiders tend to unintentionally compromise an organisation's cybersecurity, caused by human error, negligence, or malicious actions by an outsider.

Information leakage is an unauthorised transfer of data between external organisations. It is defined as an intentional or unintentional distribution of sensitive data to an unauthorised entity [2]. Often, information technology security is a failsafe for the error that individuals make. It is a widely known fact that humans are the weakest link in the security chain of any organisation [3] against threats to information security. Statistics show that one of the leading causes of information leakage is human error [4]. The unintentional insider threat has only recently been studied formally [5], but not many studied human error as part of the insider threat problems. The human error refers to human carelessness, such as accidental disclosure of information, loss of data storage, and data disposal that is not in accordance with procedures. Human error also arises due to the differences in skills, motivations, and knowledge between employees [6] and closely related to the factors of the work environment, organisation, and job process that influence employees' behaviour at work [7]. Human error is one of the major causes of quality and production losses in many industries. This study focuses on human error that tends to disrupt an organisation's information security. It would be important to understand human error taxonomy and identify the activities and human error factors that can help apply appropriate information security protection to prevent unintentional insider threats.

2. METHODOLOGY

This study has reviewed relevant articles to identify the human error that can cause unintentional insider threats in an organisation. A systematic literature review has been used to retrieve articles related to human error activities and human error factors. This method has four phases: identification, screening, eligibility, and result from the review process (Figure 1). Keywords related to human error, unintentional insider threat, and information leakage were used in the first phase (Table 1). The screening phase has been divided into two stages. Stage one will remove the duplicate articles, while in the second stage, 3335 articles were screened based on several inclusion and exclusion criteria (Table 2). A total of 155 articles were prepared for the third stage, known as eligibility. This process was done by reading the remaining articles' full texts to remove the articles that do not focus on the human error

activities and human error factors in unintentional insider threat, which will tend into information leakage. Overall, there were only 52 articles selected.

Table 1 Keywords used for the systematic review process

Database	Keyword used
Science Direct / IEEE / Scopus / Web of Science / ProQuest / ACM / Emerald / Taylor&Francis / Springer	Unintentional insider threat, accidental insider threat, human error, human error taxonomy, human error factor, information security, information leakage, data breach, data loss, data exfiltration

Table 2 Inclusion and exclusion criteria

Criteria	Inclusion	Exclusion
Human Error	<ul style="list-style-type: none"> • Papers that focus on human error taxonomy and describe human error classifications • Papers that provide human error, human mistakes on information security • Empirical studies on human error factors 	<ul style="list-style-type: none"> • Papers not related to human error in information security • Paper that focuses on intentional insider threat

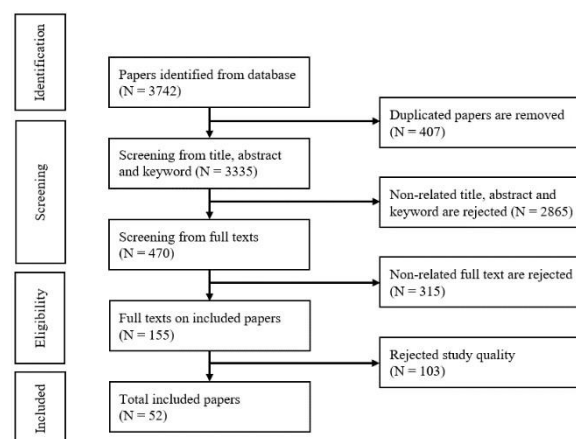


Figure 1 Flow diagram of the study selection

3. RESULTS AND DISCUSSION

A systematic review process has resulted in 52 articles related to human error on information security. The result indicates that human error is important to understand to prevent human error in unintentional insider threats. Human error taxonomy and human error factors have been identified and classified as main elements in this study.

3.1 Human Error Taxonomy

There are three types of human errors: mistakes, slips, and lapses [8], leading to information leakage [4]. **Firstly**, slip is a failure of execution, whereas a result of carelessness, the informant fails to perform a properly planned step. **Secondly**, the lapse is an execution failure, whereas a result of a memory failure. **Finally**, the mistake is a knowledge-based error when the plan itself is inadequate to accomplish the objective [9].

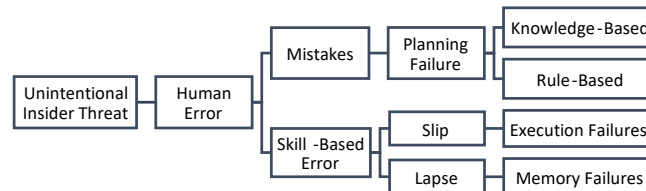


Figure 2 Human error taxonomy according to generic error modelling system (GEMS) [10]

3.2 Human Error Factors

Environmental, organisational, and job process will influence the behaviour at work to affect the employee's health and safety. A simple way to view human error factors is to think about four aspects: the individual, job process, work environment, and management support.

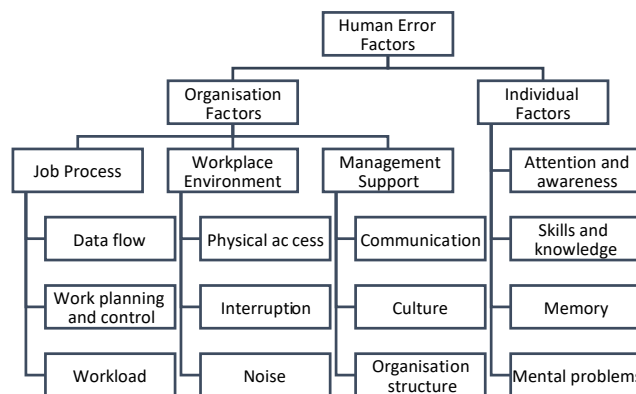


Figure 3 Contributing factors of human error

3.3 Relationship between possible human error activities, human error factors, and human error taxonomy

Possible human error activities have been identified based on the review process and human error taxonomy classification with contributing factors in unintentional insider threat. As a result, we have mapped out the relationship between possible human error activities, human error factors, and human error taxonomy, which will adversely affect an organisation's information security.

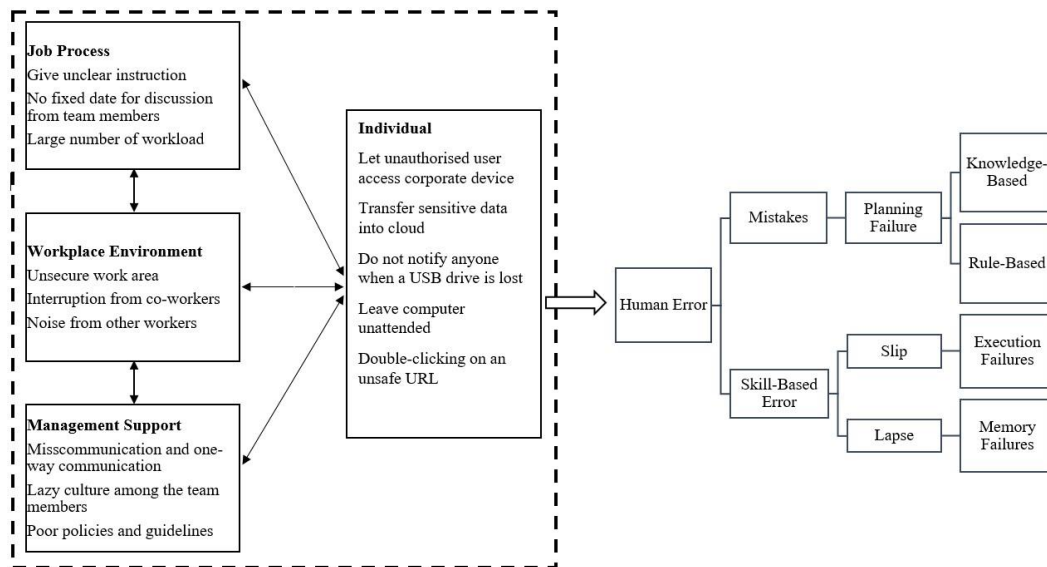


Figure 4 Relationship between possible human error activities, human error factors, and human error taxonomy

4. CONCLUSION

Identifying and classifying human error provides a structured way to understand and prevent human errors that cause information leakage in the organisation. The classification of human error in this paper will help employees and organisations to understand the importance of human error taxonomy and identify the most common activities and factors of human errors to warn against those errors or focus the review process on identifying and removing the faults caused by those errors.

REFERENCES

- [1] F. L. Greitzer, J. Strozer, S. Cohen, J. Bergey, J. Cowley, A. Moore, and D. Mundie, "Unintentional insider threat: Contributing factors, observables, and mitigation strategies", in Proceedings of the Annual Hawaii International Conference on System Sciences, pp 2025-2034, 2014
- [2] A. Shabtai, Y. Elovici, and L. Rokach, "A survey of data leakage detection and prevention solutions", in SpringerBriefs in Computer Science, 2012
- [3] C. Boulton, "Humans are (still) the weakest cybersecurity link", Cio.Com, 2017
- [4] X. Shu, J. Zhang, D. Yao, S. Member, and W.-C. Feng, "Fast detection of transformed data leaks", IEEE Trans. Inf. Forensics Secur., vol. 11(3), pp 528–542, 2016
- [5] F. L. Greitzer, J. R. Strozer, S. Cohen, A. P. Moore, D. Mundie, and J. Cowley, "Analysis of unintentional insider threats deriving from social engineering exploits," Proc. - IEEE Symp. Security. Priv., vol. 2014-January, pp. 236–250, 2014
- [6] D. Miyamoto and T. Takahashi, "Toward automated reduction of human errors based on cognitive analysis", in Proceedings - 7th International Conference on Innovative Mobile and Internet Services in Ubiquitous Computing, IMIS 2013, pp 820–825, 2013
- [7] P. S. Ganguly, "Human error vs work place management in modern organizations", Int. J. Res. Manag. Technol., vol. 1(1), pp 13–17, 2011
- [8] J. T. Selvik and L. J. Bellamy, "Addressing human error when collecting failure cause information in the oil and gas industry: A review of ISO 14224:2016", Reliab. Eng. Syst. Saf., vol. 194, pp 106418, 2020
- [9] V. Anu, W. Hu, J. C. Carver, G. S. Walia, G. Bradshaw, "Development of a human error taxonomy for software requirements: A systematic literature review", Inf. Softw. Technol., vol. 103, pp 112–124, 2018
- [10] J. Reason, "Review. Human error.," Hum. Error., 1990

EXAMINING VALIDITY AND RELIABILITY WBISA INSTRUMENT USING RASCH MODEL: A PILOT STUDY

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Abstract – This paper illustrates the process of assessing the validity and reliability of items of Web-Based Integrated Student Assessment (WBISA) using Rasch Model. The validity and reliability was analysed by examining Summary Statistics, Item Validity, Infit and Outfit and Principle Component Analysis (PCA). The study involved a collection of pilot data from 30 academicians using clustering technique, who are from public institution implementing WBISA application. A survey was administered on WBISA instrument where eight constructs involved. Respondents were required to answer the questions using a Likert scale of 1 to 4 (1= Strongly Disagree, 2 = Disagree, 3 = Agree and 4 = Strongly Agree). Instrument developed has 62 items and questionnaire items are analysed using the Rasch Measurement Model. The summary statistics from the study indicated that the item reliability and item separation was 0.86 and 2.06 respectively, while person reliability and person separation was 5.65 and 0.97, respectively. The findings show that out of 62 items, 1 item suggested to be removed.

Keywords : validity; reliability; Rasch Model; instrument; questionnaire

1. INTRODUCTION

Web-based academic application become essential platform for academicians to perform crucial daily task. However, very few web-based academic applications meet user requirement in terms of quality aspects. Although mobile application become current trend today, most of the academic applications are still utilizing web-based platform[1]. Several quality models have been proposed using established quality models such as ISO 9126 where characteristics or attributes of the application have been identified. For WBISA application, a set of characteristics have been proposed as mentioned by [2].The quality of application is vital and affects user satisfaction hence require accuracy in data processing[3]. The characteristics of a quality application have been identified based on a preliminary study conducted at a public institution implementing WBISA.

2. METHODOLOGY

A pilot study was conducted using quantitative technique by disseminating the survey to the respondents either by email or face-to-face communication. Rasch Measurement model or identified as Rasch model has its own practice to execute construct validation. As reported by[4], Rasch analysis emphasizes on the pattern of item responses that involves interaction among item and person.

In Rasch, there are two groups of validity, which is content validity and construct validity. The objective of content validity for the questionnaire is used to examined unclear terms, and poor grammar while constructing the questionnaire. Content validity refers how to examine the aspects of the construct. One of the practical ways to assess content validity is to refer to expert's opinion[5]. Expert opinion or subject matter experts (SME) must be established to answer the related question or test. In Rasch, this technique is called face-to-face. According to [6] who developed method of measuring content validity stated that a minimum of five SMEs is sufficient to perform content validity.

2.1 Instrument Development

The questionnaires consist of 62 items and eight constructs. The questionnaire was divided into two sections where section A assessed quality attributes and section B collected respondents' demographic information. Eight constructs are Usability, Reliability, Efficiency, Functionality, Supportability, Availability, Security, and Integrity. The data were analysed descriptively using Bonds&FoxSteps3 version 3.91.0.0 software with Rasch Measurement Model approach.

3. RESULTS AND DISCUSSION

This section explains the validity and reliability of the items used to identify the quality attribute of WBISA in public institution. The results of the Rasch analysis were examined based on acceptable criteria and guideline for Rasch [4], [7], [8]. The data was first loaded into Excel software and then export to Bond&FoxSteps3 to acquire the results [9].

3.1 Summary Statistics

Person separation indicates how efficiently a set of test items is able to separate those persons measured. Item separation indicates how well a sample of people is able to separate those items used in the test. Table 1 shows the summary statistics of 30 persons. The reliability index for person is 0.97 which is considered as excellent and for item is 0.81 which is good. The separation index for person is 5.65 (excellent) and for item is 2.06 considered as fair. The person is divided into six strata. The mean value for person is 0.82 and for item measure is 0.0 logit. The value of Cronbach Alpha is 0.97 which is excellent based on Rasch Model[10]. The OMNSQ and ZStd value is 0.99, very close to expectation of 1 reveals that the 62 items are targeting the right respondents. The $Person_{Max} = 6.63$ logit and $Person_{Min} = -1.51$ logit.

Table 1 Summary Statistics (N=30, I=62 items)

	Person	Item
Reliability Index/Separation Index	0.97/5.65	0.81/2.06
Mean	0.82	0.00
Outfit Mean Square (OMNSQ)/ Outfit ZStd (OZSTD)	0.99/-0.60	0.99/0.00
Max/Min	6.63/-1.51	1.94/-1.68

3.2 Item Fit

To assess item validity, three elements need to be satisfied, which is Point Measure Correlation (PTMEA), OUTFIT and ZSTD. The value of PTMEA must be in positive value to ensure the items measure the construct that it wants to measure[10]. The negative value of PTMEA or value near to zero means that the item needs to be removed or need further investigation. All the values of PTMEA are positive and in acceptable values. Table 2, two items Sb and Ff need further examination.

Table 2 PTMEA correlation

Item	MnSq	ZStd	PT MEACORR.
Sb	3.49	4.4	0.18
Ff	1.61	1.3	0.28

An item is considered as infit if the value of outfit MNSQ ranging from $0.52 < OMNSQ < 1.46$ and the value of Outfit Z-standard ranging from $-2 < ZSTD < 2$ [7]. All items met the fit statistics rules except item Sb where ZSTD value is 4.4 and OMNSQ 3.49. Since this item violated the rules, thus rendered removal in the actual study. Although the value of MnSq is greater than 1.46 but Z-Std value is in the acceptable range, therefore item Ff will remain for the actual study.

3.3 Principle Component Analysis (PCA)

The unidimensionality is evaluated by looking at value of raw variance explained by measure and unexplained variance in 1st contrast produced by PCA. The results showed that the raw variance explained is 45.4% and unexplained variance in 1st contrast 7.3%, indicating good percentage because less than 15% [11].

4. CONCLUSION

The paper described how the pilot data is analysed in Rasch Measurement Model. Survey instrument showed satisfactory internal consistency and construct validity by Rasch. Scrutinization and removal of items are done based on PTMEA and Item Misfit analysis and expert advice. Based on the pilot study result, 1.6% (1 out of 62 items) does not meet the item fit and should be deleted. Future research will be an implementation of actual study with 61 items. It is also approved that Rasch can act as a good measurement in producing reliable instrument.

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REFERENCES

- [1] M. Hong, J. C. De Gagne, H. Shin, S. Kwon and G. H. Choi, "The Korean version of the academic cyberincivility assessment questionnaire for nursing students in South Korea: Validity and reliability study", *J. Med. Internet Res.*, vol.22 (5), pp. 1–11, 2020
- [2] N. R. Mohd Suradi, S. Kahar and N. A. A. Jamaluddin, "Identification of software quality characteristics on academic application in Higher Education Institution (HEI)", *J. Telecommun. Electron. Comput. Eng.*, vol.10 (2–7), pp. 133–136, 2018
- [3] B. Huda, F. Nurapriani and H. Amanda, "Academic Application Design WEB-based on junior high schools", *Buana Inf. Technol. Comput. Sci. (BIT CS)*, vol.1(1), pp. 5–7, 2020
- [4] T. G. Bond, "Validity and assessment : a Rasch measurement perspective", *Behav. Sci. Methodol.*, vol. 5 (2), pp.179–194, 2003
- [5] D. F. Polit and C. T. Beck, "The Content Validity Index : Are You Sure You Know What 's Being Reported ? Critique and Recommendations", *Res. Nurs. Health*, vol. Oct 29(5), pp. 489–497, 2006
- [6] C. Lawshe, "A quantitative approach to content validity", in *Content Validity II*, vol.28 (1) pp. 563–575. 1975
- [7] J. M. Linacre and B. D. Wright, "Reasonable mean-square fit values", *Rasch Meas. Trans.*, vol.8 (3), pp. 370, 1994
- [8] Fisher, "Rating Scale Instrument quality criteria", *Rasch Meas. Trans.*, vol.21(1), pp. 1095, 2007
- [9] A. Husairi, "Introduction to Rasch Measurement", 2004
- [10] T. G. Bond and C. M. Fox, "Applying the Rasch Model: Fundamental in Human Sciences", Third Edit. 2015.
- [11] Fisher, "Rasch Measurement Transaction," *Trans. Rasch Meas. SIG Am. Educ. Res.*, vol. 21 (1) pp. 1095, 2007

UNIVERSITY STUDENT FINANCIAL MANAGEMENT USING STUDENT BUDGETING SYSTEM

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Abstract – Budgeting help student to organize their spending and saving. However, previous research report that university students have difficulties juggling with the cost and expenses at university. The objective of this project is to develop a student budgeting system that enabled university students to manage their money more efficiently. For this purpose, the research has used Universiti Selangor student as a case study. A survey had been conducted with UNISEL student to get their perceptions about the development of the budget system and to get the requirement of the student budgeting system. Ninety-five respondents had responded to the survey. The survey had identified functions that should be included in the system. The system had been develop using Rational Unified Process (RUP) methodology. The system provides information about the student achievement in reaching their target to spend within budget. The student budgeting system is expected to help the student to plan their fund, budget effectively and view their target saving achievement.

Keywords : Budgeting; financial management; university student; saving; budgeting achievement

1. INTRODUCTION

Going to the university is an opportunity for individuals to prepare holistically for a successful future. However, university students always faced lack of money problem. University students must not only learn how to learn academically, but also need to equip themselves with financial management knowledge. Nowadays, many university students get caught with the trend of living beyond what they can afford. Even though student got their money from scholarship, loans, parents or saving, student who did not plan how to manage their money will become penniless by the end of the semester. Student also do not have time to make a calculation and estimation of how much they need to spend so that they will financially survive until the end of the semester. Females student were found to be more likely than males to create a monthly budget ($t = -2.25, p = .025$). Males student were significantly more likely than females to go out to eat ($t = 3.83, p = .000$) [1]. Budgeting system can help university students to plan their budget more wisely. This project aims to develop a web-based system which can help student manage their money more efficiently, control the amount of money for any fees and student's living cost and spend less than they got.

2. METHODOLOGY

The project uses Rational Unified Process (RUP) as the methodology for system development. During the Inception Phase, comparison have been made between several budgeting systems which is Budget Calculator (UCAS), RBC Student Budget Calculator, UniBudget and Spending Tracker to identify main functions that should be included in the system. For data collection phase, a survey has been distributed to UNISEL student to gain perceptions and the requirements of the systems using Google Form. During the data analysis phase, the survey data has been analysed descriptively by identifying the perception on the system, the frequency percentage of the required functions to be included in the system and the system requirements. After all the system requirements had been identified, the Elaboration Phase has been conducted. In this phase, system architecture, use case model and system interface had been designed. During the Construction Phase, the system has been develop using PHP and MySQL. During the Transition Phase, the system has been presented to user and the system testing has been conducted. Then, documentation and report of the system has been prepared.

3. RESULTS AND DISCUSSION

Based on the user requirements analysed from the survey, the functionality of the student budgeting system had been identified. Functional requirements agreed by respondents are as following: register user (91.7%), user login (93.6%), update budget (95.7%), calculate budget (96.8%), provide feedback (96.8%) and provide notification if expenses above budget. The user of the system can be divided into two categories namely, admin of the system and the student that will use this system. The use case diagram in Figure 1 had been designed based on the system functionality. The most important functionality of the system is the system will calculate the total expenditure and compare to budget to identify whether the student achieve his or her budget target for saving. The user need to record their income (loan/scholarship or other income), their expenses and their target saving of the month. The system will calculate balance money the student has each month and this system will help to remind student to make sure their money balance is not lower than target saving amount. Figure 2 shows some of the interface of the budget system that will show the achievement of student saving for each month.

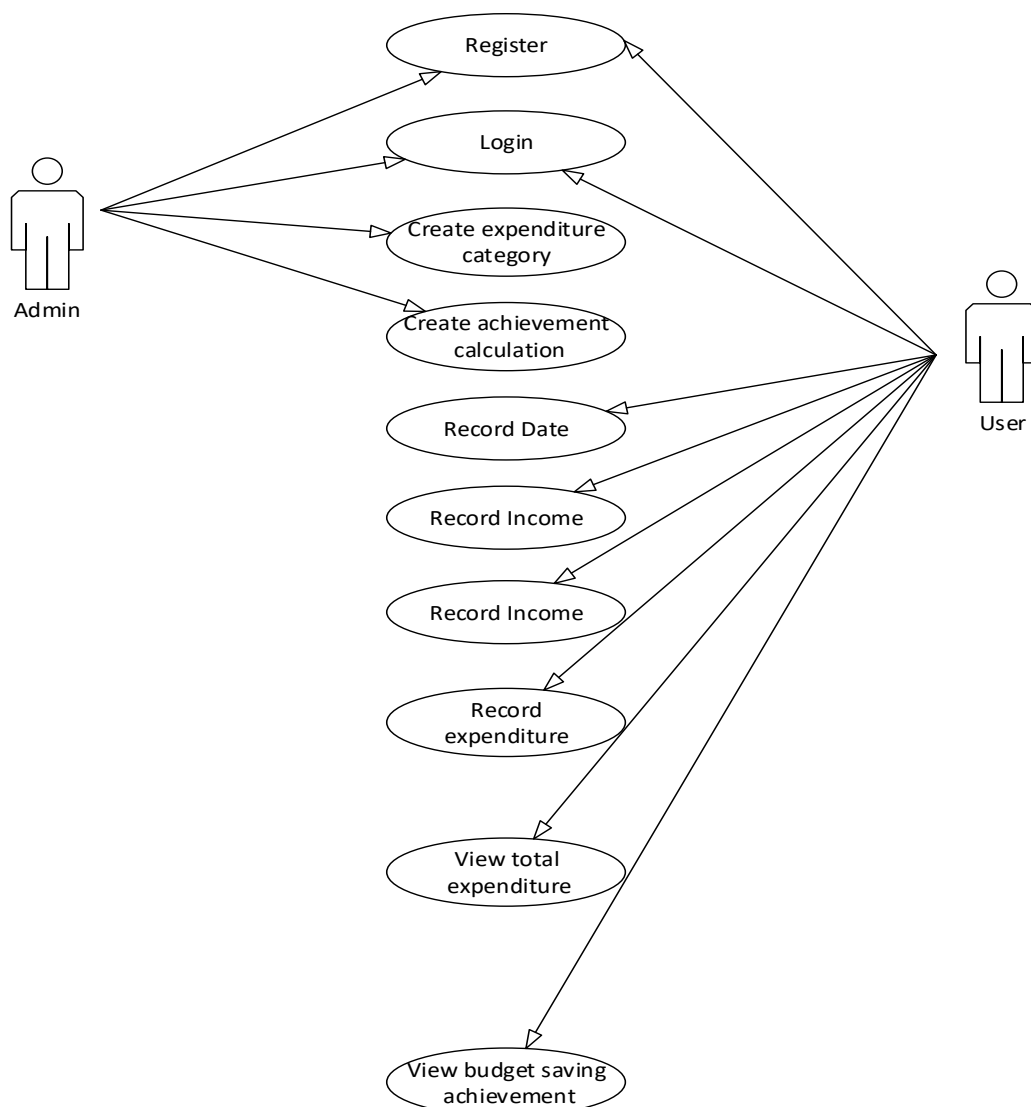


Figure 1 Use Case Diagram

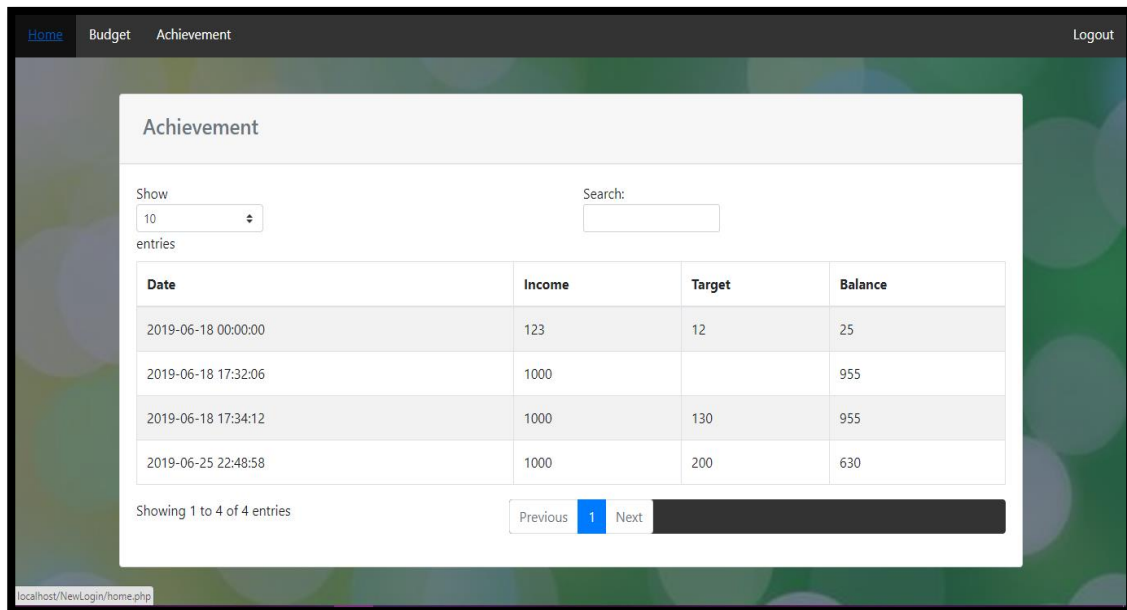


Figure 2 Student Budgeting System Interface

Once the system is fully developed, the student budgeting system were tested by user to get their acceptance. Upon successful identification of features for testing, the testing was conducted among the UNISEL students. The UAT session revealed the result as shown in Table 1.

Table 1 UAT Results

ID	Test Cases	Pass/Fail	Date Tested
1.1	Register the system	Pass	1/7/2019
1.2	Login the system	Pass	1/7/2019
1.3	Record the data and target saving	Pass	1/7/2019
1.3	Record expenditure	Pass	1/7/2019
1.4	View target saving achievement report	Pass	1/7/2019

4. CONCLUSION

Based on the User Acceptance Testing (UAT) conducted, it shows that the student budget system is usable and accept by the user. The data collection, data analysis and development method used in this projects can be a guideline to develop web based budgeting systems. The findings of this study support the idea that budgeting system can help university student to plan and budget more effectively. Moreover, the application also help student to monitor their target saving achievement. The system is very helpful and might help student to manage their money more effectively. Despite of the fact that there are limitations due to developer skills, yet the research process and development process help in developing the system successfully.

REFERENCES

- [1] M. Stollak, A. Vanderberg, K. Steiner and J. Richard, "Student Budgeting and Spending Behaviours: A Comparative Study", Journal of Behavioral Studies in Business. vol.3 (1-5), 2016

SISTEM PENGURUSAN ADUAN DAN MAKLUMBALAS BERASASKAN WEB SERTA APLIKASI MUDAH ALIH UNTUK INSTITUT PENGAJIAN TINGGI: KAJIAN KES DI UNISEL

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Abstrak – Keberkesanan pengurusan aduan dan maklumbalas memberi impak yang besar kepada reputasi sesebuah Institut Pengajian Tinggi (IPT) di kalangan pemegang taruh (*stakeholders*). Ia dapat membantu memastikan IPT memenuhi kepuasan pelanggan. Namun begitu, IPT yang masih menggunakan kaedah manual dalam pengurusan aduan dan maklumbalas mengalami masalah kecekapan dalam menangani aduan. Oleh itu, kajian ini dilaksanakan bagi membantu penambahbaikan pengurusan aduan dan maklumbalas IPT menggunakan sistem berasaskan web dan aplikasi mudah alih. Kajian ini dilakukan melalui temubual dan Perbincangan Meja Bulat (RTD) dengan Pegawai Unit Tadbir Urus Korporat (UTUK) dan beberapa Pusat Tanggungjawab (PTJ). Selain daripada itu, kajian tinjauan juga telah dilaksanakan melibatkan 339 staf dan pelajar di Universiti Selangor (UNISEL). Bagi membangunkan sistem dan aplikasi dalam kajian ini, metodologi *Rapid Application Development* (RAD) telah digunakan. Pengujian sistem dan aplikasi mudah alih ini telah dilaksanakan di UNISEL. Sistem dan aplikasi mudah alih yang dibangunkan didapati dapat memudahkan proses pengurusan aduan dan maklumbalas di IPT sekaligus dapat meningkatkan kepuasan pelanggan IPT.

Kata Kunci : Aplikasi mudah alih; kepuasan pelanggan; pengurusan aduan; sistem pengurusan maklum balas

1. PENGENALAN

Kepuasan pelanggan adalah pengukuran tentang bagaimana produk atau perkhidmatan sesebuah organisasi memenuhi kehendak pelanggan [1]. Biasanya sesebuah organisasi mendapatkan maklumbalas pelanggan melalui sistem aduan dan maklumbalas pelanggan ataupun kajian kepuasan pelanggan. Kebanyakan aktiviti berkaitan perkhidmatan akan menerima aduan kerana manusia sering melakukan kesilapan. Namun begitu tindakan baikpulih perkhidmatan perlu dilakukan agar situasi kembali pulih dan langkah proaktif dapat diambil untuk menyelesaikan masalah. IPT seperti organisasi pemberi perkhidmatan yang lain perlu memberikan perkhidmatan yang berkesan kepada pelanggan. Kajian ini membincangkan pembangunan prototaip sistem pengurusan aduan dan maklumbalas pelanggan berasaskan web dan aplikasi mudah alih. Ia dilakukan agar segala aduan dapat ditangani dengan cekap dan maklumbalas dibincangkan untuk penambahbaikan sesebuah IPT, menambahbaik perkhidmatan dan meningkatkan kepuasan pelanggan di UNISEL.

2. METODOLOGI

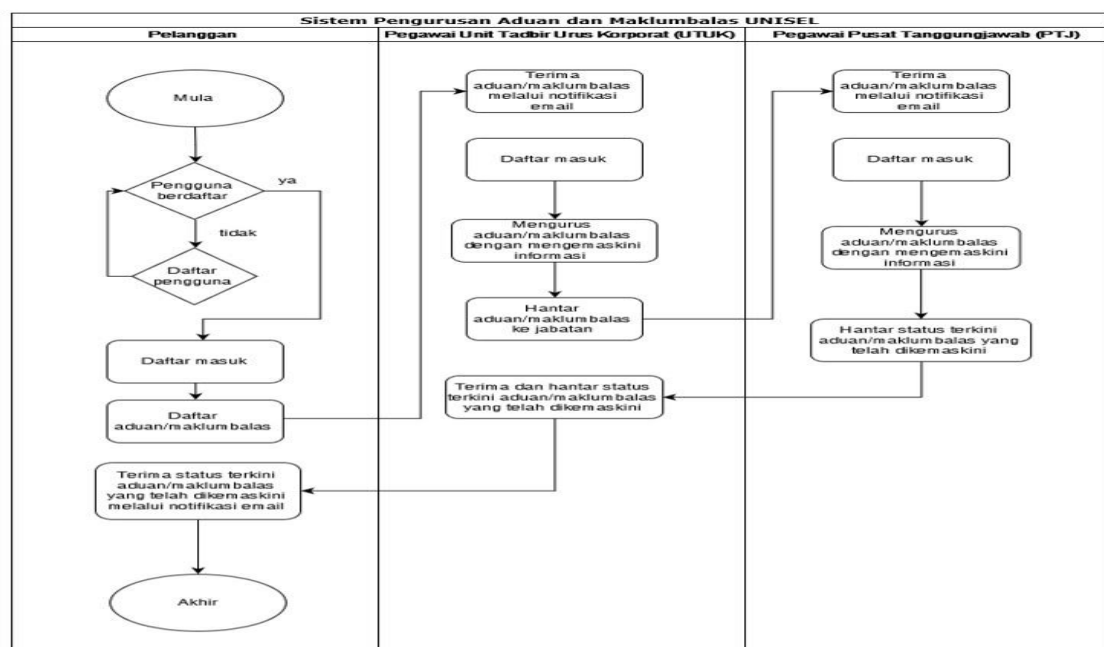
Kajian ini menggunakan teknik survei/ kajian tinjauan dan perbincangan meja bulat (RTD). Teknik survei (tinjauan) digunakan ke atas staf dan pelajar UNISEL, perbincangan meja bulat (RTD) dilaksanakan bersama staf dan pegawai di Unit Tadbir Urus Korporat (UTUK), CGQA UNISEL dan temubual bersama pihak Jabatan Pembangunan dan Penyelenggaraan (JPP) dan Pusat ICT (CICT). Kajian ini dilaksanakan dalam empat fasa iaitu Fasa 1: Pengenalpastian Masalah, Fasa 2: Kajian Tinjauan, Fasa 3: Analisis Kajian dan Pembangunan Sistem serta Fasa 4: Pengujian dan Penghasilan Laporan Kajian.

3. HASIL KAJIAN DAN PERBINCANGAN

Berdasarkan perbincangan meja bulat yang dilaksanakan dengan pihak UTUK, masalah utama yang dihadapi adalah oleh pihak UTUK adalah ketiadaan sistem aduan berkomputer yang bersistematik. Bagi

carta alir sistem pengurusan aduan menggunakan kaedah manual, pengadu perlu menggunakan sama ada borang manual, email, borang aduan untuk membuat aduan. Pegawai UTUK akan merekod aduan dan menghantar email kepada Pusat Tanggungjawab (PTJ) berkaitan. PTJ akan menjawab email berkenaan maklumbalas tindakan PTJ untuk menyelesaikan aduan. Proses manual ini menyukarkan proses pengurusan aduan dengan sistematik dan notifikasi status aduan tidak dimaklumkan kepada pengguna sekiranya kes belum selesai. Bagi CICT, terdapat sistem *helpdesk* berkomputer namun mereka mengalami masalah kekurangan staf, masalah bajet, masalah melibatkan vendor yang menyukarkan mereka menyelesaikan aduan dalam tempoh yang lebih cepat. Ketiadaan sistem aduan berkomputer bagi keseluruhan UNISEL kecuali CICT menyukarkan notifikasi aduan sekiranya aduan tidak dapat diselesaikan apabila menunggu pembelian peralatan, melibatkan kontraktor luar atau pembaikan yang terpaksa ditangguhkan kerana kos yang terlalu tinggi.

Berdasarkan kajian tinjauan yang telah dijalankan di kalangan pelajar dan staf UNISEL, majoriti iaitu 90% daripada responden menyatakan bahawa sistem pengurusan aduan dan maklumbalas pengguna berasaskan web dan aplikasi perlu direka agar dapat memudahkan proses membuat aduan atau laporan berkaitan isu-isu yang membabitkan penggunaan pelajar dan staf. Ramai responden bersetuju bahawa sistem ini akan memudahkan mereka untuk membuat aduan pada bila-bila masa sahaja tanpa kesukaran apabila membuat aduan secara manual. Jadual 1 menunjukkan fungsi yang dipersetujui oleh responden untuk dimasukkan ke dalam sistem pengurusan aduan yang dibangunkan. Berdasarkan hasil kajian, keperluan dan spesifikasi aplikasi telah dikenalpasti. Fungsi yang dipersetujui oleh responden untuk dimasukkan ke dalam sistem aduan adalah fungsi memuat turun aplikasi sistem pengurusan aduan dari playstore/iOS store (91.7%), fungsi daftar pengguna (92.9%), fungsi membuat aduan (97.3%), fungsi memberi maklumbalas.penghargaan (95.5%), fungsi memberi cadangan penambahbaikan(96.7%), fungsi memuatnaik gambar/video aduan (93.5%), fungsi mendapat notifikasi maklumbalas aduan melalui email atau SMS(95.3%), fungsi melihat status aduan (95.8%), mendapat notifikasi maklumbalas sekiranya aduan telah diambil tindakan(96.1%) dan fungsi papir laporan aduan (93.5%). Cartalir pengurusan aduan UNISEL menggunakan sistem pengurusan aduan dan maklumbalas berasaskan web dan aplikasi mudah alih telah dihasilkan seperti di Rajah 1.



Rajah 1 Cartalir pengurusan aduan UNISEL menggunakan sistem pengurusan aduan dan maklumbalas berasaskan web dan aplikasi mudah alih

Penambahbaikan yang telah dilakukan ke atas carta alir sistem pengurusan aduan berasaskan web dan aplikasi mudah alih adalah notifikasi sistem dan email berkenaan aduan diberikan kepada PTJ dan maklumbalas tindakan PTJ untuk penyelesaian aduan melalui notifikasi status aduan kepada UTUK

dan pengadu melalui notifikasi sistem dan email. Sistem yang dihasilkan mengandungi modul untuk pengguna, pegawai Unit Tadbir Urus Korporat (UTUK) dan pegawai Pusat Tanggungjawab (PTJ). Pengujian Sistem Pengurusan Aduan Dan Maklumbalas Berasaskan Web Dan Aplikasi Mudah Alih telah dilaksanakan bersama pelajar dan staf UNISEL. Hasil sesi pengujian UAT modul pengguna menunjukkan keputusan pengujian seperti di Jadual 1. Setelah pengujian dilaksanakan, penulisan laporan kajian dilaksanakan. Selain menyediakan laporan hasil kajian, laporan kajian juga mengandungi maklumat Dokumen Spesifikasi Keperluan Sistem (SRS), Dokumen Spesifikasi Rekabentuk Sistem (SDD) dan Manual Pengguna.

Jadual 1 Hasil Pengujian UAT Modul Pengguna

ID	Kes Pengujian (<i>Test Cases</i>)	Lulus/Gagal	Tarikh Pengujian
1.1	Mendaftar melalui sistem	Lulus	23/5/2019
1.2	Log masuk sistem	Lulus	23/5/2019
1.3	Mendaftar aduan baru	Lulus	23/5/2019
1.3	Memuat-naik gambar	Lulus	23/5/2019
1.4	Kesan lokasi menggunakan GPS	Lulus	23/5/2019
1.5	Melihat kandungan peti masuk	Lulus	23/5/2019
1.6	Membuat semakan aduan	Lulus	23/5/2019
1.7	Mengemaskini maklumat pengguna	Lulus	23/5/2019
1.8	Menyemak status aduan tanpa perlu daftar masuk	Lulus	23/5/2019

4. KESIMPULAN

Secara keseluruhannya kajian ini telah dapat mengenalpasti masalah semasa sistem pengurusan aduan dan maklumbalas di UNISEL yang menggunakan kaedah manual, mendapatkan keperluan pengguna untuk sistem dan aplikasi mudah alih pengurusan aduan dan maklumbalas UNISEL, merekabentuk dan seterusnya membangunkan sistem dan aplikasi mudah alih pengurusan aduan dan maklumbalas UNISEL. Berdasarkan pengujian yang dilaksanakan, sistem dan aplikasi ini dapat berfungsi mengikut spesifikasi keperluan pengguna. Pada masa hadapan, sistem dan aplikasi ini boleh dinaiktaraf dengan menambahkan fungsi impak dan risiko. Secara keseluruhannya, sistem dan aplikasi mudah alih pengurusan aduan dan maklumbalas UNISEL akan dapat membantu pihak pengurusan menguruskan aduan dan maklumbalas dengan lebih berkesan dan cekap. Ini dapat meningkatkan reputasi UNISEL dalam aspek kecekapan pengurusan aduan.

PENGHARGAAN

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RUJUKAN

- [1] R. Milner and A. Furnham, "Measuring Customer Feedback, Response and Satisfaction. Psychology. 08. 350-362, 2017

DEEP LEARNING APPROACH FOR IDENTIFICATION OF POVERTY THROUGH SENTIMENT ANALYSIS

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Abstract – This research aims to identify poverty in Indonesia through sentiment analysis using a deep learning approach to the Long Short-Term Memory (LSTM) method. Poverty is one of the main problems that the Indonesian government has become aware of over the years. Many policies have been implemented and created by the government, either with their efforts or assistance from other countries or the World Bank. The dataset used is 10288 twitter data that is crawled using poverty-related keywords. Training uses 80% and testing uses 20 datasets. The training data is further divided into 2, namely the training set and the validation set. The LSTM model produces a training accuracy of 88% with a validation-accuracy of 72%.

Keywords : Deep Learning; poverty; LSTM; sentiment analysis

1. INTRODUCTION

Many countries, organizations, and individuals pay attention to the problem of poverty, how to accurately and precisely measure poverty, or to how to determine whether their efforts have an impact on poverty reduction. This issue is essential because there are different approaches to poverty measurement, and none of them is perfect and can become an overall standard. It is not certain that the existing standards are suitable for every region, where household economic conditions and cultures are quite diverse [1-2]. Poverty is one of the main problems that the Indonesian government has become aware of over the years. Many policies have been implemented and created by the government, either with their efforts or assistance from other countries or the World Bank, to overcome poverty's issues. Therefore, there is a need to approach the poverty prediction models using other variables to obtain rights. Poverty prediction is based on previous data using the Bayesian regulation method to predict poverty data in Indonesia [3].

Online social networks such as Facebook, Twitter, and Weibo have become an integral part of everyday life in recent years and provide a platform for information exchange with one another. Because large amounts of social network data have exact features such as high quality, big data, semi-structured and direct flow to the real human community, social networks are more attentive to many researchers from existing fields or disciplines. Mining and analysing social network information, however, is a daunting task, facing two challenges: incomplete and dynamic [4-5]. Research related to social media is experiencing rapid development and evolution due to commercial pressures and the potential use of social media data for the benefit of social science research [6]. In particular, for computational social science research using quantitative techniques (e.g., computer statistics, machine learning, and complexity) called big data, social media is critical [7-8]. Social media connects many individuals around the world, thereby increasing the number of prediction participants. In social media, the diversity of individuals has the potential to improve the quality of the results of the forecast. Empirically, there are many prediction markets for economic, social, and political products in the social media era [9].

The purpose of sentiment analysis or opinion mining is to determine the attitude of a speaker, writer, or other topics concerning a specific subject or event. In different fields, sentiment analysis has many trending applications. It allows companies to automatically collect their customer's views on their products or services [10-12]. In order to investigate data and to gain business insights, business organizations need to process and study these feelings. The demand for sentiment analysis is increased by the need to analyse and structure hidden information from social media in the form of unstructured data [13]. Deep learning has become an effective mechanism for the production of high precision. In recent years, with comparatively remarkable results, deep learning models such as convolutionary neural networks (CNNs) and recurrent neural networks (RNNs) have been applied to text sentiment analysis

[14]. In a number of NLP tasks, such as machine translation, neural networks have achieved state-of-the-art performance. Aspect-level Sentiment Classification [15], Long Short-Term Memory (LSTM) Recurrent Neural Networks to Speech Enhancement, LSTM for Aspect-level Sentiment Classification. This study aims to identify poverty in Indonesia through the Sentiment Analysis approach with a deep learning LSTM algorithm. We explore the potential of the LSTM model to obtain the highest accuracy in identifying public opinion through sentiment analysis.

2. METHODOLOGY

With a total of 10228 data text, the data used for this research is Twitter data. The information is divided into three classes, namely positive, negative, and neutral classes.

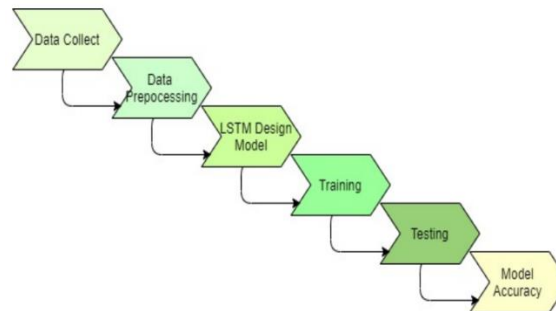


Figure 1 Methodology

The most class data are neutral class as many as 4252, positive class 3410, and negative class as much as 2566. The research dataset was divided into two, with a ratio of 80:20 for training and testing. The training dataset is divided into training and validation. The research stages consisted of six steps: data collection, data preprocessing, designing LSTM models, training, testing, and model accuracy (Fig.1). The LSTM algorithm data processing in this study has stages of text-preprocessing, lemmatization, stemming, word-embedding, tokenizer.

3. RESULTS AND DISCUSSION

In this study, the training carried out using a maximum epoch of 100. The outcomes of the study are shown in the graph in the form of precision and loss. The initial accuracy of this epoch is relatively very large, namely 0.7542, and the final accuracy of 0.8758, which means that the accuracy of the model training is 87.58%. Meanwhile, the validation accuracy at epoch 75 also produced the largest value among the other epochs, amounting to 0.7218, which means predicting new data is 72.18%. The final results of the training set and the validation set in the form of the final accuracy number, final validation accuracy, final loss, and final validation are shown in Table 1.

Table I Table Accuracy, Loss, and Validation

No	Epoch	Start Accuracy	Final Accuracy	Final Val_Accuracy	Final Loss	Final Val_Loss
1	20	0.5587	0.7542	0.6435	0.6749	2.3936
2	30	0.6661	0.7582	0.6741	0.6012	2.8793
3	40	0.7578	0.8042	0.6792	0.6127	3.4888
4	50	0.8048	0.8297	0.6540	0.6456	3.3008
5	60	0.4091	0.7769	0.7194	0.5613	3.0731
6	75	0.8402	0.8758	0.7146	0.5672	3.5658
7	85	0.3543	0.8249	0.7218	0.4801	3.3643
8	90	0.3471	0.8689	0.7141	0.4725	4.2014
9	100	0.8398	0.8646	0.7074	0.4912	4.4213

4. CONCLUSION

Analysis of the results of the study, one of the deep learning algorithms, namely LSTM, on sentiment analysis for poverty identification in Indonesia, provides training accuracy of 88%. These results indicate that LSTM can provide good model accuracy, but the model still has weaknesses, as the accuracy validation value is 72%. The results found that there were always the same text data during the training. The training accuracy is higher for a large number of epochs. The results of training losses are very small compared to validation-loss; this shows that the model can identify poverty through social media, namely Twitter. LSTM can learn the words in the training dataset so that it can use these words to classify sentiment analysis with training accuracy of 88%

REFERENCES

- [1] S. Alkire et al., *Multidimensional Poverty Measurement and Analysis : Chapter 3 – Overview of Methods for Multidimensional Poverty Assessment* years . We are also grateful for direct comments on this working paper from Tony Atkinson , Achille. 2015.
- [2] H. Megasari, S. Amar, and I. Idris, “Analisis Perekonomian Dan Kemiskinan Di Indonesia,” *J. Kaji. Ekon.*, vol. 3, no. 6, pp. 1–18, 2015.
- [3] A. Wanto and J. T. Hardinata, “Estimasi Penduduk Miskin di Indonesia sebagai Upaya Pengentasan Kemiskinan dalam Menghadapi Revolusi Industri 4.0,” *CESS (Journal Comput. Eng. Syst. Sci.)*, vol. 4, no. 2, pp. 198–207, 2019.
- [4] A. Zielinski, S. E. Middleton, L. N. Tokarchuk, and X. Wang, “Social media text mining and network analysis for decision support in natural crisis management,” *ISCRAM 2013 Conf. Proc. - 10th Int. Conf. Inf. Syst. Cris. Response Manag.*, no. May 2013, pp. 840–845, 2013.
- [5] X. Jin, B. W. Wah, X. Cheng, and Y. Wang, “Significance and Challenges of Big Data Research,” *Big Data Res.*, vol. 2, no. 2, pp. 59–64, 2015, doi: 10.1016/j.bdr.2015.01.006.
- [6] S. Stieglitz, M. Mirbabaie, B. Ross, and C. Neuberger, “Social media analytics – Challenges in topic discovery, data collection, and data preparation,” *Int. J. Inf. Manage.*, vol. 39, pp. 156–168, Apr. 2018, doi: 10.1016/j.ijinfomgt.2017.12.002.
- [7] B. Batrinca and P. C. Treleaven, “Social media analytics: a survey of techniques, tools and platforms,” *AI Soc.*, vol. 30, no. 1, pp. 89–116, 2014, doi: 10.1007/s00146-014-0549-4.
- [8] A. Amado, P. Cortez, P. Rita, and S. Moro, “Research trends on Big Data in Marketing: A text mining and topic modeling based literature analysis,” *Eur. Res. Manag. Bus. Econ.*, vol. 24, no. 1, 2018, doi: 10.1016/j.iemeen.2017.06.002.
- [9] H. Schoen, D. Gayo-avello, and P. Gloor, “The power of prediction with social media,” 2015, doi: 10.1108/IntR-06-2013-0115.
- [10] I. Hemalatha, D. G. P. S. Varma, and D. a. Govardhan, “Sentiment Analysis Tool using Machine Learning Algorithms,” *Int. J. Emerg. Trends Technol. Comput. Sci.*, 2013.
- [11] W. Medhat, A. Hassan, and H. Korashy, “Sentiment analysis algorithms and applications: A survey,” *Ain Shams Eng. J.*, vol. 5, no. 4, pp. 1093–1113, Dec. 2014, doi: 10.1016/j.asej.2014.04.011.
- [12] M. Heikal, “ScienceDirect Sentiment Analysis of Arabic Tweets using Deep Learning Sentiment Analysis of * Arabic Tweets using Deep Learning,” *Procedia Comput. Sci.*, vol. 142, pp. 114–122, 2018, doi: 10.1016/j.procs.2018.10.466.
- [13] A. M. Kaplan and M. Haenlein, “Users of the world, unite! The challenges and opportunities of Social Media,” *Bus. Horiz.*, vol. 53, no. 1, pp. 59–68, 2010, doi: 10.1016/j.bushor.2009.09.003.
- [14] X. Wang, W. Jiang, and Z. Luo, “Combination of Convolutional and Recurrent Neural Network for Sentiment Analysis of Short Texts,” pp. 2428–2437, 2016.
- [15] Y. Wang, M. Huang, L. Zhao, and X. Zhu, “Attention-based LSTM for Aspect-level Sentiment Classification,” 2016.

CONCEPTUAL FRAMEWORK DEVELOPMENT FOR TRANSACTIONS' DECISION-MAKING MANAGEMENT

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Abstract – The COVID-19 pandemic has affected many countries' economy and business owners. With the country going through a period of new normal, decision-making factors have become more complex. Therefore, a more comprehensive and analytical business model needs to be created in order to cater complex decision-making management. This paper aims to investigate the concept of Transaction Decision Management and develop a conceptual framework that can solve the complexity of decision-making process for Malaysian Halal SME owners. Interview and documentation analysis show that leadership, top management, stakeholders, Halal supply chain key players or participants, business activities, Halal governance, Islamic law, and Halal industry activities affect transactions and the way transaction data is managed, structured, and processed. More studies need to be done on conceptual studies with a more viable long-term business analytical model catering detailed and complex transaction activities for online Halal businesses and virtual Halal companies.

Keywords : Conceptual framework; decision-making management; halal transactions

1. INTRODUCTION

The COVID-19 pandemic has affected many countries' economy and business owners. According to the World Bank, the global GDP is going through a deep economic recession [1]. Despite this, the Halal industry both globally and locally in Malaysia is resilient [2-3]. With rising demands in Halal-based products and services in Malaysia, the Malaysian government encourages Halal SME owners to improve their businesses' performance and increase sales transactions [4]. With 99% out of 907,065 established SMEs being Halal SMEs, each SMEs have different sizes and sales turnover depending on which sector they are in. [5-8] and different decisions to manage. With the country going through a period of new normal, decision-making factors have become more complex. Therefore, a Halal analytical business model needs to be created to cater complex decision-making management [9-10]. However, before a business model can be created, the conceptual framework must first be formed.

2. METHODOLOGY

A Halal payment gateway expert was interviewed in order to better gain the context of the whole concept. After analysis, the research question and main focus were formed where the research boundaries and limits were established. Then, key variables, relationship and factors are identified with supporting literature review (LR). Then, a hypothesis and its counter hypothesis were formed using qualitative documentation analysis and tested. The test was conducted on 200 research papers from high impact research databases on transactions, decision-making management, and conceptual framework development related to Halal SMEs from year 2016 to 2020. Then, the final framework was produced.

3. RESULTS AND DISCUSSION

The summary of the interview analysis is as shown in Table 1.

Table 1 Interview Analysis Summary

Criteria	Context			Research Question	Boundaries		
	Transaction (C1)	Data Structure (C2)	Decision-Making (C3)		Data Coll. (B1)	Model Dev. (B2)	System Dev. (B3)
MAIN LR	[11]–[13]	[14], [15]	[14], [15]	Q1. What are the variables that will affect transaction analytics?	[11]–[13]	[14], [15]	[14], [15]
TOTAL (%)	80	80	100	Q2. How to implement and apply the analytics? Q3. How to measure the analytics' effectiveness?	80	80	100

The main contexts of Halal transactions' decision-making management are transactions, data structure, and decision-making. The conceptual hypothesis, H_0 is that transaction is the main factor that affects decision-making, and its alternative hypothesis, H_1 is that transaction is not the main factor that affects decision-making. Analysis shows that H_1 is accepted, where leadership, top management, and stakeholders are key factors that affect transaction as they are decision-makers and consists of expertise of the company [11], [16], [17]. Other factors are Halal supply chain key players or participants, business activities are activities involving the growth of the business, Halal governance, Islamic law, and Halal industry activities involving Halal compliance procedures [18]–[22]. Based on the interview results, literature review, and final hypothesis testing results, the final framework design is as shown in Figure 1.

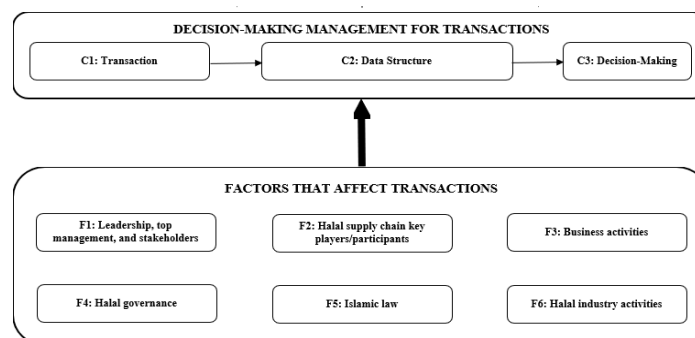


Figure 1 TDM Conceptual Framework

4. CONCLUSION

Leadership, top management, stakeholders, Halal supply chain key players or participants, business activities, Halal governance, Islamic law, and Halal industry activities affect transactions and the way transaction data is managed, structured, and processed. This framework only focuses on the general and overall aspects of sales transaction among Halal SME owners within the Halal industry. The other limitation is that there are not many conceptual papers during the COVID-19 pandemic, catering for a more complex and physically restricted business transactions. The current research concept caters it by reviewing more non-physical element research papers. Future suggestions will be to study more on conceptual studies with a more viable long-term business analytical model catering detailed and complex transaction activities for online Halal businesses and virtual Halal companies.

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REFERENCES

- [1] World Bank, “June 2020 Global Economic Prospects”, Washington DC, 2020
- [2] The Japan Times, “Increased global halal demand offers various new opportunities”, The Japan Times, Tokyo, Sep. 01, 2020
- [3] Salaam Gateway, “Malaysia halal industry remains resilient despite challenging times”, Salaam Gateway, Petaling Jaya, Mar. 25, 2020.
- [4] A. Yusof, “Bid to improve performance”, The New Straits Times, Kuala Lumpur, Aug. 26, 2020
- [5] SME Corp. Malaysia, “Profiles of SMEs,” SME Info, 2020. <https://smeinfo.com.my/profile-of-smes>.
- [6] N. A. Azizi, “9 out of 10 SMEs do not have halal certification,” The New, Port Dickson, Aug. 01, 2019.
- [7] Halal Industry Development Corporation (HDC), “Press Release: The 11th World Halal Conference 2019 Presents Strategic Direction For The Halal Economy”, Islamic Finance Knowledge Repository, 2020. <https://ifikr.isra.my/news/post/press-release-the-11th-world-halal-conference-2019-presents-strategic-direction-for-the-halal-economy> (accessed Mar. 14, 2020)
- [8] SME Corp. Malaysia, “SMEs need more capacity to boost halal exports”, SME Corp. Malaysia, 2019. <http://www.smeinfo.com.my/index.php/en/resources/2015-12-21-10-55-22/news/3694-smes-need-more-capacity-to-boost-halal-exports-2> (accessed Jan. 22, 2020)
- [9] V. Boldosova and S. Luoto, “Storytelling, Business Analytics And Big Data Interpretation: Literature Review And Theoretical Propositions”, *Manag. Res. Rev.*, vol. 43 (2), pp 204–222, 2019
- [10] B. K. H. Chau, C. K. Law, A. Lopez-Persem, M. C. Klein-Flügge, and M. F. S. Rushworth, “Consistent Patterns of Distractor Effects During Decision Making”, *Elife*, vol. 9, pp 1–36, 2020
- [11] X. Qu, “From Purchase, Usage, To Upgrade - Consumer Analytics Using Large Scale Transactional Data,” *Iowa State Univ.*, vol. 53 (9), pp 1689–1699, 2019
- [12] Z. Shang, J. X. Yu, and Z. Zhang, “TuFast: A Lightweight Parallelization Library for Graph Analytics”, in *Proceedings - International Conference on Data Engineering*, vol. April, pp 710–721, 2019
- [13] R. Arora and A. Singh, “Multivariate Discriminant Predictive Modelling of Transactional Credit Risk in SME and Mid-corporate Lending,” *Abhigyan*, vol. 35 (2), pp 15–27, 2017
- [14] P. A. Johnson, P. J. Robinson, and S. Philpot, “Type, Tweet, Tap, And Pass: How Smart City Technology Is Creating A Transactional Citizen”, *Gov. Inf. Q.*, vol. 37(1), p 101414, 2020
- [15] D. Bumblauskas, H. Nold, P. Bumblauskas, and A. Igou, “Big Data Analytics: Transforming Data to Action,” *Bus. Process Manag. J.*, vol. 23 (3), pp 703–720, 2017
- [16] A. C. Hsieh, M. Fific and C. Yang, “A New Measure of Group Decision-Making Efficiency”, *Cogn. Res. Princ. Implic.*, vol. 5 (1), 2020
- [17] M. M. Asad, R. Bin Hassan, F. Sherwani, M. Aamir, Q. M. Soomro, and S. Sohu, “Design and Development of A Novel Knowledge-Based Decision Support System For Industrial Safety Management at Drilling Process: HAZFO Expert 1.0”, *J. Eng. Des. Technol.*, vol. 17 (4), pp 705–718, 2019
- [18] B. Demir, “Trade and Developing - Country Exporters: The Case of Latin American and Caribbean Countries”, in *The Handbook of Global Trade Policy*, 1st ed., A. Klasen, Ed. New Jersey: John Wiley & Sons Ltd, 2020, pp 328–350
- [19] M. Saini, M. Arif, and D. J. Kulonda, “Critical Factors for Transferring and Sharing Tacit Knowledge Within Lean and Agile Construction Processes”, *Constr. Innov.*, vol. 18, (1), pp 64–89, 2018
- [20] A. Klasen, “Introduction to the Special Section: Strengthening Institutional Collaboration for Development and Economic Growth”, *Glob. Policy*, vol. 10 (3), pp 397–400, 2019
- [21] British Broadcasting Corporation (BBC), “Religions: Sharia,” British Broadcasting Corporation (BBC), 2009. https://www.bbc.co.uk/religion/religions/islam/beliefs/sharia_1.shtml (accessed Jun. 03, 2020)
- [22] A. N. Ahmad, U. F. Ungku Zainal Abidin, M. Othman, and R. Abdul Rahman, “Overview of the halal food control system in Malaysia”, *Food Control*, vol. 90, pp 352–363, 2018

BRAND LOYALTY IN MODEST FASHION INDUSTRY AMONG THE EMPLOYED FEMALE IN MALAYSIA: A CONCEPTUAL PAPER

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Abstract – The paper aims to determine the Gen Y employed female’s brand loyalty in modest fashion industry in Malaysia by considering the role of brand personality, brand love and brand equity. This cohort is the subject of such a research because they are of particular value to the Malaysian market due to their size and increased buying power in this industry. The theories made use of in this study were the Theory of Planned Behaviour (TPB) of Ajzen in 1991. TPB has been used to clarify and forecast human behaviour. The approach used for this conceptual paper is focused on reviews of literature from journal articles, proceedings and conferences, books and online news related to keywords and study. In order to explain the hypotheses and uncover further issues relating to brand loyalty among females employed by Gen Y, more study, both empirical and non-empirical, must be conducted.

Keywords: Brand personality; brand love; brand equity; brand loyalty; modest fashion

1. INTRODUCTION

In 2017, with more than RM15 billion in exports, textile and apparel sector became the 11th largest contributor to Malaysia's economy [1]. In 2015, about 20.6% of SMEs are women-owned [2]. Investing in women's entrepreneurship is good for businesses and essential for economic development. In 2019, about 70% of the total Malaysia’s population contributed by the working age group [3]. The negative trend in live births and fertility rates has driven the demographic transition to an aging global population and changing potential financial profits from sales to the Gen Y consumers to the older segment. In line with the goal declared by the Selangor State Government in November 2019 that Selangor aims to be a regional hub for modest fashion. The initiative is capable of generating and enhancing the economic growth of the state with revenues of fashion industry expected to rise from RM3.5 billion in 2019 to RM5.5 billion by 2023 [4]. The KL Fashion Week was first conceptualized in 2013 and has positioned the country as strong emerging fashion capital in Asia. Malaysia neighbouring countries with higher earnings like Singapore and Brunei wanting to invest and spend many of their resources on style, Malaysia's goal has all the best ingredients to succeed. It is reported that only 39.1% female employed persons in 2019 [5]. Reducing gender differences in labor force participation could significantly improve global GDP from an economic perspective. According to previous study, there were limited research on gender and occupational background context roles [6]. There is still a lack of prior research in trade literature, particularly in the fashion industry and Muslim brands, especially modest fashion clothing [7]. Most scholars believe that Gen Y has different preferences, behaviours and characteristics compared to the previous generation. Gen Y brand loyalty is rapidly changing due to the brand's fashion, trends, and popularity, focusing mostly on overall quality than on price. Ordun [8] suggested that only 3% of Gen Y customers were loyal to a particular brand and it can last just 6 to 8 months.

2. METHODOLOGY

The approach used for this paper consists of searching for libraries and reviewing previous literature reviews on the topic of Gen Y brand loyalty. From online and offline materials to article journals and a book chapter, the library quest involves. Online databases such as Web of Science, Scopus, Science Direct and Google Scholar are based on references. The advance search is limited to brand loyalty, Gen Y, modest and employed female in the fashion industry. The references are only taken from a journal article, a book chapter, and a full text paper. Therefore, as stated earlier, the limitations of this paper may be due to restricted database resources, as the search results are also excluded from research, education and health studies related to the effect of brand loyalty on SMEs and businesses.

2.1 Framework

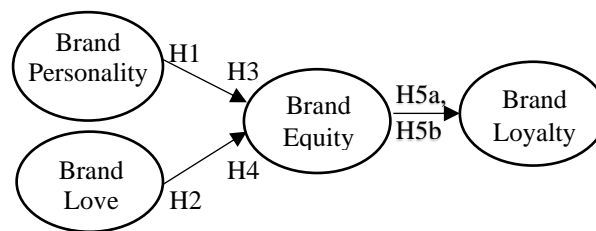


Figure 1 Theoretical framework

This study proposes a model as shown in figure 1. TPB framework is used to assess the effect of personality, brand love and brand equity on brand loyalty. The TPB was widely adopted as one of the most powerful tools to evaluate the behavioural purpose of consumers [9].

Brand personality is a set of human traits associated with a brand, especially distinctive, strong, and favourable, is beneficial to marketers and consumers alike and can build a bond between them, contributing to consumer brand loyalty [10] and brand equity [11]. Brand personality increases satisfaction and loyalty due to the brand's ability to promote self-expression of customers and it plays a dominant role in shaping the positive and negative emotions of customers predicting satisfaction and loyalty [10]. Hence, the hypotheses suggested are built as follows:

- H1.* Brand personality has a significant positive effect on consumer brand loyalty.
- H3.* Brand personality has a significant positive effect on consumer brand equity.

Brand love can be defined as the extent to which a satisfied consumer has a passionate emotional attachment to a brand. Recently, both practitioners and researchers are particularly interested in the concept of brand love because it contributes to positive WOM, brand loyalty; these two are aspects of brand equity [12]. Brand love comprises of many forms of emotions, such as enthusiasm, good attitude and assessment, loving, attachment and commitment [13]. It improves customer retention, increases consumer forgiveness when faced with negative information, and evokes customer loyalty to the brand. On that basis, this analysis thus extends the impact on brand loyalty and brand equity of these components of brand love and hypothesizes that:

- H2.* Brand love has a significant positive effect on consumer brand loyalty.
- H4.* Brand love has a significant positive effect on consumer brand equity.

From the viewpoint of both spiritual enlightenment and clinical psychology, the effects of mediation are well-known [14]. Previous studies explored the relationship between brand loyalty and brand equity found that brand equity had positive effect on brand loyalty [15]. In addition, previous researches indicate the mediating factors of brand equity, are in the positive responses of consumers, such as engagement, self-identity and loyalty. According to what have mentioned above and supported statement from previous research, the researcher hypothesizes that:

- H5a.* Brand equity has mediating effects on the relationship between brand personality on brand loyalty.
- H5b.* Brand equity has mediating effects on the relationship between brand love on brand loyalty.

3. CONCLUSION

The findings from literature led the researchers to draw conclusions about what factors affect brand loyalty among Gen Y female employed consumers toward modest fashion industry. It is obvious that no single factor is responsible for the consumer to be loyal to a brand. The Gen Y consumers is a valuable segment of the market. A company's marketing activities focus on developing, maintaining and enhancing brand loyalty among consumers for their products or services. This is a demanding task,

as this group is less loyal, most emotional and least pleased of all groups. Given the increasing unpredictability, reduced product differentiation and increased competitive pressure, brand loyalty has become even more important. The present research is therefore focused at identify the factors influencing brand loyalty among Gen Y female employed consumers Gen Y aged 24 to 40 years.

REFERENCES

- [1] Malaysia Investment Development Authority. (2018, September 25). Malaysian Textile and Fashion Entrepreneurs to Leap to the Next Level. <https://www.mida.gov.my/home/7106/news/malaysian-textilefashion-entrepreneurs-to-leap-to-the-next-level/>
- [2] Department of Statistics Malaysia (2017). Output of Malaysia's SMEs Surged to RM1.0 Trillion for the First Time Since 2003. Retrieved from https://www.dosm.gov.my/v1/index.php?r=column/cthemedByCat&cat=426&bul_id=T20rcEJyQmFENUpRYThOSGRmdFlIZz09&menu_id=WjJGK0Z5bTk1ZEIvT09yUW1tRG41Zz09
- [3] Department of Statistics Malaysia (2019). Demographic Statistics Second Quarter 2019, Malaysia. Retrieved from https://www.dosm.gov.my/v1/index.php?r=column/cthemedByCat&cat=430&bul_id=VTJDDStOakJd2EwcEVVTm4yRDZSQT09&menu_id=L0pheU43NWJwRWVVSZklWdzQ4TihUUT09
- [4] Bernama (2019, November 11). Selangor aims to be regional hub for modest fashion. Selangor Journal. <https://selangorjournal.my/2019/11/selangor-aims-to-be-regional-hub-for-modest-fashion/>
- [5] Department of Statistics Malaysia (2019). Principal Statistics of Labour Force, Malaysia, Second Quarter (Q2) 2019. Retrieved from https://www.dosm.gov.my/v1/index.php?r=column/cthemedByCat&cat=149&bul_id=ekx5ZDVkVFAyWGg3WHNLUnJWL3RwUT09&menu_id=U3VPMldoYUxzVzFaYmNkWXZteGduZz09
- [6] Coffé, H., & Theiss-Morse, E. "The effect of political candidates' occupational background on voters' perceptions of and support for candidates", *Political Science*, 68(1), 55-77, 2016
- [7] Zainudin, M. I., Haji Hasan, F., & Othman, A. K., "Halal brand personality and brand loyalty among millennial modest fashion consumers in Malaysia", *Journal of Islamic Marketing*, (October). <https://doi.org/10.1108/JIMA-10-2018-0187>, 2019
- [8] Ordun, G., "Millennial (Gen Y) consumer behavior their shopping preferences and perceptual maps associated with brand loyalty", *Canadian Social Science*, 11(4), 40-55, 2015
- [9] Ajzen, I., "Nature and operation of attitudes", *Annual review of psychology*, 52(1), 27-58, 2001
- [10] Brakus, J. J., Schmitt, B. H., & Zarantonello, L., "Brand Experience: What Is It? How Is It Measured? Does It Affect Loyalty?", *Journal of Marketing*, 73(3), 52-68. <https://doi.org/10.1509/jmkg.73.3.52>, 2009
- [11] Giroux, M., Pons, F., & Maltese, L., "The role of perceived brand personality in promotion effectiveness and brand equity development of professional sports teams", *International Journal of Sports Marketing and Sponsorship*, 18(2), 180-195, 2017
- [12] Ansary, A., & Nik Hashim, N. M. H., "Brand image and equity: the mediating role of brand equity drivers and moderating effects of product type and word of mouth," *Review of Managerial Science*, 12(4), 969-1002, 2018
- [13] Batra, R., Ahuvia, A., & Bagozzi, R. P. (2012). Brand love. *Journal of marketing*, 76(2), 1-16.
- [14] Liao, Y. K., Wu, W. Y., Amaya Rivas, A. A., & Ju, T. L., "Cognitive, experiential, and marketing factors mediate the effect of brand personality on brand equity", *Social Behavior and Personality*, 45(1), 1-18, 2017
- [15] Sallam, M. A., "The Effects of Satisfaction and Brand Identification on Brand Love and Brand Equity Outcome : the Role of Brand Loyalty", *Nature*, 4(09), 42-55, 2015

CUSTOMER RELATIONSHIP MANAGEMENT, TECHNOLOGY AND MARKET SHARE PERFORMANCE OF BANKING SECTOR

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Abstract – The study reveals and provides in-depth analysis of the market of Malaysia and various factors involves in Customer Relationship Management (CRM) that effects the banking sector and its market share performance. CRM is the process to facilitate the existing customers by offering best services and products according to their need and demands. It also plays a dominant role to improvise relationship including internal and external environment of the organisation. As this study focuses on the banking sector, the aim of the study emphasis the following factors: customer identification, customer retention and impact of technology on market share performance of the banks. The study was analysed using SPSS analysis and spearman's rank order correlation. 243 questionnaires were distributed to the management in the banking market of Malaysia. The study concluded that by developing effective customer relationship strategies along with its proper appreciation and implementation by stakeholders banking sector have the competitive advantage comparatively with all the other sectors. The bank market share performance will only reach its desired location when the CRM strategies bring these factors into consideration Moreover, new customers require lot of efforts and cost therefore it is important to retain and identify the previous customers.

Keywords : Bank performance; market share; customer identification; customer retention

1. INTRODUCTION

The study examines and provides in-depth knowledge and effects of various factors in CRM and market share performance of banks [1]. These factors include the growing and advancement in the field of technology, the retention rate of customers and their process of identification which is the most important area with respect to security purpose [2]. The same study suggested that competition in the banking sector along with other dynamics in the market is increasing day by day. The banking sector must improve their relationship with the customers, marketers and stakeholders by growing a strong bond and meeting all the requirements and objectives call for this to survive in the market. CRM plays a significant role which emphasis on the relationship between organisation and employees rather having individual transactions [3]. CRM brings customers and organisations together and provide unlimited benefits to the organisation out of which one is earning brand loyalty and products [1]. With the effective and efficient CRM strategies increment in customer identification and retention rate are promised [4]. Moreover, a significant increase in the financial performance of an organisation and practice of customer relationship management is also associated with the level of customer satisfaction. Likewise, Navimipour and Soltani, [5] recognised that there is a significant relationship between satisfaction and loyalty of the customer and customer satisfaction is the main key to maximise the profit of an organisation. The dynamics of the customer should be understood, when one is trying to comprehending the concept of CRM [1]. This is because these customers are theoretically hypothesised consistently which they are not. CRM can be taken as the strategy which involves both employees and customers.

1.1 Concept of operational performance of the organisation:

The main idea of organisational performance depends upon the productive assets and their relationship with people and capital resources with a definite objective to achieve a certain purpose, growth of the company. The CRM is mainly responsible to perform in three cores (i.e. sales, marketing and services) in term of operational performance. The lead generation of the firm entirely depend upon the operational performance of the organisation.

1.2 CRM and Technology

To make effective use of human resources along with technology and to get detail insight on the consumer behaviour in the banking sector is the idea behind successful implementation of CRM strategy. Also, it helps to determine the value of those customers. If this strategy is implemented successfully and worked accordingly as planned, it offers efficiency and accessibility in the call centre and offers better services to the customers. It helps to generate more sells, signing deals, ease down the process of sales and marketing, increase in the revenue of the customers and their new customer discoveries. With the help of technology, the online transactional facility is introduced in all the formats of a business world which not only has made the business faster but has eased down the process and is more convenient compared to other traditional means.

2. METHODOLOGY

The study observes 21 money deposit banks located in Kuala Lumpur and 617 HQ which are all registered with MDIC that stands for Malaysia Deposit Insurance Corporation. The sample size features 243 entries, the research instrument that was used in collecting primary data was questionnaires and contains 5 points. The technique that was applied for hypothesis testing was Spearman's Rank Order correlation.

2.1 Framework

The process work as customer relationship management has its two dimensions and these are customer identification (CI) and customer retention (CR). For having an effective CRM, the company has to work on both the dimension. They need to identify the customer specifically those who can bring unlimited profits to the company. The identification means recognition which can be done by calling and asking their valuable opinion on the performance on the company, giving them gifts and other benefits if they have proved to be the best customer so far. The next dimension is customer retention (CR). It requires a lot of effort and investment for the company to bring new customer. They have to perform certain advertisement campaign to attract previous customers. The idea is to retain previous customer by offering them valuable product and services, recognising their part in your company's performance. Then comes the dependent variables that are; bank performance and market share along with earning their loyalty. Also, technology plays a dominant role in cutting the cost of transactions, retaining the previous customer, identifying and managing the customer as can be seen in Figure 1. According to the above theories, the following hypothesis is developed accordingly:

Ho1: There is no impact of CI on MS.

Ho2: There is no influence of CR on MS.

Ho3: Technology has no vital impact on CRM and bank market share performance.

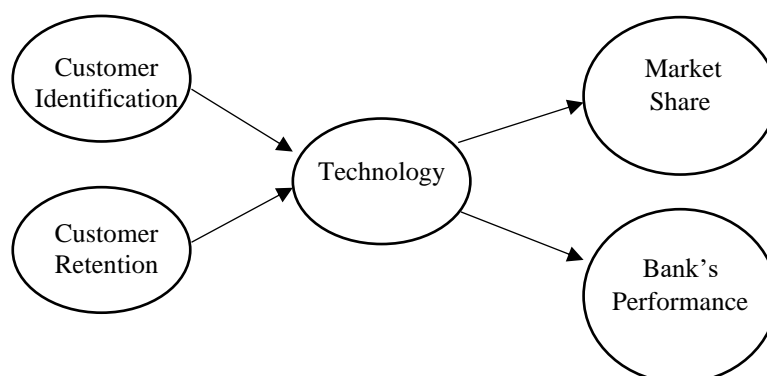


Figure 1 Conceptual framework on CRM and bank market share performance

3. RESULTS AND DISCUSSION

The findings reveal that all the above mention factors are directly associated with the future benefit of the organisation. In addition, these factors; customer identification and retention, and market share have a positive relationship between each other, however, technology has an assertive influence on customer relationship management and market share performance of banks. Also, this product feedback from the customer will help to meet the future need and market demands and CRM. In the first finding, it is observed that the performance of the bank is positively influenced by CI. Also, it is identified that customer satisfaction was found to be an antecedent to customer loyalty, retention, behavioural intention, market share and profitability. It is also observed that profit and future growth of the organisation can be increased by giving great services to the customers and customising the products according to the current market needs.

4. CONCLUSION

In the end, the study identifies that there is a direct relationship between customer identification, customer retention, and technology and these factors influence CRM and bank market share performance. Also, the success and profit of the bank market share performance rely on these factors. Also, apart from these factors, CRM should be widely practising in organisations, the employees should be motivated by giving appreciation based on the performance, as it helps in the growth and survival of the business at the end of the day. Moreover, the organisation's devotion towards CRM should be ensured by stakeholders as it helps to increase market share performance. Having said that it is understood in the above findings that banks have better competitive advantage comparatively from other sectors, but stakeholders should adopt and practice CRM strategies to attain desired aims, objectives and future organisational benefits.

REFERENCES

- [1] Wang, X., White, L., Chen, X., Zhao, X., Yeung, K., Huang, Q., & Song, X. "Improving the predictability of business failure of supply chain finance clients by using external big dataset", *Industrial Management & Data Systems*, 2015
- [2] Zhang, Y., Zhang, L. Y., Zhou, J., Liu, L., Chen, F., & He, X. "A review of compressive sensing in information security field", *IEEE access*, 4, 2507-2519, 2016
- [3] Otache, I., & Mahmood, R. "Entrepreneurial orientation and performance of Nigerian banks: The mediating effect of teamwork", *Mediterranean Journal of Social Sciences*, 6(3), 406, 2015
- [4] Reinartz, W., Krafft, M., & Hoyer, W. D. "The customer relationship management process: Its measurement and impact on performance", *Journal of marketing research*, 41(3), 293-305, 2014
- [5] Soltani, Z., & Navimipour, N. J. "Customer relationship management mechanisms: A systematic review of the state-of-the-art literature and recommendations for future research", *Computers in Human Behavior*, 61, 667-688, 2016

VARIATION VALUE OF LOCAL OWN-SOURCE REVENUE TO DEVELOPMENT EXPENDITURES FLUCTUATIONS OF ROKAN HULU REGENCY, RIAU-INDONESIA

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Abstract - The ability of regional expenditure can be seen from the implementation of development spending carried out by the regional government, based on the value of Local Own-Source Revenue (PAD). This study was conducted to investigate whether there is a relationship between variations in the value of PAD to the fluctuations in development spending experienced by the government of Rokan Hulu Regency, Riau-Indonesia. This research is quantitative, where the data analyzed is based on the variation in the value of the PAD of the Rokan Hulu Regency, fiscal year 2014 to 2018. From the results of the analysis, it was found that the percentage value of PAD fluctuation toward Development Expenditures Fluctuations was -0.08% in the budget of 2014 to 2015 periods; 0.14% in 2015 to 2016 periods; 1.10% in 2016 to 2017 periods; and -0.14% in 2017 to 2018 period. The conclusion of this research is that development in Rokan Hulu Regency was not running well.

Keywords : Variation value of PAD; fluctuation; value of development expenditure

1. INTRODUCTION

All income received from the local own economic source is a means to carry out development in all fields of community life and is called local own-source revenue (PAD) [1]. The main sources of PAD are regional taxation and retribution, wealth management and other legal sources of income [2]; such as regional business income [3], and the income other than the State Revenue and Expenditure Budget ([4, 5]. The sources of PAD greatly influence regional spending on a yearly basis [6]. Regional development expenditure is inseparable from the draft and the financial availability of the PAD as set forth in the Local Revenue and Expenditure Budget (APBD) document after obtaining the approval of the Regional House of Representative. The implementation of development expenditure carried out by the regional government is certainly based on the value of PAD. But how can the implementation of regional development expenditure other than expenditure for the apparatus meet the overall aspirations of the people need to be specified if there is a variation in the value of PAD and also a fluctuation in development spending such as experienced in Rokan Hulu Regency in the period of 2014 to 2018 budgets.

2. METHODOLOGY

The methodology of this research is quantitative, and the data is processed based on the statement of that descriptive analysis can provide an overview of the relationship between the two variables [7]. The variable is the variation in the value of PAD as the independent variable toward the fluctuation of development spending in Rokan Hulu Regency as the dependent variable. The analysis was carried out using the equation

$$H = \frac{B_b - B_a}{B_a \times 100\%} | A \quad (1)$$

where: H states the relationship between the independent variables with the dependent variable, B_a and B_b are the dependent variable namely fluctuations in development spending in the year before and after, A is the independent variable as a comparison factor according to the year in B_a and B_b , and 100% is the multiplier to get the percentage fluctuation of H.

3. RESULTS AND DISCUSSION

The value of PAD of Rokan Hulu Regency based on the data is in the eighth rank out of twelve regencies and municipalities in Riau province [8]. The PAD, and Development Expenditure of Rokan Hulu Regency from 2014 to 2018, there is a variation in the value of regional own revenue and there is a fluctuation in the regional development expenditure, and relationship between the variation in the value of PAD toward the development expenditure that has been fluctuated and it influenced the development implemented by the government of Rokan Hulu Regency, as the budget was insufficient with a total debt at Rp. 16,094,761,397.51 that should be paid off in the following budget period.

Based on analysis, the variation value of Local Own-Source Revenue toward Development Expenditures Fluctuations was minus 0.08% in the 2014 to 2015 budget period, 0.14% in 2015 to 2016 periods, and in 2016 to 2017 periods, there was a plus at 1.10%. While in the 2017 to 2018 period, there was a minus at 0.14% which means that the relationship of PAD to development expenditure fluctuation has fallen,

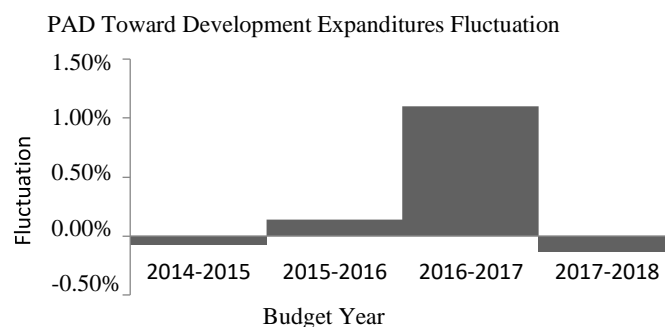


Figure 1 The relationship between value of local own-source revenue towards development expenditures fluctuations

4. CONCLUSION

Based on the result analysis, it can be concluded that there is a relationship between variations in the value of PAD toward the fluctuation in the government expenditure that has been implemented by the government of Rokan Hulu Regency. This fluctuation is based on the decreased and increased percentage value of regional own-source revenue toward the development spending in PAD, and PAD toward Development Expenditures Fluctuations budget year 2014 to 2018. While the percentage value of PAD fluctuation toward Development Expenditures Fluctuations was -0.08% in the budget of 2014 to 2015 period; 0.14% in 2015 to 2016 period; 1.10% in 2016 to 2017 period; and -0.14% in 2017 to 2018 period.

REFERENCES

- [1] Abdul Halim, "Akuntansi Sektor Publik Keuangan Daerah", Salemba Empat, Jakarta 2012
- [2] Rudy Badrudin, "Ekonomika Otonomi Daerah", UPP STIM YKPN, Yogyakarta, 2011
- [3] Republic Indonesia Minister of Home Affairs Regulation Number 13, 2006
- [4] Bratakusumah, Deddy Supriyadi, and Dadang Solihin, "Otonomi Penyelenggaraan Pemerintahan Daerah", Gramedia Pustaka Utama, Jakarta 2004
- [5] Mardiasmo, "Perpajakan Edisi Revisi", Andi, Yogyakarta, 2011
- [6] Afdhal Chatra, Yeni, "Pengaruh sumber-sumber pendapatan asli daerah terhadap belanja daerah di kabupaten bungo: Benefita, volume.2, 122-131, 2017
- [7] Kuncoro, Mudrajad, "Otonomi dan Pembangunan Daerah, Reformasi, Perencanaan, dstrategi, dan Peluang", Erlangga, Jakarta, 2004
- [8] Ministry of Finance of the Republic of Indonesia-Directorate General of Budget 2019

IMPAK PINJAMAN MIKRO KREDIT PERNIAGAAN HIJRAH SELANGOR TERHADAP PENINGKATAN PERNIAGAAN

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Abstrak – HIJRAH Selangor merupakan organisasi yang memberi pinjaman mikro kredit bagi pembangunan usahawan kecil. Namun begitu, sehingga kajian ini dijalankan, belum ada lagi kajian ini dijalankan untuk mengkaji impak Pinjaman Mikro Kredit HIJRAH Selangor terhadap peningkatan perniagaan peminjam. Kajian ini telah dilaksanakan menggunakan kajian tinjauan ke atas 1006 peminjam HIJRAH Selangor yang telah sekurang-kurangnya melengkapkan satu kitaran pinjaman. Hasil kajian menunjukkan Program Pinjaman Mikro Kredit Perniagaan HIJRAH Selangor berjaya meningkatkan pendapatan kasar perniagaan, meningkatkan pengeluaran produk/ perkhidmatan, meningkatkan jaringan perniagaan, membantu meningkatkan bilangan aset perniagaan, saiz pasaran dan jenis premis perniagaan. Responden juga bersetuju bahawa pinjaman ini membantu meningkatkan modal perniagaan walaupun melibatkan kenaikan kos operasi.

Kata Kunci : Pinjaman Mikro Kredit; HIJRAH Selangor; usahawan kecil; usahawan Selangor; peningkatan perniagaan; keberkesanan mikrokredit

1. PENGENALAN

Perusahaan Kecil dan Sederhana atau lebih dikenali sebagai PKS menjadi sumber pendapatan utama di kalangan negara membangun kerana ia merangkumi 95 peratus keadaan ekonomi sesuatu negara [1]. Prestasi perniagaan usahawan Melayu bagi perusahaan kecil dan sederhana (PKS) boleh diukur dengan melihat kepada (1) penambahan modal syarikat, (2) penambahan bilangan pekerja, (3) pendapatan kasar perniagaan ataupun (4) melalui kuantiti pengeluaran produk yang dipasarkan [2]. Sejak tahun 2015, Kerajaan Negeri Selangor telah memperuntukkan geran untuk Pinjaman Mikro Kredit HIJRAH Selangor sebanyak RM100 juta bagi pembangunan usahawan kecil. Namun begitu, sehingga kajian ini dijalankan masih tiada kajian khusus yang dibuat bagi melihat impak pinjaman mikro kredit dari Pejabat HIJRAH Selangor kepada usahawan kecil. Sehubungan dengan itu, satu kajian penilaian impak program perlu dijalankan bagi mengenalpasti keberkesanan Program Pinjaman Mikro Kredit Perniagaan HIJRAH Selangor ini kepada penerimanya. Objektif khusus kajian adalah untuk mengenalpasti kerangka demografi umum pihak berkepentingan dan mengenalpasti kesan Program Pinjaman Mikro Kredit Perniagaan HIJRAH Selangor terhadap pencapaian peminjam dari segi pertambahan aset peribadi dan peningkatan perniagaan.

2. METODOLOGI

Kajian ini menggunakan pendekatan kuantitatif di mana teknik *survei* (tinjauan) digunakan ke atas peminjam Program Pinjaman Mikro Kredit Perniagaan HIJRAH Selangor yang telah melengkapkan sekurang-kurangnya satu kitaran pinjaman. Kajian ini menggunakan kaedah teknik persampelan rawak berstrata (*stratified random sampling*). Bilangan sampel ditentukan oleh analisis yang diperlukan oleh kajian ini. Untuk mendapatkan bilangan minimum sampel untuk analisis setiap data, ia boleh ditentukan oleh perisian *Raosoft*. Jumlah sampel yang dicadangkan adalah 1100 orang responden yang dibahagikan mengikut zon menggunakan pengiraan menggunakan formula persampelan rawak berstrata berikut,

$$n_h = \left(\frac{N_h}{N} \right) * n \quad (1)$$

yang mana n_h = saiz sampel strata h , N_h = saiz populasi strata h , N = saiz populasi keseluruhan, n = saiz sampel keseluruhan.

Borang soal-selidik telah direkabentuk berdasarkan proses sorotan literatur dan beberapa siri mesyuarat serta bengkel pembentukan instrumen. Draf borang soal-selidik telah diuji melalui kajian rintis (*pilot test*) ke atas 30 responden yang dipilih untuk menentukan kebolehpercayaan item soal-selidik (*reliability*). Kajian rintis ini perlu dilakukan bagi menentukan kesesuaian soalan serta mengenal pasti kebolehpercayaannya. Sejumlah 30 responden dari kalangan penerima Program Pinjaman Mikro Kredit Perniagaan HIJRAH Selangor terdekat dipilih dalam proses pra-uji ini. Setelah borang soal-selidik tadi ditambahbaik, kajian lapangan dilaksanakan ke atas 1100 responden yang telah melengkapkan sekurang-kurangnya satu kitaran pinjaman. Pengumpulan data bagi kaji selidik ini telah dijalankan secara temubual bersemuka menggunakan borang soal selidik. Dalam fasa ini, data hasil *survei* dianalisis menggunakan SPSS.

3. HASIL KAJIAN DAN PERBINCANGAN

Berdasarkan kajian, sebanyak 35.1% responden adalah lelaki dan 64.9% responden adalah perempuan. Sebahagian besar responden adalah Melayu (93.3%) dengan selebihnya berbangsa Cina (2.2%), India (4.0%) dan lain-lain (0.5%). Sebanyak 71.4 % responden adalah berumur antara 21-50 tahun. Selebihnya adalah dalam kategori umur kurang daripada 21 tahun (0.4%) dan responden yang berumur lebih daripada 50 tahun adalah sebanyak 28.1%. Majoriti responden (91.2%) telah berkahwin, (6.9%) bujang, (1.5%) berstatus janda/balu dan (0.5%) pula bergelar duda. Kebanyakan responden (97.5%) adalah sihat namun sebilangan kecil menghidapi sakit kronik (0.3%), OKU (1.4%) dan lain-lain (0.8%).

Kebanyakan responden telah menetap di Selangor melebihi 21 tahun (72.5%). Sebanyak 23.5% adalah responden yang telah tinggal di Selangor antara 11-20 tahun manakala 4.0% pula menetap kurang daripada 10 tahun. Seramai 51.0% daripada responden didapati mempunyai pendidikan peringkat SPM/O LEVEL/SPMV, manakala 23.6% responden adalah berpendidikan peringkat STPM/Diploma/ STAM dan 6.1% berpendidikan di tahap Ijazah Sarjana Muda. Dapatan kajian menunjukkan majoriti responden memperolehi pendapatan lingkungan RM2001 hingga RM5000 (47.2%). Sebahagian responden mendapat pendapatan kurang RM2000 (25%) manakala 9.1% responden mendapat pendapatan melebihi RM10 000.

Jika dibuat perbandingan dari segi kategori perniagaan, perniagaan pemakanan merupakan perniagaan yang paling tinggi peratusan penglibatan responden iaitu 36.1%. Ini diikuti oleh perniagaan perkhidmatan (30.1%) dan perniagaan pembekal (26.1%). Kebanyakan kategori perniagaan lebih melibatkan usahawan perempuan kecuali perniagaan penternakan yang lebih banyak melibatkan usahawan lelaki.

Berdasarkan Jadual 1, majoriti responden berpendapat dengan adanya pinjaman HIJRAH, peminjam dapat meningkatkan pendapatan kasar perniagaan (85.0%), meningkatkan pengeluaran produk (86.8%), menambahkan bilangan aset perniagaan (71.0%), meluaskan saiz pasaran (70.0%) serta menambahkan jaringan perniagaan (76.0%). Majoriti responden bersetuju bahawa pinjaman HIJRAH dapat membantu meningkatkan modal perniagaan (81.9%) walaupun melibatkan kenaikan kos operasi (75.2%). Terdapat 58% responden juga berjaya mengembangkan saiz perniagaan yang dimiliki peminjam setelah membuat pinjaman HIJRAH Selangor. Contohnya perniagaan mereka berkembang dari gerai meningkat kepada restoran. Sebahagian besar responden berpendapat setakat ini mereka belum mengalami peningkatan dari segi bilangan premis perniagaan (62.2%) dan bilangan pekerja (58.8%). Namun begitu sebahagian kecil peminjam HIJRAH Selangor telah meningkat dari segi bilangan premis perniagaan (37.8%) dan bilangan pekerja (41.2%).

Jadual 1 Peningkatan perniagaan

PERKARA	SANGAT TIDAK SETUJU (%)	TIDAK SETUJU (%)	AGAK SETUJU (%)	SETUJU (%)	SANGAT SETUJU (%)
Peningkatan Jenis Perniagaan	6.9	35.2	35.6	19.5	2.9
Peningkatan Bilangan Premis Perniagaan	9.4	52.8	28.1	7.4	2.3
Peningkatan Bilangan Pekerja	8.0	50.8	28.6	10.7	1.9
Peningkatan Modal Perniagaan	1.0	17.1	45.9	28.1	7.9
Peningkatan Kos Operasi Perniagaan	1.5	23.4	40.9	30.0	4.3
Peningkatan Pendapatan Kasar	0.7	14.3	49.4	29.0	6.6
Peningkatan Kuantiti Pengeluaran Produk	0.5	12.7	48.9	30.3	7.6
Peningkatan Bilangan Aset Perniagaan	1.5	27.5	43.5	20.3	7.2
Peningkatan Saiz Pasaran Perniagaan	1.0	29.1	40.0	24.3	5.7
Peningkatan Jaringan Perniagaan	1.2	22.8	43.7	26.2	6.1

4. KESIMPULAN

Dari aspek peningkatan perniagaan, responden menyatakan bahawa Program Pinjaman Mikro Kredit Perniagaan HIJRAH Selangor berjaya meningkatkan pendapatan kasar perniagaan (85%), meningkatkan pengeluaran produk/ perkhidmatan (86.8%), serta meningkatkan jaringan perniagaan (76%). Selain daripada itu, Program Pinjaman Mikro Kredit Perniagaan HIJRAH Selangor berjaya membantu meningkatkan bilangan aset perniagaan (71%), saiz pasaran (70%) dan jenis premis perniagaan (58%). Responden juga bersetuju bahawa pinjaman ini membantu meningkatkan modal perniagaan (81.9%) walaupun melibatkan kenaikan kos operasi (75.2%). Namun begitu, responden berpendapat setakat ini mereka belum mengalami peningkatan dari segi bilangan premis perniagaan (62.2%) dan bilangan pekerja (58.8%).

PENGHARGAAN

Pihak penyelidik ingin mengucapkan sekalung penghargaan kepada Dato' Mansor Othman, Pengerusi Eksekutif HIJRAH SELANGOR dan Tn. Haji Roslim Md Akhir, Ketua Pegawai Eksekutif HIJRAH Selangor dan Pn. Normaiza Yahya, Ketua Pegawai Operasi HIJRAH Selangor kerana mengizinkan kami menjalankan kajian ini dan memberikan data yang diperlukan. Penghargaan juga buat Prof Dato' Dr Mohamad Redzuan bin Othman, En Khairul Arifin Munir, Pn. Azmariana Azman, dan En. Firdaus dari Institut Darul Ehsan (IDE) atas kolaborasi UNISEL dan IDE untuk melaksanakan kajian ini. Tidak dilupakan, penghargaan buat Prof. Dr. Azami Zahrim, Penasihat Statistik IDE atas khidmat nasihat yang diberikan dalam menambahbaik kajian. Kajian ini disokong dan ditaja sepenuhnya oleh Kerajaan Negeri Selangor di bawah Geran Penyelidikan Impak Program Sektor HIJRAH Selangor.

RUJUKAN

- [1] Jamaiah Haji Yahaya, S. R., "Model Kesediaan Pelaksanaan Teknologi Maklumat untuk Perusahaan Kecil dan Sederhana Ke Arah Era Revolusi Industri 4.0", Jurnal Pengurusan, 54, pp 1-26, 2018
- [2] Muhamad Asri, Zaimah Darawi, "Transformasi dan prestasi perniagaan usahawan Melayu Perusahaan Kecil dan Sederhana (PKS) di Johor Bahru", Persidangan Kebangsaan Ekonomi Malaysia ke VII (PERKEM VII), Transformasi Ekonomi dan Sosial Ke Arah Negara Maju, Ipoh, Perak 4-6 Jun 2012, (pp. JILID 1 696 708), Universiti Kebangsaan Malaysia, 2018

ROLE OF STRATEGIC COMPETITIVENESS AS MEDIATING BETWEEN LEADERSHIP SUCCESSION AND FAMILY BUSINESS SUSTAINABILITY at WEST SUMATERA

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Abstract - The main purpose of this study is to examine the role of strategic competitiveness as mediating between leadership succession and family business sustainability. The research can contribute and expand the existing body of knowledge on family businesses. The object of this research is family businesses industries range from small medium businesses (SMB) industry. Populations are an active CEO, directors, managers of the family firm industries for small medium businesses. Sample was 100 industries of family companies at West Sumatera. Purposive sampling technique are applied to get the primary data through questionnaires. Then, the data computed by using SmartPLS-3.2.8 to examine the direct effect and indirect effect on family business sustainability. The result showed that the leadership succession affected positively on family business sustainability; leadership succession affects positively on strategic competitiveness; strategic competitiveness affects significantly on family business sustainability; and strategic competitiveness mediated between leadership succession and family business sustainability.

Keywords : Family business; sustainability; leadership succession; strategic competitiveness.

1. INTRODUCTION

The sustainability of a family company is a very important factor to keep the company growing, especially with regard to the company's successors. Family business is a business that is managed by families and change from one generation to the next [1]. Sustaining family business will achieve the financial stability, creating jobs, and positively impact on economy [2]. The average percentages of some countries in developing family businesses found 80% in absorbing the employment in the world [3]. Phenomena shows that family businesses have significant role in developing the businesses in some countries [4]. However, the continuity of family business was low. Most of the problems due to lack of preparation for a successor after the owner retired or died [5] and low competitiveness.

In this study, we discuss the family business sustainability issue specifically for family companies in West Sumatra. Besides, the problems that often arises in family businesses in West Sumatra is that most of the family companies have low competitiveness. To ensure the sustainability of the family businesses, they need to employed the strategic competitiveness by implementing the value creating strategy [6-7]. As stated by Pojasek [8], family company that is able to exist and sustain as living company is a visionary family company. Thus, current study proposed to examine the strategic competitiveness as mediating variable between leadership succession and family businesses sustainability. In addition, this study will try to answer several research questions such as how leadership succession and strategic competitiveness affects family business sustainability; how leadership succession affects strategic competitiveness and whether the effect of leadership succession is mediated by strategic competitiveness on family business sustainability.

2. METHODOLOGY

The population of this research is the CEO or manager of the small medium business industries that located at the region of West Sumatera, Indonesia. The total sampling is 100 family business industries which based on minimal recommended by using G*Power, one tail, and error probability 0.05. The result of Cronbach's Alpha of three variables has an acceptable reliability which is more than 0.70 is considered reliable and valid [9].

2.1 Conceptual Framework

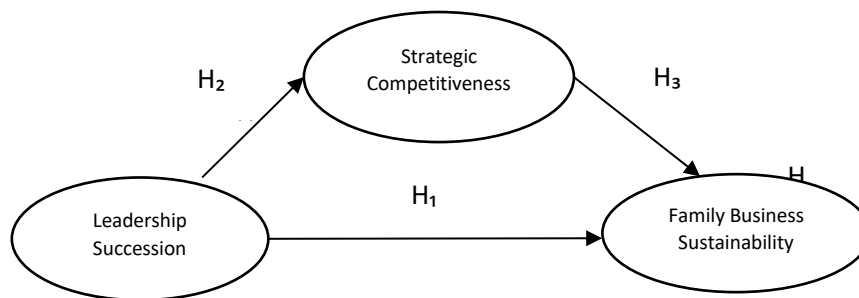


Figure 1 Conceptual framework design

Figure 1 is the conceptual framework in this study which there are three constructs to be examined. The development of the research hypotheses is done in order to prove the research objectives and the answer of the research questions of the sustainability of family business. The hypotheses are based on the research questions and have been narrowed down based on the literature review to attain the objectives. This study was supported by Resource Based view (RBV) theory [10]. Furthermore, the hypotheses of this study formulated which leadership succession affect positively on family business sustainability; leadership succession affect positively on strategic competitiveness; strategic competitiveness affect significantly on family business sustainability and strategic competitiveness mediated between leadership succession and family business sustainability.

3. RESULTS AND DISCUSSION

The key finding of this study shows that the result of Cronbach's Alpha of Leadership Succession variable is 0.885, Strategic Competitiveness is 0.771 and Family Business Sustainability is 0.863. Therefore, the data is considered reliable and valid. Furthermore, the structural model path coefficient indicate that leadership succession affects positively on family businesses sustainability. Leadership succession affect positively on strategic competitiveness and strategic competitiveness affect significantly on family business sustainability. Therefore, the hypotheses are supported. The value can be shown on table below:

Table 1 Testing Results of Structural Model Assessments

	Path Coefficient	t-Values	p-Value	Significance ^a (P< 0.05)
Leadership Succession → Family Business Sustainability	0.610	7.485	0.000	Yes
Leadership Succession → Strategic Competitiveness	0.680	15.383	0.000	Yes
Strategic Competitiveness → Family Business Sustainability	0.272	2.600	0.010	Yes

4. CONCLUSION

The results of this study indicate that the leadership succession factor has a positive effect on the sustainability of family companies and strategic competitiveness. Strategic competitiveness affects significantly on family business sustainability. We believe that by preparing early successors, the sustainability of family companies can be realized. Furthermore, the strategy of competitiveness will have a positive impact as a mediation between leadership succession because family companies need value that can create innovative products by paying attention to products that cannot be replicated, low cost and accepted in the market.

REFERENCES

- [1] R. Bakoğlu, O. Bige, and A. Yıldırım, “The Role of Sustainability in Long Term Survival of Family Business : Henokiens Revisited,” *Procedia - Soc. Behav. Sci.*, vol. 235, no. October, pp. 788–796, 2016
- [2] V. Naidoo, “Sustainability of Families in Business into the Third Generation and Beyond: Analysis of Three Cases,” 2013.
- [3] M. Rautiainen, *Dynamic Ownership In Family Business Systems – A Portfolio Business Approach*. 2012.
- [4] M. D. Soedibyo, *Family Business Responses to Future Competition*. PT Gramedia Utam Umum, 2012.
- [5] N. M. Cho, S. Okuboyejo, and N. Dickson, “Factors Affecting the Sustainability of Family Businesses in Cameroon: An Empirical Study in Northwest and Southwest Regions of Cameroon,” *J. Entrep. J. Entrep. Res. Pract.*, vol. 2017, 2017
- [6] M. A. Hitt *et al.*, *Competitiveness & Globalization Concepts and Cases*. Cengage Learning, 2016.
- [7] R. Sirmon, D., Hitt, M., Ireland, “Managing Firm Resources in Dynamic Environments to Create Value: Looking inside the Black Box,” *Acad. Manag. Rev.*, vol. 32(1), no. 1, pp. 273–292, 2007.
- [8] R. B. Pojasek, *Organizational Risk Management and Sustainability: A Practical Step-by-Step Guide*, vol. 91. 2017.
- [9] J. F. J. Hair, G. T. M. Hult, C. M. Ringle, and M. Sarstedt, *A Primer on Partial Least Squares Structural Equation Modelling (PLS-SEM)*. SAGE, 2017
- [10] T. G. Habbershon and M. L. Williams, “A resource-based framework for assessing the strategic advantages of family firms,” *Fam. Bus. Rev.*, vol. 12, no. 1, pp. 1–25, 1999

THE CORPORATE GOVERNANCE CHARACTERISTICS AND RISK-TAKING IN THE ISLAMIC FINANCIAL INSTITUTIONS: A THEORETICAL REVIEW

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Abstract – The present study intends to examine existing literature and summarized the effects of the corporate governance characteristics on risk-taking and justified with existing most relevant theories in the Islamic financing system. The study extracted available literature from Google Scholar, ProQuest, and Scopus as well as other online data-based. The theoretical review findings summarized that there are two theories such as agency theory and stakeholder theory are considered as most relevant for underpinning to justify the literature summary of this study. Moreover, the agency theory explains the role of the corporate governance characteristics on the risk-taking of IFIs. The present study also shows stakeholder theory paradigm that, influences on the creates effective measurement of risk-taking and the stakeholders which lead to insolvency, economic collapse, liquidity shortage, financial institution corrupted, financial institution scandal, enterprise fall and monetary instability even misunderstanding amongst the stakeholder that lead to credit risk, liquidity. The study recommendations will be used to develop a research framework to examine relationships between corporate governance characteristics and risk-taking based on empirical data and findings could be a valuable source of knowledge for policymakers and regulators in the Islamic financial services sectors in the world.

Keywords : Corporate governance characteristics; agency & stakeholder theory; risk taking

1. INTRODUCTION

The journey of Islamic finance has a long history in global finance. In the early of Islamic revolution, Islamic finance was an uneven competition but today, Islamic finance has become much popular due to safe and competitive packages with compliance of Islamic Shariah which follows specific Islamic norms, principles and compliance of Islamic law. This compliance of Islamic law is maintained under the Islamic financial institutions (IFIs). IFIs are those institutions that practically and officially abide by Islamic compliance (Shari'a law), which issue guidelines for financial transactions, with ethical conduct [1]. The IFIs include Islamic banks, Islamic insurance companies, Islamic mutual funds, Islamic hedge funds, and issuers of Islamic bonds (Sukuk) institutions [2].

The intention of this section is to discuss the most appropriate theories that can be used to analyse the thesis conceptual frame work in order to effectively explore the effect of the corporate governance characteristics that influence on risk taking. This section is conducted based on two teaching and learning theories which are agency [3] and stakeholder theory [4]. These two theories will be the backbone of the thesis analysis and study framework development. These theories are embedded to outline the importance of relationships between corporate governance characteristics including; BOD characteristics, AC committee characteristics, RMC characteristics, SSB characteristics and other influencing and moderating factors that affecting risk taking of IFIs. In the context of Bangladesh, there are six core risk in financial sectors such as credit risk credit policy 8 (CP8), market risk credit policy 13 (CP13), liquidity risk credit policy 14 (CP14), operational risk credit policy 15 (CP15) and interest rate risk credit policy 16 (CP16) (Bangladesh Bank, 2012). However, there are several studies have examined on the issues of risk taking which has become the most concerning issues to the Islamic financial institutions [1,5,6]. In light of this fact, it cannot be denying the influence of credit and liquidity risk on a sound economic infrastructure of IFIs in Bangladesh. To minimize these risks, the study has examined the characteristics of corporate governance and risk taking of IFIs in Bangladesh.

2. METHODOLOGY

This study covers all Islamic financial institutions in Bangladesh over a six-year period (2013-2018) and includes Islamic banks, insurance and financial investment companies ltd. Secondary data is filtered from the most recent literatures by conducting a meta-analysis technique literature finding. In order to include a firm in the sample, this study has applied three different criteria. First, for applying the agency theory that maintains an adjacent relationship between corporate governance characteristics and risk-taking. Second, due to the stakeholder theory employed in this paper, it is required to measure the interest of stakeholders that impact on risk taking. Third, the study used key words extracted available literature from Google Scholar, ProQuest, and Scopus as well as other online data based. The study summarized the empirical review on the corporate governance characteristics which analyses the effects of governance attributes on the risk taking for IFIs.

2.1 Research Framework

In this paper, a unique framework (Figure 1) is made with determinants of corporate governance literatures and the risk-taking literature. In this new integrated framework, firm size is another new variable which influence between corporate governance and risk taking.

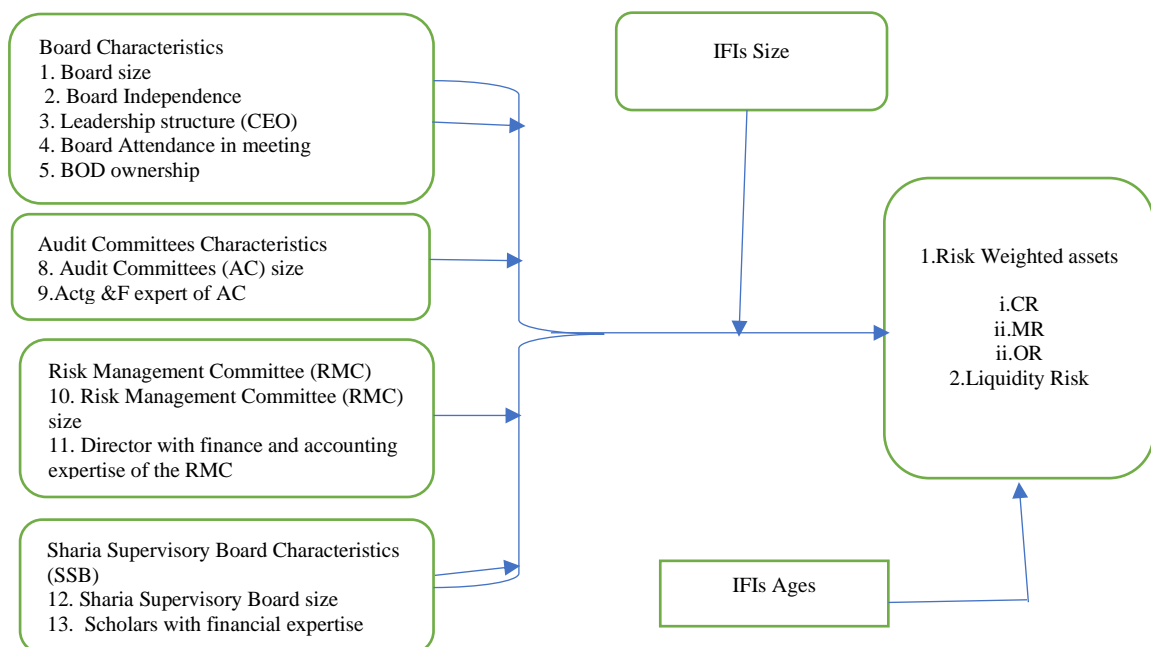


Figure 1 Research framework

3. RESULTS AND DISCUSSION

The presents study analysis the corporate governance characteristics and risk taking among IFIs in Bangladesh. The corporate governance characteristics indicate BOD, AC, RMC and SSB characteristics. Previous studies highlighted that the average board size, whereas more than one-third independent directors and dual position of leadership strongly able to control risk. In addition, director's ownership and maximum participate in meeting (more than 70 %) highly able to control excess risk taking [7]. Audit committee and risk management committee place in right position which is highly supervise and monitor to control risk [8]. Akbar et al. [7] explained that multiverse board play a significant role to control excess risk taking. The present study indicates that board characteristics, AC, RMC and SSB characteristics have built up a conceptual framework where there is a corporate relationship on each other that underpin agency theory.

However, financial firms are more complex and larger in size where the bigger board is generally expected. In addition, there is evidence in the existing literature which suggests a positive relationship between board size and complexity of the firms [5]. Previous literatures show a noticeable statistic that even though financial services have the smallest board size containing around six directors, the majority of those directors are independent with an average figure of around 76%, which is the highest satisfactory position to risk control. Similarly, director's role in board indicate that are statistically significant to maintain the entity. It is important to note that previously published studies in these areas use only banks in their sample [6]. BOD characteristics follow up on each other and maintain a principal- agency relation that impact to reduce risk [5]. Previous study analyses that BOD characteristics means board size, independent, duality and directors' ownership as an important determinant of risk taking [5].

4. CONCLUSION

This study has been conducted through a systematic research review formality to identify the key corporate governance characteristics to fill the gap among the Islamic financial institutions (IFIs). The corporate governance characteristics capture the two theory that affecting the risk taking and has justified with most relevant theories in the particular area. The findings of this study thus offer the theoretical rationale way that BOD, AC, RMC and SSB influence corporate risk taking of IFIs in Bangladesh. Finally, the study has examined the perceptions of Islamic financial firms' BOD, AC, RMC and SSB through the application of qualitative methods provide interesting and in-depth insights to the link between corporate governance mechanism and risk taking in Islamic financial firms. This study contributes to IFIs literature on corporate governance. Additionally, future research could further extend the role of the Shari'ah supervisory board.

REFERENCES

- [1] Abu-Tapanjeh "Corporate governance from the Islamic perspective:A comparative analysis with OECD principles", *Critical Perspectives on Accounting*, 20, 556–567, 2019
- [2] Rammal, H. G. "The Importance of Shari'Ah Supervision in Islamic Financial Institutions" *Corporate Ownership and Control* 3(3), 2006
- [3] Michael, Jensen, C., William, & Meckling, H. "Theory of the firm: Managerial behavior, agency costs, and ownership structure", Springer, 1979
- [4] Andre, Laplume, Sunpar, & Reginald, "Stakeholder: Reviewing a theory that moves US", *Journal of Management*, 2008
- [5] Islam, M. M., Bhuiyan, A. B., & Kassim, A. A. "Board Characteristics and Risk-Taking Decisions among Islamic Financial Institutions in Bangladesh" *Selangor Business Review*, 4(1), 2019
- [6] Mollah, S., Hassan, M. K., Farooque, O. A., & Mobarek, A. "The Governance, Risk-taking, and Performance of Islamic Banks" *Journal of Financial Services Research*, 2017
- [7] Akbar, S., Kharabsheh, B., Poletti Hughes, J. and Shah, SZA., "Board Structure and Corporate Risk Taking in the UK Financial Sector", *International Review of Financial Analysis*, Volume 50, pp. 101-110, 2017
- [8] Pearl-Kumah, S., Sare, Y. A., & Bernard, B. (2014) "Corporate Governance and Risk Management in the Banking Sector of Ghana", *European Journal of Accounting Auditing and Finance Research*, 12(2), 2014

THE INFLUENCE OF ECONOMIC DIVERSIFICATION AGENDA ON ECONOMIC GROWTH OF THE SULTANATE OF OMAN

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Abstract – This paper presents a study on the relationship between economic diversification agenda and economic growth of the Sultanate of Oman. As one of the oil-exporting countries that is heavily dependent on it for income, Oman believes that the state's policy should be geared towards creating an effective economic diversification agenda that serves Oman's economic growth away from the increasingly volatile oil prices. As a result, Oman initiated a national program called *Tanfeedh*, as a catalyst for the development of economic diversification agenda that helps to reduce its over-reliance on oil and gas. In this paper, the impacts of both the economic diversification and *Tanfeedh* Programme and coupled with another factor, industrial development, on the economic growth were examined. This was operationalised through the development of a conceptual framework that represents the inter-relationships between these strategic factors. While industrial development represents its role as a mediating factor, the *Tanfeedh* Programme acts as a moderating factor in the framework. The initial findings from a pilot study carried out indicated that the internal consistency of the proposed framework that represents all the strategic factors was adequate in predicting the economic growth of Oman.

Keywords : Economic diversification; economic growth; industry development

1. INTRODUCTION

Petroleum is the biggest source of income in Oman and over 80% of the national GDP is generated from petroleum. Oman's economic growth is basically measured through the exports of oil and gas accounted for sales of 62.7% and 51% of its GDP. The volatility of Oman's oil price tends to be rather obvious recently as the price has dropped to USD 42.83 as reported by the Dubai Energy Market [1]. In view of the oil prices' fluctuations over the past 10 years, the Government of Oman has embarked on some audacious efforts to reduce its dependence on oil and is setting its ambitious goal of decreasing its current GDP by 37.2 to 9% in 2020 [2].

Economic diversification has historically been used as a strategy in order to move the economy from one source to several sources of revenue distributed across the primary, secondary and tertiary markets, with a large population. Oman initiated a national program, *Tanfeedh*, for the development of economic diversification agenda in 2016, to reduce its over-reliance on oil and gas. *Tanfeedh* Programme is an accelerator that creates an easy business environment in the country. In the programme the Government has chosen five strategic industries: *manufacturing, transport and logistics, tourism, fishing and mining* [3].

However, there are still scanty studies that investigate the effectiveness of *Tanfeedh* in driving Oman economic growth. Another strategic issue is the lack of information on the success of industrial development such as is the drive for the imports of modern technology and machinery by the industries, on the economic growth. Thus, the purpose of this study is to examine, to some extent, the impact of the strategic factors on the economic growth for Oman.

2. METHODOLOGY

In this study, cross-sectional design, quantitative, and correlational research were adopted in the process of gathering the relevant data. The units of sampling in this study are the personnel or staff who are involved directly and had the experience and information with regards to the Economic Diversification agenda. More specifically, the sampling units will comprise of members or staff of

government agencies and ministries involved directly with *Tanfeedh* programme, and members of industry partners who come from the selected industry sectors involved in the programme.

Survey research method was adopted, and the study instrument based on questionnaires were used in this study to collect quantitative data from the respondents. The preliminary data analysis explains the basic data analysis that involves data cleansing process, and descriptive analysis for the study instruments. This preliminary analysis also includes the reliability measure using Cronbach's alpha. The Statistical Package for Social Sciences (SPSS) version 20.0 was used to analyse the data collected from the pilot survey.

2.1 Framework

Based on the arguments presented earlier and a comprehensive review of previous studies, a conceptual framework displayed in Figure 1 was proposed to model the relationships between the drivers of economic diversification and economic growth.

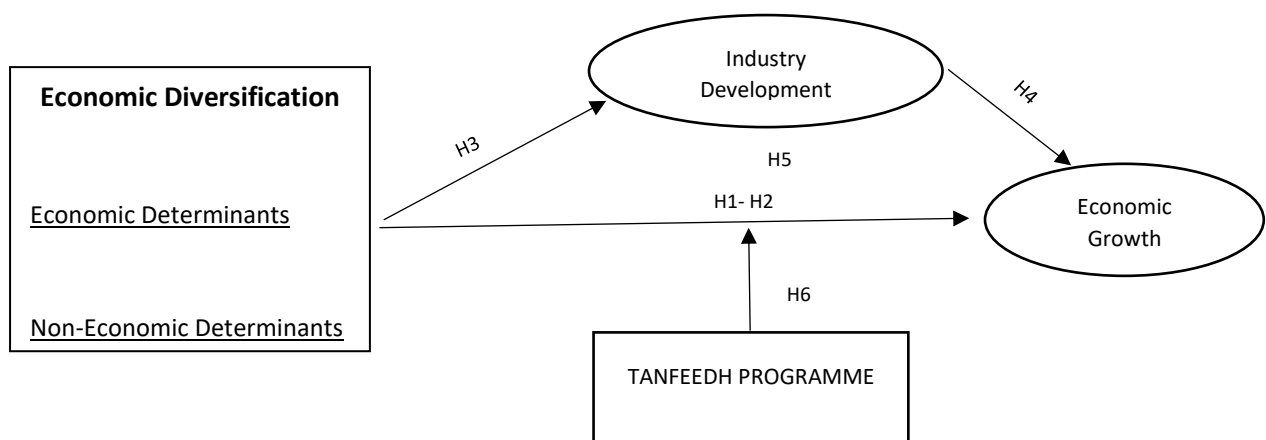


Figure 1 The conceptual framework

Based on the interrelationships between the variables or constructs in the conceptual framework in Figure 1, the following hypotheses statements can be formulated.

- H1: Economic determinants have a significant influence on the economic growth
- H2: Non-economic determinants have a significant influence on economic growth
- H3: Economic diversification has significant influence on industrial development
- H4: Industrial development significantly influence economic growth
- H5: Industrial development significantly mediates the relationship between economic diversification and economic growth.
- H6: TANFEEDH Programme significantly moderates the relationship between economic diversification and economic growth.

3. RESULTS AND DISCUSSION

A pilot study was implemented to verify whether the content and format of the study instrument are clear, logic and not ambiguous in terms of achieving the objectives of the study. A sample of 42 respondents will be selected, comprising of managers/ head of department/unit/section. Table 1 presents the summary statistics of the data from the indicators of each of the constructs. This strongly indicate that all the indicators and subsequently the constructs are normally distributed. the internal consistency of the items in the scale. The Cronbach's reliability scores, ranging from 0.912 for the Economic Growth to 0.942 for the Non-Economic Determinants, strongly indicated that the internal consistency of the model was adequate.

Table 1 The summary statistics

	N	Min	Max	Mean	Std. Deviation	Cronbach's Alpha (CA)	Skewness		Kurtosis	
							Statistic	Std. Error	Statistic	Std. Error
Economic Determinants	42	1.45	6.23	4.8084	.93911	.921	-1.568	.365	3.727	.717
Non-Economic Determinants	42	1.67	6.67	5.0030	.96765	.942	-1.473	.365	3.365	.717
Economic Diversification	42	1.25	6.50	4.7440	1.03388	.914	-1.163	.365	2.285	.717
Industry Development	42	1.20	6.60	4.9738	1.10830	.925	-1.374	.365	2.370	.717
Tanfeedh Programme	42	2.11	6.56	4.9921	1.12388	.926	-.889	.365	.340	.717
Economic Growth	42	1.33	6.50	4.3016	1.13770	.912	-.518	.365	-.169	.717

4. CONCLUSION

The preliminary study seemed to indicate that the characteristics of the pilot data satisfied the normality assumptions, and the internal consistencies of the proposed conceptual framework were adequate. The results of this pilot study will be clear when analysing the actual study data in the next phase and the observations will be made as well as recommendations for future studies and research to complete the conclusion of this study.

REFERENCES

- [1] Times of Oman, "Price of Oman Oil drops", July 31, 2020, <https://timesofoman.com/>
- [2] Mubeen, S.A, Kumar, A.R. and Nazneen, Q., "Economic Diversification in Sultanate of Oman amidst Oil crises", IOSR Journal of Business and Management, pp 9-12, 2017
- [3] *Tanfeedh* Handbook, "The National Program for Enhancing Economic Diversification (*Tanfeedh*)", 2017, <http://www.tanfeedh.gov.om/>

ZAKAT DISTRIBUTION MANAGEMENT SYSTEM (ASNAF)

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Abstract – Zakat is one of the basic principles of Islam, which has been made obligatory by Allah to each and every Muslim to carry out. The basic rule of zakat is that the zakat organization has to be established within Muslim society in a well-organized way. The zakat organization should be under the liability of the Muslim Supremacy or it also can be under the special Muslim supervisory body who has knowledge of Islam that has been appointed by Government. Selangor Zakat Board is a prominent charity Government organization in Selangor. Distribution of Zakat is important in helping the poor and the needy people (Asnaf). Therefore, an online distribution system for Asnaf people is highly needed to distribute the Zakat effectively and efficiently. The system generated is an online zakat application and web-based system for Asnaf who can apply through online. This system is capable of minimizing the burden of zakat centre staff in facing zakat applications from Asnaf in large quantities. In addition, this system is able to manage information efficiently where information about zakat from the Selangor Zakat Board that can be disseminated quickly and every applicant's information can be stored online as well as eliminating manual applicant's record keeping system. Applicants are able to check their approval, reject and pending status through apps and web-based system and zakat admin could take necessary action immediately. Finally, this system is able to improve the quality of management and service of the zakat centre with changes in zakat management procedures in line with the use of the online system.

Keywords: Zakat distribution; online application; asnaf

1. INTRODUCTION

Zakat is one of the basic principles of Islam, which has been made obligatory by Allah to each and every Muslim to carry out. The basic rule of zakat is that the zakat organization has to be established within Muslim society in a well-organized way. The zakat organization should be under the liability of the Muslim Supremacy or it also can be under the special Muslim supervisory body who has knowledge of Islam that has been appointed by the Government.

Zakat payment has been ordained by Allah (S.W.T.) through His Messenger Muhammad (PBUH) with a view to acquire social coherence among diverse sections of the Ummah (followers of the religion of Islam). In Islam, brotherhood among Muslims is highly mentioned (Al-Quran 49:10) [1]. It is a given fact that the population of a country is not homogenous in terms of their economic standing. There are the rich, the poor, the needy, the orphans, single parents, widows and disable person. Zakat management in Selangor is under the authority of state government. The roles of zakat organizations are not only to collect the zakat payment but also to distribute the zakat funds to the zakat recipients, so called Asnaf. Zakat is being collected from variety of sources such as individuals as well as corporate companies, while later on is allotted to the eight groups of recipients (Asnaf) like what has been instructed by Allah in his Holy Quran.

Although the administration of zakat has undergone many improvements in terms of infrastructure, human capital, delivery system and governance transparency, there are still issues that need to be tackled to ensure that the administration of zakat is moving on the right track, henceforth to eradicate poverty and to upgrade people's standard of living nationally and internationally. No matter how good the system is developed, if it could not cater to the needs of the community especially the poor and needy, such institution is considered as inefficient. There is a need to enhance/strengthen the zakat management system to address the inefficiency issue especially in distribution aspect. Generally, zakat is normally given based on the applications and sometimes based on public report or initiatives carried out by zakat institution itself. Certain criteria are set by the authority so that zakat is channelled to the rightful

asnafs/beneficiaries. However, there are complaints made by the public that zakat did not reach the targeted group due to lack of publicity by the authority or lack of knowledge on the other part of the community [2].

Selangor Zakat Board is a prominent charity Government organization in Selangor. Distribution of Zakat is important in helping the poor and the needy people (Asnaf). Therefore, an online distribution system for Asnaf people is required to distribute the Zakat effectively and efficiently. This system enables applicants to easily register and get the results quickly.

2. METHODOLOGY

The method has used to develop Zakat Distribution Management System is Unified Software Development Process which is also known as (USDP). It is an iterative and incremental software development process framework which, it is claimed, can be adopted for the development of both small- and large-scale information systems [3].

2.1 Software Framework of USDP

The USDP lifecycle is divided into a sequence of phases. Each phase may include many iterations as shown in Figure 1.

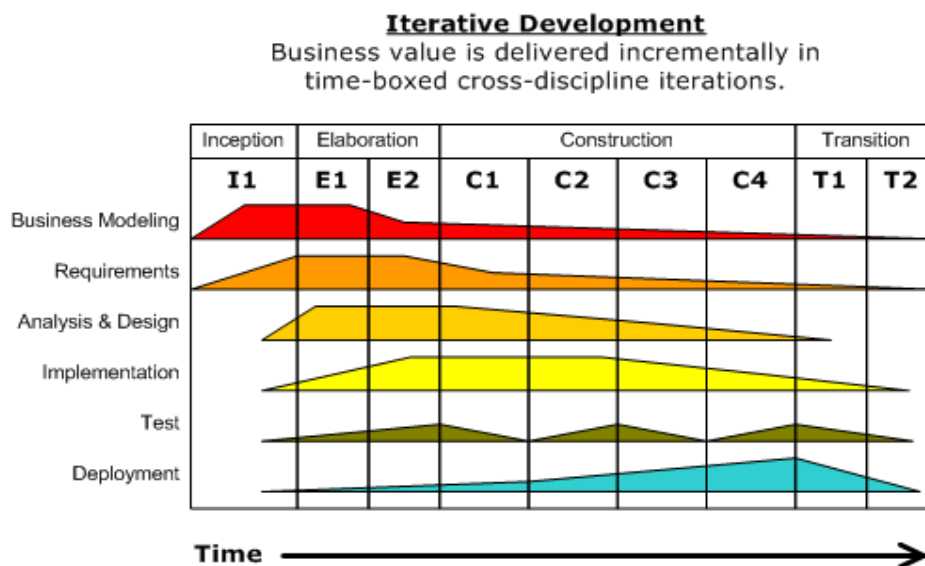


Figure 1 Iterative development

Inception Iterations: Project Scope, Objectives, Functional and Non-Functional requirements

Elaboration Iterations: System architecture, Use case diagram, Class diagram.

Construction Iterations: Activity diagram.

Transition Iterations: User manual, Training, Testing and Maintenance.

3. RESULTS AND DISCUSSION

The app is designed based on client request. The colour and the arrangement of information are all based on client. Here are the sample of the apps screen designed that has been developed.

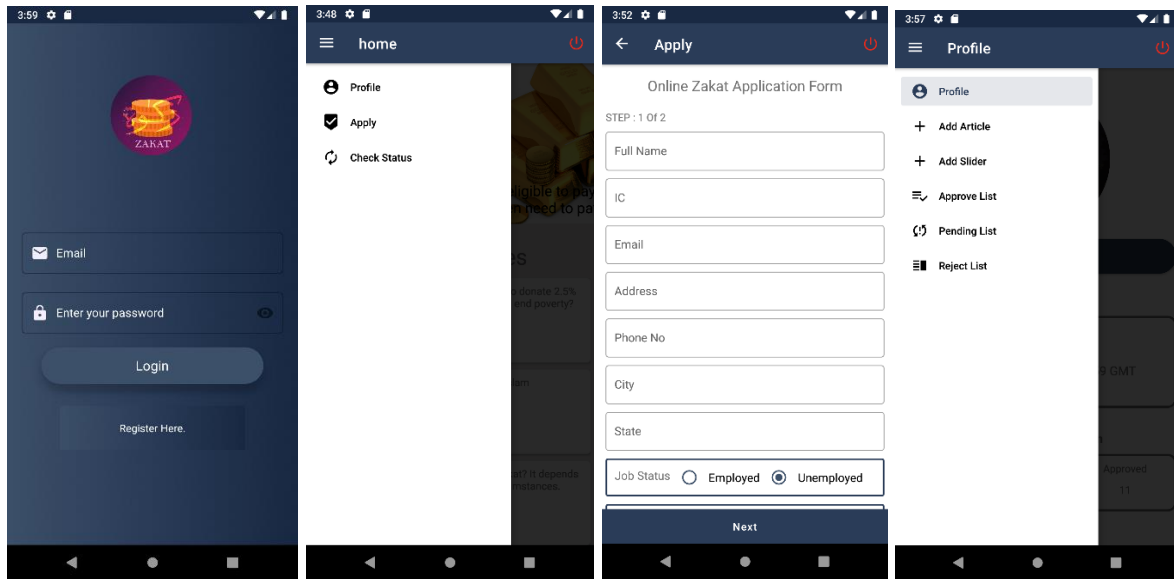


Figure 2 User, Admin home page, login and application form page

As in Figure 2, User and Admin both need to register and login to access their area. Once registration has done then users are accessible to visit the system. Users need to fill the necessary information for zakat application and may check status whether their application pending, approve and reject. Admins are the authorized person who are responsible to check all applications.

4. CONCLUSION

This project has been developed to replace the traditional way the zakat centre used to store any of their data either from the outside of the zakat centre or the opposite. I do believe that this app able to assist them to be more organized and try to use lesser paper for their accounting year to year. The features where the users would be able to see their application status result at anywhere rather than going to office. Admin may update everything regarding zakat matters through app.

REFERENCES

- [1] Al-Quran
- [2] Azman Ab Rahman, M.H., "Zakat Institution in Malaysia: Problems and Issues", GJAT,35, 2012
- [3] Unified Process. (20 June,2019). Retrieved from Science Direct:
<https://www.sciencedirect.com/topics/computer-science/unified-process#:~:text=Unified%20Process%20is%20base%20on,iterative%20and%20incremental%20softw are%20development.>

DOES SHARIAH SUPERVISORY BOARD CHARACTERISTICS INFLUENCE CORPORATE SOCIAL RESPONSIBILITY DISCLOSURE IN ISLAMIC BANKS PERFORMANCE IN BANGLADESH?: A CONCEPTUAL MODEL

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Abstract – This research is aimed to discover the effects of corporate social responsibility and the Shariah Supervisory Board in Bangladesh's Islamic bank's Performance. The efficiency of the Shariah Supervisory Board is crucial for promoting corporate social responsibility. The Shariah Supervisory Board does not have a significant impact on corporate social responsibility disclosure in Islamic Banks. This study shows that Shariah supervisory boards are still focused only on the conformity of Shariah products and operations with Islamic banks in Bangladesh. This study's new feature is that the Shariah Supervisory Board has an impact as a unique feature of the Shariah government.

Keywords : Shariah Supervisory Board Characteristics; Influence Corporate Social Responsibility; Islamic Banks Performance.

1. INTRODUCTION

Corporate Social Responsibility is the continuing commitment by business to behave ethically and contribute to economic development while improving the quality of life of the workforce and their families and the local community and society at large. The firm has responsibilities for a member of society if they operated within the law's confines, generated profit, and provided employment. CSR is a required investment in the context of an organization to create sustainable development for the business because it offers the companies an opportunity to bridge the "trust gap" among different stakeholders-government, customers, employees, suppliers, investors, etc. CSR is a required investment to create sustainable development for the business because it offers the companies an opportunity to bridge the "trust gap" among different stakeholder's government, customers, employees, suppliers, investors, etc. [1].

The extent to which the SSB influences CSR disclosure may be based on corporate governance attributes. Hence, several determinants associated with the SSB's characteristics may affect the effectiveness of the SSB's role and, consequently, the extent of CSR disclosure among Islamic banks. Therefore, this study introduces the effectiveness of the SSB as a mediating variable with the presence of the SSB strengthening the relationship between the banks' characteristics and the level of corporate social responsibility disclosure [2].

This study is expected to contribute to Islamic banking's CSR disclosure, particularly on the relevance of Islamic bank performance (ROA and ROE) and SSB (Educational qualification, Size, Annual change, Cross-membership) [1]. Few studies are being done to analyze the CSR, SSB, and performance relationships of Islamic banks. Arshad, Othman, and Othman (2012) have sought to explore CSR's impact on the Performance of the Islamic Bank [3]. In earlier studies [4], positive relations between good governance and firm Performance were established. Consequently, SSB's functions, characteristics, and responsibilities.

2. METHODOLOGY

Research work should be conducted through a specific and predetermined methodology to explore an effective research outcome. The nature of the study is qualitative research.

2.1 Framework

The framework that has been developed for this project is shown in Figure 1.

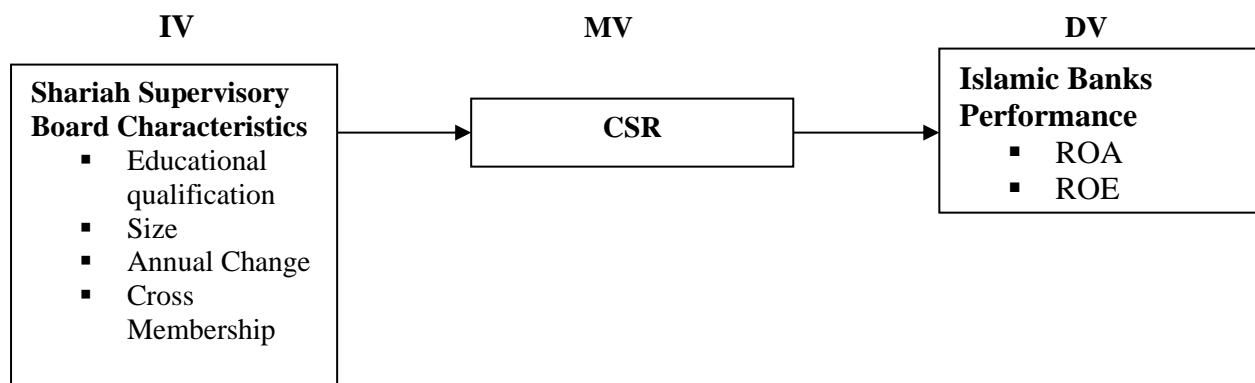


Figure 1 Developed framework

3. RESULTS AND DISCUSSION

Despite the emphasis on their ethical and moral identity and the objective of promoting different aspects of societal welfare, this review of studies on Islamic bank's corporate social responsibility disclosure affirms their common concern for reporting on socially responsible activities. Studies reviewed cover the ten years 2000-2019 and carried across different Islamic countries. All the studies use content analysis and develop benchmarks or indexes to measure the level of CSR disclosure. Some of the reviews extend their research and employ statistical methods to empirically test the influence of several variables they suggest as CSR disclosure determinants on CSR levels. The investigations documented by the studies indicate that Islamic banks' Performance in terms of CRS disclosure is far below average. There is a large discrepancy between actual disclosure and the ideal or hypothetical one gauged by the CSR indexes. Disclosure level ranges from a low of 13.3% to a high of 49% of constructs of the themes of CSR indicators. Low disclosure levels are reported by studies involving large samples and/or extended periods, which makes their inferences more reliable. The most disclosed of the benchmark themes is the Sharia Supervisory Board, with all banks thoroughly disclosing information relating to Sharia-compliant corporate governance. Banks appear to be more committed to debtors, products and services, and employees as their disclosure on these items rank high. Despite Islamic banks' assertion of commitment to Sharia teachings, such responsibility does not appear to be translated in their disclosure of more socially related undertakings. The themes of unlawful transactions, Quard Hassan, charitable and social activities show the lowest disclosure level [5].

4. CONCLUSION

In conclusion, Islamic banks seem to prioritize the disclosure of information related to their shareholders' obligations rather than to the interests of the society at large. The influence of the Sharia Supervisory Board on corporate social responsibility disclosure, as evidenced by researches, is a positive one [5].

The positive influence of the Sharia Supervisory Board on CSR disclosure by Islamic Banks has proclaimed on the basis that users of Islamic banks' financial reports attach great importance to the Sharia Supervisory Board opinion because it indicates whether the bank has complied with Islamic principles in its operations and whether it has dealt justly with different concerned parties. The board's existence will lead to greater monitoring and, therefore, more compliance with Sharia principles and rules. This, in turn, will lead to increased disclosure of information, including that on social activities. Researches reviewed have affirmed this positive effect; disclosure on the Sharia Supervisory Board ranks top, with all banks systematically disclosing information regarding their compliance to Sharia corporate governance. Further, research on CSR determinants documented a significantly positive relationship between CSR and the existence of the Sharia Supervisory Board. The low level of CSR

disclosure, then, can be attributed, among other factors, to the standing of the Sharia Supervisory Board and its role in this issue. The positive relationship between CSR and SSB implies that the latter's part in enhancing social disclosure by Islamic banks is a limited one. Its existence has not augmented disclosure levels or broadens it. Disclosure levels remain very low across the period covered by the studies, combined with fewer items being disclosed. Most Islamic banks consider the provision of the SSB report as a sufficient means of disclosure, which entails no need for detailed disclosure of socially or religiously related items in annual reports. Thus, one of the inferences of this review is that Islamic banks provide CSR information, not as a part of a strategy of coherent and sustainable responsibility towards society, but mainly to meet the requirements of SSBs [5].

The theory of stakeholders assumes that CSR and IB performance can be linked positively. Waddock and Graves argued [6], compared with their costs, that the advantages of CSR are greater. The Performance of CSR and IBs should, therefore, be a positive association. Preston and O'Bannon argued that meeting the various company stakeholders' requirements enhances the reputation of the company in such a way that its Performance has a positive impact [7]. Based on data from a sample of US commercial banks, Simpson and Kohers empirical findings support the idea of a positive CSR and the Performance of the Islamic bank [8].

REFERENCES

- [1] Fitriyah, F., & Oktaviana, U. O., "Relevance of financial Performance and good corporate governance determinant of sustainability corporate social responsibility disclosure in islamic bank in Indonesia" *International Journal of Nusantara Islam*, 1(2), 22-37, 2013
- [2] Ibrahim, A. M., Yahya, S. B., & Abdalla, Y. A., "Examining the influence of the characteristics of Islamic banks and Shariah supervisory board on the level of social responsibility disclosure: a review from Sudan", *International Journal of Business and Innovation*, 2(3), 23-51, 2015
- [3] Arshad, R., Othman, S., & Othman, R., "Islamic corporate social responsibility, corporate reputation and Performance", *World Academy of Science, Engineering and Technology*, 64(4), 1070-1074, 2012
- [4] Rajan, R., & Zingales, L., "Financial development and growth", *American Economic Review*, 88(3), 559-586, 1998
- [5] El Hussein, N. H. A., "The Sharia Supervisory Board: Does it Influence Corporate Social Responsibility Disclosure by Islamic Banks? A Review", *Journal of Islamic Studies and Culture*, 6(1), 121-132, 2018
- [6] Waddock, S. A., & Graves, S. B., "The corporate social Performance–financial performance link", *Strategic management journal*, 18(4), 303-319, 1997
- [7] Preston, L. E., & O'bannon, D. P., "The corporate social-financial performance relationship: A typology and analysis", *Business & Society*, 36(4), 419-429, 1997
- [8] Simpson, W. G., & Kohers, T., "The link between corporate social and financial Performance: Evidence from the banking industry", *Journal of business ethics*, 35(2), 97-109, 2002

DESIGN OF LEARNING OUTCOME ATTAINMENT TOOL

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Abstract –The focus of this paper is on the development of a programme and course learning outcome student attainment tool using Microsoft Excel codenamed Horus. Student learning outcome attainment measurement is required in ensuring the quality of the content delivered to the students. However, the shift from traditional process-based learning to outcome-based education requires an explicit direct measurement methodology to ensure accurate analysis corresponding with the constructive alignment. This tool allows the analysis of the course learning outcome (CLO) attainment direct measurement for continuous quality improvement implementation while tracking the programme learning outcome (PLO) progress of the student. The user will be able to monitor on both student's performance and course delivery achievement perspective. The closed beta version was implemented in several courses in a programme from a private education institution. The output from this closed beta testing was used in the design improvement of the tool. The finalised design of this tool will be used for further tested in the open Beta test to measure the achievement of CLO. A separate PLO spiderweb sheet is connected to this tool to further analyse the attainment of the students during the open Beta session.

Keywords : OBE; learning outcome attainment; PLO; CLO; constructive alignment

1. INTRODUCTION

Higher education assessments are designed to aid students to acquire specific skills within the duration of the course they enrolled through the attainment of Course Learning Outcome (CLO) [1]. The accumulation of these skills would prepare them to obtain required traits necessity for them to apply when they join the work force upon graduation through the achievement of the Programme Learning Outcome (PLO) [2]. The measurements of student attainment of their CLO are done through series of assessments throughout each course, aligned with the learning experience they gained and the design of the programme and series intended outcomes that embraces the 5 clusters of programme outcomes stated in Malaysian Qualification Framework (MQF) [3]. This is termed as constructive alignment, the integral backbone in ensuring the capability of the students are up to the standard that has been set [4]. All of these processes are carried out under the concept of Outcome Based Education (OBE), an approach that allows both institutions and learners to focus on outcome to be achieved rather than the process of learning [5]. OBE is a standard based stylized education implementation, hence the output of each programme can be considered equal regardless the institution and location, as long as they are within the same framework and standards.

The measurement of student's learning outcome attainment requires explicit analysis of each of the assessments conducted on the student [6]. Constructive alignment plays an important role in this, where direct summative assessment must be accurately mapped to the appropriate CLO to ensure the outcome is achieved as intended. The allocation of marks set according to the dominant learning domain matched with the PLO allows the assessor to gauge the level of attainment of the outcome achieved by the student [7]. However, conventional method of marks allocation for the assessment task(s) set potentially causing misalignment to the distribution of marks and inaccuracy in measuring the student's attainment of the outcomes [8]. The severity of this situation amplifies in courses with higher degree of learning domain mapped paired with complex learning outcomes [9]. This will lead to inability of the programme to ensure the student to achieve all intended PLO, which will be reflected in the performance of the students once they graduated and join the industry as a member of the work force. The situation is worsen by the inability of the programme fulfil the PEO performance indicators, a requirement in measuring the level of attainment of the students [10].

The general objective of this paper is to propose a tool to assist academicians to accurately measuring student's learning outcome attainment through distributions of marks in assessments. This consisted of identification of attainment area according to constructive alignment, user process flow design which details on the input and output data and functional testing of the tool during the beta test. The design concept behind this tool is to be able to accommodate any assessment patterns and level of complexity without overkilling the data management process.

2. METHODOLOGY

The foundation of the framework is in accordance to the framework set in the MQF and Code of Practice for Programme Accreditation (COPPA) 2nd Edition [11]. This framework identifies the data to be captured, hence allowing the design of calculation and programmes to be set within the Excel worksheet. The framework of the design of this tool is shown in figure 1.

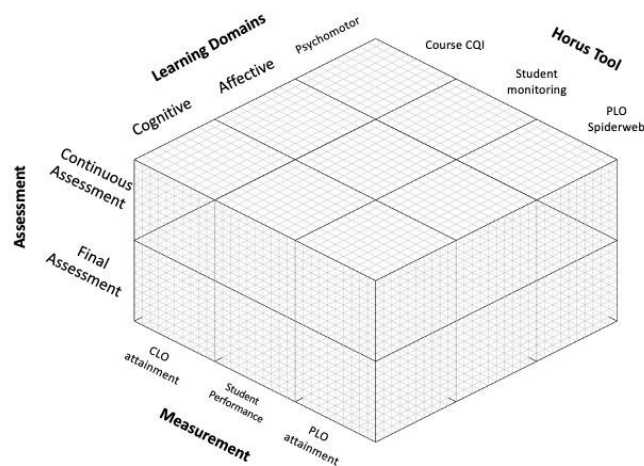


Figure 1 Framework of data capture in Horus Tool.

3. RESULTS AND DISCUSSION

A closed beta test was conducted on a college located in Selangor, Malaysia. This is a private college that possesses autonomy in regards to the design of the assessment. To ensure the quality of the measurement, courses from one of their accredited program was selected. The selected programme is a diploma in management programme, a programme that is matured with ongoing number of students enrolled in the courses. The programme practices entry-exit survey for every course they conducted, a superficial means for them to understand the level of learning outcome attainment of the students. The assessors (lecturers teaching the selected courses) were briefed in regard to the usage of the tool, and a one day training were conducted on them.

A comparison on existing course learning outcome attainment was conducted. Data and conclusion from entry-exit survey was retrieved and the same set of student assessment data was converted using this tool. The result in term of overall outcome attainment was compared. It was discovered that both methods were able to identify problematic CLOs. It was also discovered that even though entry-exit survey were able to gauge student's attainment, it fails to specify the problematic areas, whereas this tool were able to detect immediately problematic assessments, assessment task, question as well as individual students that contributes to the lower achievement of the CLO. A concern of the Dunning-Kruger effect, an over-and -under estimation of self-achievement [12] can be seen in entry-exit method implementation, whereas the students might not be able to self-assess accurately.

The ability of this tool to identify immediately problematic areas that contributes to lower achievement of CLO allowing programme managers and lecturers to perform their CQI in order to

improve the assessment process as well as reviewing the content of the courses as well. The generation of CLO-PLO attainment of each course allows the detection of several issues undetected prior to using this tool, namely misalignment in the assessment, inappropriateness in the assessment task and weakness specific to a student attribute.

4. CONCLUSION

A comprehensive tool was design to ensure the attainment of the student's learning outcome can be measured accurately. This tool enables the constructive alignment of a course to be adhered and provides further depth in regards to the analysis of both students and course performance by identifying specific problematic areas within the course. This tool is modular, capable of being a standalone analysis or to be linked with test blueprint of the whole course. This enables the managing of CLO and PLO attainment of the students to be done accurately through functional testing conducted during the beta test.

REFERENCES

- [1] A. Cundell and E. Sheepy, "Student perceptions of the most effective and engaging online learning activities in a blended graduate seminar," *Online Learn. J.*, vol. 22, no. 3, pp. 87–102, 2018
- [2] C. Kesan, "The Relationship between the Amount of Learning and Time(The Example of Equations)," *Eur. J. Educ. Res.*, vol. 5, no. 3, pp. 125–135, 2016
- [3] Malaysian Qualifications Agency, "Malaysian Qualifications Framework 2nd Edition." Agensi Kelayakan Malaysia, p. 39, 2017
- [4] L. Ali, "The Design of Curriculum, Assessment and Evaluation in Higher Education with Constructive Alignment," *J. Educ. e-Learning Res.*, vol. 5, no. 1, pp. 72–78, 2018
- [5] S. Hassan, N. I. Admodisastro, A. Kamaruddin, S. Baharom, and N. Che Pa, "Developing a Learning Outcome-Based Question Examination Paper Tool for Universiti Putra Malaysia," *Int. Educ. Stud.*, vol. 9, no. 2, p. 132, 2016
- [6] C. Luce and J. P. Kirnan, "Using Indirect vs. Direct Measures in the Summative Assessment of Student Learning in Higher Education," *J. Scholarsh. Teach. Learn.*, vol. 16, no. 4, pp. 75–91, 2016
- [7] A. C. Welch, S. C. Karpen, L. B. Cross, and B. N. Leblanc, "A Multidisciplinary Assessment of Faculty Accuracy And Reliability with Bloom's Taxonomy," *Res. Parctice Assess.*, vol. 12, pp. 96–105, 2017
- [8] S. W. Lenhoff and J. B. Ulmer, "Reforming for 'all' or for 'some': Misalignment in the discourses of education reformers and implementers," *Educ. Policy Anal. Arch.*, vol. 24, p. 108, 2016
- [9] P. Shivraj, "Evaluating the (Mis)Alignment of the Intended to the Assessed Curriculum for the U.S.: Implications for the Common Core State Standards for Mathematics," *Int. J. Educ. Math. Sci. Technol.*, 2017
- [10] K. Y. Tshai, J. H. Ho, E. H. Yap, and H. K. Ng, "Outcome-based education - The assessment of programme educational objectives for an engineering undergraduate degree," *Eng. Educ.*, vol. 9, no. 1, pp. 74–85, 2014
- [11] Malaysian Qualifications Agency, "Code of Practice for Programme Accreditation 2nd Edition," no. 2017. Agensi Kelayakan Malaysia, Malaysia, 2018
- [12] A. Karatjas and J. Webb, "The Role of Student Major in Grade Perception in Chemistry Courses," *Int. J. Scholarsh. Teach. Learn.*, vol. 11, no. 2, 2017

RISK MANAGEMENT IMPLEMENTATION AT UNIVERSITI SELANGOR (UNISEL)

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Abstract – Risk can be defined as an obstacle or challenge that can obstruct the ability of effective services to an organisation, especially in relation to the achievement of a set vision and mission. Thus, risk management is an essential strategy for many organisations to improve their performances. Risk management is considered a management tool or strategy to create a better pathway in achieving the organisation objectives by reducing the risk of ineffective processes, losses and damage. Universiti Selangor (UNISEL) has implemented risk management using own risk management model based on contexts and issues which are derived from the SWOT analysis. All departments and faculties are required to apply this approach in their operations as well as quality objectives which support the university strategic objectives. The achievements of the department's objective qualities are used as the performance indicator to measure the effectiveness of risk control. The model incorporates the risk management of all departments to control the risk of not achieving the university strategic objectives. The likelihood of the risks is monitored and analysed. The effectiveness of the implemented risk management model based on likelihood trend is presented in this paper. The model proves that the implemented risk management model can minimize the risks of not achieving the organization objectives. In general, it can be concluded that this study is useful and has contributed significant knowledge to better understanding the risk management implementation at UNISEL.

Keywords : Risk management; risk control performance indicator; organisation objectives

1. INTRODUCTION

The impact of risks to the achievement of the organization's objectives can be a negative impact known as threats or positive effects known as opportunities [1]. One example of unexpected events is the Covid-19 pandemic, and it dramatically affects individuals, family institutions, organizations, politics, social and economic problems of the country. There were few risk management models had been proposed. One of them is Enterprise Risk Management (ERM). This model proposes that firms address all their risks comprehensively and coherently, instead of managing them individually [2]. Soltanizadeh et al. [3] presented the ERM implementation varies across different industries and that having an ERM framework in place is more common among firms in the infrastructure, hotel, and technology sectors. An example the effect of implementing ERM, firms experience lower risk and higher profits, simultaneously [9] and that firms with advanced levels of ERM implementation present higher performance, both as financial performance and market evaluation [5].

University Good Governance Index (UGGI) introduced in 2011 requires Malaysian public universities to implement an organized risk management [5]. R.Md Sum and Z. Md Saad [6] studied the risks in university environment, factors driving the emergence of risks and benefits gained if the risks are managed. It also explained risk management process or frameworks for risk management in university setting. However, risk management is not limited to coordination of activities to mitigate losses, but also involves integrated coordination activities to cope with any possibilities that could interfere with the organisation's operations including development activities to enhance the professionals, organisational governance, infrastructure development and research. Z.Othman et al.[7] presented the core process owners at polimas have completed the analysis documents on the issues given; they have successfully identified the risk of referring issues and relationships with the stakeholders. However, to date, there are lack of studies related to risk management process in education systems. This paper is novel as so similar study using the same approach has been reported before. Moreover, the new technique and data generated in this study could be used by other researchers for validation, comparison or reference purposes.

2. METHODOLOGY

In general, this study uses commercially available Microsoft Office 365 software, (Microsoft excel macro-enabled worksheet,) to model the risk management system at UNISEL. Utilizing the available built-in micro enable functions, the risk assessment was analyzed and presented using a spider-web graph and standard bar graph. For better organization and clarity, the methodology adopted in this study is explained in 3 processes which identifying risk and opportunities, identifying the risk level, existing and new risk controller as well as evaluate the effectiveness of new risk controller.

3. RESULTS AND DISCUSSION

Figure 1 shows the distribution number of a risk register for each core process at UNISEL. The core process had been decided were the management of teaching and learning (PT01), research (PT02), human resources (PT03), infrastructure and properties (PT04), financial (PT05), commercialisation (PT06), student affairs (PT07), library (PT08), residential college (PT09), services (PT10), marketing and admission (PT11), quality (PT12). It can be observed that the highest number of a risk register for the core process is teaching and learning management, and the lowest in the management of research. This is because most of the responsible centres (PTJ) are listed in PT01 the teaching and learning process which is the core business in UNISEL. The effectiveness of new risk controller had been analysed and shown in Figure 2. In general, it could be observed that risk level had reduced from high to moderate and moderate to low. It was achieved by reducing the probability of risk using the new controller that had been applied and analysed.

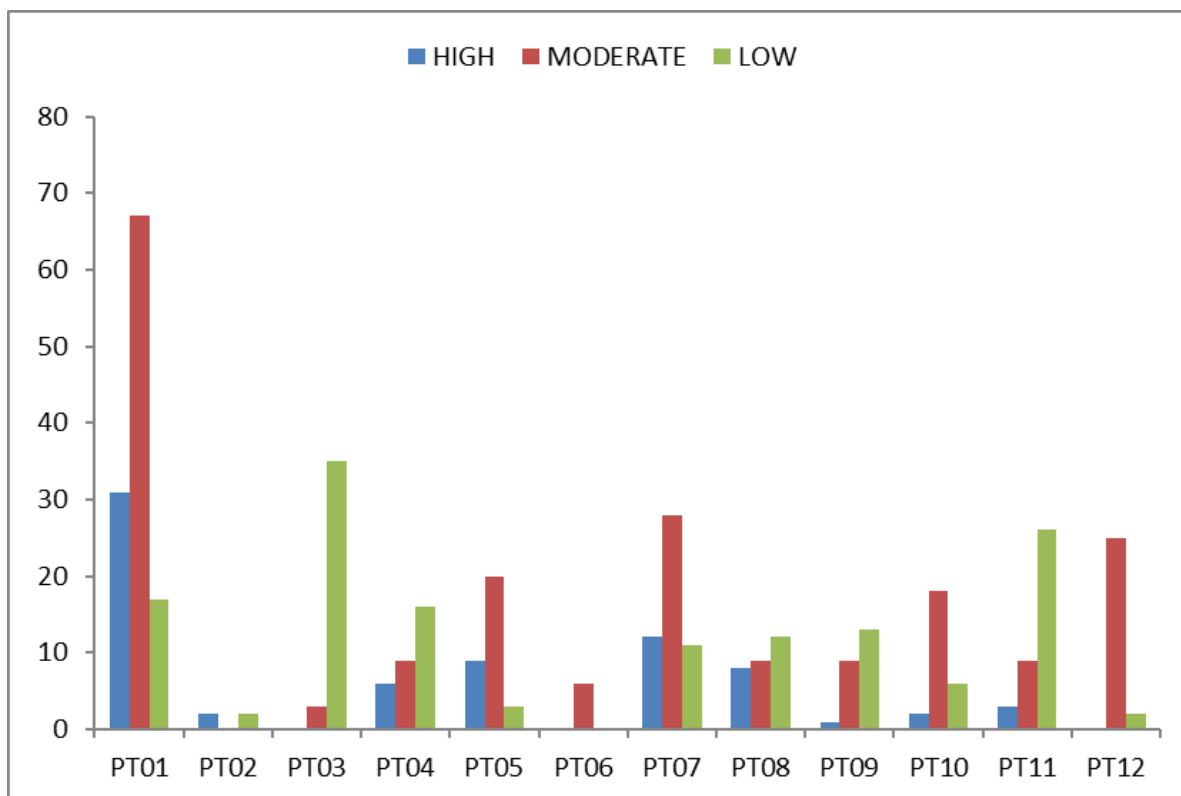


Figure 1 Risk level distribution for each core process at UNISEL

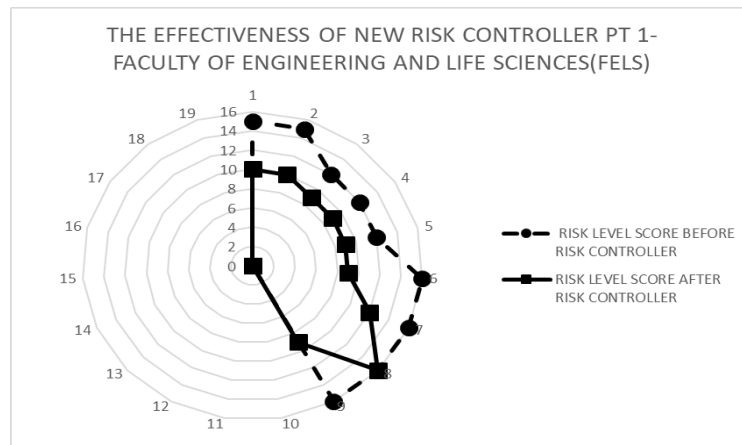


Figure 2 The effectiveness of risk assessment controller

4. CONCLUSION

This paper presents the implementation of the risk management system at UNISEL. Based on the results, most of the risks were able to be controlled by reducing the probability of risk compared with the impact of risk. Due to these findings, it can be concluded that this study is useful and has contributed knowledge about understanding the implementation of the risk management system at UNISEL for each core process.

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REFERENCES

- [1] Hillson, D., "The risk management handbook: A practical guide to managing the multiple dimensions of risk", Kogan Page, London, 2019.
- [2] Bromiley, P., McShane, M., Nair, A., & Rustambekov, E., "Enterprise Risk Management: Review, Critique, and Research Directions", Long Range Planning, 48(4), 265–276, 2015
- [3] Soltanizadeh, S., Rasid, S. Z. A., Golshan, N., Quoquab, F., & Basiruddin, R., "Enterprise Risk Management Practices among Malaysian Firms", Procedia - Social and Behavioral Sciences, 164, 332–337, 2014
- [4] Eckles, D. L., Hoyt, R. E., & Miller, S. M., "Reprint of: The impact of enterprise risk management on the marginal cost of reducing risk: Evidence from the insurance industry", Journal of Banking & Finance, 49, 409–423, 2014
- [5] Florio, C., & Leoni, G., "Enterprise risk management and firm performance: The Italian case", The British Accounting Review, 49(1), 56–74, 2017
- [6] Rabihah Md.Sum & Zurina Md. Saad, "Risk Management In Universities", 3rd International Conference on Qalb-Guided Leadership in Higher Education Institutions, 2017
- [7] Z.Othman, R.M. Amin. and Z.Kassim, "Kajian Isu Dalaman Dan Luaran Pihak Berkepentingan Yang Memberi Kesan Pada Polimas", Journal of Technical and Vocational Education, vol. 1, pp 79-86, 2019

THE DIGITAL TRANSFORMATION OF EDUCATION IN OMAN

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Abstract - This article examined the digital transformation of education in Oman. There are more problems facing normal education in Oman. In this study, the issue of digital transformation in Omani education discussed mainly. The secondary research approach has used by reading numerous articles on websites, books, magazines and scientific research, from July to November 2020. The aim of this study is to study the effects of the environment, human, financial resources, and educational content on the speed of digital transformation of education as the speed of digital transformation leads to the development of the performance of digital technology in the Sultanate of Oman. The researcher used several methods in this research. The results indicated that the environment, human resources, finance and content have a significant impact on the performance of digital technology. The inclusion of digital technology has revealed the conceptual model of complementary mediation impact on the relationship between digital content and digital transformation as well as the performance of technology as a whole. This study has demonstrated the importance of digital transformation along with e-learning and meeting users' expectations. The results of this study have contributed significantly to both theory and practice by promoting the use of digital technology.

Keywords : Digital transformation; e-learning; online education

1. INTRODUCTION

With digitization, the function of traditional teaching methods and the varying role of teachers. The role of the teacher develops in a direction that directs information rather than teaching knowledge. With digitization in education, expect that students are active participants by participating in their learning processes. In the digital age, educators; Depending on the increase in technological opportunities, home schooling or, in other words, "e-learning" is also growing rapidly in the world. Schools, higher education, institutions and many vocational educations are now being provide online. The increase in these educational alternatives also changes the e-learning model. Technological tools and learning processes change the way people think and communicate, while creating an interactive learning environment. It is now expected that students today will know not only basic educational information, but also compete for the organization of data sources, the development of effective cooperation, the collection, evaluation and use of information. The concept of digital skills identifies competencies such as coding, and software creation capability [1].

2. METHODOLOGY

The research objective of this paper is to explore how digital transformation affects education in the Sultanate of Oman. Due to the paucity of empirical research on digital transformation, our study is exploratory. Thus, a multimodal comparative research design chosen for the study sampling approach guided. This study includes an analysis of the digital transformation in the Sultanate of Oman. Data collected between December 2020 and November 2020 using magazines, books, the Internet and various newspapers. In this study, the researcher reviewed the research methodology and the study plan on which the researcher relied to obtain information. The researcher also used a quantitative survey system to collect information. The researcher used the inference method because it is suitable for this research. The analyst also explained the types of data such as basic data and secondary data such as magazines, books, internet and newspapers. Use keywords containing the following terms: digital transformation, e-learning, and online education. The researcher also prepared a list of all the references that readied and transferred. The researcher also clarified and explained the relationship between independent and unexpected variables affecting digital transformation.

2.1 Framework

Figure 1 shows the framework adopted for this study.

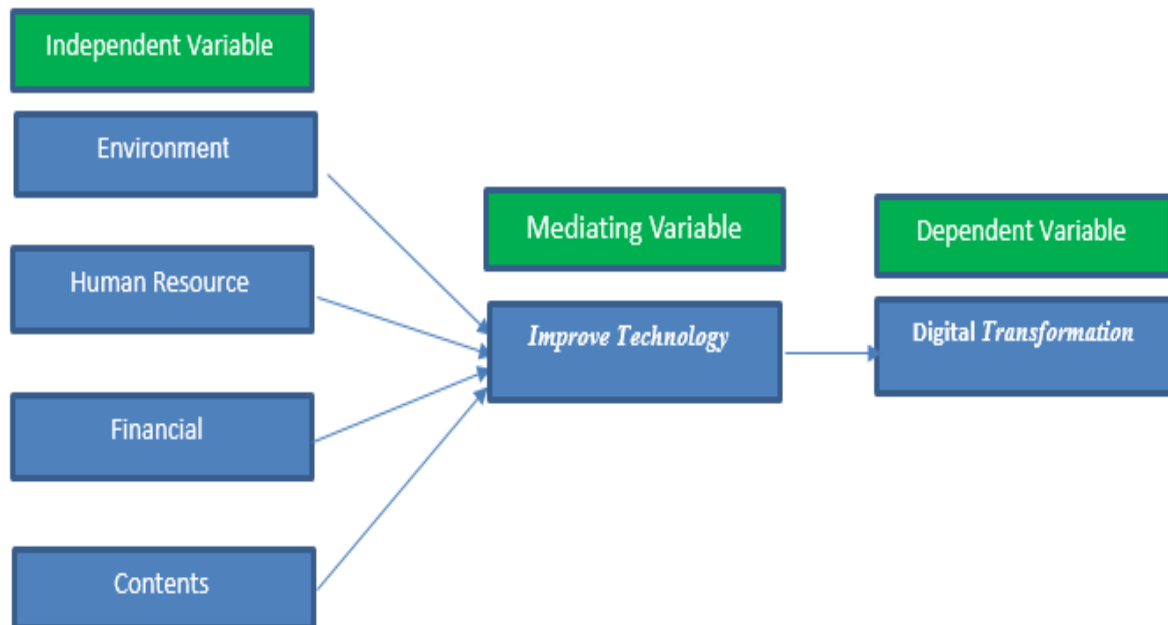


Figure 1 Theoretical Framework as referred to [2-7]

3. RESULTS AND DISCUSSION

In this study, the dependent and independent variables affecting the digital transfer of education in Oman. The potential and analysis of data and perceptions in the context discussed as the first part of the study of digital transformation. The analysis results in four proposals on the factors influencing digital transformation. Our goal is to further develop these proposals into a testable model and derive hypotheses about the relationships between these factors. For this purpose, we collected data on digital transformation in e learning in Oman to determine our proposed theoretical framework in the study. Through a quantitative research approach, quantitative results can be further supported for digital transformation with quantitative evidence and thus enhance preliminary results. Therefore, stakeholders in the digital transformation decision can supported through this process by using data-driven insights to find the optimal time for digital transformation in organizations. The results also show great interest and applicability of data analysis in a context of enabling faster and more evidence-based decision-making. A thorough research into literature resulted in 32 studies, including magazine articles, conference papers and doctoral theses. The study looked at definitions in the selected sample from previous studies. The study analyses previous studies and make recommendations. In addition to providing a deeper understanding of the digital conversion, process and giving suggestions on how and how important the use of data analysis can support this process in the future. From a research perspective, quantifying factors influencing digital transformation. Based on these preliminary findings, future studies can use specific features to address issues related to digital transformation.

4. CONCLUSION

This study examines the correlation between environment, human resources, finance and content as it has a significant impact on the performance of digital technology. The variables provide useful guide and information to accelerate the digital transformation to ensure the implementation and application of digital technology. The study also emphasizes the role of improving technology in digital transformation. In conclusion, the interconnection between technology improvement and digital

transformation is useful in developing a conceptual framework to connect the environment, human resources, finance and content. After the success of this study to link all the variables, it can be a useful starting point for discussion. Also through the adoption of the proposed framework. In addition, the study made theoretical contributions to literature and further understood the effects of the environment, human resources, finance and content on improving technology in digital transformation. Finally, promoting digital transformation in Oman can contribute to the rapid completion of business and can develop Oman's economy.

REFERENCES

- [1] Van Laar, E., Van Deursen, A. J., Van Dijk, J. A., & De Haan, J., "The relation between 21st-century skills and digital skills: A systematic literature review", *Computers in human behavior*, 72, 577-588, 2017,
- [2] Ting, D. S. W., Carin, L., Dzau, V., & Wong, T. Y., "Digital technology and COVID-19", *Nature medicine*, 26(4), 459-461, 2020
- [3] Pinchuk, O. P., Sokolyuk, O. M., Burov, O. Y., & Shyshkina, M. P., "Digital transformation of learning environment: aspect of cognitive activity of study", 2019
- [4] Sousa, M. J., & Rocha, Á., "Digital learning: Developing skills for digital transformation of organizations", *Future Generation Computer Systems*, 91, 327-334.2019 ,
- [5] Chanas, S., Myers, M. D., & Hess, T., "Digital transformation strategy making in pre-digital organizations: The case of a financial services provider", *The Journal of Strategic Information Systems*, 28(1), 17-33.2019 ,
- [6] Al-Balushia, N., al-Harasi, N. & al-Oufi, A., "The reality of digital transformation in Omani institutions", *Journal of Information Studies & Technology (JIS&T)*, 2020(1), 2, 2020
- [7] Doloreux, D., Shearmur, R., & Guillaume, R., "Collaboration, Transferable and Non-transferable Knowledge, and Innovation: A Study of a Cool Climate Wine Industry (Canada)", *Growth and Change*, 46(1), 16-37, 2015

SATISFACTION OF UNIVERSITY STUDENTS ON ONLINE CLASSES DURING MOVEMENT CONTROL ORDER PERIOD

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Abstract – The first phase of Movement Control Order (MCO) had been announced by the Prime Minister starting from 18th March 2020 until 28th April 2020 due to the outbreak of Covid-19 pandemic in Malaysia. As such, an abrupt decision was made by the Ministry of Higher Education that all face-to-face classes were put on hold and replaced by online classes. This study was conducted to see whether the satisfaction level of students was met on online classes during this MCO period. Factors that were investigated are lecturers teaching skills, learning applications, class interaction, and internet connection. A total number of 213 students from various institutions who experienced online classes were surveyed using online survey form. The result showed a moderate score on the overall satisfaction and on satisfaction level of four factors which are lecturers teaching skills, learning applications, class interaction and internet connection during online classes. The study also showed that there exists significance correlation between students' satisfaction level with lecturer teaching skills, learning application and class interaction, but not with the internet connection.

Keywords : Online classes; movement control order; satisfaction

1. INTRODUCTION

Movement Control Order (MCO) had been announced by prime minister starting from 18th March 2020 due to the Covid-19 outbreak in the country. As a result of it, all universities were instructed to stop the face-to-face teaching and learning method in view of students' safety. It was estimated over 1.2 million students in higher education institutions including public and private universities, polytechnics and community colleges in Malaysia in early 2020. This amount includes about 130,000 international students; however, some international students had been returned home before the MCO. During this pandemic, education needs to choose virtual learning as an alternative to face-to-face mode of learning even though it may seem to be challenging and limited [1]. In view of this, a study was conducted to gauge student's satisfaction on online classes in relation to the lecturer teaching skills, learning applications, class interaction and the internet.

2. METHODOLOGY

2.1 Instrument

The survey instrumentation used in the study was a closed ended questionnaire. The questionnaire was divided into three sections which are Part A, Part B and Part C. Part A was the respondent demographic questions, Part B was about general questions for student satisfaction and Part C was the factors of satisfaction divided into four dimensions as lecturer teaching skills, learning applications, class interaction and the internet. Four points Likert scale were used for Part B and Part C. The questionnaire was adopted from various studies [2-6] done earlier.

2.2 Data Collection

Data collection method used was online survey whereby respondents were given Google form link to answer the questionnaire. Convenience sampling and snowball sampling method were used due to the MCO implementation. At the end, a total number of 213 respondents participated in this survey.

2.3 Analysis of Data

The data collected was analysed using Statistical Analysis Software (SAS) OnDemand for Academics.

3. RESULTS AND DISCUSSION

The mean score was calculated to determine the satisfaction level in term of lecturers teaching skills, web applications, class interaction, and the internet. The score of mean was interpreted as suggested by Wiersma [7]: 1.00-2.00 as low, 2.01-3.00 as moderate and 3.01-4.00 as high. Based on Table 1, the mean scores of all factors are in the range of 2.01-3.00 of 4.00 Likert scale that equals to moderate. The average score for all four factors was 2.61 with standard deviation of 0.61. The result showed that respondents gave the mean score for lecturers teaching skills as 2.93, follows by class interaction (2.84), learning applications (2.73) and lastly the internet (2.58).

Table 1 Satisfaction level

Factor	Mean	Standard Deviation	Interpretation
Overall Satisfaction	2.61	0.61	Moderate
Lecturer Teaching Skills	2.93	0.57	Moderate
Class Interaction	2.84	0.60	Moderate
Learning Applications	2.73	0.58	Moderate
The Internet	2.58	0.84	Moderate

Table 2 shows the relationship between overall satisfaction and the four factors: lecturers teaching skills, learning applications, class interaction and the internet. The result showed that there exists a strong positive relationship between overall satisfaction with lecturers teaching skills (0.65), learning applications (0.69), and class interaction (0.66). On the other hand, the relationship between overall satisfaction and the internet was a weak negative relationship (-0.05).

Table 2 Correlation between satisfaction level and factors

Factor	Correlation (<i>r</i>)	p-value
Overall Satisfaction vs Lecturer Teaching Skills	0.65	<0.0001*
Overall Satisfaction vs Learning Applications	0.69	<0.0001*
Overall Satisfaction vs Class Interaction	0.66	<0.0001*
Overall Satisfaction vs The Internet	-0.05	0.4778

Note: *exist significance correlation at $\alpha = 0.05$.

4. CONCLUSION

As a conclusion, the level of satisfaction on the four factors (lecturers teaching skills, learning applications, class interaction and internet connection) during the abrupt decision to switch to online classes were moderate. Therefore, it is important that all higher learning institutions to improve on those factors for future online classes. However, the internet connection was not the main consent of students' satisfaction during online classes as compared the other three factors.

REFERENCES

- [1] D. Rahman, "A reckoning for online learning in time of crisis", The Star, Retrieved from <https://www.thestar.com.my>, 20 March 2020
- [2] O. Cakir, "The development of online students' satisfaction scale", Energy Education Science and Technology Part B: Social and Educational Studies, Special Issue-1, vol.4(5), pp 947-950, 2012

- [3] C. Schubert-Iratorza and D. L. Fabry, "Improving student satisfaction with online faculty performance", *Journal of Research in Innovative Teaching*, vol.4(1), 2011
- [4] S. Chakravorti, "Student Satisfaction and Learning in Online Classes: The Case of a US Midwestern University", *Association of Marketing Theory and Practice Proceedings*, pp 42, 2019
- [5] A. Sher, "Assessing the relationship of student-instructor and student-student interaction to student learning and satisfaction in web-based online learning environment", *Journal of Interactive Online Learning*, vol.8(2), 2009
- [6] L. Fedynich, K. S. Bradley and J. Bradley, "Graduate students' perceptions of online learning", *Research in Higher Education Journal*, pp 27, 2015
- [7] W. Wiersma, *Research Methods In Education: An Introduction*, 7th ed, Boston: Allyn & Bacon, 2000

THE EXPRESSION OF GRATITUDE AND ITS INFLUENCE ON ACADEMIC STAFFS' MOTIVATION LEVEL

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Abstract – Gratitude and motivation level among employees within an organisation are always linked to each other for the big role they play in achieving individual and organisational goals. This research aims to investigate the perceptions of the academic staff towards the expression of gratitude and employee motivation level, as well as to determine the influence of gratitude on academic staff's motivation in particular. A quantitative approach was employed, utilising a 27-item questionnaire administered through an online platform to 104 academic staff from both public and private higher learning institutions in Selangor. The finding revealed that there is a positive relationship between the expression of gratitude and the academic staffs' motivation level. This is an important and valuable insight to be provided to the higher management of learning institutions in Malaysia for a possible consideration on the adjustment of the appreciation method in boosting employee's motivation level.

Keywords: gratitude; employee motivation level; organisational communication

1. INTRODUCTION

Communicating and expressing gratitude especially at the workplace actually enhances job satisfaction among employees in any organizational direction [1]. The expressions of gratitude actually increase social worth and encourages helpers, who feel socially valued, to provide more help. In addition to this, the expression of gratitude could actually value higher than monetary reward. Professionals mostly prefer verbal one-to-one gratitude to electronic, handwritten and monetary gratitude [2], taking into account that money extrinsic motivator has less impact than other intrinsic motivators [3]. This research had explored and studied on the expression of gratitude at the workplace and provide more insight on the relationship between gratitude and self-motivation at the workplace.

2. METHODOLOGY

This study employed a quantitative approach. The sample chosen for this research is 104 academic staff working in both public and private higher learning institutions in Selangor. This study attempts to reflect the academic staffs working in higher learning institutions. A questionnaire adapted and modified from a study done by Singh [4] and Patil [5] was employed in this research to elicit the responses from selected respondents on an online platform. Figure 1 shows the expression of gratitude and its influence on employee motivation level.

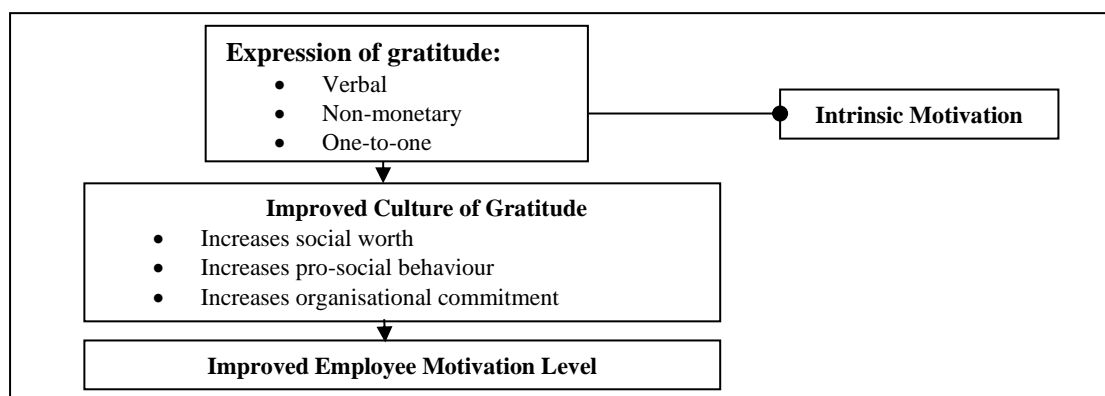


Figure 1 Expression of Gratitude and Its Influence on Employee Motivation Level

3. RESULTS AND DISCUSSION

There were 104 participants who took part in this research. 48% out of those participants (50 people) were male academicians, while the other 52% were female academicians (54 people).

3.1 Perceptions of academic staff towards gratitude in higher learning institutions

There were 17 items from the questionnaire under the sub-topic gratitude. The data collected was analysed using the Means procedure under the Compare Mean submenu on SPSS, and the item with the highest and lowest mean is presented in the following table.

Table 1 Perceptions of Academic Staff towards Gratitude in Higher Learning Institutions

No.	Expression of gratitude	Mean
6.	I believe that the nature of gratitude needs to be monetary.	3.3077 (lowest)
17.	I feel appreciated when my subordinates/students thank me.	4.3269 (highest)

Based on the Table 1, the item with the highest mean score is Item 17. This reveals that the academic staffs find that being expressed gratitude by their subordinates/students gave them the feeling of appreciation the most. This is in line with the study done by Patil et al [5] who also revealed in that their respondents feel more appreciated when thanked by their subordinates, compared to when receiving it from their superiors or colleagues. This finding concurs relevantly with the study done by Grant & Gino [3] who concluded that when educators receive gratitude upon their effort, their social worth is elevated, encouraging them to provide more assistance. On the other hand, the item with the lowest mean score is Item 6, which reveals that to these employees, gratitude does not necessarily need to be monetary. This is in line with the finding from a study in 2016 [2] which found that extrinsic motivator like money has less impact compared to intrinsic motivators like recognition and appreciation.

3.2 Motivation Level of Academic Staff in Higher Learning Institutions

There were 10 items from the questionnaire under the sub-topic employee motivation. The data collected was analysed using the Means procedure under the Compare Mean submenu on SPSS, and the item with the highest and lowest mean is presented in the following table.

Table 2 Academic Staff Motivation Level

No.	Employee Motivation	Mean
2.	I feel a sense of personal satisfaction when I do my job well.	4.067 (highest)
	I only do this job so I get paid at the end of the month.	3.606 (lowest)

Based on Table 2, the item with the highest mean score is Item 2. This shows that the academic staff's motivation is driven by the sense of achievement in their job. On the other hand, the item with the lowest mean score is Item 4. This finding reveals that the academic staffs are committed to their organisation, and are not only motivated by extrinsic factor such as their salary. This result is in accordance with a study done by Tentama [6] who found that employees have the tendency to accord satisfying and fulfilling incidents at work (sense of achievement) when reflecting upon their own work. It can be said that the respondents of the present study are more driven by intrinsic rewards and motivation, particularly sense of achievement, which later provide job satisfaction that increases their commitment to the organisation.

3.3 Relationship between Gratitude and Motivation Level

To determine this, the data was analysed using Pearson Correlation. The result from the test revealed that there is a positive, significant correlation between expression of gratitude and employee motivation level ($r=0.627$, $p<0.01$). It could be said that if the r value is between 0.5 and 0.7, the strength of relationship is considered moderate [7]. Hence, it can be concluded that the more gratitude is expressed at the workplace, the higher the employee motivation level will be. This finding concurs with the study done by both Beck [2] and Patil [5] which found that the increased level of motivation is influenced by the expression of gratitude as it represents appreciation and respect that drive the employee towards enjoyment and commitment in the organisation.

4. CONCLUSION

This study has discovered that intrinsic motivation especially the expression of gratitude has greater impact compared to extrinsic factors like monetary and materialistic benefits. From this research, it can be concluded that gratitude actually has a greater and positive impact on motivation, because people who are being expressed with gratitude will feel valued and appreciated, enhancing their willingness to develop work productivity and collaborate with others. The findings in this study provide implications for the top management of higher learning institutions which could suggest possible improvement in the existing culture of gratitude which could provide them a win-win situation in retaining employees, which is especially relevant in the current pandemic situation. For future research, it is suggested that longitudinal and experimental approaches, mixed with qualitative approach such as interviews and observation could be employed to produce stronger result.

REFERENCES

- [1] L. H. Chen., and C. H. Wu, "Gratitude enhances change in athletes' self-esteem: The moderating role of trust in coach", *Journal of Applied Sport Psychology*, vol.26(3), pp 349-362, 2014
- [2] C. W. Beck, "Perceptions of thanks in the workplace: Use, effectiveness, and dark sides of managerial gratitude", *Corporate Communications: An International Journal*, vol.21(3), 333-351, 2016
- [3] A. M. Grant and F. Gino, "A little thanks goes a long way: Explaining why gratitude expressions motivate prosocial behavior", *Journal of Personality and Social Psychology*, vol.98(6), pp 946, 2010
- [4] R. Singh, "The impact of intrinsic and extrinsic motivators on employee engagement in information organizations", *Journal of Education for Library and Information Science*, vol.57(2), 197-206, 2016
- [5] M. Patil, S. Biswas, and R. Kaur, "Does Gratitude Impact Employee Morale in The Workplace", *Journal of Applied Management-Jidnyasa*, vol.10(2), pp 21-36, 2018
- [6] F. Tentama and D. Pranugasari, "The Roles of Teachers' Work Motivation and Teachers' Job Satisfaction in the Organizational", *International Journal of Evaluation and Research in Education*, vol.5(1), 39-45, 2016
- [7] D. S. Moore and S. Kirkland, "The basic practice of statistics", WH Freeman, vol. 2, 2007

HAKAM DAN APLIKASINYA DALAM PENYELESAIAN KES PERCERAIAN DI MAHKAMAH SYARIAH NEGERI SELANGOR

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Abstract – Hakam adalah satu kaedah yang berlandaskan hukum syarak yang diberi kuasa dalam memutuskan sama ada pertikaian tersebut akan diselesaikan dengan cara perdamaian atau perceraian. Justeru itu, kajian ini bertujuan untuk mengenalpasti aplikasi hakam sebagai salah satu kaedah perceraian dan menganalisa implikasi hakam terhadap kes perceraian yang diputuskan. Kajian ini adalah merupakan kajian eksplorasi dan induktif yang menggunakan data kualitatif. Data primer bagi kajian ini adalah data dari dokumen berkaitan hakam, iaitu laporan kes-kes hakam yang diputuskan di Mahkamah Syariah di Selangor. Data ini dianalisa menggunakan kaedah analisa dokumen, dengan pembinaan tema yang bersesuaian bagi menjawab objektif kajian. Kajian ini mendapati bahawa, aplikasi hakam adalah terhad kepada kes-kes perceraian yang tidak mendapat kerjasama atau persetujuan dari kedua pihak atau dalam keadaan telah berlaku *shiqaq* di antara mereka. Oleh kerana perceraian yang diputuskan oleh hakam adalah merupakan *talaq ba'in sugra*, maka, implikasinya adalah rujuk tidak terpakai kepada suami dan isteri tersebut. Keputusan perceraian oleh hakam juga tidak boleh dirayu, bersifat muktamad dan mengikat pihak-pihak yang bertikai. Rayuan hanya boleh dibuat apabila terdapat kecacatan dari sudut prosiding sahaja. Kaedah hakam ini juga akan meringankan bebanan yang ditanggung oleh isteri dalam pertikaian seperti penjimatan kos prosiding. Namun, kaedah hakam sebagai salah satu kaedah perceraian alternatif yang dijalankan di Mahkamah Syariah masih baharu dan memerlukan penambahbaikan, terutamanya dari sudut perundangan substantif dan prosedur berkenaan hakam.

Kata kunci : Hakam; perceraian; Mahkamah Syariah

1. PENGENALAN

Tahkim atau *arbitration* (arbitari) dari sudut etimologi bermaksud memberi kuasa menjatuhkan hukuman kepada seseorang atau melantik seseorang oleh dua pihak yang bertikai dengan persetujuan keduanya supaya pihak yang dilantik itu menyelesaikan pertikaian serta dakwaan keduanya. Manakala, *tahkim* dari sudut terminologi adalah suatu proses timbang tara atau penyelesaian perkelahian (*shiqaq*) yang melibatkan pertemuan suami dan isteri bersama dengan hakam untuk tujuan perdamaian atau perceraian dengan lafaz *talaq* atau dengan *khul'*. Hakam pula merupakan orang yang dilantik bagi mengadili pihak yang bertikai. Ia merupakan seseorang penimbang tara yang diberi kuasa oleh pihak-pihak atau oleh Mahkamah untuk menyelesaikan perkelahian (*shiqaq*) antara suami dan isteri.

Menurut perundangan Islam di Malaysia, hakam dijelaskan dalam Arahan Amalan Jabatan Kehakiman Syariah Malaysia 2006, termasuk perlantikan dan tanggungjawab hakam serta sabitan *syiqaq* terhadap pasangan suami isteri yang terlibat. Di negeri Selangor, fungsi hakam dinyatakan dalam seksyen 48 Enakmen Undang-undang Keluarga Islam (Negeri Selangor) 2003 dan dijelaskan lebih lanjut dalam Kaedah-kaedah Hakam (Negeri Selangor) 2014 [1]. Seksyen 48 ini memperuntukkan timbang tara hakam bagi menyelesaikan pihak yang bertikai sekiranya wujud sabitan *syiqaq* atau perkelahian yang berlaku secara berterusan. Ini disebabkan oleh permohonan salah satu pihak yang bertikai melalui seksyen 47 iaitu sesuatu perceraian dengan talak ataupun melalui sesuatu perintah.

Secara teorinya, hakam adalah menjadi kaedah perceraian alternatif kepada kaedah perceraian lain iaitu perceraian yang diselesaikan dalam prosiding di Mahkamah dan perceraian yang diputuskan melalui proses sulh. Ini kerana, perceraian melalui prosiding Mahkamah adalah melibatkan masa dan kos yang tinggi serta terdapat risiko kesilapan teknikal [2-3], manakala perceraian melalui sulh pula melibatkan masalah penangguhan [4] dan isu penarikan semula keputusan sulh [5-6]. Justeru, kajian terhadap praktis atau aplikasi hakam sebagaimana yang dilaksanakan oleh Mahkamah Syariah adalah perlu bagi menganalisa implikasi yang lahir dari hakam, sama ada dari aspek hukum, prosedur dan

aspek sosial. Analisa dari implikasi-implikasi ini boleh menyokong kaedah hakam sebagai kaedah perceraian alternatif yang lebih baik kepada pihak-pihak tertentu.

2. METODOLOGI

Kajian ini merupakan suatu kajian yang menggunakan kaedah kualitatif ini menggunakan kaedah perpustakaan dengan menganalisis dokumen bagi mendapatkan data kajian dari bahan ilmiah seperti buku, artikel dan laporan kes-kes yang terdapat dari mahkamah. Analisa dokumen adalah merupakan salah satu kaedah analisa data bagi data kualitatif. Ia juga berfungsi sebagai kaedah pengumpulan data. Analisa Dokumen adalah merujuk kepada prosedur sistematik yang digunakan untuk mengkaji dan menilai data bertulis. Kaedah ini merangkumi aktiviti mentelaah, membaca dan menginterpretasi [7]. Analisa dokumen digunakan ke atas laporan dan kes mahkamah yang dipohon daripada Mahkamah Syariah Negeri Selangor yang terpilih.

3. HASIL DAN PERBINCANGAN

3.1 Pelaksanaan Kaedah Hakam di Negeri Selangor

Kaedah *tahkim* atau timbang tara (*arbitration*) merupakan antara kaedah penyelesaian pertikaian alternatif selain pengantaraan (*mediation*) dan perdamaian (*conciliation*) [4]. Hakam pula merupakan rentetan daripada Majlis Sulh yang mengutamakan penyelesaian kes permohonan cerai oleh pihak isteri. Peruntukan Arahan Amalan No. 1 Tahun 2006 membolehkan penyelesaian kes melalui kaedah Hakam. Jabatan Kehakiman Syariah (JKSM) mengeluarkan Arahan Amalan setelah melalui suatu perbincangan dalam Mesyuarat Jawatankuasa Induk Arahan Amalan Mahkamah Syariah. Tujuannya adalah untuk menyeragamkan tadbir urus dan pentadbiran serta boleh menjadi rujukan Hakim dan Pegawai Syariah [8].

Di negeri Selangor, hakam merupakan kaedah baharu yang diperkenalkan sebagai salah satu alternatif dalam menyelesaikan pertikaian suami isteri. Kaedah-Kaedah Hakam (Negeri Selangor) 2014 [1], merupakan suatu kaedah bagi menentukan prosiding dan pelaksanaan majlis *tahkim* di Negeri Selangor. Kaedah Hakam ini juga merupakan kaedah baharu yang bertujuan memperkasakan fungsi hakam, mempercepatkan penyelesaian prosiding kes perceraian di Mahkamah Syariah serta menjelaskan pelaksanaan prosiding hakam seperti yang diperuntukkan dalam seksyen 48 Enakmen Undang-undang Keluarga Islam (Negeri Selangor) 2003 [9]. Seksyen 48 ini merupakan lanjutan permohonan perceraian dari seksyen 47 enakmen yang sama. Kebanyakan kes perceraian tertangguh adalah disebabkan pihak yang terlibat tidak memberikan kerjasama semasa prosiding kes dijalankan seperti tidak menghadirkan diri ke mahkamah. Selain itu, wujudnya *syiqaq* antara suami isteri membolehkan kes tersebut di bawa ke majlis tahkim. Kaedah hakam di Selangor juga diaplikasikan sebagai alternatif mengatasi kelewatan pengendalian fasakh. Realiti di Selangor, pembentukan Jawatankuasa Pendamai (JKP) sebelum proses pelantikan Hakam yang tidak sempurna menyebabkan isu penyampaian saman kepada pihak suami. Hal ini berlaku kerana Selangor mempunyai jumlah penduduk yang ramai serta kawasan yang luas [10].

3.2 Implikasi Hakam Dalam Kes Perceraian di Mahkamah Syariah Negeri Selangor

Hukum perceraian yang diputuskan oleh hakam adalah *talaq ba'in sugra*. Maka, implikasinya adalah rujuk tidak terpakai kepada suami dan isteri tersebut. Selain implikasi hukum, implikasi prosedur hakam adalah keputusan perceraian yang dibuat oleh hakam adalah tidak boleh dirayu, bersifat muktamad dan mengikat pihak-pihak yang bertikai. Rayuan hanya boleh dibuat apabila terdapat kecacatan dari sudut prosiding sahaja, iaitu pihak yang bertikai boleh membuat semakan pada tahap mana ia dirasakan perlu. Dari sudut implikasi sosial pula, hakam adalah kaedah perceraian alternatif yang boleh meringankan bebanan yang ditanggung oleh isteri untuk melepaskan mereka dari belenggu gantung tidak bertali [11]. Kaedah ini banyak membantu golongan susah terutama mereka yang tidak mengetahui prosedur perundangan yang panjang serta kos guaman yang tinggi. Kaedah hakam juga dapat mengurangkan risiko kesilapan teknikal dalam prosiding. Walaupun kaedah ini mempercepatkan proses perceraian,

namun terdapat beberapa kelemahan. Ini memberi implikasi kepada kelewatan proses perceraian apabila hakam sebelah pihak atau keduanya menarik diri atau mahkamah memecat dan membatalkan pelantikan mereka, ia akan melambatkan proses perceraian tersebut. Justeru, kaedah hakam sebagai salah satu kaedah perceraian alternatif yang dijalankan di Mahkamah Syariah masih baharu dan memerlukan penambahbaikan, terutamanya dari sudut perundangan substantif dan prosedur berkenaan hakam.

4. KESIMPULAN

Pelaksanaan Kaedah Hakam dalam sistem perundangan Islam di Selangor merupakan suatu yang masih baru. Ia merupakan suatu kaedah atau cara bagi menyelesaikan kes yang tertangguh begitu lama supaya lebih cepat diselesaikan, terutama melibatkan isteri-isteri yang teraniaya agar mereka dapat memulakan hidup baru. Walau bagaimanapun, terdapat juga beberapa kelemahan dalam kaedah ini. Sekiranya hakam sebelah pihak atau keduanya menarik diri atau mahkamah memecat dan membatalkan pelantikan mereka, ia akan melambatkan proses perceraian tersebut. Walau bagaimanapun, kaedah ini merupakan suatu kaedah alternatif yang dapat membantu menyelesaikan kes dengan lebih cepat yang melibatkan pertikaian suami isteri sama ada pihak yang bertikai kembali kepada perdamaian atau berlakunya perceraian.

PENGHARGAAN

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RUJUKAN

- [1] Kaedah-kaedah Hakam (Negeri Selangor) 2014
- [2] Abdullah, R., "Penangguhan Kes Di Mahkamah Syariah: Cabaran Dan Penyelesaian", *Jurnal Syariah*, 17(1), 1–30, 2019
- [3] Ahmad, Saodah. "Sulh: an Alternative Dispute Resolution and Amicable Settlement of Family Dispute", *UMRAN Journal of Muslim Affairs*, 1(1), 2015
- [4] Khalidah, N., Rizal, D. M., Noor, P., Yaakub, I., Abdul, M., & Abstrak, H. "Sulh: Pengadilan Tanpa Perbicaraan Mahkamah dalam Memenuhi Tuntutan Pasaran Kewangan Islam di Malaysia (Sulh: Justice Without Court Trial in Fulfilling the Needs of Islamic Finance in Malaysia)", *Jurnal Undang-Undang Dan Masyarakat (Malaysian Journal of Law and Society)*, Volume 21(Special Issue, 2017), 1–22, 2017
- [5] Ahmad, Sa'odah, & Abdul Hak, N., "Family Mediation and Sulh: An Alternative Dispute Resolution in Malaysia" *International Journal of Social Policy and Society*, 66–79, 2010
- [6] Dahalan, H. M., & Mohamad Azhan, Y., "Perjanjian Sulh Di Antara Pihak-Pihak Bertikai Di Mahkamah Syariah Sebagai Pilihan Atau Persetujuan Yang Perlu Dipatuhi?", *Muzakarah Fiqh & International Fiqh Conference 2016*, (November), 254–261, 2016
- [7] Bowen, G. A., "Document Analysis as a Qualitative Research Method", *Qualitative Research Journal* (Vol. 9). <https://doi.org/10.3316/QRJ0902027>, 2009
- [8] Ramizah Wan Muhammad & Khairunnasriah Abdul Salam, "Kejayaan Modal Insan Dan Inovasi Dalam Pentadbiran Mahkamah Syariah: Membina Model Antarabangsa", *Jurnal Syariah*, 2(1), 27–44, 2019
- [9] Syukran Yusof, "Prosiding Hakam Mengikut Hukum Syarak", bertempat di Dewan Muktamar, Jabatan Kehakiman Syariah Negeri Selangor pada 20 Oktober 2018 bersamaan 11 Safar 1440H.
- [10] Mohd Zaidi Md Zain@Zakaria, Raihanah Hj. Abdullah, "Kelewatan pengendalian kes fasakh dalam aspek undang-undang tatacara mal: kajian kes di Selangor", *Jurnal Syariah*, 27(3), 459486, 2019
- [11] Wan Abdul Fattah Wan Ismail, "Perlaksanaan Hakam di Malaysia: Isu dan Cabaran" bertempat di Dewan Muktamar, Jabatan Kehakiman Syariah Negeri Selangor, 2018

KEBERKESANAN PENGGUNAAN PERISIAN SMART AL-FATIHAH (SAF) DALAM PEMBELAJARAN KOSAKATA BAHASA AL-QURAN

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Abstrak – Surah al-Fatihah merupakan surah yang wajib dibaca dalam solat. Pemahaman kepada makna ayat dalam surah al-Fatihah merupakan perkara yang perlu dititikberatkan bagi mendapatkan khusyu' dalam solat sekaligus dapat memahami bahasa al-Quran iaitu bahasa Arab. Justeru, salah satu kaedah yang digunakan sesuai dengan zaman teknologi IR 4.0 adalah pembelajaran menggunakan permainan aplikasi. Kajian ini dijalankan bertujuan untuk meninjau keberkesanan kaedah bermain dalam mengukuhkan penguasaan terjemahan bahasa Arab al-Quran dari surah al-Fatihah di kalangan pelajar Tahun 1. Responden kajian terdiri daripada 231 orang pelajar dari tiga buah sekolah rendah iaitu SK Puncak Alam, SK Puncak Alam 2 dan SK Puncak Alam 3. Kajian menggunakan model kajian yang diadaptasi daripada model Kurt Lewin. Sebanyak tiga instrumen kajian yang digunakan iaitu pemerhatian, ujian pra dan ujian pasca. Hasil tinjauan awal mendapati pelajar ini masih lemah dalam menguasai terjemahan bahasa al-Quran dan kurang aktif dalam pembelajaran. Untuk mengatasi masalah ini, pengkaji telah melaksanakan kaedah bermain melalui aktiviti permainan perisian Smart al-Fatihah (SaF). Dapatan kajian menunjukkan perubahan yang positif pada skor min markah pelajar yang dinilai melalui ujian pra dan pasca yang dijalankan secara dua tahap. Di akhir sesi, kesemua pelajar mula menguasai terjemahan bahasa al-Quran dari surah al-Fatihah di tahap memuaskan. Pelajar lebih yakin untuk melibatkan diri dalam aktiviti yang dijalankan. Selain itu, pelajar juga memberikan kerjasama yang memberangsangkan serta menyeluruh pada sesi pengajaran di dalam kelas.

Kata kunci : Kaedah bermain; bahasa al-Quran; smart al-Fatihah

1. PENGENALAN

Surah al-Fatihah merupakan surah madaniyyah dan ada yang berpendapat bahwa al-Fatihah merupakan surah Makiyyah, diturunkan setelah surah al-Mudatstir [1]. Pembelajaran surah al-Fatihah memang telah lama dilaksanakan. Pelbagai kaedah yang digunakan oleh pendidik dalam memberi pemahaman terhadap surah al-Fatihah. Pengkaji telah membuat aplikasi permainan Smart al-Fatihah (SaF) sebagai satu alternatif yang boleh digunakan sebagai bahan bantu mengajar kepada guru-guru disekolah. Seiring dengan zaman teknologi dan multimedia kini, kaedah belajar menggunakan permainan aplikasi akan menarik perhatian dan minat pelajar untuk lebih fokus. Permainan merupakan strategi baru yang diterapkan dalam proses pembelajaran bahasa Arab, dan hasil dari aplikasi itu sangat berdampak positif dalam penguasaan keterampilan berbahasa, karena pada dasarnya dalam proses pembelajaran bahasa asing diperlukan situasi yang menyenangkan [2].

2. METODOLOGI

Kajian ini dijalankan di tiga buah sekolah iaitu SK Puncak Alam, SK Puncak Alam 2 dan SK Puncak Alam 3. Kaedah kajian yang dilaksanakan adalah menggunakan ujian pra dan pasca I dan II. Sebaik sahaja kedua-dua kumpulan berkenaan selesai menjalani proses pengajaran dan pembelajaran pada minggu pertama dan ujian pasca II pada minggu kedua. Soalan pasca ujian ini sama dengan soalan pra ujian. Namun begitu, sampel tidak diberitahu bahawa mereka menerima kertas ujian yang sama. Markah pra ujian juga tidak diumumkan kepada mereka. Ujian ini adalah untuk melihat kesan kesesuaian kaedah pembelajaran kosakata surah al-Fatihah terhadap murid-murid peringkat permulaan bagi kefahaman surah al-Fatihah. Markah yang diperoleh daripada ujian pra dan ujian pasca yang diberikan

kepada murid direkodkan dalam bentuk peratus. Kaedah ini lebih mudah bagi menganalisis data serta mengikuti perkembangan murid sebelum dan semasa kaedah permainan digunakan dalam pengajaran kefahaman surah al-Fatihah.

3. DAPATAN KAJIAN

Dalam menganalisis keberkesanan ini, pengkaji telah membuat perbandingan kesan pencapaian pelajar antara dua kumpulan yang dilaksanakan dalam pembelajaran bahasa Arab Al-Quran menggunakan bahan bantu belajar iaitu permainan SaF. Pengkaji membuat analisis purata (min) markah sebelum dan purata (min) selepas bagi kedua-dua kumpulan tersebut iaitu;

3.1 Ujian pra dan ujian pasca kitaran pertama

Berdasarkan hasil dapatan yang diperolehi, kumpulan murid kajian A dan B menunjukkan sedikit pencapaian pada ujian pasca yang dijalankan berbanding ujian pra yang sebelumnya yang mana kumpulan murid kajian A mendapat kenaikan sebanyak 16.465% dengan markah ujian sebanyak 45.991% berbanding markah sebelumnya mendapat 29.526%. Manakala kumpulan murid kajian B mendapat kenaikan sebanyak 15.345% selepas ujian pasca dengan markah ujian sebanyak 44.849% berbanding sebelumnya mendapat markah sebanyak 29.504%. Dapatan awal menunjukkan peningkatan walaupun kurang memuaskan iaitu dari status gagal kepada lulus. Bagi meningkatkan lagi pencapaian tersebut, kajian ini diteruskan kepada kitaran yang kedua.

3.2 Ujian pasca kitaran pertama dan kedua

Berdasarkan ujian pasca II, kumpulan murid kajian A mendapat kenaikan peratus sebanyak 10.819% dengan markah ujian sebanyak 56.810% berbanding sebelumnya mendapat 45.991%. Kumpulan murid kajian B pula mendapat kenaikan peratus sebanyak 10.905% dengan markah sebanyak 55.754%, berbeza dengan ujian sebelumnya hanya mendapat 44.849%. Hasil pencapaian ini menunjukkan setiap murid menunjukkan peningkatan yang memberangsangkan dengan masing-masing mendapat markah yang baik.

Hasil analisis ujian-t bagi perbandingan purata (min) markah ujian sebelum dan selepas penggunaan permainan SaF dalam pembelajaran bahasa Arab Al-Quran bagi keseluruhan 231 orang murid menunjukkan nilai yang significant dimana nilai p kurang daripada 0.00. Hasil daripada analisis menunjukkan bahawa skor min dalam ujian pra bahasa Arab Al-Quran adalah 29.643 manakala skor min dalam ujian pasca 2 selepas penggunaan permainan SaF adalah 56.526. Perbezaan skor min antara ujian tersebut ialah -26.883. Keputusan keseluruhan kajian adalah signifikan ($t = -27.638$, $p < .000$). Ini menunjukkan bahawa terdapat peningkatan bagi pencapaian pelajar apabila dilaksanakan kaedah pembelajaran menggunakan perisian permainan SaF sebagai bahan bantu mengajar bagi keseluruhan murid. Sekolah Kebangsaan Puncak Alam menunjukkan penurunan beza min kepada 0.49% bagi ujian pasca 2 berbanding 15.12% ketika peperiksaan Pendidikan Islam. Manakala Sekolah Kebangsaan Puncak Alam 2, menunjukkan murid dari kedua-dua kumpulan sudah berada pada tahap yang hampir sama di mana perbezaan min markah Pendidikan Islam begitu kecil iaitu 0.57% dan 0.35% bagi ujian pasca 2. Bagi Sekolah Kebangsaan Puncak Alam 3 menunjukkan penurunan beza min kepada 0.81% bagi ujian pasca 2 berbanding 8.55% ketika peperiksaan Pendidikan Islam.

Secara keseluruhan, perubahan positif melalui peningkatan skor min markah bagi ujian pra dan pasca terhadap kedua-dua peringkat pertama dan kedua menunjukkan kreativiti penagajaran Bahasa Arab melalui kaedah permainan lebih interaktif dan boleh menarik minat pelajar menguasai dan memahami Bahasa tersebut dengan lebih mudah. Aktiviti-aktiviti penyokong seperti kaedah permainan serta kreativiti bahasa amat diperlukan dalam mewujudkan dan mengembangkan persekitaran bahasa Arab [3].

4. KESIMPULAN

Hasil analisis kedua-dua kelas murid Tahun 1, SK Puncak Alam menunjukkan keputusan ujian t - 16.684 dan nilai signifikan $0.00 < 0.05$. Ini membuktikan terdapat perbezaan skor min markah yang tinggi di antara ujian pra dan ujian pasca 2 selepas murid menggunakan perisian permainan Smart al-Fatihah. Dengan erti kata lain melalui perisian permainan SaF keputusan murid semakin baik dan sentiasa meningkat. Manakala dari aspek perbezaan skor min di antara dua kumpulan A dan B menunjukkan, sebelum menggunakan perisian permainan Smart al-Fatihah terdapat perbezaan skor min yang tinggi pada keputusan peperiksaan Pendidikan Islam di antara kumpulan A dan kumpulan B. Di mana murid dari kumpulan A lebih berkemampuan menguasai pembelajaran berbanding murid dari kumpulan B. Namun, setelah menggunakan permainan tersebut, perbezaan skor min memberikan nilai yang sangat kecil, di mana ianya menunjukkan markah antara kumpulan A dan kumpulan kelas B hampir tiada perbezaan. Keputusan yang hampir sama diperolehi bagi setiap sekolah. Dapat disimpulkan bahawa perisian permainan SaF sangat relevan dan boleh membantu murid mula menguasai kosakata bahasa Arab al-Quran dalam surah al-Fatihah.

RUJUKAN

- [1] Ahmad Mohd. Salleh “Pendidikan Islam Falsafah, Sejarah dan Kaedah Pengajaran Pembelajaran. Selangor”, Penerbit Fajar Bakti Sdn. Bhd., 2004
- [2] Jauhar, A., “Permainan Sebagai Strategi Aktif Learning Dalam Pembelajaran Bahasa Arab”, Stain Pekalongan 1–32, 2019
- [3] Febrian, D., Lubis, M. A., Yasim, I. M. M., & Wahab, N. S. A., “Teknik Pengajaran Bahasa Arab Interaktif Di Pusat Bahasa Arab Negeri Selangor”, *Asean Comparative Education Research Journal On Islam And Civilization (ACER-J)*. eISSN2600-769X, 1(1), 78-93, 2017

PENILAIAN GURU TERHADAP MODEL PERISIAN SMART AL-FATIHAH

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Abstrak – Multimedia yang sering dikaitkan dengan trend masa kini dalam pendidikan merupakan salah satu strategi yang boleh diaplikasikan untuk mengatasi kelemahan yang dihadapi dalam proses pengajaran dan pembelajaran. Pelbagai elemen multimedia yang diterapkan dalam suasana interaktif dalam perisian dapat menyediakan suatu persembahan yang menarik dan memotivasikan murid untuk belajar. Kajian ini bertujuan untuk menilai model pembelajaran bahasa Arab al-Quran melalui perisian permainan bahasa bermultimedia yang telah dibangunkan yang dikenali sebagai Smart al-Fatihah (SaF). Perisian multimedia ini dibangunkan berasaskan sukatan pelajaran Pendidikan Islam Tahun 1 yang dikeluarkan oleh Kementerian Pelajaran Malaysia (2006). Persoalan kajian yang dikemukakan dalam kajian ini adalah untuk membina dan menilai sama ada isi kandungan perisian ini menepati kurikulum Pendidikan Islam, mengaplikasikan unsur multimedia serta menilai dari sudut kepuasan pengguna dan mengaplikasikan konsep pembelajaran. Kajian ini telah dijalankan keatas 12 orang guru Pendidikan Islam dan Bahasa Arab. Data-data yang telah dianalisa dengan menggunakan perisian *SPSS 11.5 for Windows*. Dapatan kajian menunjukkan para guru bersetuju bahawa perisian SaF menepati dari aspek persembahan multimedia (skor min 4.52), aspek isi kandungan (skor min 4.69) serta dari aspek kepuasan pengguna (skor min 4.60) dan pengaplikasian konsep pembelajaran (skor min 4.64). Perisian ini juga boleh digunakan oleh guru-guru sebagai alternatif bahan bantu mengajar mereka. Kombinasi pelbagai media dalam perisian SaF ini juga telah menjadikan proses pengajaran dan pembelajaran lebih menarik.

Kata kunci : Pendidikan Islam; smart al-Fatihah (SaF); multimedia dan bahasa Al-Quran

1. PENGENALAN

Perisian bahasa al-Quran dengan aplikasi permainan bahasa bermultimedia yang telah dibangunkan ini adalah berpandukan kepada model Hannafin & Peck yang melibatkan lima fasa iaitu analisis, reka bentuk, pembangunan, implementasi dan penilaian. Hasil penyelidikan yang berbentuk perisian bahasa al-Quran melalui permainan bahasa bermultimedia adalah satu alternatif tambahan untuk para pelajar mempelajari bahasa al-Quran secara mudah dan santai serta mesra pengguna. Tambahan pula ia mampu untuk dimuat turun melalui aplikasi telefon bimbit dan komputer tablet. Perisian ini dapat membantu pelajar dari Sekolah Rendah Tahun 1 yang mengambil mata pelajaran Pendidikan Islam, khususnya dalam bidang penguasaan surah-surah pilihan yang telah ditetapkan. Menurut Carter & Yeo dan Ding & Chai kesan penggunaan aplikasi yang terdapat di dalam peranti mudah alih mendapati, penggunaan aplikasi yang terdapat pada teknologi mudah alih atau *mobile technology* mampu meningkatkan keseronokan dan emosi yang positif kepada murid setiap kali mereka menggunakan aplikasi mudah alih [1-2]. Kecenderungan menggunakan aplikasi inilah yang dapat memberikan keseronokan kepada murid terutama sekali bagi pribumi digital.

2. METODOLOGI

Dalam fasa ini, sesi penilaian ke atas model pembelajaran dilaksanakan dari persembahan multimedia, aspek isi kandungan, aspek kepuasan pengguna dan aspek pengaplikasian konsep pembelajaran. Selain itu, fasa ini juga melibatkan analisis terhadap keupayaan model yang dibangunkan dalam membantu murid memahami kosakata surah al-Fatihah. Kaedah kajian ini adalah berbentuk kualitatif menggunakan soal selidik. Soal selidik dibahagikan kepada empat bahagian mengikut soalan kajian iaitu aspek persembahan multimedia, aspek isi kandungan, aspek kepuasan pengguna dan aspek pengaplikasian konsep pembelajaran.

3. DAPATAN KAJIAN

Bagi memantapkan lagi proses penilaian, pengkaji telah melakukan penilaian ini kepada 12 orang guru yang sama iaitu guru Pendidikan Islam dan Bahasa Arab. Statistik deskriptif digunakan untuk menjelaskan dapatan kajian daripada soal selidik guru.

Hasil dapatan kajian berkaitan multimedia menunjukkan bahawa tahap persetujuan guru bagi aspek multimedia adalah pada tahap tinggi di mana nilai min keseluruhan ialah 4.52. Skor menunjukkan 56.7% guru 'sangat setuju' dan 39.1% guru 'setuju' yang mewakili 100% daripada skor keseluruhannya. Kesimpulannya, hasil dapatan daripada soal selidik ini mendapati guru bersetuju bahawa perisian yang dibangunkan ini telah berjaya mengintegrasikan unsur-unsur multimedia dengan baik dan dapat menarik minat murid untuk menggunakan perisian ini. Dapatan ini telah menjawab persoalan kajian yang pertama iaitu adakah perisian ini mempunyai unsur-unsur multimedia seperti teks, audio, grafik, warna, animasi dan bersifat interaktif yang mampu menarik minat murid untuk mempelajari tajuk ini.

Dapatan kajian berkaitan isi kandungan aplikasi menunjukkan isi kandungan perisian ini bertepatan dengan bidang ATQ berada pada tahap tinggi iaitu nilai min keseluruhan 4.69. Skor tertinggi ialah 5.00 iaitu pada item 'Tiada kesalahan ejaan' dan nilai min 4.83 bagi 2 item iaitu 'Perisian ini sesuai dengan tahap kemampuan murid Tahun 1' dan item 'Isi kandungan perisian ini menepati sukatan mata pelajaran Pendidikan Islam seperti yang ditetapkan oleh Kementerian Pelajaran Malaysia. Ini menunjukkan para guru bersetuju dengan kesesuaian isi kandungan perisian ini.

Dapatan berkaitan kepuasan pengguna menunjukkan bahawa guru berpendapat tiada masalah yang dihadapi semasa meneroka perisian ini di mana nilai 33.3% guru sangat setuju dan 50% setuju. Begitu juga dengan item-item yang lain yang mempunyai nilai min lebih tinggi dari 4.17. Ini menunjukkan bahawa para guru bersetuju bahawa perisian ini adalah berkesan dan memberi kepuasan kepada mereka.

4. KESIMPULAN

Secara keseluruhannya, dapatan kajian menunjukkan responden terdiri daripada guru sangat bersetuju bahawa perisian permainan SaF ini boleh digunakan sebagai salah satu alternatif dalam proses P&P bidang asuhan tilawah al-Quran.

Dapatan berkaitan multimedia menunjukkan elemen-elemen multimedia yang telah diintegrasikan dalam perisian permainan SaF ini adalah baik, bersesuaian dan seterusnya dapat menarik minat murid untuk terus bermain sambil belajar kosakata dan terjemahan surah al-Fatihah. Ini sejajar dengan dapatan Diana [3] menggunakan aplikasi permainan pelajar dapat lebih pengetahuan serta mengubah pola belajar agar tidak membosankan dan dapat menarik perhatian. Begitu juga pandangan Rosni dan Norhayati [4-5], BBM yang berbentuk rakaman bergambar seperti animasi, filem dan VCD banyak membantu pelajar dalam meningkatkan kemahiran mendengar. Ini kerana mereka akan dapat memahami pendengaran tersebut melalui gambar yang ditontonnya dan mereka dapat mengajuk suara yang didengari. Menerusi penggunaan aplikasi, pembelajaran boleh berlaku pada bila-bila masa dan di mana-mana jua mengikut keselesaan, kesediaan dan keperluan pembelajaran murid [6].

Tahap persetujuan pakar bagi aspek isi kandungan perisian ini adalah tinggi iaitu nilai min keseluruhan adalah 4.69. Julat nilai min bagi setiap item adalah tinggi iaitu di antara 4.42 dan 5.00. Dapatan ini menunjukkan pakar amat bersetuju bahawa perisian permainan SaF ini boleh dijadikan sebagai bahan bantu mengajar dalam proses P&P bidang asuhan tilawah al-Quran. Dari aspek kepuasan pengguna, dapatlah dirumuskan bahawa murid lebih bermotivasi serta mendapat kepuasan setelah bermain menggunakan perisian ini. Justeru, perisian ini amat sesuai sekali digunakan dalam proses P&P bidang asuhan tilawah al-Quran.

RUJUKAN

- [1] Carter, S., & Yeo, A. C., “From hedonism and utilitarianism to anticipated actual behavior: Do UK and Malaysian postgraduate students behave differently to mobile apps?”, *Economics, Management and Financial Markets*, 12(2), 11–34, 2017
- [2] Ding, Y., & Chai, K. H., “Emotions and continued usage of mobile applications”, *Industrial Management & Data Systems*, 115(5), 833–852, 2015
- [3] Diana Laily Fithri, Dave Andre, “Analisa Dan Perancangan Game Edukasi Sebagai Motivasi Belajar Untuk Anak Usia Dini”, *Jurnal SIMETRIS*, Vol 8 No 1 April 2017 ISSN: 2252-4983, 2017
- [4] Rosni Samah, “Pendekatan Pembelajaran Kemahiran Bahasa Arab Untuk Pelajar Bukan Penutur Jati. Nilai”, *Universiti Sains Islam Malaysia*, 2019
- [5] Norhayati Che Hata, Shaferul Hafes Sha'aria, Mohd Fauzi Abdul Hamida, “Persepsi Pelajar Terhadap Penggunaan Animasi dalam Pembelajaran Bahasa Arab”, *Sains Humanika*, 63(1), 2013
- [6] Subadah, R., “Joy of learning of Malay vocabulary using unique vocabulary app: Singapore experience”, *Muallim Journal of Social Sciences and Humanities*, 4(2), 70-86, 2020

IMPACT OF MOTIVATIONAL PROGRAM ON STUDENT'S ACADEMIC ACHIEVEMENT IN HIGHER EDUCATION

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Abstract - This paper aims to present an overview of how a motivational program that creates peer mentoring applied to a group of University Selangor students who were the recipients of zakat fund in achieving better performance in their studies. These students mostly come from a poor family background with less motivation to excel in their study. A significant number of these students were unable to complete their study due to poor grade in their examination. For this purpose, observation on the pre- and post-examination result for these control group models were used. We focused for the two consecutive semesters, April and November 2019. The groups consisted of 103 of students of which 19 of them are male and 84 are female whom were invited in three separate motivational programs to give them the opportunity to explore new experience with the communities and simultaneously building team spirit among them. Consequently, it was found that the motivation of the students in the experimental group increased based on the increasing of the examination result. However, there might be several factors that also contributing on the student's motivation. Limitations of this study include the small sample size and the short period of time in which students were asked to be a part of the mentoring program. So, further research should assess comprehensively to determine the influence of student's motivation to enhanced academic excellence for the students.

Keywords : Motivational program; peer mentoring; academic excellence

1. INTRODUCTION

Zakat & Sedeqah Unit in University Selangor is responsible in handling all funds collected through zakat and charity for those students who need financial assistance throughout their studies. An average fund of more than RM500,000 a year need to be distributed to the needy one including sponsoring their outstanding study fees, food, accommodation and even pocket money.

Heirdsfield, Walker, Walsh and Wilss highlight that money is invested into attracting students to study at Universities [1]; however, little is invested into retaining students. It is obvious that quite a number of students who were sponsored by zakat fund were found not to achieve academic excellent even though their study fees were fully paid plus other personal financial assistance without them need to think about it. As a result, there were a number of dropouts from the university throughout the semester. The application of a mentoring scheme especially peer mentoring could help reduce the problems.

However, there are a number of students amongst those being helped were not doing well in their academics standing. Some even were terminated from the university due to failing to achieve at least CGPA 2.0 for three semesters. This situation should not happen in the first place since money is not the main problem to them. All or part of their tuition fees were paid by zakat fund plus pocket money. Hence, academic motivation should play an important role in education because it produces motivational outputs. According to researchers, the concept of motivation has a larger degree of multifaceted, non-cognitive psychosocial structure, whereas academic motivation is a more specific concept, which is creative thinking skills and learning skills, students' satisfaction from school and reasons for school attendance and doing homework [2]. With regards to this matter, Zakat & Sedeqah Unit is exploring another responsibility i.e. to develop these group of students to achieve academic excellent through peer mentoring. As mentioned by Gimbel and Kefor (2018) feeling connected to colleagues and professional peers is an integral part of helping educational leaders feel connected and satisfied in their jobs [3]. A group of selected excellent students were chosen and invited to join a special

train-on-trainer program. They are then expected to share and guide their colleagues in another separate program towards achieving better results in the examination.

2. METHODOLOGY

With some allocation contributed from several corporate agencies, Zakat & Sedaqah Unit has planned and carried out a few series of motivational programs for these groups of students. Module of motivation applied varies from one group to another. However, the elements of building self-confidence were included in all the three programs. Students were taught to be brave enough for public speaking in voicing their ideas and points through several activities. From that, all data were collected from the examination result from observation pre- and post-program. Students' result was chosen for the April semester and November semester 2019.

3. RESULTS AND DISCUSSION

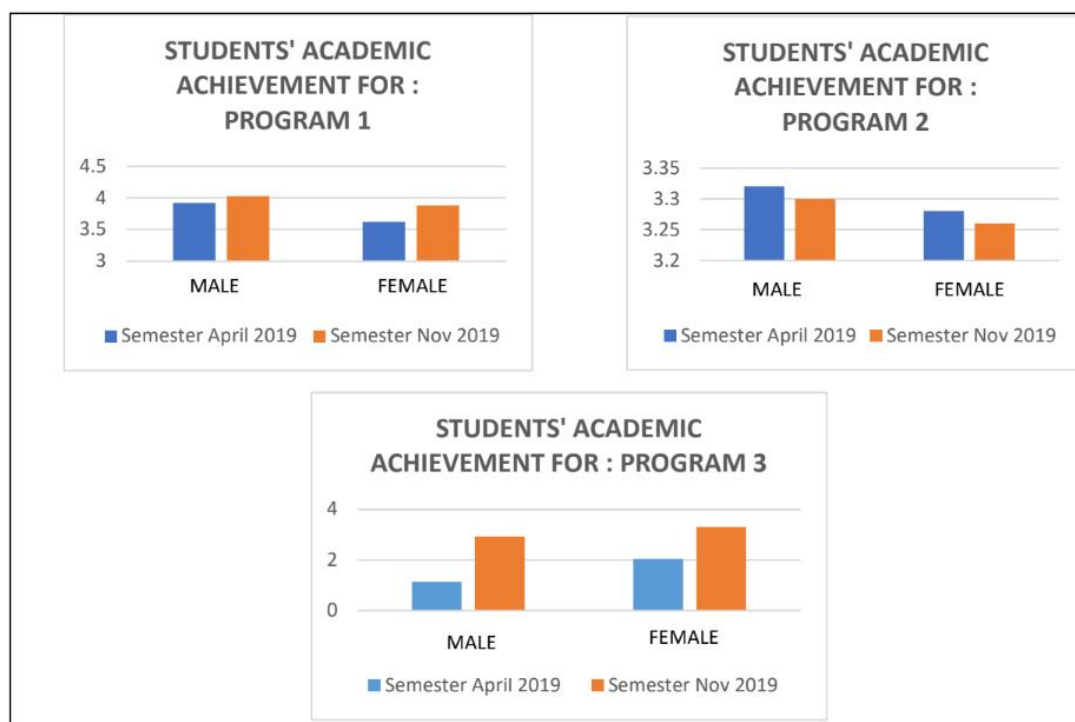


Figure 1 Comparison students' academic achievement for 3 programs

Even though there might be other factors that may contribute to better achievement of the participants, at least it is a good start to improve the study in understanding them more in the future. The immediate result of their CGPA obtained before and after the program can be justified as the impact of the motivational program. Academic motivation is an important concept in education because it produces motivational outputs [3]. Figure 1 shows that 3 programs were conducted for the target group to get the comparison between students' academic achievement for the two semester which is April before joining the program and November semester after program done. The average achievement was increased due to impact of motivational program. Mentoring programs may be the key element that provides new students assistance, provides more advanced students new connections and creates a more welcoming and connected environment for everyone involved [4].

4. CONCLUSION

The result clearly shows that these students really need some motivational programs apart from their normal syllabus in classroom in boosting their academic performance. A detail study needs to be carried

out to determine the real factors that might be the hindrance for them to excel in their examination. There is also a need to restructure the allocation of zakat fund so that not only they are being spent to assist them financially but more importantly is the need to allocate some portion for human development in producing students with towering personality and academic excellent.

ACKNOWLEDGEMENT

I would like to thank Universiti Selangor for giving me the opportunity and trust to handle Zakat and Sedeqah Unit in managing zakat funds and also in developing the students through outdoor program.

REFERENCES

- [1] Ann M. Heirdsfield, Sue Walker, Kerryann Walsh & Lynn Wilss, "Peer mentoring for first- year teacher education students: the mentors' experience, *Mentoring & Tutoring: Partnership in Learning*", 16:2, 109-124, DOI: 10.1080/13611260801916135, 2008
- [2] Sivrikaya, Ahmad Haktan, "The Relationship between Academic Motivation and Academic Achievement of the Students", *Asian Journal of Education and Training*, 5(2): 309-315, 2019
- [3] Gimbel, P. and Kefor, K., "Perceptions of a principal mentoring initiative", *NASSP Bulletin*, Vol. 102 No. 1, pp. 22-37, doi: 10.1177%2F0192636518754405, 2018
- [4] McConnell, K., Geesa, R.L. and Lowery, K., "Self-reflective mentoring: perspectives of peer mentors in an education doctoral program", *International Journal of Mentoring and Coaching in Education*, Vol. 8 No. 2, pp. 86-101, doi: 10.1108/IJMCE-07-2018-0043, 2019

PEMBANGUNAN DAN PERLAKSANAAN SISTEM PENGURUSAN KUALITI ISO 9001:2015 DAN ISO 21001:2018 DI UNISEL

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Abstrak – Sistem Pengurusan Kualiti (SPK) merupakan sesuatu yang penting bagi memastikan sesebuah organisasi dapat memberi perkhidmatan yang berkesan dan memenuhi keperluan pelanggan. Ketiadaan prosedur piawai menyebabkan ketidaksefahaman dan kesukaran bagi pegawai baru melaksanakan tugas apabila berlaku pertukaran staf antara jabatan atau apabila ada staf bersara. Dalam usaha memantapkan SPK agar lebih menyeluruh dan berkesan, Universiti Selangor (UNISEL) telah mengambil inisiatif untuk mendapatkan persijilan Sistem Pengurusan Kualiti ISO 9001:2015 dan Sistem Pengurusan Organisasi Pendidikan ISO 21001:2018. Kaedah utama yang dilaksanakan dalam usaha mendapatkan persijilan ISO adalah melalui lawatan penandaarasan, bengkel latihan dalaman oleh pihak SIRIM, latihan Ketua Juruaudit, penyediaan dokumentasi, audit dalaman dan audit persijilan. Polisi kualiti dan pencapaian objektif kualiti di setiap fakulti dan jabatan telah diselarikan dengan perancangan strategik dan pelan transformasi UNISEL untuk meningkatkan pendapatan universiti, menjadikan infrastruktur dan persekitaran universiti lebih kondusif, pengurusan yang berintegriti, membangunkan kerjasama strategik dan mencapai kecemerlangan akademik. Kaedah yang dijalankan ini terbukti berkesan kerana UNISEL telah berjaya mendapat dua pensijilan ISO 9001:2015 dan ISO 21001:2018 serentak pada tahun 2018.

Kata Kunci : Sistem Pengurusan Kualiti; persijilan ISO; Sistem Pengurusan Organisasi Pendidikan

1. PENGENALAN

Sebelum Naib Canselor yang terkini menyertai UNISEL pada tahun 2016, UNISEL tidak mempunyai prosedur yang mengikut piawai antarabangsa. Ada sesetengah Pusat Tanggungjawab (PTJ) membangunkan prosedur masing-masing dengan melihat contoh prosedur dari universiti lain. Ini menyebabkan ketidaksefahaman berlaku kerana ada pegawai yang ingin mengikut prosedur tempat mereka bertugas sebelum ini. Selain daripada itu, ada sebahagian PTJ yang tidak mempunyai prosedur yang didokumentasikan. Ini menyebabkan kesukaran apabila terdapat pertukaran staf, staf bersara atau berhenti. Ini kerana pengetahuan menguruskan PTJ tersebut berada dalam minda pakar pegawai yang telah bertukar/bersara atau berhenti. Oleh yang demikian, Naib Canselor UNISEL telah memperkenalkan Pelan Transformasi UNISEL untuk menambahbaik keupayaan UNISEL sejak Januari 2016. Bagi menyokong transformasi UNISEL, satu Sistem Pengurusan Kualiti (SPK) berasaskan piawai antarabangsa ISO 9001:2015 [1] telah dimasukkan dalam agenda Transformasi UNISEL. SPK dirancang dan diimplementasikan kepada semua proses di UNISEL yang melibatkan semua PTJ di UNISEL. Satu piawai baru iaitu Sistem Pengurusan Organisasi Pendidikan (EOMS) ISO 21001:2018 [2] telah diperkenalkan untuk institusi pendidikan formal oleh SIRIM QAS INTERNATIONAL SDN. BHD. pada 11 Julai 2018. UNISEL mengambil keputusan untuk terlibat dalam bengkel *pilot* pensijilan EOMS dan menjadi universiti pertama menerima persijilan EOMS. Oleh yang demikian, keperluan tambahan untuk proses pendidikan terutamanya dalam pengajaran dan pembelajaran telah disediakan untuk memenuhi keperluan piawai EOMS. Sistem pengurusan kualiti untuk kedua-dua piawai telah berjaya diaudit dan mendapat persijilan bermula 31 Oktober 2018 sehingga 30 Oktober 2021. Kertas kajian ini membincangkan proses untuk mendapatkan persijilan berganda ISO di UNISEL dalam tempoh masa yang singkat, dan bagaimana sistem pengurusan kualiti dapat menyokong perancangan strategik dan agenda transformasi UNISEL.

2. METODOLOGI

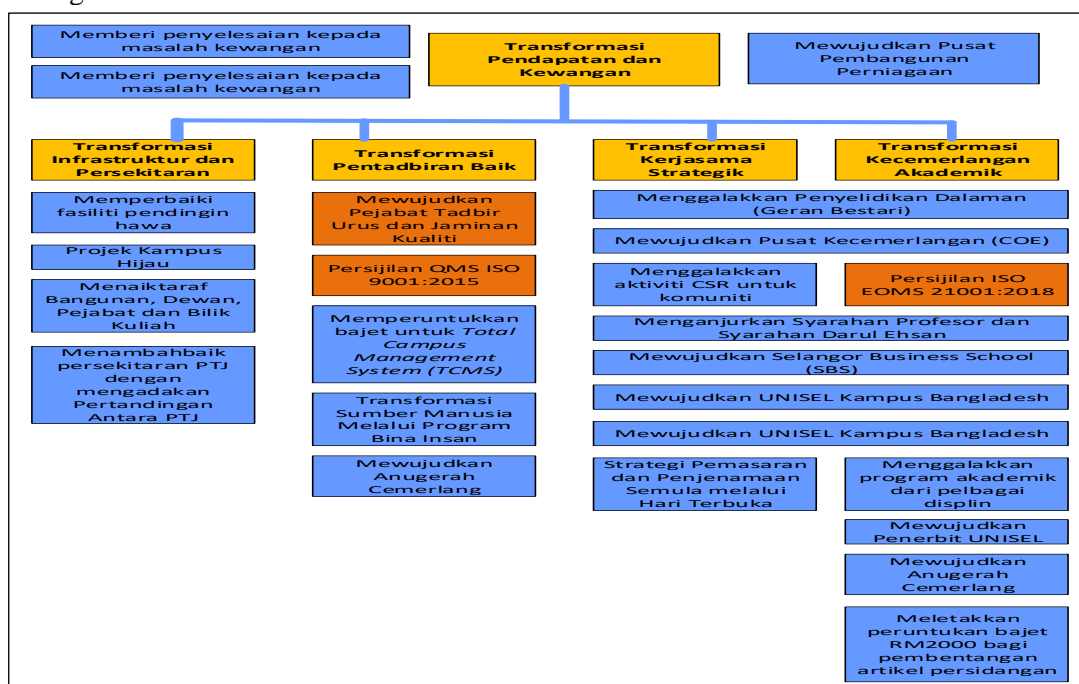
Kaedah mendapatkan persijilan berganda ISO di UNISEL dilaksanakan melalui beberapa fasa utama (rujuk Rajah 1) iaitu melalui pengwujudan Pejabat Tadbir Urus Korporat dan Jaminan Kualiti (CGQA), Program Pelancaran UNISEL ke Arah Persijilan ISO 9001:2015 dan Ikrar Kualiti, lawatan penandaarasan, siri bengkel latihan dalaman oleh pihak SIRIM, persediaan dokumentasi ISO, 12 siri bengkel semakan dokumen ISO, kemaskini dokumentasi ISO, Program Pelancaran Pelaksanaan ISO, persediaan audit dalaman, taklimat juruaudit, Audit Dalaman ISO 9001:2015, bengkel latihan *pilot* EOMS, analisis jurang, perbaiki dokumentasi untuk memenuhi keperluan ISO 21001:2018, Audit Dalaman ISO 21001:2018, Mesyuarat Kajian Semula Pengurusan dan Audit Persijilan.



Rajah 1 Proses UNISEL untuk Persijilan ISO

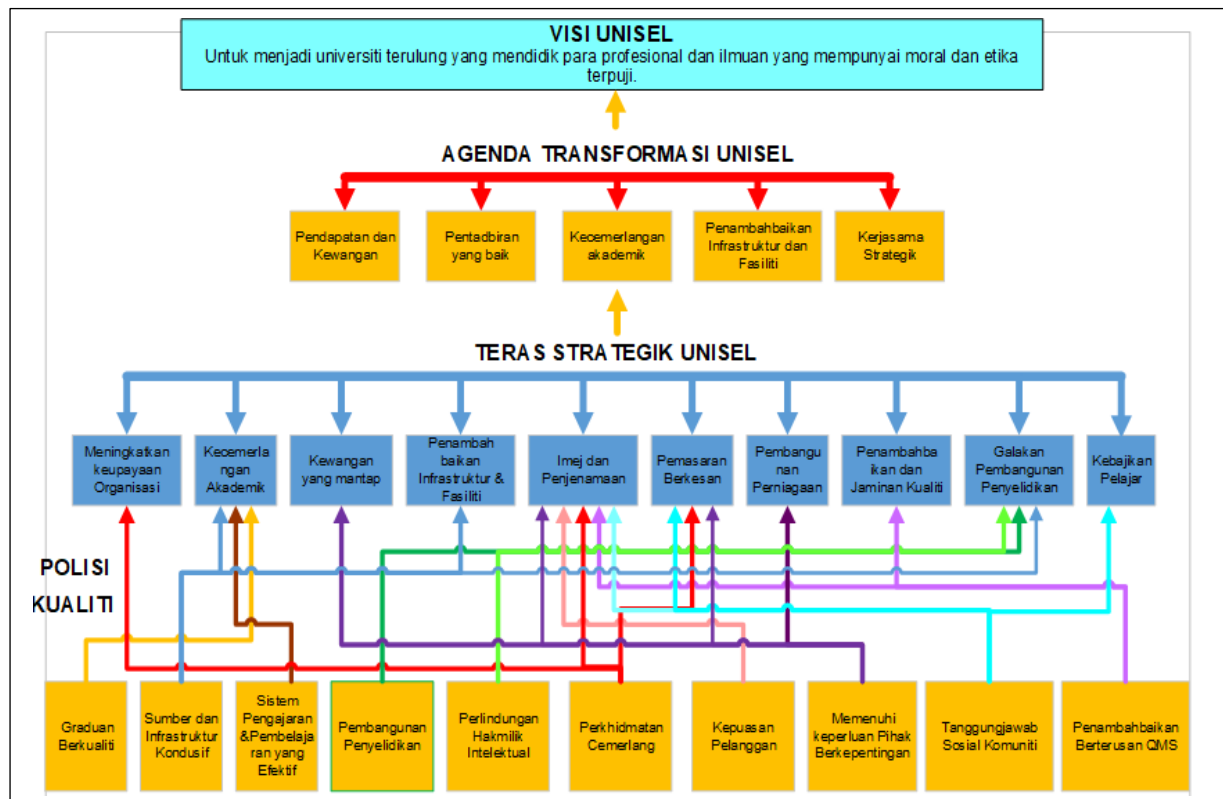
3. HASIL KAJIAN DAN PERBINCANGAN

Rajah 2 menunjukkan bahawa persijilan berganda ISO 9001:2015 dan ISO 21001:2018 di UNISEL adalah menyokong Pelan Transformasi UNISEL. Terdapat 5 agenda utama Pelan Transformasi UNISEL iaitu transformasi pengurusan kewangan dan pendapatan, transformasi infrastruktur dan persekitaran, transformasi pentadbiran baik, transformasi kerjasama strategik, transformasi kecemerlangan akademik.



Rajah 2 Pelan Transformasi UNISEL

Selain daripada itu, polisi kualiti UNISEL juga menyokong teras perancangan Strategik UNISEL dan Agenda Transformasi UNISEL (Rujuk Rajah 3). Bagi setiap polisi kualiti, terdapat objektif kualiti yang menyokong pencapaian polisi kualiti. Pelaksanaan Sistem Pengurusan Kualiti yang menyokong teras strategik dan visi universiti amat penting dalam mendapatkan sokongan pihak pengurusan atasan.



Rajah 3 Pemetaan Polisi Kualiti dengan Teras Strategik dan Agenda Transformasi UNISEL

4. KESIMPULAN

Terdapat beberapa perkara yang boleh dijadikan panduan daripada pengalaman UNISEL dalam mendapatkan persijilan ISO 9001:2015 dan ISO 21001:2018. Pertama, sesebuah organisasi yang ingin mendapatkan persijilan ISO buat kali pertama perlu melakukan penanda arasan kaedah pelaksanaan sistem pengurusan di institusi lain. UNISEL telah membuat penanda arasan Sistem Pengurusan Kualiti di beberapa universiti awam. Selain daripada itu, komitmen pihak pengurusan atasan dan Naib Canselor juga amat penting terutama dari sudut bajet dan kepimpinan. Program pelancaran ke arah ISO dan program pelancaran ISO juga didapati amat penting untuk memberi kesedaran kepada staf tentang pelaksanaan ISO di universiti. Latihan Ketua Juruaudit (*Lead Auditor*), latihan dalaman ISO oleh pihak SIRIM dan bengkel semakan dokumen ISO didapati membantu melatih juruaudit dan membantu semua PTJ menyediakan dokumentasi ISO. Penyelarian objektif kualiti dan polisi kualiti dengan perancangan strategik universiti dan agenda transformasi universiti adalah amat penting bagi menentukan hala tuju kualiti sesebuah organisasi dan dalam mendapatkan komitmen pihak atasan.

RUJUKAN

- [1] International Organization for Standardization, Quality Management Systems - Requirements ISO 9001:2015
- [2] International Organization for Standardization, Educational Organization Management Systems - Requirements ISO 21001:2018

AN INFUSION APPROACH IN THE TEACHING OF CRITICAL THINKING SKILLS: PERSPECTIVES FROM INTERNATIONAL STUDENTS AND TEACHERS

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ABSTRACT - Research on reading has been abundant and diverse but little has been carried out on how critical thinking can be infused into reading lessons by the application of an explicit direct instruction procedure that integrates with the cognitive processes. This study proposes a way of learning critical thinking skills that comes in five infusion stages, beginning from the initial stage of a learner's reading skill to the final stage mastery. The study was carried out to investigate how critical thinking skills were infused by this instruction procedure to a cohort of twenty-two international students who had enrolled in a fourteen-week reading programme at a local university. A qualitative method was used and data were collected by semi-structured interviews. The sample involved six international students and three teachers. The students were interviewed on their understanding of critical thinking values after the course, and perspectives of teachers were sought on the usefulness and benefits of the infusion instruction. Codes and themes were evaluated by the rubrics of the AAUC and findings revealed critical thinking skills were learnt through the infusion approach. In conclusion, the results indicated that students were able to apply critical thinking skills and teachers share this perspective as well.

Keywords: Infusion; critical thinking

1. INTRODUCTION

There have been many schools of thought in the implementation of teaching critical thinking skills, but this study emphasises on the infusion approach by applying the Explicit and Direct Instruction (EDI) instrument. It is a stand-alone approach proposed by Hollingsworth and Yabarra [1]. There has been a strong on-going interest in developing critical thinking skills in the academic world [2], but the perspectives of teachers after delivering the lessons, and the students after receiving the lessons are just as important. This paper seeks to investigate perspectives of teachers and students by formal interviews of students and informal interviews of teachers after the end of the lessons. Views and experiences of these two groups provide a more balanced view of the course's outcome.

2. METHODOLOGY

A qualitative approach with a phenomenological design is adopted in this study. Two aspects of the methodology are discussed here:

- The conceptual framework by which the effects of the critical thinking lessons are realised in the five stages of infusion. See Figure 1.
- Both the data from formal and informal interviews are collected. Codes and themes were generated and evaluated. See Table 1.

To get the live experiences of research participants I have adopted the Interpretive Phenomenological Analysis (IPA) for multiple participants who share these experiences to tell their stories [3]

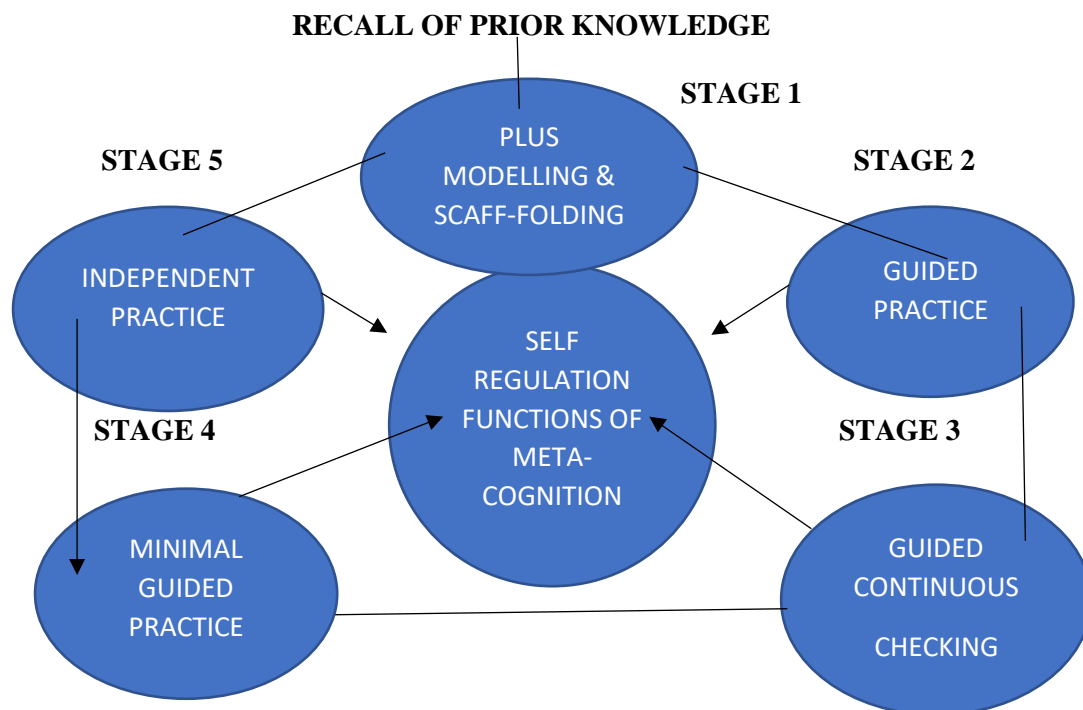


Figure 1 Conceptual framework

2.1 COLLECTION OF INTERVIEW DATA

Reduction of codes to themes were organized in one table to show perspectives from both teachers and students (Table 1). Students' perspectives of critical thinking values of analysis, evaluation and inference were evaluated by the AAUC Rubrics. Perspectives of teachers on the infusion instruction and its benefits were evaluated as well.

Table 1. AAUC evaluation of SS's understanding of critical thinking and teachers' perspectives

Students (pseudonyms)	Students' (CT) Perspectives based on themes generated	Evaluation of teachers' perspectives on course Instruction (Themes)	T1	T2	T3
Alsafadi	2	Materials suitable for CT lessons	4	4	4
Ahmed	3	Teaching strategies collaborated with materials	4	4	4
Mahmud	3	Infusion lessons understood by students	3	3	3
Amjed	2	SS gained new learning experience	3	3	3
Qaseem	2	Infusion lessons benefited students	4	4	4

3. RESULTS AND DISCUSSION

The interview results (Table 1) revealed that teachers viewed positively the concept of teaching infusion in five stages. It also indicated that the infusion of critical thinking skills was successfully implemented.

4. CONCLUSION

The infusion approach in teaching critical thinking with a direct explicit instruction looks promising especially when perspectives of teachers are taken into account. Many CT skills can be learnt, but a good benchmark points to skills which Facionne [3] places great importance on - analysis, evaluation and inference. Perspectives of teachers and students on infusion and critical thinking often help shed light on how it can be carried out.

REFERENCES

- [1] Hollingsworth, J & Ybarra, S., "Explicit direct instruction for English learners. Thousand Oaks", CA: Corwin Press & Data Works Educational Research, 2013
- [2] Indar, D., "Awakening the Awareness: Critical thinking in Vocational Education", School of Education. University of Sheffield, 2017
- [3] Facione, P. A., "Critical Thinking. What is it and why it counts?", Milbrae, CA:California Academic Press. Available at <http://www.student.uwa.edu.au/data/assets/pdf> , 2015

PENGARUH SISTEM PEMBELAJARAN SEPANJANG HAYAT (PSH) TERHADAP KOMPETENSI GURU DI SEKOLAH

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Abstrak - Sistem Pembelajaran Sepanjang Hayat (PSH) merupakan satu proses pendemokrasian pendidikan yang merangkumi program-program dan usaha untuk meningkatkan ilmu pengetahuan, kemahiran dan nilai sendiri, sama ada secara formal atau pun tidak formal. Kajian ini bertujuan untuk mengetahui sejauh mana pengaruh sistem PSH terhadap kompetensi guru di sekolah. Pengkaji ingin mengenalpasti kepekaan dan persepsi guru-guru terhadap sistem PSH, serta menghuraikan bagaimana sistem PSH ini mempengaruhi kompetensi guru-guru di sekolah. Metodologi kajian adalah secara deskriptif kuantitatif dan analisa terhadap hasil soal selidik bagi mendapatkan nilai kekerapan, peratus dan min. Kajian dijalankan terhadap sampel 450 orang responden merangkumi guru-guru di seluruh Malaysia yang dipilih secara rawak. Hasil kajian ini mendapati bahawa sistem PSH mempunyai pengaruh dan berkait rapat dengan kompetensi dan prestasi guru di sekolah. Hasil kajian ini boleh dimanfaatkan untuk menyedarkan golongan guru akan kepentingan melaksanakan sistem PSH dan kesannya terhadap perkembangan profesionalisme sektor perguruan negara pada masa hadapan.

Kata kunci: Pembelajaran Sepanjang Hayat (PSH); kompetensi guru

1. PENGENALAN

Sistem Pembelajaran Sepanjang Hayat (PSH) merupakan istilah yang digunakan bagi aktiviti pembelajaran yang dilaksanakan sepanjang hayat, khususnya oleh orang dewasa. Dalam kajiannya, Hanipah (2011) telah mengkategorikan PSH kepada tiga bentuk pelaksanaan, iaitu secara formal, *in-formal* dan *non-formal* [1]. Kesemua kaedah ini dianggap satu proses membina dan membangunkan potensi diri manusia secara berterusan, yang mana segala pengetahuan, kemahiran dan nilai yang diperolehi itu akan digunakan untuk menambah baik taraf dan mutu kehidupan.

Menurut Intan Shazila (2016), PSH sangat penting kerana ia bukan sahaja memberikan pengetahuan dan kemahiran baharu seiring dengan perkembangan tamadun, tetapi juga mampu menyediakan seseorang individu dalam melaksanakan kerja dengan lebih cekap dan mahir [2]. Dari sudut yang lain, guru pula berperanan sebagai tunjang kepada sistem pendidikan di negara ini. Menurut Noor Shamsinar et.al, terdapat tiga teras utama kompetensi keguruan yang telah digariskan oleh Kementerian Pendidikan Malaysia (KPM) iaitu nilai profesional, pengetahuan dan kemahiran [3].

Antara ciri-ciri guru yang berkompentensi tinggi adalah mereka mesti mampu mengawal kelas dengan baik. Selain itu, guru yang kompeten juga wajib mempunyai keyakinan diri yang tinggi dan mempunyai asas pengetahuan yang kukuh terutama berkaitan tajuk yang diajar [4]. Kajian yang dijalankan oleh Mohammed Sani et.al, telah mendapati bahawa kejayaan atau kegagalan proses pengajaran dan pembelajaran di dalam kelas adalah bergantung sepenuhnya kepada kompetensi guru [5].

Kajian ini dijalankan bagi mengenalpasti sejauh mana pengaruh sistem PSH terhadap kompetensi guru di sekolah. Selain itu, kepekaan dan persepsi guru-guru terhadap sistem PSH, serta menghuraikan bagaimana sistem PSH ini mempengaruhi kompetensi guru-guru di sekolah juga akan dikaji.

2. METODOLOGI KAJIAN

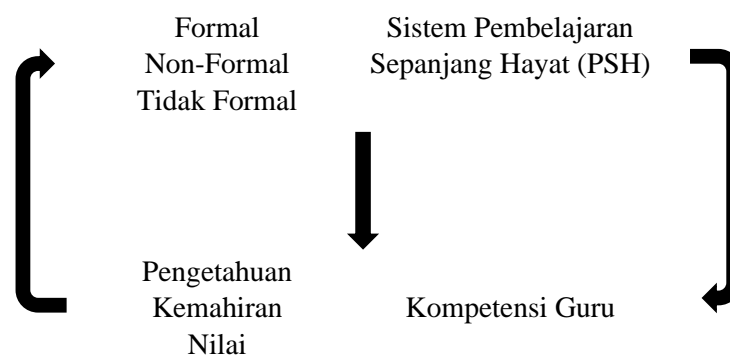
Kajian ini merupakan kajian deskriptif yang menggunakan kaedah tinjauan kerana ia adalah kaedah yang paling sesuai bagi mencapai objektif kajian dan menjawab soalan kajian berkaitan aspek pengetahuan, kemahiran dan nilai [6]. Kaedah ini sememangnya sangat popular digunakan dalam penyelidikan untuk mengetahui sikap, kepercayaan, nilai, demografi, tingkahlaku, pendapat atau

maklumat lain yang berkaitan dengan sekumpulan orang [7]. Oleh kerana populasi responden kajian ini adalah seramai besar dan memerlukan sampel sehingga seramai 450 orang, kajian tinjauan adalah cara terbaik yang boleh digunakan bagi mengumpul data asli dari responden.

Bagi melaksanakan kajian deskriptif yang bersifat tinjauan ini, kaedah kuantitatif akan digunakan. Borang soal selidik digunakan untuk mengumpulkan semua data primer yang dikehendaki. Bagi data sekunder pula, kaedah kajian perpustakaan telah digunakan. Pendekatan kuantitatif menggunakan borang soal selidik ini telah dipaparkan secara meluas, dan terbukti cekap serta dapat menjimatkan penggunaan masa dan kos dalam melaksanakan sesebuah kajian [8].

2.1 Kerangka Konseptual Kajian

Rajah 1 ialah kerangka konseptual yang diguna pakai dalam kajian ini berdasarkan Causal Modelling (Hubungan Sebab–Akibat) yang diperkenalkan oleh Herbert B. Asher pada tahun 1990.

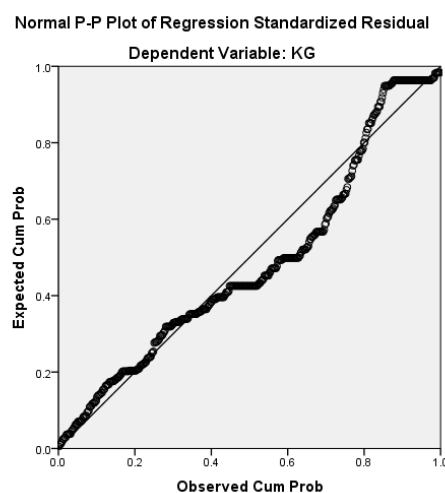


Rajah 1 Kerangka Konseptual Kajian

3. KEPUTUSAN DAN PERBINCANGAN

3.1 Andaian kenormalan

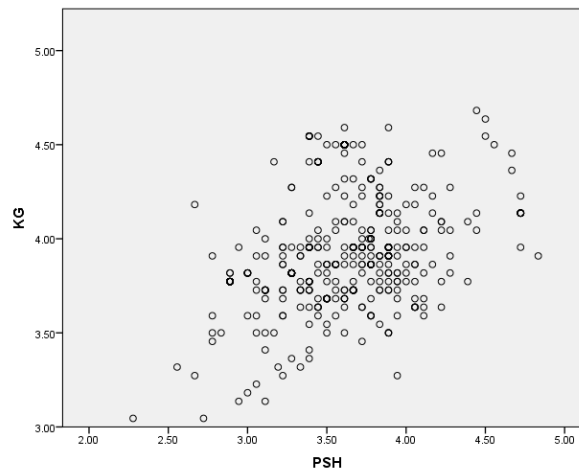
Andaian kenormalan data memberikan kesan terhadap model yang dipadankan. Data yang tidak normal akan mempengaruhi nilai statistik t atau F yang kemudiannya memberi kesan terhadap selang keyakinan dan selang peramalan. Rajah 2 di bawah menunjukkan data kelihatan membentuk seolah-olah garis lurus. Maka andaian kenormalan data telah dipenuhi.



Rajah 2 Plot kebarangkalian normal

3.2 Andaian hubungan linear antara pemboleh ubah

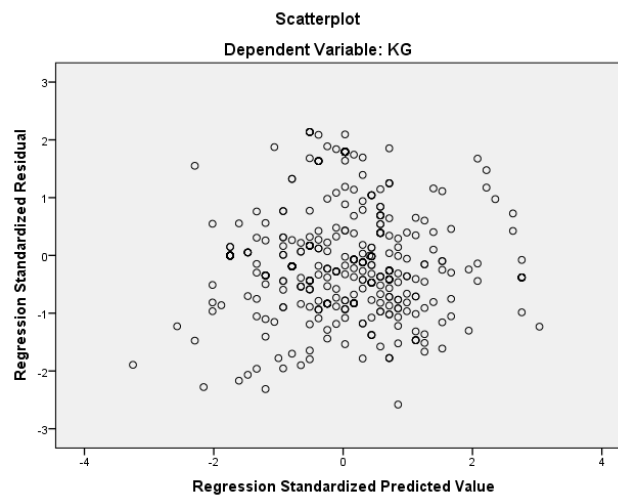
Didapati secara keseluruhannya, hubungan antara pemboleh ubah bersandar dengan pemboleh ubah tidak bersandar adalah linear melalui Rajah 3 seperti di bawah.



Rajah 3 Plot serakan

3.3 Kehomoskedastikan

Data perlu menunjukkan kehomoskedastikan, iaitu ralat adalah sama bagi pemboleh ubah tidak bersandar. Rajah 4 plot sebaran raja di bawah menunjukkan ralat kelihatan tertabur secara rawak dan tiada bentuk tertentu yang kelihatan, maka ini membuktikan andaian kehomoskedastikan dipenuhi.



Rajah 4 Plot serakan *regression standardized residual* melawan *regression standardized predicted value*

Jadual 1 Keputusan analisis regresi

R ²	R ² terlaras	Pemboleh ubah tidak bersandar	Unstandardized Coefficients B	Standardized Coefficients Beta	T	Sig.
0.11	0.109	PSH	0.260	0.332	7.552	< 0.001*

*signifikan pada aras 0.05

Hasil analisis regresi linear seperti yang ditunjukkan dalam jadual di atas menunjukkan bahawa Sistem Pembelajaran Sepanjang Hayat (PSH) mempunyai pengaruh yang signifikan terhadap kompetensi guru dengan nilai $(F(1, 459) = 57.039, p < 0.05)$. Nilai R^2 adalah bersamaan 0.11, menunjukkan bahawa sebanyak 11% varians dalam kompetensi guru diterangkan oleh PSH. Didapati min tahap persetujuan kompetensi guru akan meningkat sebanyak 0.26-unit apabila terdapat pertambahan setiap 1-unit pada min tahap persetujuan PSH.

Dapatan ini jelas menunjukkan Sistem PSH menyumbang terhadap kompetensi guru. Ini bermakna semakin tinggi tahap PSH, semakin tinggi tahap kompetensi guru. Dapatan ini menunjukkan sistem PSH memberi kesan terhadap kompetensi guru dengan nilai sumbangan, $\beta = 0.332$.

4. RUMUSAN

Secara kesimpulannya, kajian ini telah mendapati wujudnya impak dan kesan yang jelas di antara PSH dan kompetensi guru. Hasil analisis regresi linear menunjukkan bahawa PSH mempunyai pengaruh yang signifikan terhadap kompetensi guru. Sehubungan dengan itu, guru adalah disarankan untuk mengamalkan PSH sebagai budaya dan norma baharu dalam kehidupan, bagi menggalakkan percambahan ilmu pengetahuan, kemahiran dan nilai yang positif dalam diri mereka.

RUJUKAN

- [1] Hanipah, H., "Kerjasama ASEAN dalam Program Profesional: Satu Kajian Pembangunan Kurikulum Pembelajaran Sepanjang Hayat", Universiti Teknikal Malaysia Melaka, 2011
- [2] Intan Shazila, S., "Membudayakan Pembelajaran Sepanjang Hayat di Malaysia", KPT, 2016
- [3] Noor Shamshinar Z, Mohd Salihin Hafizi MF, Zakiah H, Julia M., Haslina H., "Kompetensi Guru Pelatih Dalam Penulisan Rancangan Pengajaran Harian Bahasa Arab", Kolej Universiti Islam Antarabangsa Selangor, 2017
- [4] Goh, P.S.C., "Conception of Competencies: A Phenomenographic Investigation of Beginning Teachers in Malaysia", Nova Southeastern University, Fort Lauderdale, FL 33317, 2013
- [5] Mohammed Sani Ibrahim, Ahmad Zabidi dan Husaina Banu, "Strategi Implementasi Pelan Pembangunan Pendidikan Malaysia", Kuala Lumpur: Universiti Malaya, 2015
- [6] Neuman, W.L., "Social Research Methods: Qualitative and Quantitative Approaches", Allyn and Bacon, New York, 2003
- [7] Noraini, K., "Kajian Tinjauan (Secara Kuantitatif)", dlm. Noraini, I. Penyelidikan dalam Pendidikan (pp. 196–214), Kuala Lumpur: McGraw-Hill, 2010
- [8] Punch, Keith F., "Introduction to Research Methods in Education", SAGE, 2009

CUPPING OR HIJAMA IN VIRTUAL LEARNING ENVIRONMENT

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Abstract – Cupping or hijama involves using sharp material in practice. Lack understanding and experience could cause fatal result. Therefore, this project was to create a prototype courseware for cupping or hijama by using an online 3D Virtual Learning Environment or experience learning platform to enhance safety. In addition, the students normally lost their focus during the learning process and venture. Hence, we had used systematic target (multisection) on each learning experience level to guide this experience learning process. The platform that we used in this project, was Second Life which includes several sections: objectives, tutorial, quiz and test. The design of the presentation was tested in five categories such as effectiveness, ease of use, efficacy, aesthetic and users' satisfaction. The obtained results provided a set of unique and empirically derived guidelines for the design and the use of multisection frameworks to generate more usable courseware in the 3D Virtual Worlds of an online learning interface. This study had shown promising outcome of the use of multisection in an online 3D Virtual Learning Environment.

Keywords : Virtual Learning Environment (VLE); cupping; hijama; health; alternative medicine

1. INTRODUCTION

Virtual World or 3D Virtual Learning Environment (VLE) or a Multi-User Virtual Environment (MUVE) would be a potential medium for distance learning which could enhance student learning experiences such as discussions, seminar, 3d presentations and other learning categories where materials are created, stored and used [1]. The versatile, immersive, creative and dynamic of 3D Virtual World learning environments would increase knowledge, self-directed learning, and peer collaboration by academics, healthcare professionals, and business executives [2]. 3D presentation and scripting language in virtual worlds would expand the teaching and learning capabilities for instructors and students. Virtual World also encourages active learning which could provide valuable experiences that could enhance engagement, promote participation, and motivate self-directed learning [3]. Thus, Virtual Worlds offer great potential to create medical and health educators and librarians, but more research is needed into their use in medical and health education [4].

The average technological capabilities or training might not be able to provide them understanding and affordability in online learning [5]. 3D Virtual World can be an interesting platform in presenting lesson of a health subject. It offers beneficial features compared to 2D conventional Web such as navigate multi-media content, realistic voice chat, live events (lectures, conferences, festivals, and concerts), develop social skills, trade (sell, buy or advertise real or virtual goods), play multi-player games, vacation, browse information and 3D libraries [4]. Learning in Virtual World should comprise three significant theoretical foundations such as social constructivist, task-centred instruction and situated learning environment [6].

Virtual World technology has the potential to enhance and transform teaching, however it can also be used inappropriately or in ways that actually interfere with learning. Furthermore, learning through Virtual World or 3D Virtual Learning Environment (VLE) or a Multi-User Virtual Environment (MUVE) can cause frustration, boring and lost. It also lacks of instructions and the students did not really understand the purpose of learning. The students have problems relating the Virtual World learning experience to the course material. Students explained inadequate instructions in Virtual World activities that make them lose in completing the tasks and caused frustration.

Advance technology in 3D Virtual World may offer more interesting learning through tutorial session. Therefore, it seems there is a need of performance evaluation in the Virtual World program for determining the understanding of students towards the course given Learning experiences in Virtual World are more synchronous and rapid compared to conventional web learning where the navigation is easier and fancier where the user may fly, walk, run, riding virtual vehicles or even teleporting to different locations simultaneously [4]. The use of multisection in this project hope to solve the problem of focus learning lost in virtual world.

2. METHODOLOGY

The cupping treatment lesson titles comprised of types of cupping, cupping body parts, cupping equipment, cupping techniques, cupping benefits, cupping optimal times and preparation before and after cupping treatment. The lesson tutorial in 2-dimensional courseware presented with text and 2-dimensional graphic images with multimedia learning while the lesson tutorial in Virtual World courseware presented in text, 2D graphic images, 3D objects with simulation and explorative learning.



Figure 1 Screenshot in one of the tutorial section of Virtual World courseware.

This cupping treatment lesson was arranged in the 4 sections platform (objective, tutorial, quizzes and test) in contributing to a courseware either in 2-dimensional (by frames) or Virtual World (by spaces).

3. RESULTS AND DISCUSSION

The study has investigated the influence of Virtual World courseware on usability (in term of user perception and satisfaction) as well as learning performance in an online interface. This investigation has been carried out by developing two different versions of the courseware as an experimental platform. The first version was based on two-dimensional (flash) courseware in teaching the cupping lesson as learning material. Meanwhile, the second version was based as metaverse (3D Virtual World) to deliver the same learning material. Both online learning platforms were then empirically evaluated by two independent groups of users. The first group (control) tested the two-dimensional (flash) interface while the second one (experimental) tested the metaverse (Virtual World) interface in learning cupping subject and answering some questions in a test section.

The results obtained from this experiment confirmed that the courseware in the metaverse (Virtual World) could indeed usable and satisfied student by adding the multisections (objective, tutorial, quiz and test). In other words, it can be concluded that the tested metaverse (Virtual World) courseware and multisection framework could significantly contribute in enhancing users' learning performance and the usability of the online learning interface in term of perception (ease of use, efficacy, aesthetic and presence) and user satisfaction. Therefore, the courseware in the metaverse (Virtual World) and

multisection framework is suggested and could be taken into consideration when designing user interfaces of online learning applications not even in teaching health but other modules as well.

4. CONCLUSION

The design of health course using online 3D virtual world which using several sections such objective, tutorial, quiz and test section with video addition has been studied and major conclusions are as follows:

1. Developing a course in Virtual World was effective and the student may manage their study time anytime and anywhere.
2. The structured objective, tutorial and quiz sections removed the sense of lost in Virtual World and can manage their timing well.
3. More real the course mimics the real situation, more understandable the student to the course subjects.

However, it was suggested that the Virtual World (online 3D VLE) course should enhance their instructional and adding high simulation towards the program. Further research could be carried out to reinforce the full potential of Virtual World for teaching and practice health and medical courses. This online 3D VLE is believed to be widely used in the future especially for training and safety purposes.

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REFERENCES

- [1] I. Simsek & T. Can, "The Use of 3d Virtual Learning Environments in Training Foreign Language Pre-Service Teachers", *Turkish Online Journal of Distance Education*, vol. 16 (4), pp. 16-40, October, 2015
- [2] J. Abdullah, W. N. Mohd. Isa, & M.A. Samsuddin, "Virtual reality to improve group work skill and self-directed learning in problem-based learning narratives", *Virtual Reality*, 23 (2), 2019
- [3] Gregory. S et al., "Learning in virtual worlds: research and applications", Athabasca University Press, April 2016
- [4] Boulos et al., "Second Life: an overview of the potential of 3-D virtual worlds in medical and health education", *Health Information and Libraries Journal*, vol. 24, no. 4. p. 233-245, 2007
- [5] A. Sun & X. Chen, "Online education and its effective practice: A research review", *Journal of Information Technology Education: Research*, 15, 157-190, 2016
- [6] Leman et al., "Constructivist Learning Theory in Virtual Design Studios", *Computational Design Methods and Technologies: Applications in CAD, CAM and CAE Education*, January 2012

STATELESS CHILDREN'S ACCESS TO TERTIARY EDUCATION

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Abstract - The issue of stateless children has become a major concern in Malaysia for quite some years and the government is continuously making the effort in solving the matters and providing the best they can for these children. In 2018, the Deputy Prime Minister has instructed public schools to accept stateless children as their students provided that they can show relevant documents as proof of their citizenship application. However, the education journey of this children is incomplete as they can only complete their secondary school education but has almost no access to tertiary education especially in public institutions. This research aimed to examine the right to education for stateless children with the main objective to identify their access for tertiary education in Malaysia. The method used in the study will be primarily based on the qualitative research methodology which comprises of the doctrinal analysis and empirical study approach. It was found that their fight for tertiary education is rarely being reported and the only means for them to further their study is to be noticed by the public or private institutions through medias. Besides giving them nationality, sponsorship is one of the solutions to enable them pursuing their dreams.

Keywords : Stateless children; education; doctrinal analysis

1. INTRODUCTION

The most precious gift that a parent can pass to their children is education as it is a powerful mean to change one's life and status. The children's right to education is guaranteed by the United Nation Convention on the Right of Children (CRC) under Article 28. Nevertheless, stateless children are often denied of the rights and this includes those in Malaysia. The term 'stateless children' refers to children without nationality of any country.

Malaysia is not a signatory to most major stateless conventions, however we are starting to provide certain rights to these stateless children as part of humanitarian initiative. In 2018, the government has decided to allow stateless children in government schools. However, their right to education is only limited until secondary level of school and cannot further until higher education. This paper seeks to examine the right to education for stateless children in Malaysia with later objective to identify the tertiary education opportunity for the stateless children in Malaysia.

2. METHODOLOGY

The method used in the study is primarily based on the qualitative research methodology which comprises of the doctrinal analysis and empirical study approach. The Doctrinal research involves a critical conceptual analysis of all relevant legislation and case law to reveal a statement of the law relevant to the matter under investigation [1]. This research looks into relevant provisions relating to children's education rights particularly stateless children in United Nation Convention on Right of Children and other Malaysian law. Besides, the research also focuses on reported news associating to stateless children's access to tertiary education.

3. RESULTS AND DISCUSSIONS

3.1 Stateless Children in Malaysia

Nationality may not be an issue for most of the children in Malaysia as they were born by citizen parents and they were registered as Malaysian since then. Nevertheless, there are some children born in Malaysia yet stateless and the number of stateless children has reached around 290,437 in 2016 as reported by former Deputy Prime Minister Dato Seri Dr Zahid Hamidi [2]. It is difficult to say the exact

current numbers as they are not registered nor can be easily traced. These stateless children are born stateless either because their parents are stateless, their parents are unknown or their citizen father and foreign mother are not married therefore their citizenship follows the mother's. Some of these children is adopted by adoptive Malaysian parents and they have to sacrifice quite a lot in fighting for their children's right to nationality and education. The situation is even worse if the statelessness is being inherited from their parents hence there will be no one who will fight for them and they will continue to live in that way. According to Rodziana [3], this is common among Bajau Laut tribes in Sabah as they are traditionally migratory people and they have no documents and other evidence to prove their nationality for generations.

3.2 Education as Universal Human Rights

Article 28 of the United Nation Convention on the Rights of the Child (CRC) provides that every child has the right to an education. Primary education should be free to all children whereas secondary and higher education should be made available and accessible to them. It is an undeniable fact that children should be encouraged to pursue the highest education possible [4]. Article 28 of CRC has preserved the education rights to all children regardless of their citizenship status. This eventually allows no discrimination towards stateless children. However, Malaysia reserved this provision as it is in contrast with Article 12 of Federal Constitution where Article 12 where this provision clearly specifies that the right to education is guaranteed only to Malaysian citizens hence it does not cover non-citizens and stateless people.

3.3 Malaysian Initiative in Providing Education to Stateless Children

With the increasing number of stateless children in the country, Malaysia seems committed to provide basic education to them. Before 2018, it is up to the discretion of the headmaster whether to allow the children to study in that particular school. Some of them are being turned down from attending public schools. This situation seems to change in 2018 when the former Deputy Prime Minister, Datuk Seri Dr Zahid Hamidi has directed that stateless children whose citizenship applications are being processed can attend school. School Management Division Deputy Director Pesol Md Saad said this was part of the Education Ministry's move to simplify the registration process for children without citizenship into government schools. This seems to fulfil the first part of Article 12 of CRC where primary and secondary education is accessible to all children in Malaysia despite them being stateless. The main concern in fulfilling Article 12 of CRC in total is the access to higher education for these stateless children.

3.4 Future of Stateless Children in Higher Education

Although there is a huge number of stateless children in Malaysia, the fight for tertiary education is rarely reported. A lot of them have completed their secondary education and even passed Sijil Pelajaran Malaysia with flying colours but their future is uncertain. They could not pursue their higher education because they do not have the Identification Card. In 2018, the news about a stateless child named Roisah Abdullah was being publicized [5]. Roisah was the best student for Sijil Tinggi Pelajaran Malaysia (STPM) in her school. Despite her achievement, she didn't receive any offer to further her study due to her status as a stateless child. She was born in Klang to a foreign mother and unknown father. Roisah's adopted parents have fought for her Malaysian citizenship since she was born but to no avail. Nevertheless, Roisah was lucky enough to receive a scholarship from Universiti Tun Abdul Razak. The former Higher Institution Minister, Datuk Seri Idris Jusoh also said that they will try to help her pursue her studies in Universiti Utara Malaysia.

In 2020, two parents residing in Pulau Pinang expressed their concerns over their children's future [6]. Both their children have completed their secondary school but could not further their studies. G. Saradha Devi was born to a Filipino mother and a Malaysian father but her parents only registered their marriage after she was born. Her father has made many appeals to the National Registration Department

but still failed to obtain Malaysian citizenship. Another stateless child, Nurul Shuhada Abdullah went through the same predicament for not being able to pursue higher studies. She was adopted by a Malaysian father and Indonesian mother while her biological mother is an Indonesian.

The above cases show the struggle that the stateless children need to face because of their status. They might get good results in Sijil Pelajaran Malaysia but sadly they cannot use that result to get place in higher institutions. Despite having private institutions who can accept stateless children into their programmes, it would still be a huge burden to the stateless children who need to pay for their tuition fees at an international rate. Applying for student loans is not a choice either, let alone being approved for the National Higher Education Fund Corporation loan (PTPTN) which has always been a secure choice for most students pursuing tertiary education in Malaysia.

4. CONCLUSION

The best way to provide complete education to these stateless children is definitely by giving them nationality so that they will be able to enjoy the same right as other children of their age. However, that may require some major changes in our policy in giving nationality, hence the option now is to open a special access for them to higher institutions. Government can allow them to enter public universities if they can provide certain documents like adoption papers and certificate. Besides that, public universities may provide places for them in the institution. This will ensure that they will receive the same kind of rights as other children and will not be left behind in terms of education.

REFERENCES

- [1] V.M. Gawas, "Doctrinal Legal Research Method a Guiding Principle in Reforming the Law and Legal System Towards the Research Development", *International Journal of Law*, vol 3(5), pp 128-130, 2017
- [2] H. Chiew, "An invisible jail" - stateless children in Malaysia. *Malaysia Kini*. Retrieved from <https://www.malaysiakini.com/news/387600> on January 7, 2020
- [3] R.M. Razali, "Addressing Statelessness in Malaysia: New Hope and Remaining Challenges", *Statelessness Working Paper Series No. 2017/9*, pp 1-10, 2017
- [4] M. Makhtar, K. N. Asari and M. L. Yusob, "Right to Education for Irregular Migrant Children in Malaysia: A Comparative Analysis", *Pertanika Journal of Social Sciences and Humanities*, vol 23 (S). 86-96, 2015
- [5] G. Tong, "Masa Depan Gelap Walau Cemerlang SPM", *Malaysia Kini*. Retrieved from <https://www.malaysiakini.com/news/387600> on 8 November 2020
- [6] Parents Worry Over Stateless Children's Education and Future, *Buletin Mutiara*. Retrieved from <https://buletinmutiara.com/parents-worry-over-stateless-childrens-education-and-future/> on 8 November 2020

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