E - PROCEEDINGS
(FULL PAPER)

SEMINAR ANTARABANGSA ISLAM DAN SAINS

SAIS 2023

PENERAJU SAINS ISLAM DIPERSADA ANTARABANGSA

EDITORS

NOORFAJRI ISMAIL (HEAD)
SYAMILA MANSOR
REZKI PERDANI SAWAI
AHMAD FADLY NURULLAH RASEDEE

ORGANIZED BY

Copyright

1. Noorfajri Ismail (Head of Editorial)
2. Syamila Mansor
3. Ahmad Fadly Nurullah Rasedee
4. Rezki Perdani Sawai

PREFACE

The **Seminar Antarabangsa Islam dan Sains** (SAIS 2023) or International Seminar on Islam and Science is jointly organized by Persatuan Kakitangan Akademik Universiti Sains Islam Malaysia (PKAUSIM), Faculty of Syariah and Law, USIM and the Institute of Fatwa and Halal (iFFAH), USIM. The theme of this year seminar is "**Peneraju Sains Islam DiPersada Antarabangsa**".

The Seminar provides a platform for dialogue and discussions between academicians, researchers, and graduate students to address current issues, challenges and opportunities across fields and industries.

All presenters involved are cordially invited to share knowledge and expertise by presenting their valuable findings in the conference which is held on 1th December, 2023.

SAIS 2023 Committee

FOREWORD OF THE PROGRAMME DIRECTOR

**PROF DR AZMAN BIN AB RAHMAN
DIRECTOR,
SEMINAR ANTARABANGSA ISLAM DAN
SAINS (SAIS 2023)**

Assalamu'alaikum warahmatullah wabarakatuh

Praise to Allah for His blessings, the **Seminar Antarabangsa Islam dan Sains** (SAIS 2023) has been successfully organized. Islam and Science presents an articulate and concise historical introduction to intellectual developments that have shaped Islamic civilization, both religious and scientific. The seminar which is organized by USIM Academic Staff Association (PKAUSIM) in collaboration with Faculty of Syariah and Law USIM and the Institute of Fatwa and Halal (iFFAH) is held as a platform to exchange ideas, thoughts and knowledges regarding the current issues which relate to Islam and science globally.

Academic would has been challenged by the 'pause' that is recorded by the presence of pandemic. Webinar and e-conference has been held, but ongoing research must go on. Today USIM is beginning to shine and together with ongoing Industrial Revolution, IR4.0, we have yet to overcome a serious problem as the cases now start to increase with the new variant the Omicron XBB. We need to work together in our different fields to overcome health, economic, education and social challenges and indulge in our all-times agenda. Therefore, the seminar theme **"Peneraju Sains Islam DiPersada Antarabangsa"** is very much reflecting the issue and current needs. The sharing session by the keynote speakers renowned in their respective field, is yet another hallmark of this seminar.

The success of the seminar is the result of the high commitment and dedication of the committee members, university, academic staff, and not forgetting the authors, presenters and participants who have given their best through participation in SAIS 2023.

Jazakumullahu khayran kathira.

FOREWORD OF THE PKA USIM PRESIDENT

PROFESSOR DR. IRWAN MOHD SUBRI
PRESIDENT,
PERSATUAN KAKITANGAN AKADEMIK
UNIVERSITI SAINS ISLAM MALAYSIA
(PKAUSIM)

Praise be to Allah, The Almighty and The Most Glorified. Peace be upon the Prophet Muhammad SAW, his family and companions. May Allah bless them with honour and graces.

The e-proceeding, titled **Leading Integration of Naqli dan Aqli Knowledge** represents a collaborative effort by the academicians who have participated at our **Seminar Antarabangsa Islam dan Sains** (SAIS 2023) or the International Seminar on Islam and Science organised by USIM Academic Staff Association (PKAUSIM), and co-organised by Faculty of Syariah & Law, USIM and Institute of Fatwa and Halal (iFFAH), USIM to provide scientific references that integrate the revealed and acquired knowledge. The e-proceeding is unique because the integration between *naqli* and *aqli* (revealed and acquired knowledge) studies will contribute to the development of humankind.

PKAUSIM is very honoured and grateful to have the privilege for the digital publication of this e-proceeding. This effort could be viewed as the early steps of these academicians in their endeavours to integrate both *naqli* and *aqli* disciplines in overcoming the COVID-19 impact in our country and improve the quality of our lives. May Allah bless all who have contributed in making the conference and its publication as our good deeds during our lifetime and the hereafter.

Thank you and Wassalamualaikum.

TABLE OF CONTENTS

Lists of English Papers

THE INTERRELATIONSHIPS BETWEEN HYBRID WORK, EMPLOYEE PERFORMANCE AND ORGANIZATIONAL CULTURE AT THE WORKPLACE: A CONCEPTUAL FRAMEWORK

Sharifah Zeenatu Zainab binti Syed Zakaria[i], Khairunneezam Mohd Noor[ii], & Mashitah binti Sulaiman[ii]

[i] (*Corresponding author*). Faculty of Leadership and Management, Universiti Sains Islam Malaysia. zeenatuzainab@gmail.com
[ii] Da'wah and Islamic Management Program, Faculty of Leadership and Management, Universiti Sains Islam Malaysia. neezam@usim.edu.my
[iii] Da'wah and Islamic Management Program, Faculty of Leadership and Management, Universiti Sains Islam Malaysia. mashitah@usim.edu.my

Abstract

Hybrid work arrangements have gained significant popularity in recent years, enabling employees to work in a flexible manner by alternating between remote and on-site work. The adoption of hybrid work is essential owing to its ability to ensure the uninterrupted operation of businesses and showcase flexibility in response to evolving work patterns. The adoption of hybrid work arrangements can provide organizations with a competitive edge in the contemporary workforce. Nonetheless, previous research emphasizes shortcomings in the execution phase of hybrid work which causes digital exhaustion, disinterest, and inconsistent performance by the workforce. Hence, the objective of this paper is to explore the conceptual way in implementing hybrid work, to analyze the impact of hybrid work on employee performance and to explore organizational culture as the moderating variable.

Keywords: *Hybrid Work, Employee Performance, Organizational Culture*

INTRODUCTION

During the Covid-19 outbreak most organizations have adopted hybrid work as a precautionary measure, combining in-office and remote work arrangements to ensure safety (Radonić, Vukmirović, & Milosavljević, 2021). Hybrid work has emerged as a post-pandemic employment option, enabling people to work from home as well as the office (Microsoft Work Trend Index, 2021). The success of hybrid work, on the other hand, depends on organizational support, flexibility, and the adaptation of physical and digital work environments to meet the different demands of individuals (Babapour, Hultberg & Bozic, 2022).

Employee performance is a critical aspect of accomplishing organizational objectives and is impacted by a variety of characteristics such as skills, experience, and dedication (Iskamto, 2021; Rizky & Ardian, 2019). Organizations must prioritize enhancing employee performance in order to achieve organizational effectiveness.

Organizational culture is an important factor to consider when analyzing the influence of hybrid work on employee performance. An excellent and supportive company culture defined by creative and democratic leadership increases employee commitment. Furthermore, characteristics such as trustworthiness, empowerment, consistency, and mentoring lead to enhanced productivity and increased output quality (Hellriegel & Slocum, 1974; Kane-Urrabanzo, 2006).

The objective of this paper is to explore the concept of hybrid work implementation, its influence on employee performance and the concept of organizational culture as the mediating variable. This paper aims to highlights the academic importance of researching the relationship between hybrid work and employee performance which will contributes to the expansion of knowledge in the fields of Human Resource Management (HRM) through the conceptual guidelines for an effective implementation of hybrid work.

HYBRID WORK
Definitions of Hybrid Work
The practice of working outside of a traditional office setting is discussed through various terms, including but not limited to telecommuting, telework, distributed work, virtual work, and distance work Tran (2022). The terms remote work and distributed work are frequently used interchangeably, which can be explained by the fact that they are derived from the umbrella term distributed work. According to scholarly literature, distributed work is characterized by the allocation of employees and their duties across various locations. The term "telecommuting" was first introduced by Jack Nilles in 1995. The concept behind this term was to shift the work to the employees, rather than requiring the employees to travel to the workplace. This approach was intended to mitigate traffic congestion and minimise energy consumption. According to Radonić, Vukmirović, & Milosavljević (2021), hybrid working refers to a work arrangement that comprises both physical office attendance and remote work. The term "telework" describes a work environment in which people carry out their everyday tasks away from the conventional office and collaborate with colleagues using technology (Shift Collective, 2021).

Implementation of Hybrid Work

Research from Hilberath (2020) had proven that in order to facilitate a successful transition to remote work, it is important to empower frontline leaders to communicate effectively with their employees and provide them with the necessary resources and support. This includes helping employees having a clear purpose and be motivated. The research also enhances the importance for employers to continue providing support for their employees' mental and physical health, social connections, and family care. In conclusion, key elements that will help establish a successful hybrid work models include strong leadership, a positive organizational culture, and a clear sense of purpose.

Grzegorczyk (2021) emphasize that a structured system for hybrid work is required to address the challenges causes from remote work. Several points mentioned includes firstly a management should not constantly monitor telework employees. Secondly, there should be specific guidelines for video conference call, including limits on the duration of daily video calls. Thirdly, employees should have the right to disconnect from work-related tasks during outside of regular work hours to prevent burnout. Thus, in order to implement hybrid work companies can consider dedicating roles specifically focused on nurturing the relationship between remote workers and the employer by regularly checking in with remote workers, taking an interest in their work conditions and career development, and helping them feel connected and supported.

According to Cherubini (2021), an effective hybrid work requires an establishment of a clear guidelines for meetings. The research further highlights that a company may also provide training for managers to ensure equal participation from all during online meetings. Aside from that, a high-quality online tool is necessary to support those who may be at risk of isolation, or who have mental health concerns. In addition, to ensure smooth operation of hybrid work, a more structured and documented processes and communication is an important element. Other research from Pass and Ridgway (2022) highlights that in order to successfully implement and enforced remote work, organizations should include employees in the discussions about company's future direction. Aside to that, organizations should offer customized practices that prioritize flexibility and inclusivity for the employee aside to promote accountability by increasing employees' self-rule for the purpose of creating an engagement between employer and employees.

Measuring the Implementation of Hybrid Work

In order to measure the implementation of hybrid work in an organization. Work Design Questionnaire (WDQ) developed by Morgeson and Humphrey (2006) is chosen. The justification is based on several reasons. Firstly, the WDQ is a validated tool that has been used in numerous studies to assess job design and work characteristics. Its reliability and validity have been well-established, making it a suitable instrument for measuring the implementation of hybrid work in the organization.

Secondly, the WDQ assesses a range of work characteristics such as work scheduling autonomy, work methods autonomy, monitoring mechanisms, home workspace suitability, digital social support and employee job satisfaction which are essential factors in hybrid work. By using the WDQ, it is possible to identify the extent to which hybrid work has been implemented and enable organization to assess the success of hybrid work and areas for improvement.

Thirdly, the WDQ is a self-administered questionnaire that is easy to complete and can be distributed to a large number of employees which allows for a comprehensive assessment of the implementation of hybrid work across different departments and job roles within the organization.

EMPLOYEE PERFORMANCE

Definitions of Employee Performance

Iskamto (2021) emphasizes that employee performance is the result of the tasks assigned to individuals, which is influenced by their skills, experience, and dedication. Achieving excellent performance is crucial for organizations to succeed. Moreover, various factors, including work output, job knowledge, initiative, mental agility, attitude, and discipline, can impact work performance.

Additionally, Rizky, M. C., and Ardian, N. (2019) define employee performance as the manifestation of values and attributes exhibited by employees while fulfilling their job responsibilities within the organization. Measurement of employee performance can be facilitated using the Likert scale. Work outcomes, responsibility, discipline, and ability serve as indicators of employee performance as they contribute significantly to overall work success. Understanding and effectively managing employee performance is essential for organizations striving to enhance productivity and achieve their goals.

As a result, a variety of factors, including work output, job knowledge, initiative, mental agility, attitude, and discipline, affect how well an employee performs. A Likert scale can be used to evaluate employee performance by examining

indications such as work outcomes, responsibility, discipline, and ability, since these elements all contribute to an employee's overall success within an organization.

Measuring Impact of Hybrid Work on Employee Performance

Utilising the Work Design Questionnaire (WDQ) created by Morgeson & Humphrey (2006) provides evaluation for impact of hybrid work on employee performance. The Work Design Questionnaire (WDQ) is chosen for its usefulness in investigating the effects of hybrid work on employee performance, as it incorporates a work design factors that significantly contribute to employees' overall performance.

Firstly, the questionnaire includes measurable indicators that assess key aspects related to employee performance, such as feedback from the job and feedback from others, monitoring mechanisms, employee productivity, work motivation, and job satisfaction. These indicators provide a comprehensive framework for evaluating the various dimensions of performance in the context of hybrid work (Morgeson, & Humphrey, 2006).

Secondly, the questionnaire has been widely used and validated in previous research, indicating its reliability and validity as a measurement tool. The questionnaire's items have been tested and refined, ensuring the accuracy and effectiveness of capturing the relevant constructs.

Furthermore, the questionnaire specifically addresses the impact of hybrid work on employee performance by incorporating items that are relevant to the hybrid work environment. For example, it assesses the efficiency and productivity of employees in a remote setting, the influence of remote work on motivation, and satisfaction with recognition and promotion opportunities during challenging economic conditions.

Overall, the Work Design Questionnaire is a suitable instrument to analyze the impact of hybrid work on employee performance as it offers a structured and validated approach to employee performance, encompassing various dimensions that are relevant in the context of hybrid work arrangements. Hence, WDQ acts as an effective measuring tool to assess work characteristics that researchers and practitioners can utilize to perform fundamental research to create and redesign the culture of work in organizations.

ORGANIZATION CULTURE (OC)

Definitions of Organizational Culture

Organizational culture plays a vital role in organization's success and has a substantial effect on employee behaviour and performance. Badura (2001) emphasizes the significance of understanding and managing cultural dynamics within organizations, differentiating between dominant culture, subculture, and counterculture. According to Badura, the essential aspect of managing organizational culture involves culture.

Moreover, Weritz, Braojos & Matute (2020) define organizational culture as a collection of assumptions, values, and artefacts, emphasizing its complexity. Over time, the integration of information technology increases the significance of organizational culture. (Brower, 2021) study, demonstrates that a strong organizational culture influences sales growth, employee retention, stock price, and net profitability positively. Employers have found it difficult to uphold organizational culture during the pandemic, which has affected employee morale. Therefore, it is essential for employers to cultivate an appropriate organizational culture that provides employees with a sense of purpose and motivation to be productive in both remote and office settings.

Organizational culture has an impact on how hybrid work and employee performance are related. According to research, various forms of organizational cultures produce varied outcomes, with clan culture being related to reduced stress and more satisfaction and productivity (Olynick & Li, 2020). Through characteristics like dependability, empowerment, consistency, and mentoring, organizational culture has a direct impact on employee performance as well (Hellriegel & Slocum, 1974; Kane-Urrabanzo, 2006). Employees who work in organizations with strong cultures are motivated and better equipped to take advantage of opportunities. As a result, creating a positive organizational culture is essential to increase enthusiasm and improving productivity as it influences employee attitudes, motivation, and productivity significantly. Employers must establish and sustain a robust and appropriate organizational culture that supports employee performance to thrives in both remote and conventional work environments.

The following figure summarizes the framework of organization culture:

Competing Values Framework	Key Factor to Organizational Cuture	Types of Organizational Culture	Organizational Culture
• Collaborate (Do Things Together) • Create (Do things first) • Control (Do things right) • Compete (Do thing fast)	• Dominant characteristics • Organizational leadership • Management of employees • Organization glue • Criteria of success • Strategic emphases	• The Collaborate / Clan Culture • The Control / Hierarchy Culture • The Create / Adhocracy Culture • The Compete / Market Culture	

Figure 1: Organization Culture Framework

Types of Organization Culture

There are four types of organization culture that influence employee performance in an organization. Firstly, the clan culture resembles family-type organization, where it highlights that organization are like extended families than corporate entities. Differ from the market culture, which promotes revenue and are known to prioritizes on rules and procedures. (Al Issa, 2019). Secondly, the adhocracy culture is recognized by a dynamic, enterprising, and innovative work setting. Organization that follows the adhocracy culture put an emphasis on keeping on the forefront of new research, products, and services (Al Issa, 2019). Thirdly, a hierarchy-dominated organization, according to the theory hierarchy culture have a dominant leadership style. The leader in this situation acts as a supervisor, overseeing and supervising the work. Fourthly, the market culture refers to a goal-oriented organization that prioritizes getting the job done. Profitability, market niche strength, competitiveness, and productivity are all major elements in a market culture organization (Al Issa, 2019).

CONCLUSION

The guidelines for implementing hybrid work can be categorized as follows: Firstly, effective implementation of hybrid work requires both employee support and strong leadership, as they facilitate the ability of frontline leaders to engage with workers in a productive manner. Secondly, establishing a well-defined system with guidelines,

which includes the regulations for video conference calls, the establishment of a time limit for daily video calls, and giving employees the freedom to take time off from work-related activities after regular business hours. Thirdly, the engagement of employees and the implementation of a customized culture in the workplace are crucial aspects to consider. It is essential to involve employees in discussions about the company's future direction while also offering customized practices that emphasize flexibility and inclusivity. Lastly, technological skills are essential for a hybrid workplace to function well. It is essential for a company to provide instruction and support for using online resources to address potential challenges such as social isolation or mental health problems.

Employee performance is defined as the key factor in achieving a company's goals and is determined by the actions and behavior of employees while carrying out their work duties. According to Iskamto (2021) and Rizky& Ardian (2019) , employee performance is influenced by factors such as skills, experience, and dedication. It is important for organizations to focus on improving employee performance in order to achieve its goals.

Employee performance is a crucial element for organizations to achieve its goals, and can be affected by various factors. Diamantidis & Chatzoglou (2019) suggests that employee performance is also affected by factors such as training culture, managerial support, environmental dynamism, organization climate, and job-related factors. Sendawula, Nakyejwe, Bananuka, & Najjemba (2018) found that training and employee engagement have a positive impact on employee performance. According to Maheshwari, Singhvi, Hameed, and Mathur (2017) highlight the importance of a strong alignment between branding and human resource operations in their research. Research from Babagana, Mat, and Ibrahim (2019) outlines that when talent management is inadequately implemented, it can result in a decreased employee performance, which in turn impacts overall organizational performance. Narayanamurthy & Tortorella (2021) research suggests that technology plays an important role in employee performance.

Work Design Questionnaire (WDQ) on the other hand is highly recommended for analyzing the impact of hybrid work on employee performance. The WDQ provides a dependable and validated method for measuring various employee performance factors pertaining to hybrid work arrangements. Using the WDQ, researchers are able to evaluate significant factors associated with work characteristics in hybrid work settings. This survey is a valuable instrument for conducting research and obtaining insights that may guide the design of organizational work structures (Morgeson & Humphrey, 2006).

In conclusion, existing literature emphasizes the importance of organizational culture in influencing organizational effectiveness and employee performance, as shared norms and values within an organization have a direct impact on employee performance. Frameworks such as the Competing Values Framework enable the identification of diverse organizational culture types, such as clan (collaborate), adhocracy (create), hierarchical (control), and market (compete) cultures. Thus, by nurturing collaboration, innovation, and effective leadership among employees, organizations can cultivate a thriving and inclusive culture.

REFERENCES

Al Issa, H. E. (2019). Organisational culture in public universities: Empirical evidence. Asian Journal of Business and Accounting, 12(1), 41-70.

Bandura, A. (1999). Social cognitive theory: An agentic perspective. Asian journal of social psychology, 2(1), 21-41.

Bandura, A. (2006). Toward a psychology of human agency. *Perspectives on psychological science*, 1(2), 164-180.

Babapour Chafi, M., Hultberg, A., & Bozic Yams, N. (2022). Post-pandemic office work: Perceived challenges and opportunities for a sustainable work environment. Sustainability, 14(1), 294.

Babagana, S. A., Mat, N. B., & Ibrahim, H. B. (2019). Moderating Effect of Employee Participation on Factors that Determine Effective Performance Appraisal (EPA): Data Screening and Preliminary Analysis. International Journal of Academic Research Business and Social Sciences, 9(4), 116-134.

Brower T. (2021). How To Sustain Company Culture in A Hybrid Work Model_2021. https://www.forbes.com/sites/tracybrower/2021/02/07/how-to-sustain-company-culture-in-a-hybrid-work-model/?sh=75458b551009 Dis article:

Cherubini, F., Newman, N., & Nielsen, R. (2021). Changing newsrooms 2021: Hybrid working and improving diversity remain twin challenges for publishers.

Diamantidis, A. D., & Chatzoglou, P. (2019). Factors affecting employee performance: an empirical approach. International Journal of Productivity and Performance Management, 68(1), 171-193.

Eden, R., & Burton-Jones, A. (2018). The Dynamics of Organizational Culture: The Case of Culture Work in a Digital Hospital. In ICIS.

Grzegorczyk, M., Mariniello, M., Nurski, L., & Schraepen, T. (2021). Blending the physical and virtual: a hybrid model for the future of work (No. 14/2021). Bruegel Policy Contribution.

Hellriegel, D., & Slocum Jr, J. W. (1974). Organizational climate: Measures, research and contingencies. Academy of management Journal, 17(2), 255-280.

Hilberath, C., Kilmann, J., Lovich, D., Tzanetti, T., Bailey, A., Beck, S., ... & Woolsey, K. (2020). Hybrid work is the new remote work. Boston Consulting Group.[en línea], Recuperado de: https://www. bcg. com/publications/2020/managing-remote-work-and-optimizing-hybridworking-models.

Iskamto, D. (2021). Stress and its impact on employee performance. International Journal of Social and Management Studies, 2(3), 142-148.

Kane-Urrabazo, C. (2006). Management's role in shaping organizational culture. Journal of nursing management, 14(3), 188-194.

Maheshwari, R., Singhvi, S., Hameed, S., & Mathur, M. (2017). Faculty Engagement in Higher Education: A New Paradigm to Foster Quality Teaching. RIDING THE NEW TIDES.

Morgeson, F. P., & Humphrey, S. E. (2006). The Work Design Questionnaire (WDQ): developing and validating a comprehensive measure for assessing job design and the nature of work. Journal of applied psychology, 91(6), 1321.

Narayanamurthy, G., & Tortorella, G. (2021). Impact of COVID-19 outbreak on employee performance–moderating role of industry 4.0 base technologies. International Journal of Production Economics, 234, 108075.

NA. March 2021. The next great disruption is hybrid work – are we ready? Microsoft 2021 Work Trend Index. https://www.microsoft.com/en-us/worklab/work-trend-index/hybrid-work

Nilles, J. M. (1995). A Brief Introduction to the Future.

Olynick, J., & Li, H. Z. (2020). Organizational culture and its relationship with employee stress, enjoyment of work and productivity. International Journal of Psychological Studies, 12(2), 14.

Pass, S., & Ridgway, M. (2022). An informed discussion on the impact of COVID-19 and 'enforced'remote working on employee engagement. Human Resource Development International, 25(2), 254-270.

Radonić, M., Vukmirović, V., & Milosavljević, M. (2021). The impact of hybrid workplace models on intangible assets: the case of an emerging country. Amfiteatru economic, 23(58), 770-786.

Rizky, M. C., & Ardian, N. (2019). Enhance Employee Performance for Increase Work Motivation on Universitas Pembangunan Panca Budi Medan. Journal Homepage: http://ijmr. net. in, 7(08).

Sendawula, K., Nakyejwe Kimuli, S., Bananuka, J., & Najjemba Muganga, G. (2018). Training, employee engagement and employee performance: Evidence from Uganda's health sector. Cogent Business & Management, 5(1), 1470891.

Tan, R., & Antonio, F. (2022). New insights on employee adaptive performance during the COVID-19 pandemic: Empirical evidence from Indonesia.

Tran, L. (2022). The Impact of Hybrid Work on Productivity: Understanding the Future of Work: A case study in agile software development teams.

Weritz, P., Braojos, J., & Matute, J. (2020). Exploring the antecedents of digital transformation: Dynamic capabilities and digital culture aspects to achieve digital maturity.

EXPLORING THE IMPACT OF HUMAN RESOURCE MANAGEMENT PRACTICES ON JOB SATISFACTION IN MALAYSIAN UNIVERSITIES: A STUDY ON ACADEMICS

Khairunneezam Mohd Noor [i] , Safiyyah Ahmad Sabri [ii], Sharifah Zeenatu Zainab Syed Zakaria [iii], Shah Rollah Abdul Wahab [iv] & Mohd Ithnin Salleh [v]

[i] (*Corresponding author*). Senior Lecturer, Faculty of Leadership and Management, Universiti Sains Islam Malaysia. neezam@usim.edu.my
[ii] Senior Lecturer, Senior Lecturer, Faculty of Leadership and Management, Universiti Sains Islam Malaysia. safiyyah@usim.edu.my
[iii] Doctoral Degree Candidate, Faculty of Leadership and Management, Universiti Sains Islam Malaysia. zeenatuzainab@gmail.com
[iv] Faculty of Social Sciences and Humanities, Universiti Teknologi Malaysia. shahrollah@utm.my
[v] Faculty of Management and Economics, Universiti Pendidikan Sultan Idris, mad.ithnin@fpe.upsi.edu.my

Abstract

The purpose of this paper is to investigate the influence of human resource management practices on job satisfaction among academics in a Malaysian higher education institution. A pilot study was carried out on a sample of 144 academics in a higher education institution. The respondents included a wide range of university faculties, departments and academic units in the participating university. A 30-item scale developed by Halid et al. (2020) and Hauret et al. (2020) were designed to measure human resource management practices and a 3-item scale developed by Noor (2013) was used to measure job satisfaction. The Statistical Package for the Social Sciences (SPSS) version 25.0 were used to analyze the data and provided descriptive, correlation and regression analyses. Human resource management practices of recruitment, selection, training and development, performance appraisal, reward, recognition and promotion opportunities were significantly and positively related to job satisfaction. The results and statistical analysis of the current study could be a reference to indicate the effects of human resource management practices on job satisfaction among academics in Malaysian Higher Education Institutions. This study made a significant contribution of human resource management practices and the current state of job satisfaction in Malaysian higher education particularly in the public sector. In light of the findings, it is worth considering that at the organizational level, there are a number of actions that can be adopted by the Ministry of Higher Education Malaysia and the university management to increase and maintain the job satisfaction among academic staff in regards to its antecedents of human resource management practices. The study is also expected to provide useful reference for future researchers in this research area.

Keywords: *Human Resource Management Practices, Job Satisfaction, Academics, Higher Education*.

INTRODUCTION

The Malaysian higher education system has experienced significant development and growth over the years. The government has made substantial investments in the sector, aiming to establish Malaysia as an education hub in the region. Some key aspects of the Malaysian higher education system and its development includes the development of Public and Private Institutions, whereby Malaysia has a mix of public and private higher education institutions. Public universities are funded and regulated by the government, while private universities operate independently but are subject to quality assurance measures. Malaysian universities offer a wide range of programs at undergraduate and postgraduate levels. These include arts and humanities, engineering, science, medicine, business, and many more. There is a particular emphasis on science, technology, engineering, and mathematics (STEM) fields to support the country's economic development.

In the realm of internationalization, the country has actively pursued internationalization in higher education. Many universities have collaborations with foreign institutions, offering twinning programs, joint degrees, and student exchange opportunities. This approach has attracted international students and contributed to cultural diversity on campuses. In terms of research and innovation, the government has placed a strong emphasis on research and innovation to drive socioeconomic development. Research universities, such as Universiti Malaya, are established with a focus on producing cutting-edge research in various disciplines. The Malaysian government has also introduced funding schemes and initiatives to encourage research and development activities.

Technological Advancements: Malaysian higher education institutions have embraced technology to enhance teaching and learning. E-learning platforms, online resources, and digital libraries are widely used. The COVID-19 pandemic further accelerated the adoption of online and blended learning approaches. When comes to education for sustainable development, Malaysia is committed to promoting sustainability in higher education. Sustainable development programs and initiatives are integrated into the curriculum, research projects, and campus operations. Universities also engage in community outreach activities to raise awareness and contribute to sustainable development goals.

It is important to note that university rankings can vary depending on the ranking methodology used by different organizations. Some popular ranking systems include QS World University Rankings, Times Higher Education World University Rankings, and Academic Ranking of World Universities (ARWU). In this sense, Malaysian Higher Educational Institutions like Universiti Malaya, Universiti Putra Malaysia, and Universiti Kebangsaan Malaysia have achieved recognition for their academic reputation, research output, and international collaboration. Malaysian universities have been actively working on enhancing their quality through various initiatives, including research funding, faculty recruitment, international collaborations, and infrastructure development. Rankings should be

seen as a part of this improvement process, rather than the sole determinant of a university's quality.

Overall, the Malaysian higher education system has seen remarkable development, with a focus on quality, internationalization, research, and technology. These efforts have positioned Malaysia as an attractive destination for both local and international students seeking quality education and diverse academic opportunities. Malaysia's system of higher education has experienced various trends and restructuring episodes that enabled the provision of high quality (Zain et al., 2017).

Past studies found that Malaysian higher education sector has been reformed in tandem with socioeconomic development and the nation's aspirations. Malaysia's economy, from 1960 to 1980, had been based on agricultural activities, however from 1980 to 2000, economic activities shifted towards industrial development in pursuit of contemporary financial trends (Zain et al., 2017). This progress is prior to the emergence of a knowledge-based economy (k-economy) that demanded a highly skilled and better informed workforce in 2000 and beyond (Noor, 2013; Zain et al., 2017).

Also, significant development has been experienced by university academics such as the implementation of a stern assessment system and key performance indicators, increasing number of student's enrolments locally and from international, vast funds for research and development, effort to place universities in the global ranks, and so forth (Noor et al., 2019). These changes have arisen from a variety of drivers such as pressures of demand, a cultural shift in the way in which higher education is viewed, financial pressures, structural and managerial diversity, and an assortment of changes in university mission or emphasis (Noor, 2020).

All of these changes portray the concentration of academic work in an increasingly demanding environment (Houston et al., 2006). Hagen (2002) asserts that universities are the largest 'knowledge-based' institution in the region; hence they are urged by the industry and policy makers to transform their traditional roles of teaching and research by adding an additional pivotal role in economic regional development. This means that university academics are expected to aid economic regeneration by disseminating their knowledge and expertise through industry linked partnerships (Noor et al., 2019).

Based on the rapid developments in higher education sector, scholars and practitioners have recognized the importance of human resource management (HRM) practices and their effectiveness for positive organizational outcomes (Najam et al., 2020) among university academics. According to past studies, effectiveness of HRM practices should be evaluated from the employee's point of view in the form of behavioral and psychological effects (Lam et al., 2009; Oluwatayo, 2015; Lim & Ling, 2012) which include academics in higher education institutions. Literature of HRM necessitates developing a theoretical and empirical model that explains the link between HRM practices and its positive and negative effects on employees and organizational outcomes (Najam et al., 2020). A review of the literature divulges an

increasing interest in the impact of HRM practices on employee attitudes including job satisfaction.

Thus, the aim of this paper is to investigate the relationship between HRM practices and job satisfaction among academics in Malaysian higher education institutions. Specifically, the study will assist the universities and policy makers with key information to increase the effectiveness of HRM practices and maintain the job satisfaction of the employees particularly the academics.

The paper is organized in four sections. Section 1 highlights the aim of the paper. Section 2 discusses the literature on HRM practices and job satisfaction. Section 3 confers the methodology used to investigate the HRM practices and the current state of job satisfaction among academics in Malaysian higher education institutions. Section 4 manifests the conclusion and the expected contributions of the current study to the body of knowledge and to the policy makers in Malaysian higher education sector pertaining to HRM practices and job satisfaction of academics.

HUMAN RESOURCE MANAGEMENT PRACTICES

Human resource management refers to the practices, systems, and policies that influence the behavior, performance, and attitudes of employees (Saifalislam, 2014). Human resource management practices are a broad term that include related but different activities, functions, and processes directed at an enterprise's holistic view of human resources (Tangthong & Agahi, 2018). According to Dessler and Tan (2009), human resource management practices include analyzing human resource needs, screening, recruiting, training, rewarding, appraising as well as attending to labor relations, safety and health, and fairness concerns. In Malaysia, research on academics in higher education institutions is perceived to be lacking, and there seems to be an absence of studies particularly discussing HRM practices in these institutions along with the people-related repercussions (Rosdi & Harris, 2011).

In this study, HRM practices are the main predictors which impact job satisfaction among academics in Malaysian higher education sector. Halid et al. (2020) stated that perceived HRM practices can be interpreted as an individuals' perceptions of this system that are most relevant to individual-level attitudinal and behavioral outcomes. Therefore, this study will contribute on an understanding of how higher education institutions academics' perceived HRM practices specifically, recruitment, selection, training and development, performance appraisal, reward, recognition and promotion opportunities, are associated with job satisfaction.

Recruitment and Selection

Recruitment is the searching for and obtaining potential job candidates in sufficient numbers and quality so that the organization can select the most appropriate people to fill its job needs (Georgia, George & Labros, 2013). Robbins and Coulter (2018) defined recruitment as locating, identifying, and attracting capable applicants. Meanwhile, the selection is screening job applicants to ensure that the most

appropriate candidates are hired (Robbins & Coulters, 2018). Armstrong (2010) asserts that selection is the process of assessing the suitability of candidates by predicting the extent to which they will be able to carry out a role successfully.

Also, the selection is the process of choosing the most appropriate person from the pool of applicants recruited to fill the relevant job vacancy (Gamage, 2014). According to Moustaghfir et al. (2020), the guiding principle of recruitment and selection processes remains transparency, as the assessment of applications follows different procedures that build on job-related criteria, including various types of interviews and considers giving feedback to both accepted and rejected applicants when such processes are completed.

Previous research found that recruitment and selection have statistically significant on employees' behavior including job satisfaction (e.g. Georgia et al., 2013; Akafo & Boateng, 2015; Mugizi & Bakkabulindi, 2018; Halid et al., 2020). Moreover, a study by Hauret et al. (2020) also supports previous studies that recruitment and selection have a significant impact on job satisfaction.

Training and Development

According to Moustaghfir et al. (2020) training programs are either designed and delivered internally by the company's own experts or managed and organized by external entities and specialized agencies. Training and development are other dimensions of human resource management practices where firms invest in the development of their employees' knowledge, skills, ability and other required skills to improve the productivity of employees (Gamage, 2014). Besides specific coaching and mentorship programs that are directly focused on internal mobility and job rotation, training programs are mainly developed to respond to clear job-related knowledge needs (Lam et al. 2009). According to Elrehail et al. (2019), training and development leads to the accumulation of knowledge and the development of human capital, which eventually influences job satisfaction, because employees can carry out assigned tasks easily and without difficulties.

In the past studies, it has been found that training and development have a strong relationship with employee's job satisfaction. Nguyen et al. (2010) argued that it was found in the past studies that training and development has a significant impact on employee satisfaction. Absar et al. (2010) in their study among manufacturing firms found training and development to have the most significant and positive influence on employees' job satisfaction. Hence, based on the previous studies, it was proved that training and development as one of the main HRM practices can influence employees' job satisfaction.

Performance Appraisal

Employee performance appraisal is a process – often combining both written and oral elements – whereby management evaluates and provides feedback on employee job performance, including steps to improve or redirect activities as needed (Elrehail et al., 2019). According to Mugizi and Bakkabulindi (2018), performance appraisal refers to the systematic evaluation of the employee with regard to his or her performance on the job and his potential for development. Halid et al. (2020) defined performance appraisal as the systematic process measuring and developing job performance of the employees in the organization concerning the set of standards for a particular period to achieve various purposes.

Appraisals allow managers to take time to discuss with each employee individual work, give feedback, propose further training if needed and also be used to define appropriate rewards included in the incentive domain (Hauret et al., 2020). Elrehail et al. (2019) postulated that employees who are satisfied with their workplace performance appraisal are often effective and efficient in their task.

According to Pagan et al. (2021), several studies support the notion that fairness of performance appraisal is saliently related to employees' job satisfaction. For instance, it is evidenced from the findings of a study by Elrehail et al. (2019), where performance appraisal had a significant impact on the job satisfaction and competitive advantage among employees in the hotel industry in Northern Cyprus. Wahjono et al. (2016), in their study found medium and positive correlation between performance appraisal and job satisfaction among employees in a private company in Malaysia. Therefore, it is essential to know the current state of the effect of performance appraisal on job satisfaction particularly among academics in Malaysia higher educational sector.

Reward and Recognition

The rewards and recognitions practice determine the type of appreciation received by employees, monetary and non-monetary rewards, from the organization based on their performance (Halid et al., 2020). Human resources effectiveness and productivity can be enhanced through a meticulous reward system designed in an organization. Recently, complex reward systems are needed to meet the demands of a more diverse workforce and gradually more, organizations found that they must focus on the total compensation package for employees (Akafo & Boateng, 2015). Employee recognition is being increasingly acknowledged as a management practice having a wide-ranging impact on people and organizations (Brun & Dugas, 2008). Furthermore, as argued by Deeprose (1994), motivation of employees and their productivity can be enhanced through providing them effective recognition which ultimately results in improved performance of organizations.

A study by Hussain et al. (2019) among employees in the call centers in Pakistan found that employee rewards and recognition have a significant and positive effect on employee performance. In the same vein, Ali and Ahmed (2009) in their study found statistically significant, direct and positive relationship between

rewards and recognition with work satisfaction and motivation. According to these findings, employees will show good level of job satisfaction when they found that rewards and recognition provided by the organization are sufficient.

Promotion

Malik et al. (2010) stated that the movement of an employee upward in the hierarchy of the organization, typically that leads to enhancement of responsibility and rank and an improved compensation package is a promotion. Past studies believe that promotion opportunity is one of the important indicators of an individual employee's satisfaction (Noor, 2013). The proposed research intends to investigate the promotion opportunities as a factor which determine academics job satisfaction.

A study by Ch'ng et al. (2010) found that promotion opportunities are positively significant in determining the job satisfaction of lecturers in Penang state, Malaysia. Noor (2013) conducted a study on job satisfaction of academics in public universities in Malaysia found that promotion had a positive but low correlation with job satisfaction. These findings reflect that the reliance of the positive correlation between promotion and job satisfaction is on perceived justice by workers. Therefore, based on evidence in the previous literature, it is shown that strategic and neat practice of promotion opportunities will increase employees' job satisfaction and other positive behavioral outcomes within the organization.

JOB SATISFACTION

Job satisfaction refers to the level of contentment, fulfillment, and positive feelings an individual experiences in their job or work environment. It reflects an individual's overall perception of their job and the degree to which their expectations and needs are met. Research findings suggest that job satisfaction is not a static state but is subject to influence and modification from forces within and outside an individual; that is his or her own personal characteristics and the immediate working environment (Noor, 2013). Among the most cited definitions of job satisfaction is that of Spector (1997) who defined it as the extent to which people like (satisfaction) or dislike (dissatisfaction) their jobs. According to Paşaoğlu and Tonus (2014), the job satisfaction is also defined as a person's general attitude to his own job.

Job satisfaction is an expression, emotional or mental, regarding the nature of work (Tangthong & Agahi, 2018). These positive results of job satisfaction can create advantageous attitudes toward the organization (e.g., reduced turnover intent, increased self-efficacy, voluntary efforts, and the development of relationships between organization members) and can increase the performance of the company (Yu et al., 2020). Consequently, in regards to the direction of current study, the job satisfaction of academics in higher education institutions is vital for ultimately reaching the financial and non-financial goals of a university.

HUMAN RESOURCE MANAGEMENT PRACTICES AND JOB SATISFACTION

While many studies view the effect of human resource management practices only in terms of organizational-level outcomes (e.g., Moustaghfir et al., 2020; Rogg et al., 2001; Park et al., 2003; Lam et al., 2013; Halid et al. 2020; and Cherif, 2020) suggested that it is vital to consider the effects of human resource management practices on the individual employees themselves, in terms of employee outcome variables. Lim and Ling (2012) found that many of the human resource practices are significantly correlated with job satisfaction.

Andreassi et al. (2014) in their study across Asia, Europe, North America and Latin America, found that there were significant relationships between human resource management practices and satisfaction across all regions of the world. Some studies conclude there is a negative link between human resource management practices and employees' job satisfaction (Haurett et al., 2020). These studies argue that human resource management practices (e.g., performance relative pay, job rotation, team work) lead to work intensification which increases job strain, accidents at work or absenteeism (Halid et al., 2020).

Recent researches have explored that HRM practices are positively related to job satisfaction (Najam et al., 2020). The main research findings in the work of Elrehail et al. (2019) revealed that HRM practices had a significant effect on job satisfaction and competitive advantage. According to Halid et al. (2020), in examining the possible effects of human resource management practices on employee behavior, it is pertinent to discover precisely how employees perceive those practices. Therefore, the researchers attempt to propose a study that looks into the question of what are the effects of human resource management practices particularly recruitment, selection, training and development, performance appraisal, reward, recognition, promotion opportunities on job satisfaction of academics in Malaysian higher educational institutions?

RESEARCH HYPOTHESES

In this study, HRM practices (recruitment, selection, training and development, performance appraisal, reward, recognition, promotion opportunities) and job satisfaction are hypothesized into seven dimensions following the work of past studies (e.g., Noor, 2013; Gamage, 2014; Boon et al., 2011; Hauret et al., 2020; Lam et al., 2009; Najam et al., 2020):

H1: Recruitment is positively and significantly related to job satisfaction;

H2: Selection is positively and significantly related to job satisfaction;

H3: Training and development are positively and significantly related to job satisfaction;

H4: Performance appraisal is positively and significantly related to job satisfaction;

H5: Reward is positively and significantly related to job satisfaction;

H6: Recognition is positively and significantly related to job satisfaction; and

H7: Promotion opportunities are positively and significantly related to job satisfaction.

METHODOLOGY

Data Collection

It is essential to assure that population selection can determine the direction of a study. Higher education is seen as a sector which concerned with the quality of the academic services. The population for the pilot study comprised of academics from a public higher education institution located in Negeri Sembilan State, Malaysia. The respondents were the academics from a wide range of university faculties, departments and academic units in the University. Deans and head of each department, faculty and school in the university were contacted through phone calls or emails to obtain their assistance on disseminating the cover letter of invitation to participate in the study, participation information sheet, and hyperlink for the online survey designed for the study to their academic staff members.

Measurement And Questionnaire Development

First, the study comprised of questions in regard to the personal characteristics of the respondents. The measures of gender, age, highest academic qualification, academia's category and tenure in the current university were included. Second, a total of 36 items were adopted from Halid et al. (2020) and Hauret et al. (2020) to measure satisfaction towards Human Resource Management Practices and it was divided into seven practices: (i) recruitment, (ii) selection, (iii) training and development, (iv) performance appraisal, (v) reward, (vi) recognition, and (vii) promotion opportunity. Each question was answered by the five-point Likert-type scale, namely 1 (disagree very much); 2 (disagree); 3 (neither agree nor disagree); 4 (agree); and 5 (agree very much). The higher the total score in the scale was, the higher the satisfaction towards each human resource management practices was. The lower the total score in the scale was, the lower the satisfaction towards each human resource management practices was.

To measure job satisfaction among the academics, 3 items were designed and revised from Noor (2013). A 5-point Likert scale namely 1 (disagree very much); 2 (disagree); 3 (neither agree nor disagree); 4 (agree); and 5 (agree very much) was used to obtain the level of job satisfaction among the respondents. The higher the total score in the scale was, the higher the job satisfaction among academics was. The lower the total score in the scale was, the lower the job satisfaction among the academics was.

Following the work of Fuzi et al. (2019) an expert validation was conducted to assess the validity of the contents of the questionnaire. This was done by inviting four experts who are familiar with the constructs included in the study, the methodology used, and both the forward and backward translations of the items in the questionnaire. In accordance to the suggestions by Tsang et al. (2017), the four appointed expert panels had reviewed the questionnaire and provided feedbacks for improvement and to produce the pre-final version of the questionnaire.

Fuzi et al. (2019) argue that a pilot study is an initial step in the research, and it is used for all research studies. A pilot study us often a smaller-sized research advocating in planning and modification of the real study to be conducted. According to Hazzi and Maldaon (2015), the importance of the pilot study is to enhance the quality and the efficiency of the main research. Sekaran and Bougie (2016) argued that a reasonable sample size larger than 30 is preferable for a pilot study. However, Kieser and Wassmer (1996) pointed out that a sample size that range from 30 to 40 is good enough in providing data for pilot study. Hence, the sample size is important for conducting the pilot study and to check the instruments used (Fuzi et al., 2019). A total of 200 questionnaires were distributed via an online survey and 167 were returned. After the returned questionnaires were sorted and categorized, 23 incomplete and invalid questionnaires were excluded and only 144 valid questionnaires were used for the pilot study.

Based on the quantitative data obtained from the 144 returned valid questionnaires, all responses were coded and analyzed with IBM Statistical Package Social Sciences (SPSS) version 25. According to the research questions and nature of this study, the present study mainly adopted statistical methods, including descriptive statistical analysis, reliability analysis, Pearson's correlation analysis and multiple linear regression analysis.

FINDINGS

Descriptive Statistical Analysis

According to the basic sample data of the respondents which includes gender, age, highest academic qualification, academia's category and lecturing experience, sample distribution was analyzed to get frequencies and percentage related to each study variables. First the measure of demographic information is gender. 87 respondents (60.40 per cent) were male and 57 respondents (39.60 per cent).

Then, the age of respondents was divided into five categories. Those in the age between 25 to 34 and 45 to 54 years old were the dominant group of age which constituted 54 respondents (37.5 per cent) for each category. Then, 29 respondents (20.1 per cent) were between 45 to 54 years old, six respondents (4.2 per cent) were more than 54 years old, and one respondent (0.7 per cent) aged below than 25 years old. In terms of highest academic qualification, 115 respondents (79.9 per cent) had a doctorate degree, and 29 respondents (20.1 per cent) obtained master degree.

In terms of academia's category, majority of the respondents work as a senior lecturer (17 respondents, 54.2 per cent), follows by 32 respondents (22.2 per cent) among Associate Professor, 13 respondents (9.0 per cent) as a Professor, 11 respondents (7.6 per cent) who work as a lecturer, and 10 respondents (6.9 per cent) were teachers. It was found that in regards to lecturing experience, 62 respondents (43.1 per cent) have between 5 to 10 years of lecturing experience. Next 40 respondents (27.8 per cent) have lecturing for more than 15 years, lecturing

experience between 11 to 15 years (31 respondents, 21.5 per cent), and 11 respondents (7.6 per cent) were those with less than 5 years of lecturing experience.

Next, the results in Table 2 show the overall mean and standard deviation for each of the dimension of HRM practices and job satisfaction. As presented in Table 2, the mean values for human resource management practices' dimensions ranged from 2.92 to 3.65. On the other hand, mean value for job satisfaction was 3.95.

Table 2: Overall mean and standard deviation for HRM practices and job satisfaction

Dimension	Mean	Standard deviation
Recruitment	3.22	0.92
Selection	2.92	0.87
Training & development	2.96	0.76
Performance appraisal	3.65	0.67
Reward	2.96	0.76
Recognition	3.57	0.66
Promotion	3.53	0.77
Job Satisfaction	3.95	0.63

Reliability Analysis

Scores from an instrument are reliable and accurate if an individual's scores are internally consistent across the items on the instrument. The consistency of responses can be examined in several ways including coefficient alpha. If the items are scored as continuous variables (e.g., strongly agree to strongly disagree), the alpha provides a coefficient to estimate consistency of scores on an instrument (Creswell, 2012). Cronbach's alpha provides a measure of the internal consistency of the scale used between 0 and 1 to test the reliability of the analysis (Fuzi et al., 2019).

Table 3: Reliability analysis results of the dimensions in the questionnaire

Variable	Dimension	Number of Items	Cronbach's alpha value	Result
Human resource management practices	Recruitment	5	0.85	High reliability
	Selection	4	0.80	High reliability
	Training and Development	6	0.84	High reliability
	Performance appraisal	6	0.82	High reliability
	Reward	6	0.84	High reliability
	Recognition	3	0.75	High reliability
	Promotion	5	0.83	High reliability
Job satisfaction	Job Satisfaction	3	0.78	High reliability

According to Lin (2021), a Cronbach's alpha value greater than 0.7 indicates high reliability, a Cronbach's alpha value in the range of 0.5 to 0.7 indicates acceptable reliability and a Cronbach's alpha value smaller than 0.5 indicates low reliability. Reliability analysis results depict that HRM practices and job satisfaction are all high in reliability value which ranged from 0.75 for recognition to 0.85. Hence, the reliability of the questionnaire used in this study inclines to be consistent and stable. The detailed data is provided in Table 3.

Pearson's Correlation Analysis

Correlation analysis is used to describe the strength and direction of the linear relationship between HRM practices (recruitment, selection, training and development, performance appraisal, reward, recognition, promotion opportunities) and job satisfaction. According to Pallant (2010), Pearson product-moment correlation coefficient (r) can take on values from -1 to +1. The sign out of the front indicates whether there is a positive correlation (as one value increases, so too does the other) or a negative correlation (as one variable increases, the other decreases). Table 4 describes the degree of Pearson's product-moment correlation between HRM practices and job satisfaction. Through the matrix for Pearson's correlation in Table 4, all HRM practices variables (recruitment, selection, training and development, performance appraisal, reward, recognition, promotion opportunities) were found to be significantly and positively correlated with job satisfaction.

Table 4: Matrix for Pearson's Correlation between HRM Practices & Job Satisfaction

	1	2	3	4	5	6	7	8
1.Recruitment	1							
2.Selection	.225**	1						
	0.007							
3.Training & Development	.654**	.341**	1					
	0.000	0.000						
4.Performance Appraisal	.549**	.187*	.689**	1				
	0.000	0.025	0.000					
5.Reward	.654**	.341**	1.000**	.689**	1			
	0.000	0.000	0.000	0.000				
6.Recognition	.390**	.170*	.458**	.508**	.458**	1		
	0.000	0.042	0.000	0.000	0.000			
7.Promotion	.554**	.181*	.693**	.991**	.693**	.496**	1	
	0.000	0.030	0.000	0.000	0.000	0.000		

| 8.Job Satisfaction | .429** | .240** | .606** | .661** | .606** | .428** | .640** | 1 |
| | 0.000 | 0.004 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | |

Notes. **Correlation is significant at the 0.01 level (2-tailed). *Correlation is significant at the 0.05 level (2-tailed).

Regression analysis

In this study, the multiple linear regression analysis was used to verify whether the hypotheses herein were true and determine whether the correlations between HRM practices (recruitment, selection, training and development, performance appraisal, reward, recognition, promotion opportunities) and job satisfaction were affected. The researchers used mean values of the variables for the analysis. Mean values provide consolidated measurement of the variable and all the dimensions of the variable into a single standardized value (Manzoor et al., 2019). By using regression analysis, this study explores the influence of HRM practices (recruitment, selection, training and development, performance appraisal, reward, recognition, promotion opportunities) on job satisfaction as illustrated in Table 5.

Table 5: Multipe Regression Analysis

	Job Satisfaction				
	β	*t*-Statistic	*p*-Value	F-Statistics	R-Square
Recruitment	0.429	5.662	0.000	32.058	0.184
Selection	0.240	2.941	0.004	8.651	0.057
Training and Development	0.606	9.073	0.000	82.323	0.367
Performance Appraisal	0.661	10.497	0.000	110.185	0.437
Reward	0.545	8.752	0.000	78.212	0.362
Recognition	0.428	5.648	0.000	31.904	0.178
Promotion Opportunities	0.640	9.934	0.000	98.676	0.406

Dependent variable: job satisfaction. Independent variables: recruitment, selection, training and development, performance appraisal, reward, recognition, promotion opportunities; *p<0.05* is significant.

In Table 5, the main findings of the multiple regression analysis show the relationship between HRM practices of recruitment, selection, training and development, performance appraisal, reward, recognition and promotion opportunities with job satisfaction as the dependent variable. The findings of the regression analysis indicate that recruitment and job satisfaction have a significant and positive relationship (R-Square=0.184; F=32.058; β=0.429; *t*-value=5.622; *p*-value= 0.000). Value of R^2 shows 18.4 percent variation occurred in job satisfaction due to recruitment. Beta value has a positive sign, which shows that recruitment and job satisfaction have a positive relationship. The *t*-value is greater than 2 and *p*-value is less than 0.05, which means variables have a positive and significant relationship. So,

the results support Hypothesis 1: *recruitment is positively and significantly related to job satisfaction*.

Then, the findings of the regression analysis indicate that selection and job satisfaction have a significant and positive relationship (R-Square=0.057; F=8.651; β=0.240; *t*-value=2.941; *p*-value= 0.004). Value of R^2 shows 5.7 percent variation occurred in job satisfaction due to selection. Beta value has a positive sign, which shows that selection and job satisfaction have a positive relationship. The *t*-value is greater than 2 and *p*-value is less than 0.05, which means variables have a positive and significant relationship. So, the results support Hypothesis 2: *selection is positively and significantly related to job satisfaction*.

Next, the findings of the regression analysis indicate that training and development and job satisfaction have a significant and positive relationship (R-Square=0.367; F=82.323; β=0.606; *t*-value=9.073; *p*-value= 0.000). Value of R^2 shows 36.7 percent variation occurred in job satisfaction due to training and development. Beta value has a positive sign, which shows that training and development and job satisfaction have a positive relationship. The *t*-value is greater than 2 and *p*-value is less than 0.05, which means variables have a positive and significant relationship. So, the results support Hypothesis 3: *Training and development is positively and significantly related to job satisfaction*.

Also, the findings of the regression analysis indicate that performance appraisal and job satisfaction have a significant and positive relationship (R-Square=0.437; F=110.185; β=0.661; *t*-value=10.497; *p*-value= 0.000). Value of R^2 shows 43.7 percent variation occurred in job satisfaction due to performance appraisal. Beta value has a positive sign, which shows that performance appraisal and job satisfaction have a positive relationship. The *t*-value is greater than 2 and *p*-value is less than 0.05, which means variables have a positive and significant relationship. So, the results support Hypothesis 4: *Performance appraisal is positively and significantly related to job satisfaction*.

Correspondingly, the findings of the regression analysis indicate that reward and job satisfaction have a significant and positive relationship (R-Square=0.362; F=78.212; β=0.545; *t*-value=8.752; *p*-value= 0.000). Value of R^2 shows 36.2 percent variation occurred in job satisfaction due to reward. Beta value has a positive sign, which shows that reward and job satisfaction have a positive relationship. The *t*-value is greater than 2 and *p*-value is less than 0.05, which means variables have a positive and significant relationship. So, the results support Hypothesis 5: *Reward is positively and significantly related to job satisfaction*.

Subsequently, the findings of the regression analysis indicate that recognition and job satisfaction have a significant and positive relationship (R-Square=0.178; F=31.904; β=0.428; *t*-value=5.648; *p*-value= 0.000). Value of R^2 shows 17.8 percent variation occurred in job satisfaction due to recognition. Beta value has a positive sign, which shows that recognition and job satisfaction have a positive relationship. The *t*-value is greater than 2 and *p*-value is less than 0.05, which means variables

have a positive and significant relationship. So, the results support Hypothesis 6: *Recognition is positively and significantly related to job satisfaction*.

Then, the findings of the regression analysis indicate that promotion opportunities and job satisfaction have a significant and positive relationship (R-Square=0.406; F=98.676; β=0.640; *t*-value=9.934; *p*-value= 0.000). Value of R^2 shows 40.6 percent variation occurred in job satisfaction due to promotion opportunities. Beta value has a positive sign, which shows that promotion opportunities and job satisfaction have a positive relationship. The *t*-value is greater than 2 and *p*-value is less than 0.05, which means variables have a positive and significant relationship. So, the results support Hypothesis 7: *Promotion opportunities is positively and significantly related to job satisfaction*.

DISCUSSION

In the present pilot study, the researchers analyzed the effect that HRM practices of recruitment, selection, training and development, performance appraisal, reward, recognition and promotion opportunities have on job satisfaction of academics in a higher education institution of Malaysia. The current study explored a significant and positive relationship among HRM practices and job satisfaction. Recruitment was found to be positively and significantly related to job satisfaction and this support the past studies of Georgia et al. (2013) and Hauret et al. (2020). Then, selection was also found to be positively and significantly related to job satisfaction which reiterated the findings by Mugizi & Bakkabulindi (2018).

The current study also found that training and development affected the job satisfaction of academics in higher education positively and significantly. This supports the work of Nguyen et al. (2010) who argued that training and development has a significant impact on employee's job satisfaction. Another dimension of HRM practices which was performance appraisal, also found to be positively and significantly related to job satisfaction. This finding restated the findings in the study by Elrehail et al. (2019) that performance appraisal had a significant impact on the job satisfaction among employees in Northern Cyprus and the work of Wahjono et al. (2016) among employees in Malaysia.

The finding from the regression analysis also indicated that reward is positively and significantly related to job satisfaction. This is consistent with the work of Hussain et al. (2019) that reward has a significant and positive effect on employee satisfaction and performance. The HRM practice dimension of recognition was also investigated to be positively and significantly affected job satisfaction. This specifically support the finding by Ali and Ahmed (2009) who found statistically significant, direct and positive relationship between recognition and work satisfaction and motivation. Subsequently, the current study also found that promotion opportunities is positively and significantly related to job satisfaction. This finding is consistent with the findings of Ch'ng et al. (2010), revealed that promotion opportunities are positively significant in determining the job satisfaction of lecturers.

CONCLUSION

In conclusion, this study focused on the effects of HRM practices on job satisfaction among academics in Malaysian higher education setting. Based on the expert validation process and reliability analysis, it was found that all HRM practices variables and job satisfaction were valid, reliable and accepted for this study. Furthermore, through the correlation and multiple linear regression analyses, all the HRM practices namely recruitment, selection, training and development, performance appraisal, reward, recognition, and promotion were found to be significantly and positively related to job satisfaction.

For practical implications, the development of the instruments in the study will be helpful as tools to evaluate HRM practices and job satisfaction in Malaysian higher educational sector. Furthermore, the empirical findings of correlation and regression analyses from this study make a significant contribution to HRM practices and the current state of job satisfaction among academics in Malaysian higher education sector. In light of the findings, it is worth considering that at the organizational level, there are potential yet significant actions that can be adopted by the university management and the Ministry of Higher Education Malaysia to increase and maintain the 'happiness' or job satisfaction among academic staff and to sustain a good and balanced ecosystem of HRM practices in the university. The study is also expected to provide useful reference for future researchers in this research area.

In the meantime, the limitation of the study was the difficulty to find the specific literature on HRM practices and its relationship with job satisfaction in Malaysian higher education sector. Another limitation is that this pilot study was conducted with academics in one higher education institution only which also restraining the generalizability of the findings to the other higher education institutions. Plan for future research, the researchers are going expand the study among a wider group of respondents among academics from all public universities in Malaysia, looking at the relationship between HRM practices and job satisfaction.

REFERENCES

Ali, R. & Ahmed, M.S. (2009), "The Impact of Reward and Recognition Programs on Employee's Motivation and Satisfaction: An Empirical Study", *International Review of Business Research Papers*, Vol. 5 No. 4, pp. 270-279.

Aboelmaged, M.G. & Subbaugh, S.M.E. (2012), "Factors influencing productivity of Egyptian teleworkers: an empirical study", *Measuring Business Excellence*, Vol. 16 No. 2, pp. 3-22.

Absar, M.N., Azim, M.T., Balasundaram, N. & Akhter, S. (2010), "Impact of human resources practices on job satisfaction: Evidence from manufacturing firms in Bangladesh", *Economic Sciences Series*, Vol. 62 No. 2, pp. 31-42.

Akafo, B. & Boateng, P.A. (2015), "Impact of Reward and Recognition on Job Satisfaction and Motivation", *European Journal of Business and Management*, Vol.7 No.24, pp. 112-124.

Andreassi, J.K., Lawter, L., Brockerhoff, M. and J. Rutigliano, P. (2014), "Cultural impact of human resource practices on job satisfaction: A global study across 48 countries", *Cross Cultural Management: An International Journal*, Vol. 21 No. 1, pp. 55-77.

Armstrong. M. (2010), *Armstrong's essential human resource management practice: A guide to people management*, London: Kogan Page Limited.

Ashraf, M. A. (2020), "How do you change the world? The role of working condition in quest for excellence in quality education: evidence from Bangladesh", *Measuring Business Excellence*, Vol. 25 No. 1, pp. 78-105.

Bhatti, M.A., Alshagawi, M., Zakariya, A. and Juhari, A.S. (2019), "Do multicultural faculty members perform well in higher educational institutions? Examining the roles of psychological diversity climate, HRM practices and personality traits (Big Five)", *European Journal of Training and Development*, Vol. 43 No. 1/2, pp. 166-187.

Boon, C., Den Hartog, D. N., Boselie, P., & Paauwe, J. (2011), "The relationship between perceptions of HR practices and employee outcomes: Examining the role of person–organisation and person–job fit", *The International Journal of Human Resource Management*, Vol. 22 No. 1, pp. 138–162.

Brun, J.P. & Dugas, N. (2008), "An analysis of employee recognition: Perspectives on human resources practices", *The International Journal of Human Resource Management*, Vol. 19 No. 4, pp. 716-730.

Ch'ng, H.K., Chong, W.K., and Nakesvari, M. (2010), "The Satisfaction Level of Penang Private Colleges Lecturers", *International Journal of Trade, Economics and Finance*, Vol. 1 No. 2, pp. 168-172.

Cherif, F. (2020), "The role of human resource management practices and employee job satisfaction in predicting organizational commitment in Saudi Arabian banking sector", *International Journal of Sociology and Social Policy*, Vol. 40 No. 7/8, pp. 529-541.

Chinyamurindi, W., Kyogabiirwe, J.B., Kabagabe, J.B., Mafabi, S. and Dywili, M. (2021), "Antecedents of small business financial performance: the role of human resource management practices and strategy", *Employee Relations*, Vol. ahead-of-print No. ahead-of-print.

Creswell, J.W. (2012), Educational Research: Planning, Conducting, and Evaluating Quantitative and Qualitative Research, 4th Ed., New York: Pearson.

Deeprose, D. (1994), *How to recognise and reward employees*, New York: AMACOM.

Dessler, G. & Tan, C.H. (2009), Human Resource Management: An Asian Perspective, 2nd. Ed., Singapore: Pearson Education.

Domínguez-Falcón, C., Martín-Santana, J.D. and De Saá-Pérez, P. (2016), "Human resources management and performance in the hotel industry: The role of the commitment and satisfaction of managers versus supervisors", *International Journal of Contemporary Hospitality Management,* Vol. 28 No. 3, pp. 490-515.

Elrehail, H., Harazneh, I., Abuhjeeleh, M., Alzghoul, A., Alnajdawi, S. and Ibrahim, H.M.H. (2019), "Employee satisfaction, human resource management practices and competitive advantage: The case of Northern Cyprus", *European Journal of Management and Business Economics,* Vol. 29 No. 2, pp. 125-149. https://doi.org/10.1108/EJMBE-01-2019-0001.

Fuzi, N.M., Habidin, N.F., Janudin, S.E. & Ong, S.Y.Y. (2019), "Critical success factors of environmental management accounting practices: findings from Malaysian manufacturing industry", *Measuring Business Excellence,* Vol. 23 No. 1, pp.1-14

Gamage, A. S. (2014), "Organisational citizenship behavior among employees in SMEs in Japan: An analysis of the link with HRM practices", *Proceedings of International Conference on Business Management,* Vol. 10, pp. 129–140.

Gannon, J.M., Doherty, L. and Roper, A. (2012), "The role of strategic groups in understanding strategic human resource management", *Personnel Review,* Vol. 41 No. 4, pp. 513-546.

Georgia, A., George, A., & Labros, S. (2013), "Employee recruitment and selection in the insurance sector: The case of the Greek insurance group", *European Journal of Management Sciences,* Vol. 1 No. 1, pp.1-20.

Hagen, R. (2002), "Globalization, university transformation and economic regeneration: A UK case study of public/private sector partnership", *International Journal of Public Sector Management,* Vol. 15 No. 3, pp. 204-218.

Halid, H. & Kee, D. M. H. & Rahim, N.F.A. (2020), "Perceived Human Resource Management Practices and Intention to Stay in Private Higher Education Institutions in Malaysia: The Role of Organizational Citizenship Behaviour", *Global Business Review,* pp. 1–18.

Hassan, A. (2001), "Impact of the economic crisis on higher education in Malaysia", paper presented to *Impact of the economic crisis on higher education in East Asia: Country experiences,* Paris.

Hazzi, O.A. and Maldaon, I.S. (2015), "A pilot study: vital methodological issues", *Verslas: Teorija ir Praktika*, Vol. 16 No. 1, pp. 53-62.

Hauret, L., Martin L., Omrani, N. & Williams, D.R. (2020), "How do HRM practices improve employee satisfaction?", *Economic and Industrial Democracy*, pp. 1–25.

Houston, D., Meyer, L.H. & Paewai, S. (2006), "Academic staff workloads and job satisfaction: expectations and values in academe", *Journal of Higher Education Policy and Management*, Vol. 28 No. 1, pp. 17-30.

Hussain, S.D., Khaliq, A., Nisar, Q.A., Kamboh, A.Z. & Ali, S. (2019), "Impact of Employees' Recognition, Rewards and Job Stress on Job Performance: Mediating Role of Perceived Organization Support", *Strategic Management Journal*, Vol. 2 No. 2, pp. 69-82. DOI: https://doi.org/10.33215/sjom.v2i2.121.

Kagaari, J.R.K. (2011), "Performance management practices and managed performance: the moderating influence of organizational culture and climate in public universities in Uganda", *Measuring Business Excellence*, Vol. 15 No. 4, pp 36-49.

Kieser, M. & Wassmer, G. (1996), "On the Use of the Upper Limit for the Variance from a Pilot Sample for Sample Size Determination", *Biometrical Journal*, Vol. 8. pp. 941-949.

Lam, W., Chen, Z., & Takeuchi, N. (2009), "Perceived human resource management practices and intention to leave of employees: The mediating role of organizational citizenship behaviour in a Sino-Japanese joint venture", *The International Journal of Human Resource Management*, Vol. 20 No.11, pp. 2250–2270.

Lee, C.-C. and Cheng, P.-Y. (2018), "Effect of the critical human resource attributes on operating performances", *Chinese Management Studies*, Vol. 12 No. 2, pp. 407-432.

Lim, L.J.W. and Ling, F.Y.Y. (2012), "Human resource practices of contractors that lead to job satisfaction of professional staff", *Engineering, Construction and Architectural Management,* Vol. 19 No. 1, pp. 101-118.

Lin, Y. (2021), "A study on the relationship between project management competency, job performance and job motivation in e-commerce industry", *Measuring Business Excellence*, Vol. 25 No. 1, pp. 24-57.

Ling, F.Y.Y., Ning, Y., Chang, Y.H. and Zhang, Z. (2018), "Human resource management practices to improve project managers' job satisfaction", *Engineering, Construction and Architectural Management,* Vol. 25 No. 5, pp. 654-669.

Malik, M.E., Danish, R.Q. & Munir, Y. (2010), "Impact of Reward and Recognition on Job Satisfaction and Motivation: An Empirical Study from Pakistan", *International Journal of Business and Management*, Vol. 5 No.2, pp.159-167.

Manzoor, F., Longbao, W., Bányai, T., Nurunnabi, M. and Subhan, Q.A. (2019), "An Examination of Sustainable HRM Practices on Job Performance: An Application of Training as a Moderator", *Sustainability*, Vol. 11, No. 8, 2263.

Martinson, B. and De Leon, J. (2018), "Testing horizontal and vertical alignment of HR practices designed to achieve strategic organizational goals", *Journal of Organizational Effectiveness: People and Performance*, Vol. 5 No. 2, pp. 158-181.

Memon, M.A., Salleh, R., Mirza, M.Z., Cheah, J.-H., Ting, H., Ahmad, M.S. and Tariq, A. (2021), "Satisfaction matters: the relationships between HRM practices, work engagement and turnover intention", *International Journal of Manpower*, Vol. 42 No. 1, pp. 21-50.

Menon, S.T. (2012), "Human resource practices, supply chain performance, and wellbeing", *International Journal of Manpower*, Vol. 33 No. 7, pp. 769-785.

Moustaghfir, K., El Fatihi, S. & Benouarrek, M. (2020), "Human resource management practices, entrepreneurial orientation and firm performance: what is the link?", *Measuring Business Excellence*, Vol. 24 No. 2, pp. 267-283.

Mugizi, W. & Bakkabulindi, F.E.K. (2018), "Human Resource Management Practices: Developing and Testing an Instrument in the Context of Academic Staff in Universities in Uganda", *Journal of Education Review*, Vol. 10. No 1, January-March 2018, pp. 130-142.

Najam, U., Ishaque, S., Irshad, S., Salik, Q., Khakwani, M.S. and Liaquat, M. (2020), "A Link Between Human Resource Management Practices and Customer Satisfaction: A Moderated Mediation Model", *SAGE Open*, Vol. October-December 2020, pp.1–16.

Nguyen, T.N., Truong, Q. and Buyens, D. (2010), "The relationship between training and firm performance: a literature review", *Research and Practice in Human Resource Management*, Vol. 18 January, pp. 36-45.

Noor, K.M, Junoh, A.M., Hashim, M. & Mutalib, M.A. (2013), "Am I Happy with My Bosses? A Study on Satisfaction of Academics with the Role of Supervision of Their Leaders in the University Setting", *Al-'Abqari: Journal of Islamic Social Sciences and Humanities*, Vol. 3, pp. 33-44.

Noor, K.M. (2013). 'Job Satisfaction in Malaysia Public Higher Education Institutions', PhD Thesis, La Trobe University.

Noor, K.M., Othman, S.S., Mustafa, M.Z., Ahmad Sabri, S. and Ali, K. (2019), "The Effect of Gender, Age and Tenure on Satisfaction towards Co-Workers Among Academics in Malaysian Public Universities". *Al-'Abqari: Journal of Islamic Social Sciences and Humanities*. Vol. 20 No. 2, pp. 107-121.

Noor, K. M. (2020). "Nature of Work Satisfaction: The Differences in Gender, Age, Tenure and Management Position Among Academics in Malaysian Universities". *AL-'ABQARI: Journal of Islamic Social Sciences and Humanities*, Vol. 23 No. 2 (Dec. 2020), pp. 27-40.

Oluwatayo, A.A. (2015), "Employee architect's perception of human resource practices and their job satisfaction", *Built Environment Project and Asset Management*, Vol. 5 No. 1, pp. 89-102.

Pagan, R. & Malo, M. (2021), "Performance Appraisal and Job Satisfaction for Workers Without and With Disabilities by Gender", *Social Indicators Research,* Vol.153, pp.1011–1039. DOI: https://doi.org/10.1007/s11205-020-02524-3.

Pallant, J. (2010), *SPSS survival manual: a step by step guide to data analysis using SPSS*. Maidenhead: Open University Press/McGraw-Hill.

Park, H. J., Mitsuhashi, H., Fey, C. F., & Björkman, I. (2003), "The effect of human resource management practices on Japanese MNC subsidiary performance: A partial mediating model", *The International Journal of Human Resource Management*, Vol. 14 No. 8, pp.1391–1406.

Paşaoğlu, D. & Tonus, H.D. (2014), "Strategic Importance of Human Resource Practices on Job Satisfaction in Private Hospitals", *Procedia - Social and Behavioral Sciences*, Vol. 150 No. 2014, pp. 394-403.

Paul, A. K., & Anantharaman, R. N. (2003), "Impact of people management practices on organizational performance: Analysis of a causal model", *The International Journal of Human Resource Management*, Vol. 14 No. 7, pp. 1246–1266.

Pfeffer, J., & Veiga, J. F. (1999), "Putting people first for organizational success", *The Academy of Management Executive*, Vol. 13 No. 2, pp. 37–48.

Robbins, S.P. & Coulter, M. (2018), *Management*, New York: Pearson.

Rogg, K. L., Schmidt, D. B., Shull, C., & Schmitt, N. (2001), "Human resource practices, organizational climate, and customer satisfaction", *Journal of Management*, Vol. 27 No. 4, pp. 431–449.

Rosdi, I.S. & Harris, H. (2011), "Human Resource Management Practices and Organizational Commitment: The Case of Academics in a Malaysian Higher Education Institution", *International Conference on Business and Economic Research (2nd ICBER 2011) Proceeding*, pp.1155-1173.

Saifalislam, K.M., Osman, A. & AlQudah, M.K. (2014), "Human Resource Management Practices: Influence of recruitment and selection, and training and development on the organizational performance of the Jordanian Public University", *IOSR Journal of Business and Management*, Vol. 16 No. 5, pp. 43-46.

Sekaran, U. & Bougie, R. (2016), *Research Methods for Business, A Skill-Building Approach*, West Sussex, John Wiley & Sons Ltd.

Tangthong, S. & Agahi, H. (2018), "The Effects of Human Resource Management Practices on Employee Service Quality in Thailand's Chained-Brand Hotels", *IOSR Journal of Business and Management*, Vol. 20 No. 3, pp. 56-71.

Tsang, S., Royse, C. F., & Terkawi, A. S. (2017), "Guidelines for developing, translating, and validating a questionnaire in perioperative and pain medicine", *Saudi journal of anaesthesia*, Vol.11 No. 1, pp. 80-89.

Wahjono, S.I., Marina, A., Perumal, S.D. & Wardhana, A. (2016), "The Impact of Performance Appraisal on Job Satisfaction with Quality of Supervisor-Employee as a Moderating variable at State Owned Company", *International Journal of Advanced Scientific Research & Development*, Vol. 3 No. 4, pp. 224–237.

Yu, J., Montez A.A., Perlinas, F.H., Munoz, A.V. & Han, H. (2020), "Hotels' Eco-Friendly Physical Environment as Nature-Based Solutions for Decreasing Burnout and Increasing Job Satisfaction and Performance", *International Journal of Environmental Research and Public Health*, Vol.17 No. 6357, pp. 1-17.

Zain, N.M., Aspah, V., Mohmud, N.A., Abdullah, N. & Ebrahim, M. (2017), "Challenges and Evolution of Higher Education in Malaysia", *International Journal of Islamic and Civilizational Studies*, Vol. 4 No.1–1, pp. 78–87.

PRELIMINARY STUDY ON THE USE OF MAGNETIZE Fe_3O_4-ZrO_2 CATALYST FOR BIODIESEL PRODUCTION

Nurul Jannah Abd Rahman [I], Afifah Mardhiah Zoolcaphly [ii,] Farah Wahida Harun [iii] & Salina Mat Radzi [iv]

[i] Pusat Tamhidi, Universiti Sains Islam Malaysia. jannahrahman@usim.edu.my
[ii] Fakulti Sains dan Teknologi, Universiti Sains Islam Malaysia. afifahmardhiah20@gmail.com
[iii] Fakulti Sains dan Teknologi, Universiti Sains Islam Malaysia. farahw@usim.edu.my
[iv] Fakulti Sains dan Teknologi, Universiti Sains Islam Malaysia. salina@usim.edu.my

Abstract

Plant oil as second generation biofuel especially waste cooking oil has been found to simplify the shortcomings experienced by its predecessors. However, high free fatty acid content represents the major limitation which requires the waste cooking oil to undergo a two-step process to produce biodiesel. As an alternative, in this study, Fe_3O_4-ZrO_2 catalysts were developed for simultaneous esterification–transesterification of waste cooking oil to biodiesel. The magnetic function of Fe_3O_4 has the advantage in the separation process, avoid the loss of catalyst and increase its reusability. First, Fe_3O_4 was synthesized using co-precipitation method where $FeSO_4.7H_2O$ and $FeCl_3.6H_2O$ were combined in deionized water to form black precipitate. Then, the precipitate was dried at 40°C for 24 hours. The Fe_3O_4-ZrO_2 catalysts were further synthesized using various Fe_3O_4 loadings (10-30 wt.%) via incipient wetness impregnation method, dried at 120 °C followed by calcination at 700 °C for 5 hours. All catalysts were characterized using Thermogravimetric Analysis (TGA) for degradation behaviour and Fourier Transform Infrared Spectroscopy (FTIR) to detect the functional groups presence. It was found that the highest biodiesel yield was achieved by 20Fe-Zr catalyst using 12:1 methanol to oil ratio and 10wt% catalyst loading at 60°C for 7 hours.

Keywords: *Biodiesel, waste cooking oil, magnetize catalyst, transesterfication.*

INTRODUCTION

Concerns over finite supply of fossil fuel and rapid fossil fuel price in 2007-2008 has stimulated interests in biodiesel. Doherty (2012) predicted the fossil fuel that generate into oil will run out by 2052, gas by 2060 and coal will last till 2090. Research on the use of alternative energy has escalated tremendously and shows a bright future for the replacement of conventional fossil fuel. This makes biodiesel an interesting renewable energy resource as compared to petroleum diesel which takes millions of years to regenerate from the decay of animals and plants.

High consumption of petroleum diesel can generate high production of carbon monoxide emissions into environment as compared to biodiesel (Shahir et al., 2015). High carbon monoxide emissions can lead to air pollution, greenhouse effects and global warming (Levy, 2015). Therefore, the use of biodiesel should be highlighted to reduce the pollution to nature. Biodiesel or fatty acid methyl ester (FAME) is a promising alternative energy as it has similar properties to petroleum

diesel. Also, it is non-toxic, biodegradable and has a low concentration of sulphur, carbon monoxide and carbon dioxide (Huang et al., 2012).

In the production of biodiesel, the selection of feedstock is vital as it determines the final biodiesel processing cost. Interestingly, biodiesel can be produced from waste cooking oil (WCO) using suitable catalyst and reaction conditions. Using WCO for biodiesel production has a dual advantage which is an effective way to reduce the production cost of biodiesel and reduce environmental pollution problems due to the disposal of the WCO. Transferring the WCO into processing equipment that can change it into a new valuable product is far better than channelized it into the sewage system in which can cause water pollution (Mandolesi de Araújo et al., 2013).

Generally, homogeneous catalysts are used in the production of biodiesel via transesterification process. However, the use of homogeneous catalysts leads to several problems such as soap production, reactor corrosion, difficult to recover and produce large amounts of wastewater. All of these drawbacks can increase the overall cost of biodiesel production. Therefore, the use of heterogeneous catalyst is promising to overcome the drawbacks associated with the homogeneous catalysis process.

Other challenges of using heterogeneous catalyst is the catalyst recovery after the transesterification for reuse potential. Successful of the catalyst recovery is important from both the economic and the environmental point of view. Fe_3O_4-ZrO_2 was selected as the potential heterogeneous catalyst in this study due to its amphoteric character to simplify the reaction process as well the magnetize properties of the catalysts which enable them to be recovered easily after completion of the process by using a magnet.

METHODOLOGY
1. Characterization of Feedstock
The WCO was collected from café around Universiti Sains Islam Malaysia where it was used for frying purpose. WCO was washed with hot water and filtered to remove salt and undissolved materials. The oil was further dried in oven at 110˚C for 24 hours. The properties of WCO such as acid value (Santos et al., 2018) and saponification value (Tan et al., 2013) were determined experimentally following the standard test methods. The average molecular weight of WCO was calculated using the following formula:

$$Average\ molecular\ weight = 56.1 \times 1000 \frac{3}{SV - AV}$$

Where,
SV = Saponification value (AOCS method Cd 3a-94)
AV = Acid value (European Standard EN 14104)

2. Synthesis of Fe₃O₄-ZrO₂ Based Heterogeneous Catalyst

Ferric oxide nanoparticles were developed using co-precipitation method. $0.02M$ $FeSO_4.7H_2O$ and $0.01M$ $FeCl_3.6H_2O$ were mixed in 60 ml of deionized water to preserve the 2:1 ratio. The solution was sonicated for 30 min at $65°C$. In 100 ml of deionized water, 4M NaOH was prepared and put into the ferum solution drop by drop until the pH achieved 13, resulting in black precipitate. The flask was then sealed, and the reaction was allowed to run for an hour in the sonicator at $65°C$. After the reaction was finished, the mixture was allowed to cool at room temperature before being centrifuged for 8 minutes at 10000 rpm. The supernatant was removed, but the black precipitate was retained. The resulting precipitate was washed several times with deionized water and ethanol. Finally, the precipitate was dried in a $40°C$ oven for 24 hours (Yadav et al., 2020). The Fe_3O_4-ZrO_2 catalyst was then produced using incipient wetness impregnation process. The estimated quantity of ferric oxide, corresponding to 10, 20, and 30 wt.% Fe_3O_4, was dissolved in deionized water, and the needed amount of ZrO_2 was slowly added into the solution, which was agitated at 100 rpm for 5 hours. Water was then removed from the catalyst by drying it in an oven at $110°C$ for 5 hours before it was calcined at $700°C$ in a furnace for 5 hours.

3. Characterization of Catalyst

The heat stability and degradation behaviour of the catalysts were determined using thermogravimetry analysis (TGA). TGA was done on a Mettler Toledo from room temperature to $700°C$ at a heating rate of $10°C$ min^{-1} using N_2 gas flow of 20 mL min^{-1}. Fourier Transform Infrared Spectroscopy (FTIR) was used to capture the functional group and chemical bonds in a molecule by creating an infrared absorption spectrum using the Nicolet -iS50 model.

4. Screening of Catalyst Performance

Transesterification was carried out in a 100 mL three-neck glass flask provided with a water-cooling condenser and thermometer. Initially, the transesterification was tested using all of the synthesized catalysts in order to discover the most active catalyst for this procedure. The reaction parameters were 12:1 methanol to WCO ratio, 10 wt.% catalyst loading, and 3 hours at 60°C with continual stirring at 350 rpm.

The transesterfication was further optimized using the most active catalyst via standard one-factor-at-a-time (OFAT) method with various catalyst loading (10, 20, 30 wt.%) and reaction periods (3, 5, 7 h) with continual stirring. The methanol to WCO ratio and reaction temperature were set at 12:1 and 60°C, respective. The agitation speed was kept constant at 350 rpm.

After the reaction has been completed, the top layer containing FAME will be collected and washed with warm water and ethanol to eliminate saponified by-products. This equation was used to determine the percentage yield of biodiesel:

$$biodiesel\ yield\ (\%) = \frac{weight\ of\ biodiesel}{weight\ of\ oil} \times 100$$

RESULTS AND DISCUSSION

1. Characterization of Feedstock

WCO is regarded as one of the best feedstocks for the synthesis of biodiesel since its cetane number, diesel index, viscosity, specific gravity, pour point, cloud point, and other fuel properties studied were equal to those of virgin oil (R U et al., 2011). The qualities of WCO as a feedstock for biodiesel synthesis were assessed in this study based on acid value and saponification value, as well as its average molecular weight, as indicated in Table 1.

Table 1: The properties of selected waste cooking oil.

Property	Unit	Value
Acid value	mg KOH/g	1.6238
Saponification value	mg KOH/g	221.0184
Average molecular weight	g/mol	767.1109

The acid value of the WCO was 1.6238 mg KOH/g, confirming the existence of free fatty acid content (0.81%) in the oil. Free fatty acid is a chemical compound generated from waste cooking oil. A high content of free fatty acid promotes saponification and a poor percentage yield of biodiesel. Furthermore, a large concentration of free fatty acid will enhance viscosity. The maximum FFA value needed in biodiesel is only 0.05 mgKOH/g (Yaakob et al., 2013). The saponification value was discovered to be 221.0184 mg KOH/g. The obtained saponification value is more than the 198 mg KOH/g given by Alias et al (2018). In biodiesel, the maximum saponification value necessary is 312 mgKOH/g. The lower the saponification value, the less suitable the oil is for creating soap, which is beneficial for biodiesel processing. The WCO has an average molecular weight of 767.1109 g/mol that had been calculated by using SV and AV.

2. Characterization of Catalyst

TGA is critical technique for determining the decomposition temperature and thermal stability of the catalysts. Figure 1 shows the TGA curves of ZrO_2, 10Fe-Zr, 20Fe-Zr and 30Fe-Zr catalysts. TGA data show that all of the catalysts are thermally stable up to 700°C. Sulaiman (2020) reported similar results, reporting that the thermogravimetric curve showed practically constant sample weight after 700°C, suggesting that $Fe/Ba/Al_2O_3$ catalysts had completely dissolved, giving pure metal

oxide. As a result, a calcination temperature of 700°C was discovered to be sufficient for employing Fe_3O_4-ZrO_2 catalyst, which may improve the transesterification process.
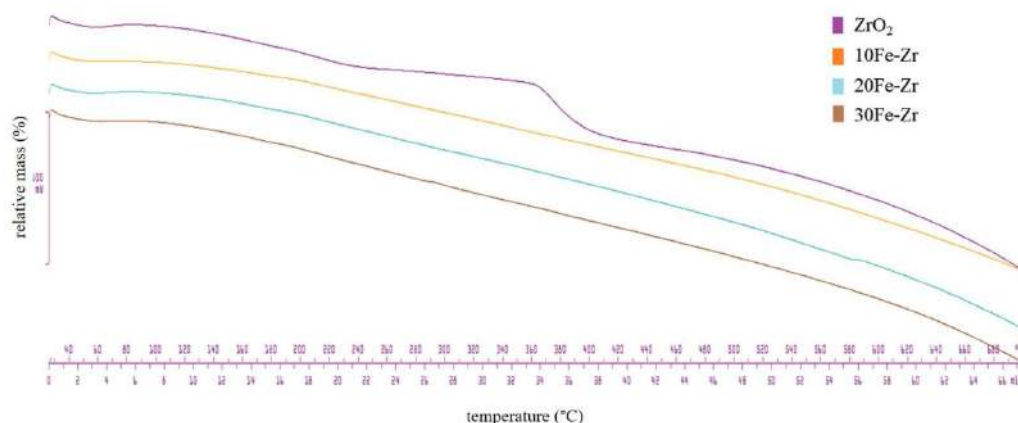
Figure 1: TGA curves of synthesized catalysts.

FTIR is used to detect the functional groups presence in the compound. Figure 2 shows the FTIR curves of 10Fe-Zr, 20Fe-Zr, 30Fe-Zr, $FeCl_3.6H_2O$ and $FeSO_4.7H_2O$. Corresponding to FTIR results two broad peaks at 3682.12 cm^{-1} and 988.88 cm^{-1} which attributed to the sulphate ($FeSO_4.H_2O$) group and three broad peaks at 3249 cm^{-1}, 1633 cm^{-1} and 739 cm^{-1} which attributed to the chloride ($FeCl_3.6H_2O$) group, respectively, were lost after calcination. The FTIR spectra of Fe_3O_4 exhibited intense peaks between 580 and 630 cm^{-1}, which attributed to the stretching vibration mode associated with the bonds of Fe-O in the Fe_3O_4 crystal lattice. Further the absorbance peak present at 628 cm^{-1} could be attributed to the Zr–O bond (metal and oxygen bond) which generally represented the presence of ZrO_2 particles. From the result we can see that there are no sulphate and chloride peaks observed in the catalyst samples after calcination at 700°C. This shows that Fe-Zr was produced as a metal and oxygen bond without other materials. The Fe-Zr catalysts used is also safe from the occurrence of unwanted reactions that will hinder the esterification and transesterification process in the production of biodiesel.
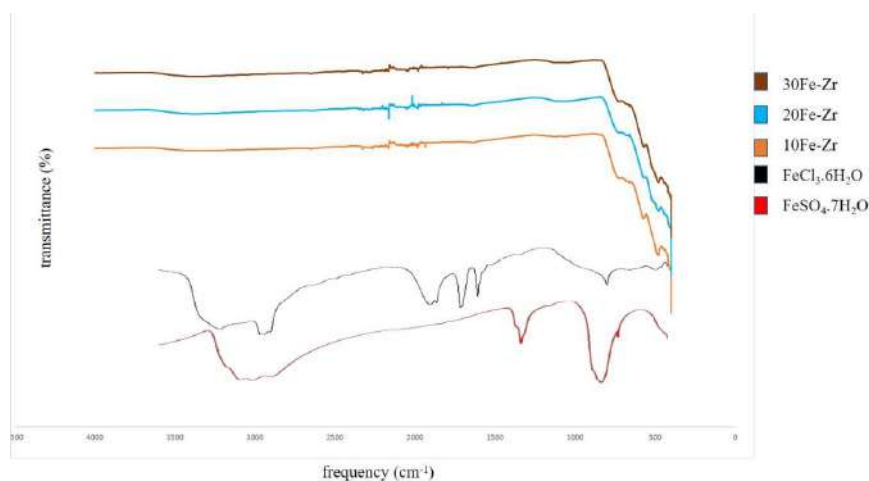
Figure 2: FTIR spectra of the synthesized catalysts.

3. Screening of Catalyst Performance

The synthesized catalysts were then employed in the transesterification of WCO to make biodiesel. Figure 3 compares the catalytic performance of Fe-Zr catalysts and single ZrO_2 under fixed reaction conditions, 12:1 methanol to oil ratio and 10% catalyst loading at 60°C for 3 hours with continual stirring at 350 rpm. As can be seen, the percentages yield of biodiesel are 2.66, 2.53, 4.04, 1.87 for ZrO_2, 10Fe-Zr, 20Fe-Zr and 30Fe-Zr catalysts, respectively. The results show that the mixed oxide catalyst of 20Fe-Zr possess higher biodiesel yield than single ZrO_2. Sun et al. (2010) found that the strong catalytic performance of the catalysts is due to sites situated between the various oxides. Umdu et al. (2009) discovered that CaO and MgO were not active for transesterification when using similar biodiesel feedstock. However, when a mixed oxide catalyst of 80 wt.% CaO/Al2O3 was used with a methanol to WCO molar ratio of 30, 97.5% biodiesel production was obtained. The researchers noted that using a mixed oxide catalyst enhanced not only the basic site density but also the basic strength of the catalyst for high biodiesel conversion. Thus, in the subsequent experiment 20Fe-Zr catalyst was selected in the synthesis of biodiesel.
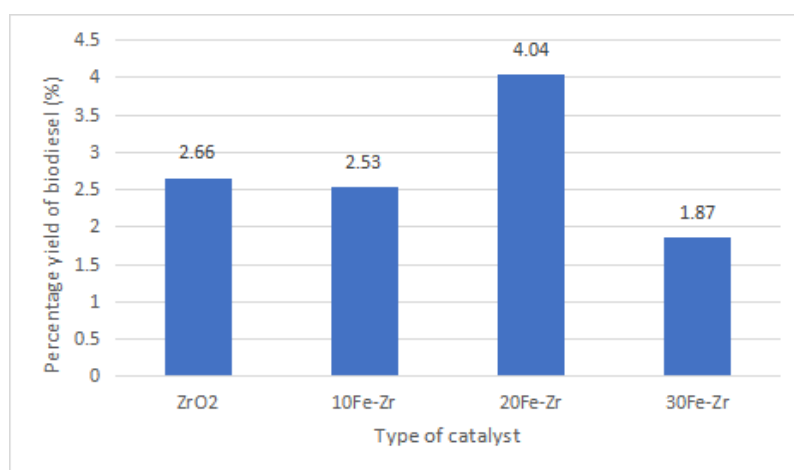
Figure 3: Biodiesel yield using different synthesized catalysts.

39

Understanding the individual influence of process factors is critical for optimising reaction conditions and achieving the intended outcome in both qualitative and quantitative terms. Based on the outstanding performance of the 20Fe-Zr catalyst, it was chosen for additional optimization studies in order to create a high percentage yield of biodiesel utilising the classic one-factor-at-a-time (OFAT) technique with varying catalyst loading and reaction periods. The methanol to WCO ratio was specified at 12:1 and the reaction temperature was set to 60 °C.

The effect of varying catalyst loadings on the percentage yield of biodiesel employing 20Fe-Zr as the catalyst is shown in Figure 4. The results indicate that increasing the amount of catalyst from 10 to 30 wt.% produces a drop in biodiesel yield. A significant quantity of catalyst is required to produce enough active sites for full transesterification. A high concentration of catalyst, on the other hand, may produce agglomeration of the catalyst particles. This issue may lead to a stagnant mass transfer rate, hindering biodiesel production and produce lower percentage yield of biodiesel. Similar study was found by Agarwal et al. (2012) using KOH-alumina catalyst. The higher the amount of catalyst in the same amount of oil and methanol, the more concentrated the solution in terms of catalyst, resulting in poor mixing at the same agitation speed, which may cause some amount of catalyst to remain unused due to increased mass transfer resistance which lead to low conversion.
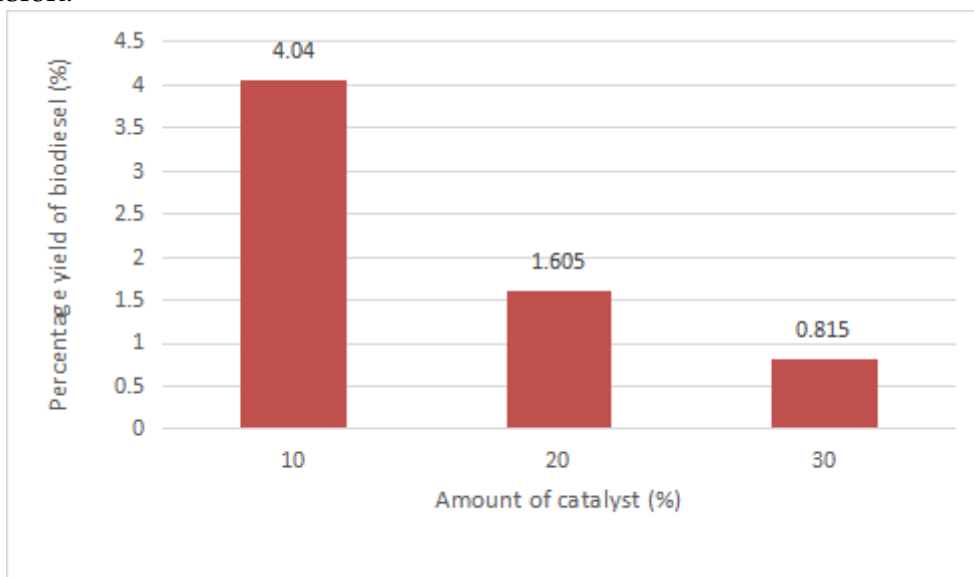
Figure 4: Effect of catalyst loading on percentage yield of biodiesel. The reaction was carried out using 12:1 methanol to WCO ratio at 60 °C reaction temperature for 3 hours.

Reaction time is an important characteristic to produce high percentage yield of biodiesel in a short amount of time and, as a result, decrease process cost, especially in large-scale production. Figure 5 shows the influence of reaction time on percentage yield of biodiesel. As can we see from the results obtained, increasing the duration causes an increase the percentage yield of biodiesel. Basically, increasing the reaction times will increase the frequency of collision between catalyst and

substrate molecules in the mixture which lead to high formation of interest products. This is obvious from the data, as the percentage yield of biodiesel was increased slightly from period of 3 to 7 hours to give an optimal point of 4.855%. A prolonged reaction time at high temperatures may cause methanol evaporation and diminish the mass transfer rate, lowering the percentage yield of biodiesel. Nizah et al. (2014) discovered a poor biodiesel yield at 3 hours reaction time while producing biodiesel from Jatropha curcas using a Bi_2O_3-La_2O_3 catalyst. It was due to the lack of period for the methanol to mix and disseminate into the oil. Similarly, a maximum percentage yield of biodiesel was produced after 4 hours of reaction time, despite the higher reaction temperature of 150 °C compared to this investigation. In this study, the maximum biodiesel yield of 4.855% was achieved using 12:1 methanol to WCO ratio and 10 wt% 20Fe-Zr catalyst at 60 °C reaction temperature for 7 hours.
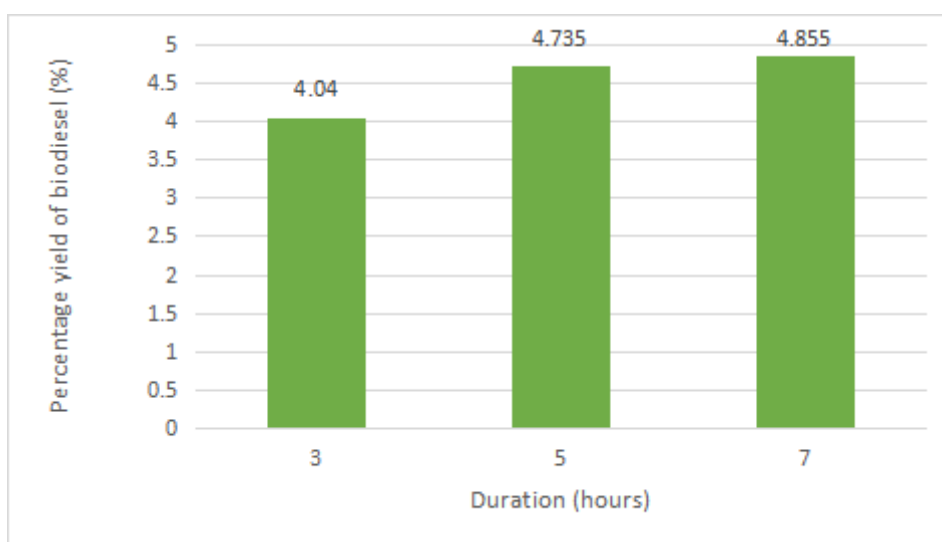
Figure 5: Effect of reaction time on percentage yield of biodiesel. The reaction was carried out using 12:1 methanol to WCO ratio and 10 wt% 20Fe-Zr at 60 °C reaction temperature.

In the current study, even though the biodiesel did not achieve a high percentage yield (>90%) of biodiesel, the synthesized catalyst has magnetic properties which enable them to be recovered easily after completion of the process by using a magnet. Figure 6 shows the magnetize properties of synthesized 20Fe-Zr.

Figure 6: The magnetize properties of synthesized 20Fe-Zr catalyst.

CONCLUSION

Biodiesel was succesfully synthesized from WCO using Fe_3O_4-ZrO_2 as heterogeneous catalysts. It was found that the mixed oxide catalysts exhibited better catalytic activity compared to the single ZrO_2, where 20Fe-Zr presented the superior catalytic activity (4.04%) for the synthesis of biodiesel. The maximum biodiesel yield achieved was 4.855% using 12:1 methanol to WCO ratio and 10wt% catalyst loading at 60°C for 7 hours.

ACKNOWLEDGEMENTS

REFERENCE

Agarwal, M., Chauhan, G., Chaurasia, S. P., & Singh, K. (2012). Study of catalytic behavior of KOH as homogeneous and heterogeneous catalyst for biodiesel production. *Journal of the Taiwan Institute of Chemical Engineers*, 43(1), 89–94.

Doherty, J. (2012). Fossil fuels: Examination and prediction of future trends (Doctoral dissertation, Ohio State University).

Huang, D., Zhou, H., & Lin, L. (2012). Biodiesel: An alternative to conventional fuel. *Energy Procedia*, 16, 1874–1885.

Levy, R. J. (2015). Carbon monoxide pollution and neurodevelopment: A public health concern. *Neurotoxicology and Teratology*, 49, 31–40.

Mandolesi de Araújo, C. D., de Andrade, C. C., de Souza e Silva, E., & Dupas, F. A. (2013). Biodiesel production from used Cooking oil: A review. *Renewable and Sustainable Energy Reviews*, 27, 445–452.

R U, O., N A, O., & M K, A. (2011). Biodiesel from household/restaurant waste cooking oil (WCO). *Journal of Chemical Engineering & Process Technology*, 02(04).

Sahar, Sadaf, S., Iqbal, J., Ullah, I., Bhatti, H. N., Nouren, S., Habib-ur-Rehman, Nisar, J., & Iqbal, M. (2018). Biodiesel production from waste cooking oil: An efficient technique to convert waste into biodiesel. *Sustainable Cities and Society*, 41, 220–226.

Santos, E. P., De Souza, E. F., Ramos, T. C., Da Silva, M. S., & Fiorucci, A. R. (2018). Evaluation of potentiometric methods for acid number determination in commercial biodiesel samples and proposal of alternative method. *Orbital: The Electronic Journal of Chemistry*, 10(1).

Shahir, V. K., Jawahar, C. P., & Suresh, P. R. (2015). Comparative study of diesel and biodiesel on CI engine with emphasis to emissions—a review. *Renewable and Sustainable Energy Reviews*, 45, 686–697.

Sulaiman, N. F., Hashim, A. N., Toemen, S., Rosid, S. J., Mokhtar, W. N., Nadarajan, R., & Bakar, W. A. (2020). Biodiesel production from refined used cooking oil using co-metal oxide catalyzed transesterification. *Renewable Energy*, 153, 1–11.

Tan, H. W., Abdul Aziz, A. R., & Aroua, M. K. (2013). Glycerol production and its applications as a raw material: A Review. *Renewable and Sustainable Energy Reviews*, 27, 118–127.

Yaakob, Z., Mohammad, M., Alherbawi, M., Alam, Z. & Sopian, K. (2013). Overview of the production of biodiesel from waste cooking oil. *Renewable and Sustainable Energy Reviews*, 18, 184-193.

Yadav, V. K., Ali, D., Khan, S. H., Gnanamoorthy, G., Choudhary, N., Yadav, K. K., Thai, V. N., Hussain, S. A., & Manhrdas, S. (2020). Synthesis and characterization of amorphous iron oxide nanoparticles by the sonochemical method and their application for the remediation of heavy metals from wastewater. *Nanomaterials*, 10(8), 1551.

ANALYSIS ON STOCK MARKET BEHAVIOUR USING HARMONIC PATTERNS: THE CASE BULLISH STOCK PATTERN OF *SHARIAH-COMPLIANT CAPITAL MARKET*

Azrul Azim Mohd Yunus[i] Nur Laili Azman [ii] Safwan Ibrahim [iii] & Arif Asraf Mohd Yunus [iv]

[i] (*Corresponding author*). Faculty of Science and Technology, Universiti Sains Islam Malaysia. azrulazim@usim.edu.my
[ii] Faculty of Science and Technology, Universiti Sains Islam Malaysia. nur.laili@raudah.usim.edu.my
[iii] Faculty of Science and Technology, Universiti Sains Islam Malaysia. msafwan@usim.edu.my
[iv] Faculty of Science and Technology, Universiti Sains Islam Malaysia. arifasraf@usim.edu.my

Abstract

In this era of globalization, the investment sector in Malaysia such as investing in stocks is growing rapidly day by day. This involves not only businessmen, but also household investors in the stock market, and it has become very widespread in Malaysia. This is due to the transparency of publicly listed firms' reporting requirements, as well as the most comprehensive and sophisticated technology and software for online trading. The methodology that was used for this study focuses on the second data which is the historical stock price of 3 shariah-compliance companies. Harmonic pattern screening is being used for stock trend indicators. At the same time, Python coding is applied to form the harmonic pattern and compare the pattern with the extremes in real-time. The results demonstrate the behaviour of stock performance on the shariah-compliant capital market in Malaysia by using harmonic pattern analysis. Despite from that, this research uses a Python program to implement a bullish pattern that has five points and reads each of them as the value of an extrema, starting with point X and moving on to points A, B, C, and D. In addition, this analysis found that the most frequent pattern that has a higher possibility of occurring beyond of stock performance is the bullish bat pattern.

Keywords: *Harmonic Pattern, Python, Shariah-Compliance, Stocks, Stock Price.*

INTRODUCTION

The investment sector in Malaysia such as investing in stocks is growing rapidly day by day. This involves not only businessmen, but also household investors in the stock market, and it has become very widespread in Malaysia. This is due to the transparency of publicly listed firms' reporting requirements, as well as the most comprehensive and sophisticated technology and software for online trading. In addition, the benchmark Malaysian stock index has been able to almost completely recover its losses from a sell-off in March because to improvements in retail investor participation, according to data from the FTSE Bursa Malaysia KLCI Index (Lee, 2020). The performance of the Malaysia Stock Index will increase as more retail investors participate in the stock market, according to that article. Gerald Ambrose, chief executive of Aberdeen Standard Islamic Investments in Malaysia, previously stated that the presence of retail investors is actually a good thing. Market

forecasting provides excellent profit opportunities. Most researchers either apply technical analysis or fundamental analysis to forecast the market. Fundamental analysis relies on the analysis of unstructured textual data, such as financial news and earnings reports, whereas technical analysis concentrates on analysing price direction to forecast future prices. Important market data is increasingly becoming more widely accessible online. This paints a picture of the importance of text mining techniques for extracting important data to study market behaviours (Alzazah & Cheng, 2020).

Harmonic pricing patterns are which take numerical price patterns to the succeeding level by defining specific turning points using Fibonacci numbers (Dudella, 2010). Harmonic trading, unlike other more frequent trading approaches, aims to forecast future movements. Finding the market's pulse or rhythm, then taking advantage of its trading opportunities, is the process of harmonics. These harmonic sequences give us visual experiences that have a propensity to recur repeatedly. The Fibonacci sequence of numbers is formed by adding the preceding two numbers which are 0, 1, 1, 2, 3, 5, 8, 13, and so on. This pattern could then be divided into ratios, which, according to some, offer hints about the direction a particular financial market will take. The ratio of any number to the next higher number is 0.618, while the ratio of the next lower number is 1.618. In the mathematics world, these values are also known as ϕ (0.618) and Φ (1.618). The ratio of (1.618) is also referred to as the "The Golden Ratio." Stock markets experience selling pressure and extensions so frequently that Fibonacci retracements to ratios like 38.2 percent, 50 percent, or 61.8 percent have become common trading terms. These can be used to enhance entry and exit performance for trading. By applying this concept, a tool for analysing stock performance was developed, namely "harmonic pattern".

HARMONIC PATTERNS

Harmonic stock patterns seem to be ones that are made up of architectural elements toward the next threshold of stock price patterns by defining precise turning points with Fibonacci numbers (Mitchell, 2021). Harmonic trading, which is unlike more different trading approaches, tries to forecast future movements. A precise trading strategy based on the idea that patterns repeat themselves, harmonic trading combines arithmetic and patterns. The main ratio, or a derivation of it, is central to the process (0.618 or 1.618). The ratios 0.382, 0.50, 1.41, 2.0, 2.24, 2.618, 3.14, and 3.618 are complimentary (Mitchell, 2022). The primary ratio is present in almost all man-made structures, as well as in the environments and natural functions and occurrences. The ratio may be observed on the stock prices, that are sometimes stimulated by the surroundings and cultures in which they operate and trade, because the pattern is repeated including both civilization and natural. As a result, among technical traders, the bat, crab, and Gartley harmonic patterns are some of the most well-liked.

The behaviour of financial market time series, particularly the stock market, has posed a difficult study environment in the past few years. Price fluctuations in the stock market have been identified as a complicated system and characterized as a temporally chaotic time series (Souza et al., 2021). To address the cognitive gaps in this crucial field of knowledge, first they define the morphological properties of the most prevalent harmonic patterns, followed by a discrete parameterization that allows any harmonic pattern to be assigned an integer. Then, using a basic method based on a parameter for recognizing peaks and values of price waves, they look for harmonic patterns in various currency zones, taking into account the frequency with which they occur. Their research shows that only one of the popular patterns has a likelihood of occurrence beyond the trivial, while also identifying the most common patterns in the classification they established.

It was stated in the study "Harmonic Pattern Trading" (Duddella, 2010) that financial markets exhibit natural stagnation and flow patterns that relate to the market's expansion and recession stages. These natural cycles correspond to harmonic price behaviour in the financial markets. This harmonic phenomenon occurs practically everywhere in life and is typically caused by particular harmonic patterns. Recognition of the key to price swings is facilitated by ratios of Fibonacci to discover important reversal points and levels in harmonic pattern detection. Each price swing contains of extreme and short prices with some many levels in between, followed by an alteration rotation consisting of the same high and low prices but in the reverse way (Duddella, 2010). If the preceding movement was an upswing, the downswing that follows is known as a reverse swing or retracement. A high movement occurs when the previous high threshold is preceded and followed by a lower-high bar, which leads to a low price (Duddella, 2010). In shorts, figure 1 shows examples on types of harmonic patterns that can be obtained.
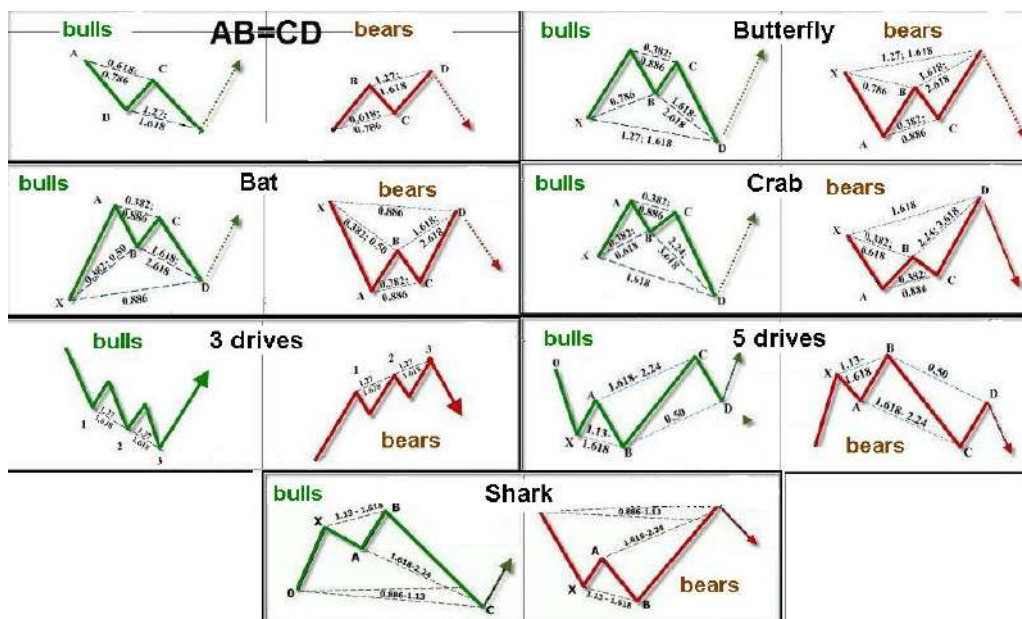
Figure 1: Types of Harmonic Patterns (retrieved from Forex Factory)

FIBONACCI NUMBER AND GOLDEN RATIO

The ratios will be discussed and summarized from the standpoint of stock markets. Keep the 1.618 in mind considering that it is currently the one of the two parameters that this analysis will employ when trading. There are numerous variations of the numbers 1.618 and 0.618. The ratios and their calculations are listed in Table 1.

Table 1: Golden Ratio Calculation

Ratio	Calculation
0.382	$(0.618)^2$
0.500	Half of an observation
0.618	Reciprocal of Fibonacci Golden Ratio
0.786	$\sqrt{0.618}$
0.886	$\sqrt{(\sqrt{0.618})}$
1.130	$\dfrac{1}{0.886}$
1.618	Fibonacci Golden Ratio
2.240	$1.618 + 0.618$

This study can identify the harmonic pattern from an attempt to find a confluence of perfect ratios based on these ratios. According to this study, many patterns contain ratio intervals, which makes them hazy and overlapping. The only complex pattern that employs only the perfect ratio, with the first leg retracing 61.8 %, the second leg retracing 161.8 %, the third leg retracing 161.8 %, and the final retracement being 224.0 %, which is the sum of the golden ratio (161.8 %) and its reciprocal (61.8 %). To have a solid confidence on the trade, this study like to employ this ratio in conjunction with technical indicators or long-term moving averages.

DATA ANALYSIS USING PYTHON

Stock markets have been working on the digital paradigm since the dawn of Information Technology, according to Vignesh CK (2016) in his study "Applying Machine Learning Models in Stocks Market Prediction." The core of this programme is Artificial Neural Networks, which serve as mathematical function approximators. The feed forward network is a widely used ANN for this purpose. There are also back propagation networks to consider. To modify the weights in the model, they use the backward propagation of errors approach (Vignesh, 2020). His research illustrated how machine learning may be used to solve stock prediction challenges. Past stock data was used to train the model so that it could detect trends and patterns and, as a result, forecast data in the future. As a result, the study concluded that by including all of the parameters that affect stock performance into a neural network with proper data processing and filtering, a model that can more accurately predict stock market values can be constructed (Vignesh, 2020).

McKinney (2010) wrote the following study, "Data Structures for Statistical Computing in Python," which dealt with the practical challenges of working with data sets that are frequent in finance, statistics, and other related subjects. Pandas is a new library that promises to make working with huge data sets easier while also providing a foundation for creating statistical models. Wes McKinney (2010) continues by speculating on the future of statistical computing and data analysis using Python (McKinney, 2010).

According to (Reddy, 2018), it stated that One of the most important activities in the financial sector is stock trading. A form of investment transaction is the performance of trying to predict the future financial performance of the company or other equity securities buy and sell on a financial markets. Their paper explains how Artificial Intelligence (AI) can be used to predict stock prices. When making stock predictions, most stockbrokers use fundamental and technical indicators in conjunction with analyses of time series (Reddy, 2018). Python is the software development language used to apply machine learning to predict the stock market. Throughout their study, they provide a software method that will be employed in order demonstrate how intelligence can be built from publicly available market data and then used to produce precise predictions (Reddy, 2018). Throughout this perspective, their work uses the Support Vector Machine (SVM) machine learning technique to forecast stock values for both small and large common stocks, as well as in three different markets, using daily and present-day prices.

Python is gaining popularity in the quant finance world (Kumar, 2021). Python's availability of adequate scientific libraries makes it simple to develop complicated statistical models. Some popular Python libraries are Pandas, NumPy, Matplotlib, Scikit-learn, Zipline, TA-Lib and more.

Nevertheless, the Python library that were used in this study are Pandas, NumPy, SciPy. Signal, argrelextrema, Matplotlib and pyplot. Python's prominence as a programming language comes in part from its acceptance by some of the domain's giants. Python's functional programming style makes it easy to create and analyse algorithmic trading structures. Python programming may be readily adapted to create dynamic trading algorithms.

PYTHON ALGORITHM

Python library that were used in this study are Pandas, NumPy, SciPy. Signal, argrelextrema, Matplotlib and pyplot. Python's prominence as a programming language comes in part from its acceptance by some of the domain's giants. Python's functional programming style makes it easy to create and analyse algorithmic trading structures. Python programming may be readily adapted to create dynamic trading algorithms. Meanwhile, this study discovered a list of Python code on GitHub which is a for profit website that provides a cloud-based Github repository as shown on sample code below:

```python
for i in range(0, len(price)):
```

```
        max_idx = list(argrelextrema(price.values[:i], np.greater, order=10)[0
        ])
        min_idx = list(argrelextrema(price.values[:i], np.less, order=10)[0])
        idx = max_idx + min_idx + [len(price.values[:i]) - 1]
        idx.sort()

    if len(idx) >= 5:
        current_idx = idx[-5:]
        start = min(current_idx)
        end = max(current_idx)
        current_pat = price.values[current_idx]
        XA = current_pat[1] - current_pat[0]
        AB = current_pat[2] - current_pat[1]
        BC = current_pat[3] - current_pat[2]
        CD = current_pat[4] - current_pat[3]

    if XA > 0 and AB < 0 and BC > 0 and CD < 0:
        err = 0.1
        ABr = np.array([0.618 - err, 0.618 + err]) * abs(XA)
        BCr = np.array([0.382 - err, 0.886 + err]) * abs(AB)
        CDr = np.array([1.27 - err, 1.618 + err]) * abs(BC)

    if ABr[0] < abs(AB) < ABr[1] and BCr[0] < abs(BC) < BCr[1] and CDr[0] < abs(
    CD) < CDr[1]:
        plt.plot(np.arange(start, end+100), price.values[start:end+100])
        plt.plot(current_idx, current_pat, c="r")
        plt.show()
```

RESULTS AND DISCUSSIONS

This paper will focus on the data of Malaysia stocks from FTSE Bursa Malaysia Kuala Lumpur Composite Index (FBMKLCI) and Shariah Advisory Council (SAC) of the Securities Commission (SC). These data consist of daily closing stock prices of ten top companies from 1st January 2017 to 31st December 2021. The data was collected from yahoo finance. The data will be used to construct the performances of the stock prices. This study also presents the interpretation data by using python in order to see the trend of harmonic patterns of the 10 stocks market with different sectors in Malaysia. Each type of pattern has their own Fibonacci ratio to determine and decide the stop loss especially when to hold or sell the stock.

Figure 2a shows stock price of AEON Co. Bhd went up from index 575 to 638 which is from 1.44 to 1.8. After that, the price gradually dropped. This called bullish performance of AEON Co. Bhd stock price. Meanwhile, figure 2b shows a bullish bat Harmonic pattern which is the red line and there have 5 points that Python program read them as values of extrema. Denoted as first point is point X, second point is point A, third point is point B, fourth point is point C and the last point is point D.

At the beginning, point X were rise to A, point B retrace 0.382 ratio to 0.50 ratio of line XA. Line BC retrace 0.382 to 0.886 of line AB. Then, line CD is 1.618 to 2.618 extension of AB. Point D is at 0.886 which is retracement of XA.
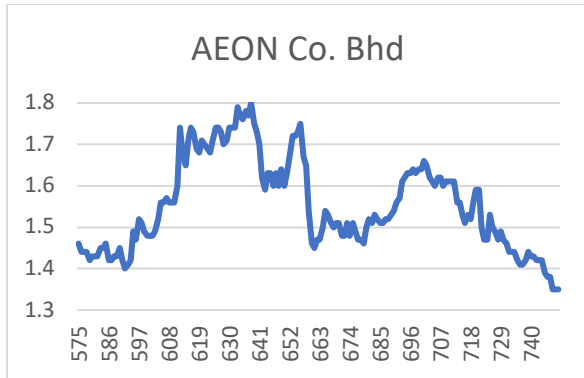
Figure 2a: Graph of Close price AEON Co. Bhd from index 575 to 740
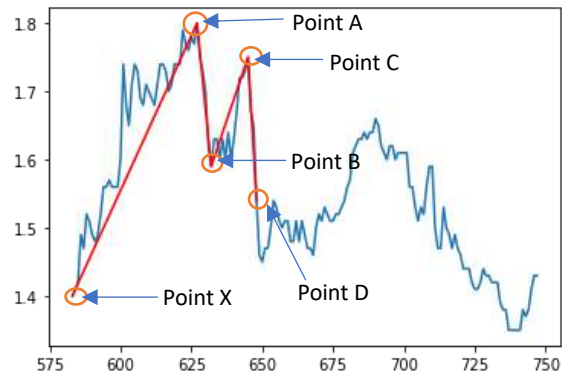
Figure 2b: Output Graph of Close price AEON Co. Bhd from index 575 to 750 from Python

Figure 3a shows the stock price of Petronas Chemical's Group Bhd gradually rose then it declined from index 650 to 845. Meanwhile, figure 3b shows a bullish crab Harmonic pattern which is the red line indicator. At the beginning, point B will pullback ratio of 0.382 to 0.618 of line XA. Line BC will retrace 0.382 to 0.886 of line AB. Then, line CD extends ratio 2.618 to 3.618 of AB. Point D is a 1.618 extension of XA.
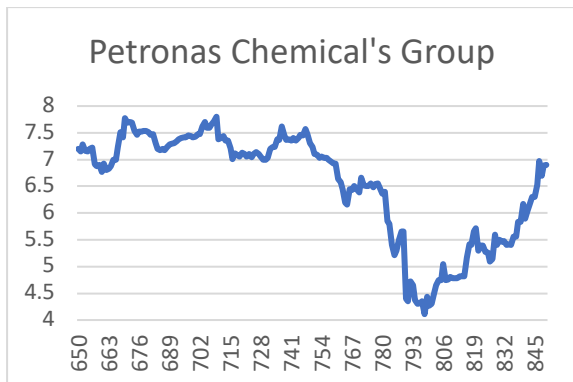
Figure 3a: Graph of Close price Petronas Chemical's Group Bhd from index 650 to 845
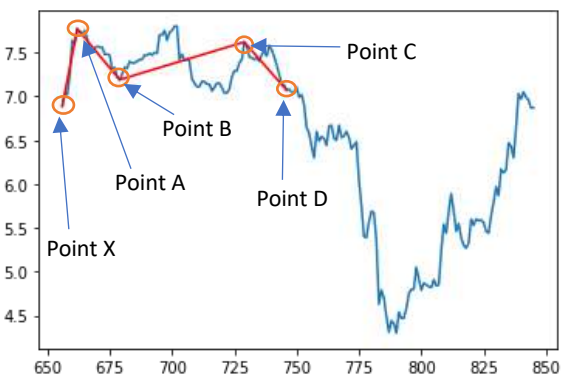
Figure 3b: Output Graph of Close price Petronas Chemical's Bhd from index 650 to 850 from Python

Lastly, Figure 4a displays Ranhill Utilities Bhd's stock price progressively growing until decreasing from index 50 to 245. Figure 4b demonstrates a bullish Gartley Harmonic pattern with red line markers. Price rises to point A, then corrects, with point B being a 0.618 retracement of line A. Price rises along line BC, which is a retracement of line AB from 0.382 to 0.886. The next stage is a down through line CD expansion of AB from 1.13 to 1.618. The 0.786 retracement of XA is shown by Point D. Line CD will attempt to increase the length of line AB from 1.27 to 1.618.
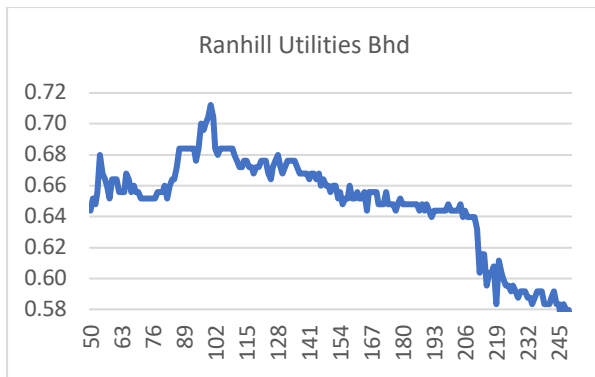
Figure 4a: Graph of Close price Ranhill Utilities Bhd from index 50 to 245
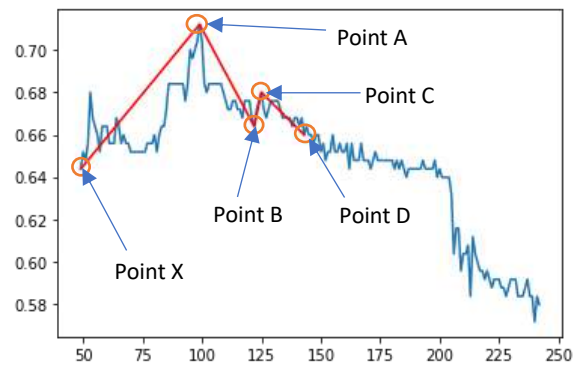
Figure 4b: Output Graph of Close price Ranhill Utilities Bhd from index 50 to 250

CONCLUSION

This study aims at two objectives which were to execute the special characteristic of stock performance in python and to identify the frequent patterns that has the probability of occurrence beyond the stock performance. As stated before, this research aims 3 *shariah*-compliance companies in a different sector to see their stock performance within 5 years which is from 1st January 2017 to 31st December 2021. From this time frames, we interpret the data by using python on Google Colab with the package that was provided such as matplotlib, Numpy, Scipy.Signal, argrelextrema and pyplot.

Despite from that, this research executes the characteristic of bullish pattern on python program which is there have 5 points and read them as values of extrema starting from point X, point A, point B, point C and lastly point D. Other than that, this study also identified that bullish bat pattern as the most frequent pattern that has greater probability of occurrence beyond the stock performance. Thus, this show that golden ratio can be applied on stock market analysis by applying Harmonic pattern.

For the recommendation for future research, there may have the other method to study the stock performance behaviour such as by using candlestick method, moving average method and more.

REFERENCE

Alzazah, F.S., & Cheng. (2020). *Recent Advances in Stock Market Prediction Using Text Mining: A Survey.* Retrieved from Chapter Metrics Overview: https://www.intechopen.com/chapters/72381

Duddella, S. (2010). Harmonic Pattern Trading. *Surinotes.com*, 236-250.

Lee, Y.N. (2020). *Retail investors with 'money to play with' help Malaysian stocks recoup nearly all losses this year*. Retrieved from CNBC: https://www.cnbc.com/2020/08/26/malaysian-retail-investors-pile-into-stocks-help-market-recoup-losses.html

Kumar, H. (2021). *How is Python Used in Quantitative Finance*. Retrieved from How Is Python Used In Quantitative Finance? (easemybrain.com)

McKinney, W. (2010). *Data Structures for Statistical Computing in Python*. PROC. OF THE 9th PYTHON IN SCIENCE CONF, 56-61.

Mitchell, C. (2021). *Harmonic Patterns in the Currency Markets*. Retrieved from https://www.investopedia.com/articles/forex/11/harmonic-patterns-in-the-currency-markets.asp

Mitchell, C. (2022). *Fibonacci Retracement Levels*. Retrieved from https://www.investopedia.com/terms/f/fibonacciretracement.asp

Reddy, V. K. (2018). *Stock Market Prediction Using Machine Learning*. Academia, 1032-1035.

Souza, L. C., Ribeiro, V. S., Suarez, D. F. (2021). An Analysis of Harmonic Patterns in the Time Series of the Forex Market. *Latin American Journal of Development*, 1688-1704

Vignesh C. K. (2020). *Applying Machine Learning Models In Stock Market Prediction*. EPRA International Journal of Research and Development (IJRD), 395-398.

COMPARISON BETWEEN PARAMETRIC MORTALITY MODELS FOR OLD AGE MORTALITY IN MALAYSIA

Nur Idayu Ah Khaliludin[i] Norrlaili Shapiee [ii] & NurLiyana Juhan [iii]

[i] (*Corresponding author*). Universiti Sains Islam Malaysia. nuridayu@usim.edu.my
[ii] Universiti Sains Islam Malaysia. norrlaili@usim.edu.my
[iii] Universiti Malaysia Sabah. Liyana87@ums.edu.my

Abstract

An Unexpected increase in life expectancy and low mortality rates for old people has lead Malaysia to be an ageing nation. As the ageing issue has gained prominence as mortality rates, study on the mortality rates and modelling these rates is significant so that the government and private sectors can prepare immediately and adequately for the specific needs of the aged such as the health care and retirement plan. However, modelling the mortality rates for old age is challenging as the mortality data often exhibit irregular patterns due to randomness and uncertainties. Several mortality models have been formulated to model the death rates. This research applies seven mortality models to the Malaysian mortality data from the years 2010 to 2016. The results show that the model established by Khaliludin et. al (2021) significantly improves Malaysian mortality estimation for old age in terms of accuracy and prediction performance, as well as its ability to capture important mortality features such as accident hump, mortality crossover, and deceleration of mortality at old ages.

Keywords: *Mortality model, Ageing, Parametric, Survival model.*

INTRODUCTION

The population for every country is inevitably ageing. Population ageing is defined as an increasing proportion of older people out of the total population (United Nations, 2020). As reported by the Department of Statistics Malaysia (2020) in the "Key Findings Population and Housing Census of Malaysia 2020", Malaysia is expected to experience an ageing population in 2030. As a matter of fact, four states have become the ageing states in 2020 which include Perak (8.9%), Kedah (7.9%), Perlis (7.9%) dan Sarawak (7.5%) (Department of Statistics of Malaysia, 2022).

This increment has changed the Malaysian population age structure from a progressive population pyramid to a regressive population pyramid. The population pyramids in 1957 and 2010 are shown in Figure 1.
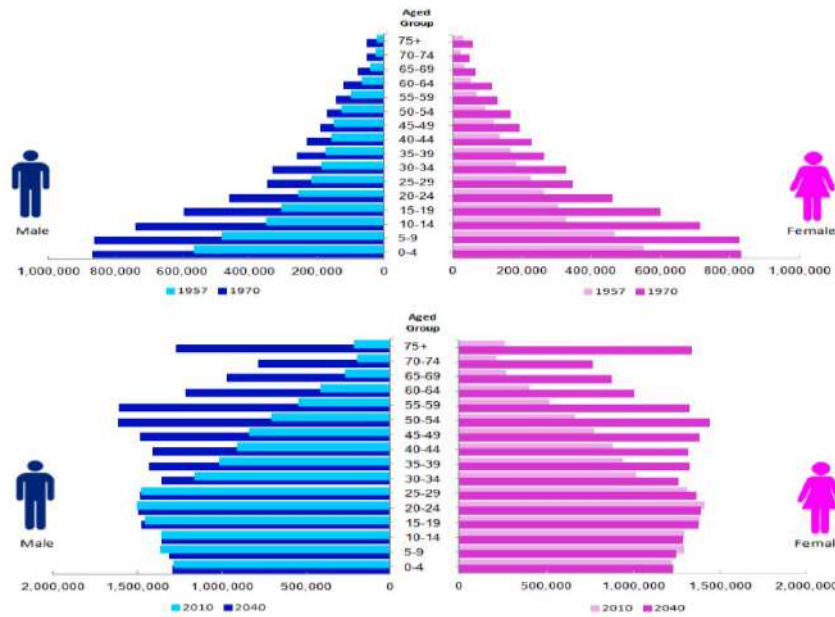
Figure 1 Population age structure in 1957, 1970, 2010 and 2040 for males and females in Malaysia.

Figure 1 shows a concave population age structure in 1957 with a broad base and pointed peak. However, the shape of this pyramid changed to a convex slope with a much smaller base and wider top. This age structure is expected to remain as such until the year 2040. The first question raised is what would happen to this population age structure after the year 2040. This can be solved by modelling historical mortality rates to forecast future mortality.

Nonetheless, the main challenge in modelling the mortality rates of Malaysian people is how to deal with the random variations which exist due to the low number of deaths and people surviving in old age. Furthermore, based on Figure 2, the death counts typically fluctuate due to the natural variability in the mortality process within the population at risk. Therefore, the mortality model ensures a harmonious link from one age to another as well as estimating the missing probabilities.

Many researchers suggest modelling the old age mortality rates using the exponential-based models. In Malaysia, the Department of Statistics of Malaysia which is the governing body to publish the Malaysian mortality rates applied the Gompertz (1825) exponential model in modelling these rates (Department of Statistics Malaysia, 2021). The Gompertz model is the oldest model yet, it is the easiest model to be fitted as it only consists of two parameters.

As more and better mortality data becomes available, studies have discovered mortality deceleration in the adult life spans. Hence, logistic-based models have been proposed to models these mortalities such as Beard (1963). Furthermore, starting from 2010, instead of increasing with increasing rate, both older age male and female mortality curves appear to grow at a decreasing rate. Hence, their shapes can no longer be modelled using the existing exponential models (Khaliludin *et al.*, 2021).
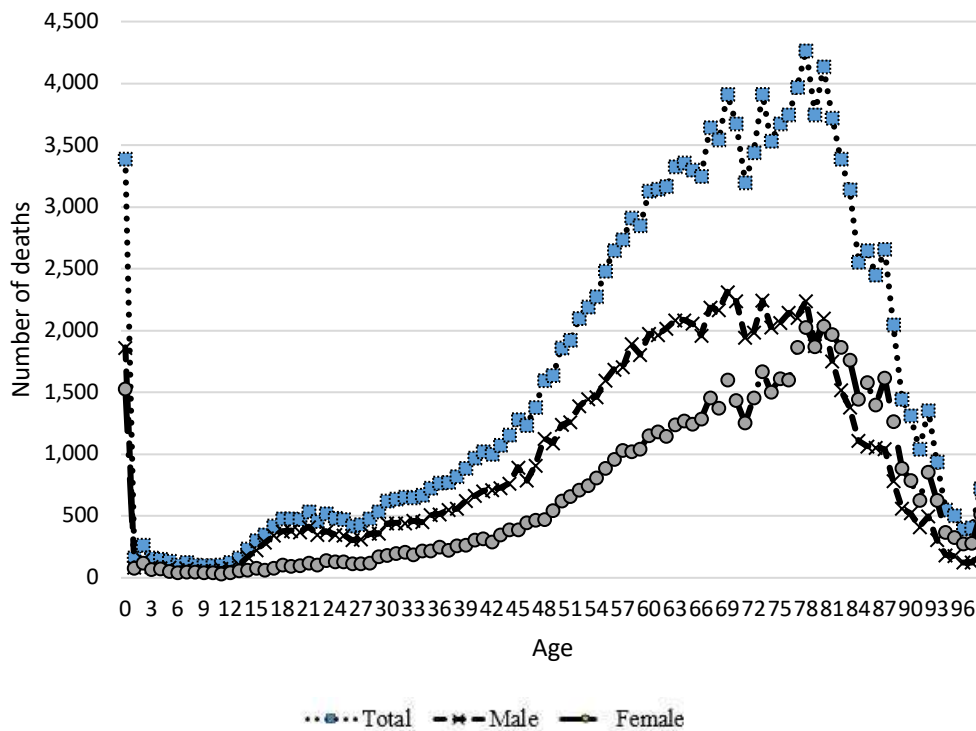
Figure 2 Death count from age 0 to 98 in 2016

This paper selects seven mortality models namely Gompertz, Makeham, Heligman and Pollard, Beard, Kannisto, Wilmoth and Khaliludin models and applies the models to the Malaysian mortality data to determine which model is the best model to estimate the mortality in Malaysia

METHODOLOGY

This study aims to compare seven mortality models that can calculate the accurate Malaysian mortality rates for old ages which is the age between 60 to 98. As each model has a distinct curve, any changes in the mortality pattern will cause the models to fit poorly on the data. The formula for each of the models are listed in Table 1. $\widehat{m}_x$ is the fitted mortality rate estimated from the crude or empirical mortality rate, m_x and age is presented by x. All the comparative models estimated the observed mortality rates directly but the Heligman Pollard (HP) model estimated the conditional probability of death which is denoted by $\hat{q}_x$. This research employs the Nelder-Mead method as the optimisation strategy.

The oldest model which is the Gompertz model is proposed by Gompertz (1825). It is perhaps one of the most notable models in the history of mortality and survival modelling. He proposed an exponential increase in death rates with age (from about 35 to 80 years of age). His mortality function increases from α at time 0 to ∞ at time ∞ at an increasing rate of β. The oldest model which is the Gompertz model is proposed by Gompertz (1825). It is perhaps one of the most notable models in the history of mortality and survival modelling. He proposed an exponential

increase in death rates with age (from about 35 to 80 years of age). His mortality function increases from α at time 0 to ∞ at time ∞ at an increasing rate of β. The parameter α represents the slope of the function or the baseline hazard and the parameter β represents the rate at which the mortality rate increases. Makeham (1867) extended the Gompertz model by adding a constant term representing the mortality of young people to the force of mortality which is symbolised by c in the Table 1. This constant also explained the risk of death from all causes which independent of age. The other terms shared similar meaning as Gompertz model.

Table 1: List of functions of the comparative models.

Name	Function
Gompertz	$\hat{m}_x = \alpha exp(\beta x)$
Makeham	$\hat{m}_x = \alpha exp(\beta x) + c$
Beard	$\hat{m}_x = \dfrac{\alpha exp(\beta x)}{1 + c exp(\beta x)}$
Kannisto	$\hat{m}_x = \dfrac{\alpha \, exp(\beta x)}{1 + \alpha exp(\beta x)}$
Heligman Pollard	$\dfrac{\hat{q}_x}{1 - \hat{q}_x} = A^{(x+B)^C} + D\, exp[-E\, log(\frac{x^2}{F})] + GH^x$
Wilmoth	$\hat{m}_x = \dfrac{exp(\alpha + \beta x)}{1 + exp(\alpha + \beta x)}$
Khaliludin	$\dfrac{\alpha}{1 + exp\left(-\dfrac{x - \beta}{\varsigma}\right)}$

Heligman and Pollard (HP) model is also another extension of Gompertz model. The first term represents a child mortality pattern in which *A* reflects the infant mortality rate, *B* reflects the mortality rate of one-year old children and *C* reflects the rate of mortality declines up to early adult life. The second part represents accident mortality in early adult life. This pattern is also known as accident hump in the demographic literature. The last term which is the Gompertz exponential, reflects the pattern of adult mortality. However, it is often difficult to estimate the parameter as there are eight parameters in total.

Likewise, Beard (1963) also derived his formula from the Gompertz function. Let us suppose that the whole population follows the Gompertz function but an older individual aged *x* slightly deviates with a scalar Z. Beard referred to Z as the longevity factor or better known as the frailty component. They further assumed that Z follows a Gamma distribution. Thus, the final formula for the Beard model is

given by equation in the Table 1 where α is the scale parameter, β is the rate of increment and c is the frailty. It should also be noted that the numerator of Beard equation is the Gompertz formula.

On the other hand, Kannisto observed an empirical result and developed one of the simplest forms of the logistic model for mortality data at high ages. Yet, it should be noted that the model is established for the oldest old age, particularly those beyond 80 years of age. In his formula, α denotes the baseline hazard or the slope of the mortality curve and β denotes the rate of increment of mortality rates.

Wilmoth *et al.* (2007) derived the Beard model by modifying the limiting parameter α to be one to ensure that the probability of death, $\hat{q}_x$ will not exceed 1. The parameter α is the point of departure at age 0 and the parameter β corresponds to the rate of increase of mortality from age x to the age *x+1*. Both parameters are assumed to be positive, and this condition is enforced as the model is estimated.

A modification of the Wilmoth model is done by Khaliludin et al (2021). In contrast to the Kannisto, Beard and Wilmoth model, this model lets the mortality data itself determine the maximum or limiting rate and thus, it lets the numerator be some number, α. Like any logistic model, the parameters β and ς in the model control the rate at which the mortality decreases or increases. Moreover, β is the age at which the change in the direction of the mortality curvature occurs and ς defines the 'wriggliness' or the sigmoidal shape of the curve.

MODEL ASSESSMENT

It is essential to assess the appropriateness of these mortality models. Graph analysis is always an excellent approach to observe the fitting of a model such as a scatterplot of fitted and observed values. This graph helps to determine the distribution of the fitted rate around the empirical rate.

The accuracy of a model is also gauged using loss functions. One of the most common choices for the loss function is the Root Mean Square Error (RMSE). RMSE computes the deviation of the estimated mortality rate from the crude mortality curve. A large RMSE indicates that the model produces more errors. In this function, N denotes the number of observations, T is the number of years, x is the age, t is the year, $m_{x,t}$ is the empirical mortality rate for age x in year t and $\hat{m}_{x,t}$ is the fitted mortality rate for age x in year t.

$$RMSE = \sqrt{\frac{1}{NT}\sum_{x}\sum_{t}\left(\frac{\hat{m}_{x,t} - m_{x,t}}{m_{x,t}}\right)^2}$$

The models are also compared in terms of Mean Absolute Percentage Error (MAPE) as shown by equation (3.37). The interpretation of MAPE is in the same way as RMSE. A lower value of MAPE suggests that the model performs well on the mortality data.

$$MAPE = \frac{1}{NT} \sum_{x}' \sum_{t}' \frac{\left|\hat{m}_{x,t} - m_{x,t}\right|}{m_{x,t}}$$

The comparison of the mortality models using these tests is conducted using the *k-fold* cross-validation. This type of cross-validation uses all data to minimise bias and variance. The mortality data are divided into k folds (k is chosen to be seven) of equal size and each of the folds is split into two parts which are the training and test sets. The test set is a measure of forecast performance. In contrast, the training sets focus on the performance of the model on unseen data and in reflecting the structure of the mortality data. A model is fit using all the data except the first subset. Then, the prediction error of the fitted model is calculated using the first held-out samples. The same operation is repeated for each fold and the model's performance is calculated by averaging the errors across the different test sets. The error gets smaller as long as the fitted values are close to the observed rates and will get larger if, for some of the observations, the fitted and observed mortality rates differ substantially. One of the aims of this method is to assess the model's ability to predict observations never seen during estimation. In general, the model that corresponds to the lowest test error will be selected as the best model. The optimal model should perform well in both training and test datasets.

RESULTS AND DISCUSSION

Seven mortality models are illustrated with data on Malaysian males and females from ages 60 to 98 over the period of 2010 to 2016 obtained from the Department of Statistics, Malaysia.

Table 2 and Table 3 summarise the result for RMSE and MAPE for all the mortality models under this study. Table 2 shows the quantitative amount of RMSE and MAPE for all the models fitted to the mortality dataset in Malaysia for both males and females and Table 3 ranks the results for each model. The model which has the lowest value of RMSE and MAPE is ranked as number one in Table 3. This means that the model produces less error and thus, becomes the best model for the Malaysian dataset.

As can be seen from Table 2 and Table 3, Khaliludin model outperforms all the existing mortality models for both males and females. Beard model becomes the best male model after the proposed model which differs by only 0.007 and 0.04 for RMSE and MAPE respectively. However, this model placed quite lower rank for female mortality dataset and Wilmoth model produced the most accurate result after the Khaliludin model. Kannisto model remains as the average model for both genders. As for the female mortality, Gompertz model, Makeham model and Heligman Pollard (HP) model that share Gompertzian trajectories performed very poorly on the Malaysian mortality dataset with Makeham model being the worst model out of the seven models. RMSE and MAPE may have assessed the quantitative measure for the accuracy of the mortality models but it is also important

to analyse the mortality visually to have a better insight into how these models describe the mortality data.

Table 2: MAPE and RMSE for male and female

Gender	Male		Female	
Model	RMSE	MAPE	RMSE	MAPE
Khaliludin	0.0242	0.0217	0.0174	0.0444
Gompertz	0.0406	0.1082	0.0246	0.1641
Makeham	0.0448	0.1155	0.0535	0.1264
Beard	0.0312	0.0673	0.0246	0.1640
Kannisto	0.0358	0.0936	0.0234	0.1633
Heligman Pollard	0.0432	0.1085	0.0276	0.1335
Wilmoth	0.0375	0.1098	0.0204	0.1640

Table 3: Ranking of model based on RMSE and MAPE

Gender	Male		Female	
Model	RMSE	MAPE	RMSE	MAPE
Khaliludin	1	1	1	1
Gompertz	5	4	6	7
Makeham	7	7	7	2
Beard	2	2	5	6
Kannisto	3	3	3	4
Heligman Pollard	6	5	4	3
Wilmoth	4	6	2	5

Figure 3 illustrates the mortality rates fitted for the older age males and females in Malaysia from 2010 to 2016. The crude mortality graphs are concave and the curves are especially pronounced for males than females in the latter years. As a rule of thumb, if the mortality model correctly explains the data, then the fitted mortality curve will roughly follow the empirical mortality curve. So, it passes the

eyeball test. It can be seen in Figure 3 that the Khaliludin logistic model adheres acceptably well to this feature for all the years except in 2016, where the fitted mortality rates slightly deviate from the empirical mortality rates. This is mainly due to the parameters α and ς which constraint the rates to drop lower as age increases.

Heligman Pollard (HP) model which has the largest number of parameter performed poorly on the older age data. The main reason is that the estimates for older age fitted using HP model are linked by the younger ages and younger people have much lower mortality rates compared to what the elderly have. Furthermore, the last term of HP model which was particularly designed for the older ages was developed from the Gompertz model. The Gompertz model formulates an exponential increase of mortality rates which eventually overstates the mortality rates. It should be noted here that Gompertz model, Makeham model and HP model were designed to model the mortality rates for countries that have a higher life expectancy and lower mortality rates than Malaysia. Therefore, it is expected that these models overestimate the Malaysian mortality rates. Similarly, the Kannisto model is developed for the oldest age too. Thus, it also overstates the Malaysian mortality rates.

Besides that, along with the results from the RMSE and MAPE from Table 2 and Table 3, Figure 3 shows a straight increasing line when the mortality rates were fitted using the Gompertz model, Makeham model and HP model which again, strongly indicates that these models are poor models for the Malaysian mortality data.
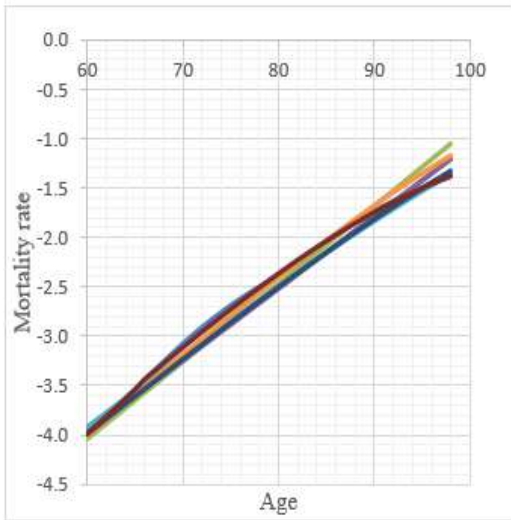
(a) Male 2010
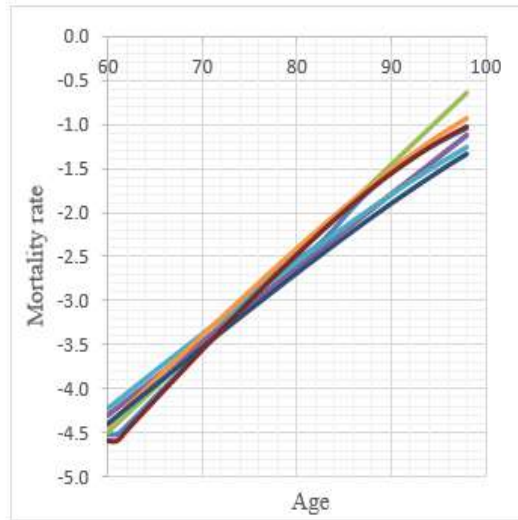
(b) Female 2010
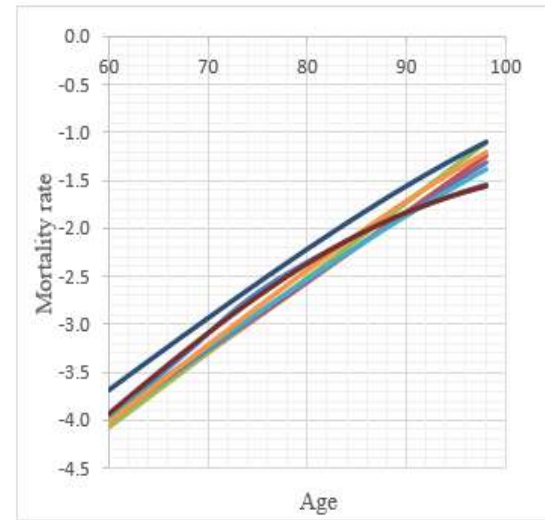
(c) Male 2011
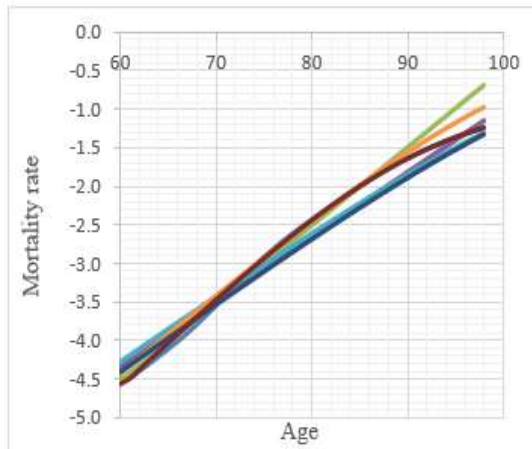
(d) Female 2011
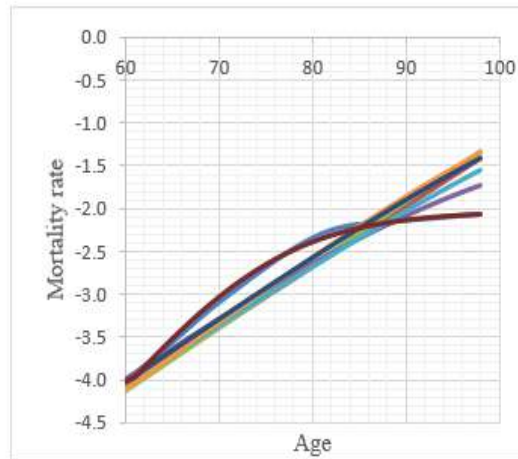
(e) Male 2012
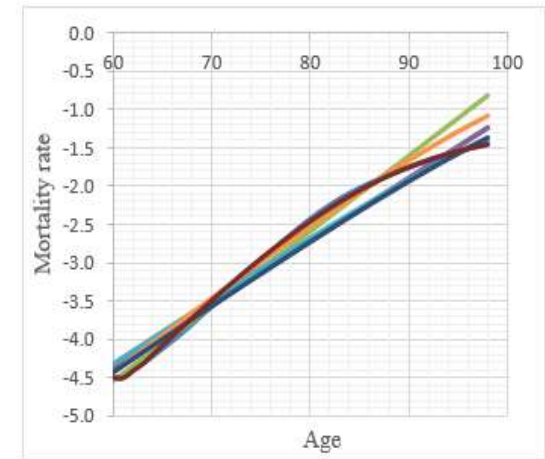
(f) Female 2012
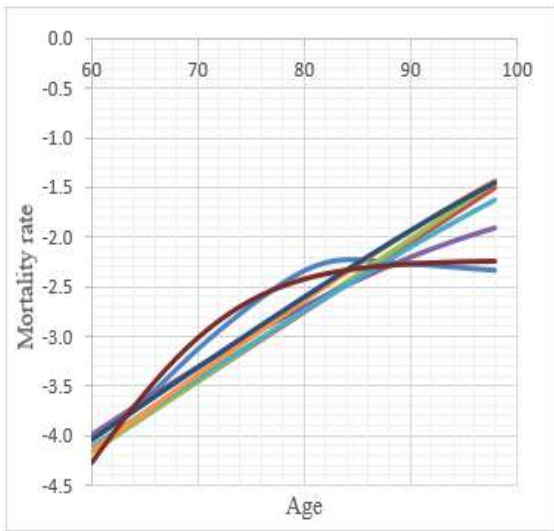
(g) Male 2013
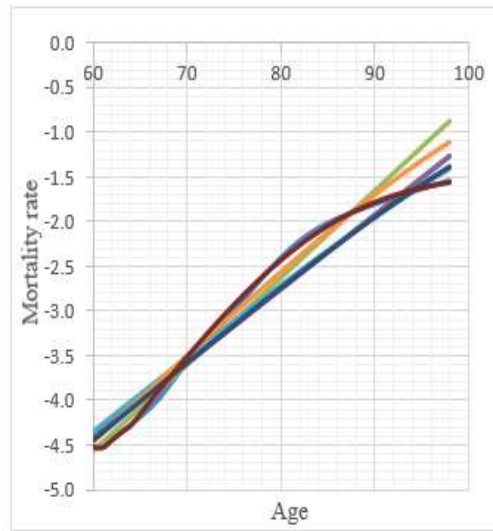
(h) Female 2013
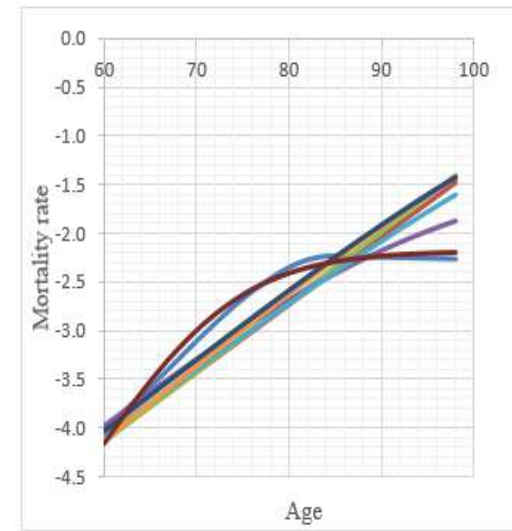
(i) Male 2014
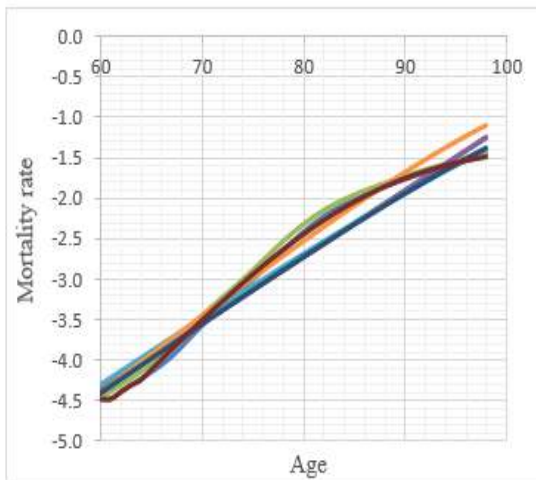
(j) Female 2014

(k) Male 2015

(l) Female 2015

(a) Male 2016   (b) Female 2016

Observed — Gompertz — Makeham — Beard
Kannisto — HP — Wilmoth — Proposed
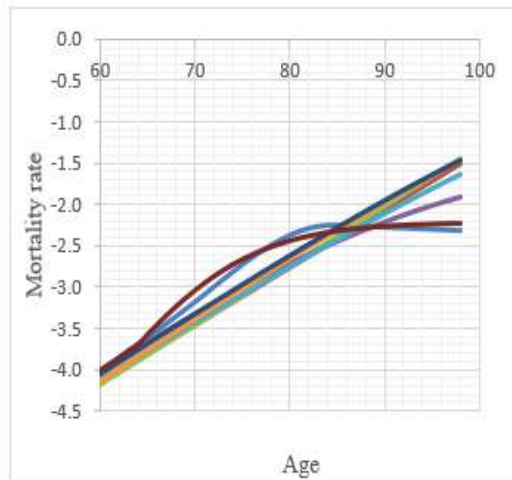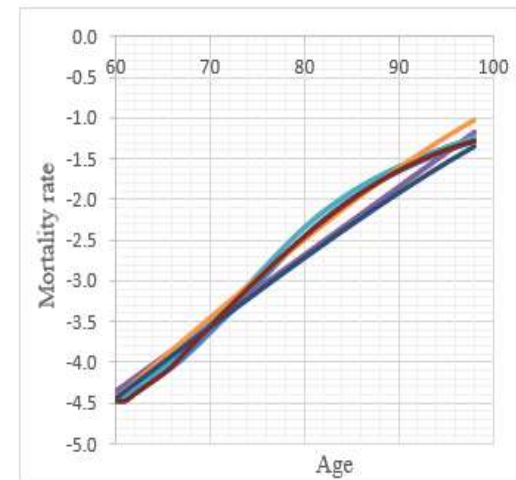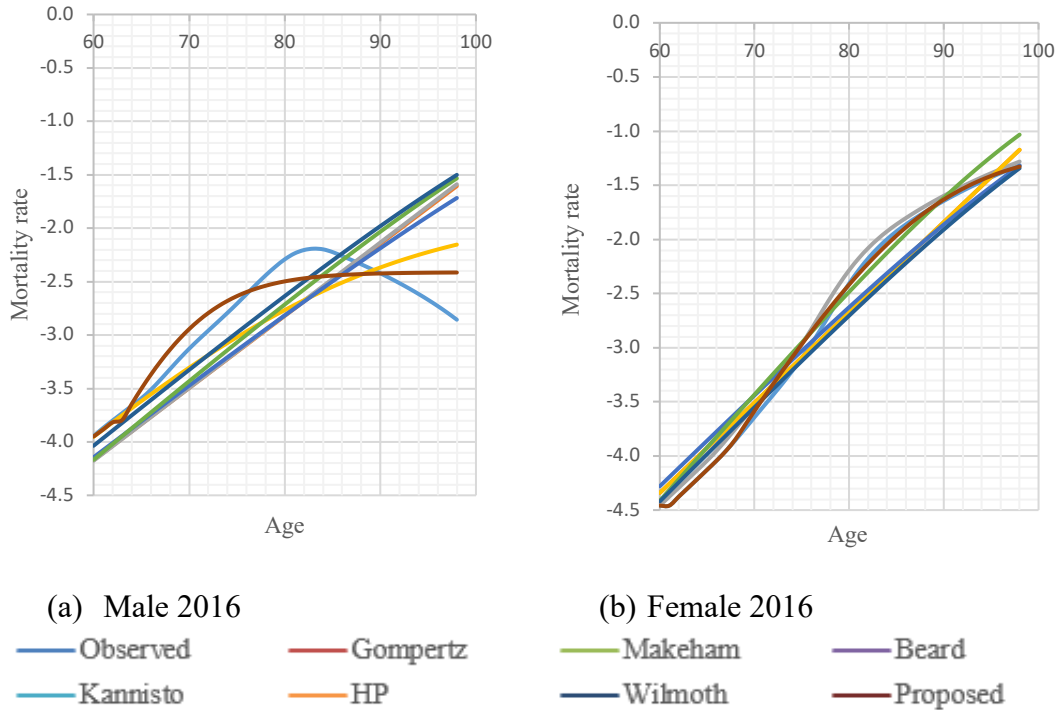
Figure 3 Fitted logistic model using the mortality models in for old age from 2010 to 2016

Apart from the assessment of accuracy, this research also measures the forecastability of the mortality models over the period of 2010 to 2016. Again, the models' goodness of fit tests are evaluated based on RMSE and MAPE and are tabulated in Table 4 and Table 5. A low value in Table 4 and low rank in Table 5 indicate that the model is the best mortality model for Malaysian dataset. Likewise, the results agree with Table 2, Table 3 and Figure 3. The Khaliludin model is the most accurate model to describe the future mortality rates of the older age in Malaysia. This is mainly because of the parameters of this model represent inflection points at which the deceleration of age starts as well as the flexibility of the curve and the limiting rates so that the produced rates will not be far from the crude mortality rates.

As can be seen from Table 4, the other logistic models, Beard and Kannisto model also produce less error. This is mainly because of the frailty component of these models.

Table 4 Forecast error measurement for males and females

Gender	Male		Female	
Model	RMSE	MAPE	RMSE	MAPE
Khaliludin	0.0017	0.1503	0.0022	0.1254
Gompertz	0.0511	0.3578	0.0215	0.1701
Makeham	0.0673	0.3821	0.0341	0.1573
Beard	0.0156	0.2673	0.0215	0.1701
Kannisto	0.0346	0.3200	0.0195	0.1824
Heligman Pollard	0.0666	0.3527	0.0257	0.1377
Wilmoth	0.0714	0.3316	0.0253	0.1391

Table 5 Ranking of model based on future RMSE and MAPE

Gender	Male		Female	
Model	RMSE	MAPE	RMSE	MAPE
Proposed	1	1	1	1
Gompertz	4	6	4	6
Makeham	6	7	7	4
Beard	2	2	3	5
Kannisto	3	3	2	7
Heligman Pollard	5	5	6	2
Wilmoth	7	4	5	3

CONCLUSION

The progressive decrement in the late-life mortality and rapid population ageing is of vital interest to policymakers, retirement providers and insurers due to the higher expenditure on retirement and insurance payments as well as greater social care costs. However, modelling of old age mortality is challenging not only because of the low quality of data but more because the observed numbers of deaths are low because of the low number of people alive at old ages. Hence, a simple parametric model would be a better choice as it allows borrowing strength across ages, which is important when the mortality data is sparse.

This paper compares seven well-known mortality models such as the Gompertz model, Makeham model, Beard Model, Kannisto model, Heligman Pollard model, Wilmoth model and Khaliludin model using the measurement error namely Root Mean Square Error (RMSE) and Mean Absolute Percentage Error (MAPE). The validation for all the mortality models are based on approximate k-fold Cross-Validation (CV) performance as this method has been proven to test the bias-variance trade-off. The results show that Khaliludin model significantly improves the estimation of the older age mortality in Malaysia in terms of accuracy and forecast performance.

All of the approaches are applied to the males and females in Malaysia from age 60 to 98 years old for the period of 2010 until 2016. The mortality data are separated into male and female as they both behave differently at certain ages such as during late teens where male mortality inherits a phenomenon known as the 'accident hump' and the male mortality has higher rate compared to the female up to an age where the female finally has higher death rate than male.

The data on the death and population number used in this research is for the years 2010 until 2016 for each male and female in the age of one to 98 years. Thus, more data from recent years can be utilised to compare these models. It is also recommended to extend these mortality model by incorporating more explanatory variables to investigate the relationship of the mortality rates with several death causes mainly smoking status and medical history.

REFERENCE

Benjamin Gompertz. (1825). On the nature of the function expressive of the law of human mortality, and on a new mode of determining the value of life contingencies. *Philosophical Transactions of the Royal Society of London.* 115: 513-583.

Department of statistics Malaysia. (2020). *Current population estimates, Malaysia, 2020.* Putrajaya, Malaysia: Department of Statistics.

Department of statistics Malaysia. (2021). *Abridged life table 2019-2020. Putrajaya, Malaysia*: Department of Statistics.

Department of statistics Malaysia. (2022). *Key Findings Population and Housing census of Malaysia, 2020 Version 2.0*. Putrajaya, Malaysia: Department of Statistics.

John R. Wilmoth, Kirill Andreev, Dmitri Jdanov, Dana A. Glei, C. Boe, Bubenheim, M., Philipov, D., Shkolnikov, V. and Vachon, P. (2007). *Methods protocol for the human mortality database*. University of California, Berkeley, and Max Planck Institute for Demographic Research, Rostock.

Larry Heligman & John H. Pollard (1980). The age pattern of mortality.*Journal of the Institute of Actuaries*, 107(1), 49-80.

Nur Idayu Ah Khaliludin, Zarina Mohd Khalid & Haliza Abdul Rahman. 2021. *Modified Logistic Model For Mortality Rates in Malaysia*. Universiti Teknologi Malaysia, Johor.

Robert E. Beard. (1963). A theory of mortality based on actuarial, biological, and medical considerations. *Proceedings of the International Population Conference*

United Nations. (2020). *United Nations Decade of Healthy Ageing 2021–2030*. New York, United States: Department of Economic and Social Affairs, Population Division.

William Matthew Makeham. (1867). On the law of mortality. *Journal of the Institute of Actuaries*,13(6), 325-358.

UNVEILING THE QURAN'S ANTIOXIDANT RED MEAT: *AL-AN'AĀM* (LIVESTOCK) REVEALED WITH PROFOUND MEANINGS

Nurul Mukminah binti Zainan Nazri

Faculty of Quranic and Sunnah Studies, Universiti Sains Islam Malaysia (USIM), Bandar Baru Nilai, 71800 Nilai, Negeri Sembilan, Malaysia.
nurulmukminah@usim.edu.my

Abstract

This study aims to delve into the profound meanings of the term al-an'aām in the Quran, exploring their linguistic styles and uncovering their potential significance. Focusing on the antioxidant-rich red meat derived from these livestock, the research offers a qualitative analysis through a content analysis approach. By employing descriptive and analytical methods, the collected data, obtained through content and document analysis, is thematically examined. The findings unveil that the Quran portrays the livestock through the term al-an'aām appearing in the plural form with the definite article in most āyah in the Quran. The implications of this study underscore the need for cautious observation of red meat consumption in accordance with Quranic guidelines, despite its beneficial antioxidant properties. This research validates the linguistic inimitability (al-i'jāz al-lughawī) of the Quran, as evidenced by its portrayal of livestock and their associated qualities.

Keywords: *Electricity generation, energy supply, import, export.*

INTRODUCTION

Al-an'aām in Arabic language is a plural form of *al-na'aām*. According to Ibn Manzur (1993), *al-na'aām* is a singular word of *al-an'aām* and its plural is *al-an'aām* which implies as economic fund. According to Ibn Faris (1979), other word of *al-an'aām* is *al-bahāim* which means livestock.

According to The Britannica Dictionary (2022), livestock refers to farm animals excluding poultry. Livestock are animals that are raised and maintained for various purposes such as agricultural use and economic gain as well as personal enjoyment (Dictionary by Merriam, 2023). Livestock are distinct from other animals as they are domesticated and reared primarily for the purposes of food production and economic profit. They contribute to the supply of essential resources such as wool, milk and meat. The term livestock originates from the concept of stock, denoting a reserve for future use or a valuable sum of money (Vocabulary.com, 2023). Cattle, sheep and goats are among the most significant livestock with worldwide populations estimated at around 1.5 billion, 1.3 billion and 1.1 billion respectively (Sandhage-Hofmann, 2022).

Red meat is defined as a raw food that comes from domestic animals like cattle, goats, sheep, horses, buffaloes, donkeys and free-living animals (Czerwonka & Tokarz, 2017) but could include meat from many other mammals (Corry, 2007). Red meat is a good source of protein, as well as important micronutrients and minerals including iron and B vitamins (Bellamri & Turesky, 2019).

A variety of endogenous antioxidants and other bioactive compounds can be found in lean red meat (Williams, 2007). Cattle were found to contain 4-hydroxyproline, carnosine, taurine, creatine and anserine was also first discovered in cattle. These five nutrients play crucial physiological functions in anti-oxidative and anti-inflammatory reactions, as well as neurological, muscular, retinal, immune and cardiovascular function. They are particularly rich in beef (Wu, 2020). The most prevalent antioxidants in meat are carnosine and anserine (Decker et al., 2000). Carnosine content is about 365mg/100 g in beef (Purchas & Busboom, 2005) and 400mg/100g in lamb (Purchas et al., 2004).

The consumption of 30g of dry beef can fulfill the daily physiological requirements of taurine and carnosine for a healthy adult weighing 70kg. It can also supply substantial quantities of creatine, anserine and 4-hydroxyproline, thereby enhancing human nutrition and promoting various aspects of health such as metabolic function, retinal health, immune system support, muscle health, cartilage maintenance, neurological well-being and cardiovascular well-being (Wu, 2020).

The inclusion of dietary taurine, creatine, carnosine, anserine and 4-hydroxyproline provides valuable benefits in preventing and managing obesity, addressing cardiovascular issues, mitigating age-related disorders, inhibiting tumor development, enhancing skin and bone health, ameliorating neurological abnormalities and promoting overall well-being in individuals across various age groups from infants to children and adults (Wu, 2020).

By enhancing the metabolism and functionality of immune cells such as monocytes, macrophages and other components of the immune system, these nutrients have the potential to bolster the immunological defense mechanisms in humans against a range of infections caused by bacteria, fungi, parasites and viruses, including the coronavirus. Red meat, including beef serves as a functional food that plays a pivotal role in optimizing human growth, development and overall well-being (Wu, 2020).

Coenzyme Q10, also known as ubiquinone, possesses antioxidant properties and has demonstrated positive effects (Overvad et al., 1999). Beef and sheep meat are estimated to contain approximately 2mg of ubiquinone per 100g (Purchas & Busboom, 2005). The Coenzyme Q10 contents in beef heart, beef liver and beef M. longissimus dorsi muscle were measured as 109.97 ± 1.54 µg/g, 33.34 ± 1.43 µg/g and 23.47 ± 1.06 µg/g, respectively (Ercan & El, 2011). Glutathione, an integral part of glutathione peroxidase enzymes has a vital antioxidant role for immune response and enhancing iron absorption (Williams, 2007). In red meat, the estimated levels of glutathione range from 12 to 26mg per 100g, which is roughly twice the amount found in poultry and up to ten times the content observed in fish (Jones et al., 1992).

Conjugated linoleic acid (CLA) possesses antioxidant and immunomodulatory properties, playing a notable role in in controlling obesity (Azain, 2003). CLA is mostly present in the fat component of red meat (approximately 1g/100g) but is also found in muscle meat: 10-46mg/100g in raw meat and 30-100mg/100g in cooked red meat (Droulez et al., 2006).

Certain Quranic terms are in singular form since they refer to specific meaning (Al-Qattan, 1998). Certain terms in the Quran are in plural form for all times, some terms are in singular form for all times, some terms are at times singular and plural at others, some opposite terms in singular and plural form and certain terms are in singular, double or plural form (Al-Qattan, 1998).

The Quranic term may manifest in various forms, either singular or plural, depending on the contextual significance it intends to convey. The linguistic styles of the Quran including its unique linguistic features such as the variations of singular and plural forms of words, is viewed as one of its miraculous aspects (*al-i'jāz al-lughawī*). These linguistic features exhibit a level of eloquence, precision and depth (*al-balāghah and al-faṣāḥah*) that surpasses human capability, providing evidence of its divine origin.

The Quranic language and its stylistic features have captivated Arabic scholars and linguists throughout history, with many acknowledging its linguistic excellence and distinctiveness. The linguistic aspect of the Quran continues to be studied and appreciated by scholars, providing further affirmation of its miraculous nature from a linguistic perspective. Some scholars of such as Al-Khattabi (1976), Al-Rummani (1976) and Al-Baqilani (1997), have demonstrated a keen interest in examining the style (*uslūb*) and eloquence of the Arabic language as a whole prior to delving into the unique linguistic inimitability of the Quran.

RESULTS AND DISCUSSION

The Quran employs the comprehensive term (*al-an'aām*) to encompass various types of livestock, as outlined in Table 1. The term (*al-an'aām*) in Sūrah al-Naḥl 16:5, Yāsīn 36: 71-72, Ghāfir 40:79, al-Mukminūn 23:21, al-An'aām 6:142 and al-Māidah 5:1 is used to denote livestock intended for consumption, particularly emphasizing their role in providing meat through the act of slaughter (Adil Abdul Qadir Hamidah, 2009). In all of these *āyahs*, the reference to livestock as food is consistently expressed in the plural form with the definite article, except for Sūrah Yāsīn 36:71 where the indefinite form is utilized and Surah al-Maidah 5:95, which employs a singular form.

AL-AN'AĀM (LIVESTOCK) AS FOOD IN THE QURAN

Table 1: *Āyahs* on *al-An'aām* (Livestock)

Sūrah & *Āyah* Number	*Āyahs* on *al-An'aām* (Livestock)
al-Naḥl 16:5	وَالْأَنْعَامَ خَلَقَهَا لَكُمْ فِيهَا دِفْءٌ وَمَنَافِعُ وَمِنْهَا تَأْكُلُونَ (5) And the grazing livestock He has created for you; in them is warmth and [numerous] benefits and from them you eat.
Yāsīn 36: 71-72	أَوَلَمْ يَرَوْا أَنَّا خَلَقْنَا لَهُمْ مِمَّا عَمِلَتْ أَيْدِينَا أَنْعَامًا فَهُمْ لَهَا مَالِكُونَ (71) وَذَلَّلْنَاهَا لَهُمْ فَمِنْهَا رَكُوبُهُمْ وَمِنْهَا يَأْكُلُونَ (72) (71) Do they not see that We have created for them from what Our hands have made, grazing livestock and [then] they are their owners? (72) And We have tamed them for them, so some of them they ride and some of them they eat.
Ghāfir 40:79	اللَّهُ الَّذِي جَعَلَ لَكُمُ الْأَنْعَامَ لِتَرْكَبُوا مِنْهَا وَمِنْهَا تَأْكُلُونَ (79) It is Allāh who made for you the grazing animals upon which you ride and some of them you eat.
al-An'aām 6:142	وَمِنَ الْأَنْعَامِ حَمُولَةً وَفَرْشًا كُلُوا مِمَّا رَزَقَكُمُ اللَّهُ وَلَا تَتَّبِعُوا خُطُوَاتِ الشَّيْطَانِ إِنَّهُ لَكُمْ عَدُوٌّ مُبِينٌ (142) And of the grazing livestock are carriers [of burdens] and those [too] small. Eat of what Allāh has provided for you and do not follow the footsteps of Satan.[356] Indeed, he is to you a clear enemy.
al-Māidah 5:1	يَا أَيُّهَا الَّذِينَ آمَنُوا أَوْفُوا بِالْعُقُودِ أُحِلَّتْ لَكُمْ بَهِيمَةُ الْأَنْعَامِ إِلَّا مَا يُتْلَى عَلَيْكُمْ غَيْرَ مُحِلِّي الصَّيْدِ وَأَنْتُمْ حُرُمٌ إِنَّ اللَّهَ يَحْكُمُ مَا يُرِيدُ (1) O you who have believed, fulfill [all] contracts.[239] Lawful for you are the animals of grazing livestock except for that which is recited to you [in this Qur'ān] - hunting not being permitted while you are in the state of iḥrām.[240] Indeed, Allāh ordains what He intends.
Taha 20:54	كُلُوا وَارْعَوْا أَنْعَامَكُمْ إِنَّ فِي ذَلِكَ لَآيَاتٍ لِأُولِي النُّهَى (54) Eat [therefrom] and pasture your livestock. Indeed in that are signs for those of intelligence.
Al-Maidah 5:95	يَا أَيُّهَا الَّذِينَ آمَنُوا لَا تَقْتُلُوا الصَّيْدَ وَأَنْتُمْ حُرُمٌ وَمَنْ قَتَلَهُ مِنْكُمْ مُتَعَمِّدًا فَجَزَاءٌ مِثْلُ مَا قَتَلَ مِنَ النَّعَمِ يَحْكُمُ بِهِ ذَوَا عَدْلٍ مِنْكُمْ هَدْيًا بَالِغَ الْكَعْبَةِ أَوْ كَفَّارَةٌ طَعَامُ مَسَاكِينَ أَوْ عَدْلُ ذَلِكَ صِيَامًا لِيَذُوقَ وَبَالَ أَمْرِهِ عَفَا اللَّهُ عَمَّا سَلَفَ وَمَنْ عَادَ فَيَنْتَقِمُ اللَّهُ مِنْهُ وَاللَّهُ عَزِيزٌ ذُو انْتِقَامٍ

	(95) O you who have believed, do not kill game while you are in the state of iḥrām. And whoever of you kills it intentionally - the penalty is an equivalent from sacrificial animals to what he killed, as judged by two just men among you as an offering [to Allāh] delivered to the Kaʿbah, or an expiation: the feeding of needy people or the equivalent of that in fasting, that he may taste the consequence of his matter [i.e., deed]. Allāh has pardoned what is past; but whoever returns [to violation], then Allāh will take retribution from him. And Allāh is Exalted in Might and Owner of Retribution.

According to Sūrah al-Anʿaām 6:143 and 144, *al-anʿaām* in the Quran encompasses eight pairs of livestock (Ibn Kathir, 1998), namely camel (*al-ibil*), cow (*al-baqar*), sheep (*al-ḍaan*) and goat (*al-maʿiz*) (Al-Syanqiti, 1995). These eight pairs specifically refer to the male and female of each species: male camel (*al-jamal*) and its female (*al-nāqah*), male cow (*al-thaur*) and its female (*al-baqarah*), male sheep (*al-kabsh*) and its female (*al-naʿjah*), male goat (*al-tais*) and its female (*al-ʿanz*) (Al-Syanqiti, 1995). Therefore, the references to livestock meat in the Quran pertain to the meat derived from these animals.

Livestock, as created by Allah, possess numerous advantageous qualities (Al-Saʿdi, 2000). Their benefits encompass the production of milk, which serves as a pleasurable and nourishing beverage for consumption and the consumption of their meat is beneficial for individuals (Tantawi, 1997). Sūrah al-Naḥl 16:5, al-Mukminūn 23:21, Yāsīn 36:71-72 and Ghāfir 40:79 emphasize the significance of livestock meat as a source of food.

Among the benefit of livestock are; transport and to carry loads as described in Sūrah Yāsīn 36:72, Ghāfir 40:79, al-Zukhruf 43:12 and al-Naḥl 16:7. Their fur is used in the production of warm clothing as stated Sūrah al-Naḥl 16:5 and the beauty of livestock can be enjoyed during the pasture time, as stated in Sūrah al-Naḥl 16:6, also, as adornment as stated in Sūrah al-Naḥl 16:8 (Al-Baghawi, 1999 & Al-Tabari, 2000).

Livestock offers numerous benefits encompassing their role in providing nutritious sustenance, serving as tools for labor, contributing to economic significance, facilitating transportation for travel and yielding valuable products such as milk, butter and oil. While modern means of transportation like cars and bicycles have diversified, traditional modes of transportation like camels, mules and donkeys still hold relevance for their respective owners. The verses that refer to these animals as modes of transportation also encompass future inventions such as bicycles, cars, airplanes, ships and other advancements that continually progress and evolve, even if the previous generations were unaware of their existence. This aspect demonstrates the Quran's miraculous nature, reflecting the Creator's comprehensive knowledge of both present and future realities (Al-Hijazi, 1993).

One of the stylistic features employed in the Quranic description of livestock is evident in the phrase "Eat of what Allah has provided for you" found in Sūrah al-

An'aām 6:142. This phrase signifies the permissibility of consuming what is lawful. It should be noted that the use of the term "eat" in this verse is not a command, but rather denotes a permissible action (Ibn Ashur, 1984). However, this permission is accompanied by an important reminder, cautioning against following the footsteps of *syaitan*.

According to Al-Sa'di (Al-Sa'di, 2000), the phrase "Certainly, he is your sworn enemy" implies that devils do not command humans except to engage in actions that can cause harm. While red meat has its health benefits, excessive consumption can be detrimental due to its high fat and cholesterol content (Lahon, 2017). Consequently, the mentioned verse discourages the overconsumption of red meat, as it can have adverse effects on health, with an intake exceeding 500g per week particularly processed meat considered unhealthy (Bingham, 2006). Given the dual nature of red meat in terms of its positive and negative aspects, exercising moderation becomes crucial in its consumption (Lahon, 2017).

In certain verses of the Quran, such as Sūrah al-Māidah 5:1, al-Ḥajj 22:28 and al-Ḥajj 22:34, a specific term (*bahīmah al-an'aām*) is used. The term (*bahīmah*) refers to land animal that has four legs encompassing both domesticated and wild animals, excluding predatory species. The word *al-an'aām* is specific because they are the well-known food for humans and the Quran points out the word *bahīmah* to indicate all the four livestock which are camel, cow, goat and sheep (Ibn Ashur, 1984).

Sūrah al-Naḥl 16:5, along with other related verses like Sūrah al-Mukminūn 23:21, Ghāfir 40:79 and Yāsīn 36:71, serves as evidence showcasing the attributes of Allah, including His knowledge, wisdom, mercy, oneness and power (Al-Syanqiti, 1995, Al-Zuhaili, 1997 & Tantawi, 1997). These verses highlight the significance of livestock (*al-an'aām*) as a miraculous symbol (Qutb, n.d.) that signifies the existence of God and His blessings upon His creation (Al-Razi Fakhruddin, 1999). The purpose of livestock is to serve and benefit human beings (Al-Syaukani, 1993). Sūrah al-Naḥl 16:5, Ghāfir 40:79, Yāsīn 36: 71 and al-Mukminūn 23:21 share a common purpose, despite employing different stylistic approaches within the Quranic discourse. For instance, Sūrah Ghāfir 40:79 commences with the invocation of Allah's majestic name (*ism al-jalalah*), while Sūrah Yāsīn 36:71 presents a rhetorical question in the form of heart witness (*ru'yah al-qalb*), aiming to express disbelief and astonishment regarding the condition of the polytheists who failed to observe the signs of divine blessings (Ibn Ashur, 1984).

CONCLUSION

The term (*al-an'aām*) in the Quran refers to livestock intended for consumption and emphasizes their role in providing meat through the act of slaughter. The Quranic verses highlight the significance of livestock as a source of food and sustenance, showcasing Allah's wisdom and blessings. These verses employ specific linguistic styles characterized by the deliberate use of the plural form of the term (*al-an'aām*) to effectively convey the messages. Regarding the consumption of red meat, the Quran encourages moderation and mindfulness, considering the potential health

implications of excessive intake. It is recommended to choose lean cuts of meat, incorporate a diverse range of protein sources and maintain a balanced and healthy diet. By following these guidelines, individuals can appreciate the blessings of livestock while taking care of their well-being.

REFERENCES

Al-Baqilani, A. B. (1997). *I'jāz Al-Qurān li Al-Bāqilāni* (A.-S. A. Saqar (Ed.); 5th ed). Dar Al-Maarif. Adil Abdul Qadir Hamidah. (2009). *Mausuah al-At'imah fi al-Islam wa Ahkamuha baina Al-Ilm wa Al-Iman*. Al-Dar al-Alamiah.

Al-Baghawi, A. M. A.-H. (1999). *Ma'ālim Al-Tanzīl fī Tafsīr Al-Qurān (Tafsīr al-Baghawi)*. Dar Ihya' al-Turath al-Arabi.

Azain, M. (2003). Conjugated Linoleic Acid and Its Effects on Animal Products and Health in Single-Stomached Animals. *Proc Nutr Soc 2003;, 62*, 319–328.

Al-Khattabi, A. S. H. (1976). *Bayān I'jāz Al-Qurān* (M. Z. Salam (Ed.); 3rd ed). Dar Al-Maarif.

Al-Hijazi, M. M. (1993). *Al-Tafsīr Al-Wādiḥ* (10th ed). Dar Al-Jail Al-Jadid.

Al-Razi Fakhruddin. (1999). *Mafātiḥ al-Ghāib* (3rd ed). Dar Ihya' al-Turath al- Arabi.

Al-Rummani, A. (1976). *Al-Nakat fī I'jāz Al-Qurān* (M. Khalafullah (Ed.); 3rd ed.). Dar Al-Maarif.

Al-Syaukani, M. (1993). *Fatḥ Al-Qadīr* (1st ed). Dar Al-Kalam Al-Tayyib.

Al-Syanqiti, M. A.-A. (1995). *Aḍwā Al-Bayān fī Īḍāḥ Al-Qurān bi Al-Al-Qurān*. Dar Al-Fikr.

Al-Sa'di, A. R. (2000). *Taysīr Al-Karīm Al-Raḥmān fī Tafsīr Kalām al-Manān (Tafsīr Al-Sa'dī)* (A. R. Ma'la Allawihaq (Ed.); 1st ed). Muassah Al-Risalah.

Al-Tabari, I. J. (2000). *Jāmi' Al-Bayān fī Ta'wīl Al-Qurān (Tafsīr Al-Ṭabarī)* (A. Muhamad Syakir (Ed.)). Muassah Al-Risalah.

Al-Zuhaili, W. (1997). *Al-Tafsīr Al-Munīr* (2nd ed). Dar Al-Fikr Al-Muasir.

Al-Qattan, M. (1998). *Mabāhith fī 'Ulūm Al-Qurān* (35th ed). Muassah Al-Risalah.

Bellamri, M., & Turesky, R. J. (2019). Heterocyclic Aromatic Amines: An Update on the Science. *Encyclopedia of Food Chemistry*, 550–558.

Bingham, S. (2006). The Fibre – Folate Debate in Colorectal Cancer. *Pro-Ceedings of the Nutrition Society*, 65(1): 19–23.

Corry, J. E. L. (2007). Spoilage organisms of red meat and poultry. *Microbiological Analysis of Red Meat, Poultry and Eggs: A Volume in Woodhead Publishing Series in Food Science, Technology and Nutrition*, 101–122.

Czerwonka, M., & Tokarz, A. (2017). Iron in red meat–friend or foe. *Meat Science, 123*, 157–165.

Decker, E., Livisay, S., & Zhao, S. (2000). Mechanisms of Endogenous Skeletal Muscle Antioxidants: Chemical and Physical Aspects. In C. F. and C. L.-B. E. Decker (Ed.), *In Antioxidants in Muscle Foods* (pp. 25–60). Wiley- Interscience.

Dictionary by Merriam. (2023). https://www.merriam-webster.com/

Droulez, V., Williams, P., & Levy, G. (2006). Nutrient Composition of Australian Red Meat: Fatty Acid Profile. *Food Aust*, *58*, 335–341.

Ercan, P., & El, S. N. (2011). Changes in content of coenzyme Q10 in beef muscle, beef liver and beef heart with cooking and in vitro digestion. *Journal of Food Composition and Analysis*, *24*(8), 1136–1140.

Ibn Ashur, M. A.-T. (1984). *Al-Taḥrīr wa al-Tanwīr*. Al-Dar Al-Tunisiah.

Ibn Faris, A. (1979). *Mu'jam Maqāyīs al-Lughah*. Dar Al-Fikr.

Ibn Kathir, I. (1998). *Tafsīr Al-Qurān Al-'Azim (Tafsīr Ibn Kathīr)* (M. H. Shamsudin (Ed.); 1st ed). Dar Al-Kutub Al-Ilmiah.

Ibn Manzur, M. (1993). *Lisān Al-'Arab* (3rd ed). Dar Sadir.

Jones, D., Coates, R., & Flagg, E. (1992). Glutathione in Foods Listed in the National Cancer Institute's Health Habits and History Food Frequency Questionnaire. *Nutr Cancer*, *17*, 57–75.

Lahon, A. (2017). *Lamb vs. Beef: Difference in Nutritional Value, Health Benefits and Taste*. https://www.foodsforbetterhealth.com/lamb-vs-beef-32858

Overvad, K., Diamant, B., & Holm, L. (1999). Coenzyme Q10 in Health and Disease. *Eur J Clin Nutr*, *53*, 764–770.

Purchas, R., & Busboom, J. (2005). The Effect of Production System and Age on Levels of Iron, Taurine, Carnosine, Coenzyme Q10 and Creatine in Beef Muscles and Lover. *Meat Sci*, *50*, 589–596.

Purchas, R., Rutherfurd, S., & Pearce, P. (2004). Concentrations in Beef and Lamb of Taurine, Carnosine, Coenzyme Q10 and Creatine. *Meat Sci*, *66*, 629–637.

Qutb, S. (n.d.). *Fī Zilāl Al-Qurān*. Retrieved January 30, 2020, from https://tafsirzilal.wordpress.com/

Sandhage-Hofmann, A. (2022). Rangeland management. *Reference Module in Earth Systems and Environmental Sciences*.

Tantawi. (1997). *Tafsīr Al-Wasīt li Al-Qurān Al-Karīm*. Dar Al-Nahdah.
The Britannica Dictionary. (2022). https://www.britannica.com/dictionary

Vocabulary.com. (2023). https://www.vocabulary.com/

Williams, P. . (2007). Nutritional Composition of Red Meat. *Nutrition & Dietetics*, *64*(Suppl 4), S113–S119.

Wu, G. (2020). Important roles of dietary taurine, creatine, carnosine, anserine and 4-hydroxyproline in human nutrition and health. *Amino Acids*, *52*, 329–360.

THE LEGAL FRAMEWORK OF THE MALAYSIAN SPACE BOARD ACT 2022

Dr. Che Zuhaida Saari

Senior Lecturer, Faculty of Syariah and Law, Universiti Sains Islam Malaysia.
chezuhaida@usim.edu.my

Abstract

Malaysian Space Board Act 2022 (Act 834) attained its Royal Assent on January 19, 2022, and was gazetted on January 25, 2022. It is a new and recent outer space legislation that was passed by the Malaysian Parliament. This Act is designed to regulate the Malaysian outer space activities that are carried out nationally or internationally. This paper discusses and explains the legal frameworks of the Malaysian Space Board Act 2022. They are: the establishment of the Malaysian Space Board, modes of authorization of space activities, registration of space object, liability and indemnification, prohibition of activities and offences, event of incident and accident, power of enforcement of public officers, and other relevant legal matters. The methodology used is by analysing the provisions stated in the Malaysian Space Board Act 2022. The paper concludes that the Act is a good space legislation, however certain matters need to be given consideration like the obligation of constant monitoring and supervision of space activities, and also the liability insurance clause.

Keywords: *Malaysian Space Board Act, Malaysian space legislation, legal framework, liability and indemnification.*

INTRODUCTION

Space exploration and activities are one of the major concerns to the world community at present. This is proven when the trend of activities has gradually shifted from scientific exploration to commercial-based activities. It is predicted that the area of outer space and celestial bodies, besides the air space, will become among the busiest area in the future.

Malaysia has been seen as one of the countries that has potentiality to develop and engage in outer space activities and its exploration. The country has started its involvement since 1960. Furthermore, Malaysia had sent various satellites into orbit including, TiungSAT-1 (26 September 2000); RazakSAT (14 July 2009); and MEASAT-1 (launched: 12 January 1996); MEASAT-2 (launched: 13 November 1996); MEASAT-3 (launched: 11 December 2006); MEASAT-3a (launched: 21 June 2009); MEASAT-3b (launched: 11 September 2014); MEASAT-3d (22 June 2022) (under the Malaysia East Asia Satellite (MEASAT) Project) and many more. In fact, one of the most Malaysian recognizable activities or programs among the space enthusiasts is the *Angkasawan* Program. In this project, an astronaut namely Syeikh Muszaphar Shukor had made his way to the International Space Station in 2007. Starting from this event, the idea of having the Malaysian space legislation had been taken into consideration in more serious means.

Based on the involvement and participation of Malaysia in outer activities and exploration, there were, indeed, propositions and recommendations had been made in urging and insisting the Malaysian Government to realize the national space legislation at her domestic level (Che Zuhaida, 2014; Che Zuhaida, 2017). This is to safeguard and govern the activities of the Malaysian citizens nationally and internationally, and the activities conducted by foreigners domestically. Therefore, in 2022, the Malaysian Parliament had successfully passed the space legislation namely, the Malaysian Space Board Act 2022 (Act 834) (hereinafter referred to as 'the Malaysian Space Board Act 2022'). It was officially gazetted on January 25, 2022.

THE MALAYSIAN SPACE BOARD ACT 2022 (ACT 834): AN OVERVIEW

The Malaysian Space Board Act 2022 get its birth from the Malaysian Space Board Bill 2020. The Bill had its first reading in Dewan Rakyat (House of Representative) on November 3, 2020. Around a year later, on October 28, 2021 the Dewan Rakyat passed the Malaysian Space Board Bill with no amendment. Therefore, on January 19, 2022, it got its Royal Assent and January 25, 2022 it was successfully gazette by the Malaysian Parliament and its name is the Malaysia Space Board Act 2022 (Act 834).

This Act comes into operation on a date appointed by the Malaysian Minister of Science, Technology, and Innovation[1] that is on August 4, 2022. It is done by notification in the Gazette. The selected provisions that firstly come into operation are: Part I (Preliminary); Part II (Malaysian Space Board); Part VII (Other Offences); and IX (Enforcement); Section 64 (Protection Against Suits and Legal Proceedings); and Section 72 (Regulations). For this matter, the Minister has power to appoint different dates for the coming into operation of different provisions of the Act (Section 1(2), Malaysian Space Board Act 2022 (Act 834).[2]

The main purpose of formation of the Malaysian Space Board Act by the Government of Malaysia is, among others, to regulate and control certain space related activities for the reason of safety. Apart of that, it is also to regulate and govern the registration matters of the space object, and to provide regulations and laws with respect to certain offences and other related matters (Malaysian Space Board Act 2022 (Act 834).

The Malaysian Space Board Act is principally divided into 10 major parts. They are, Part 1 (Preliminary); Part II (Malaysian Space Board); Part III (Prohibition); Part IV (Licensing, etc); Part V (Registration of Space Object); Part VI (Liability); Part VII (Other Offences); Part VIII (Incident and Accident); Part IX (Enforcement); and lastly Part X (General).

The Act provides some legal interpretations to certain space-related terms under its Preliminary section (Section 2, Malaysian Space Board Act 2022 (Act 834).[3] They include, for instance, the term 'space, incident, accident, launch facility, damage, Board, licence, Minister, space object, authorized officer, Launch Safety Officer, permanent resident, Space Regulator, investigator, launch certificate, launch permit, weapon of mass destruction and so forth.

Since the Act is related to the space matters, thus, the main area applicable is the space area. Hence, the key-term of the paper is 'space' and it has been given its legal meaning in specific in the Act. At this juncture, 'space' refers to 'a void extending from the one hundred kilometers above sea level' (Section 2, Malaysian Space Board 2022 (Act 834).[4] Thus, the Malaysian Space Board Act 2022 governs and applies to the activities that is conducted or aimed to be conducted at such area.

THE PRINCIPAL LEGAL FRAMEWORKS

There are eight principals of legal frameworks for the Malaysian space legislation. They are: (1) formation of the Malaysian Space Board; (2) Authorisation matters in regard of licensing and its procedures; (3) Registration of space object; (4) Liability and indemnification; (5) Prohibition of activities and offences; (6) Event of incident and accident; (7) Power of enforcement of public officer; (8) Other relevant legal matters. These eight major legal frameworks will govern and regulate the Malaysian space activities within the countries, as well the involvement of the Malaysian national, nationally, and internationally.

(1) Formation of the Malaysian Space Board

The first major legal framework of the Malaysian Space Board Act, as it was named, it is the formation of the Malaysian Space Board (Part II, Malaysian Space Board Act 2022 (Act 834)[5] (hereinafter referred to as 'the Space Board'). The establishment of the Malaysian Space Board (Section 5, Malaysian Space Board Act 2022 (Act 834)[6] is significant to the country as it is the principal body to advise the Malaysian Government on matters related to the implementation of the Act (Section 6(1)(a), Malaysian Space Board Act 2022 (Act 834).[7]

Apart from the Space Board's advisory role, the major function of the Board is to ensure the effectiveness of the implementation of the Act in the country. It is also to perform and provide for the performance of the obligations resulted from any agreements, conventions, and relevant international treaties and accords. On top of that, the Space Board's responsibilities are to issue guidelines and directives relevant to the Act, as well to cater all other matters that related to the functions of the Board (Section 6(1)(b), (c), (d), (e), Malaysian Space Board Act 2022 (Act 834).[8]

Members of the Space Board are appointed in writing by the Minister who is in-charged with the science and technology responsibilities (Section 2 (Interpretation), Malaysian Space Board Act 2022).[9] Thus, the Minister refers to the Minister of the Ministry of Science, Technology, and Innovation of Malaysia (hereinafter referred to as 'MOSTI'). The Minister may appoint an alternate member to attend the Board's meeting if the member is unable to attend it for any reason (Section 5(3), Malaysian Space Board Act 2022 (Act 834).[10] The Space Board consists of 8 members namely:

    (i) Secretary General of the Ministry in charge with science and technology (Section 5(2)(a), Malaysian Space Board Act 2022 (Act 834).[11] This refers to the Secretary General of MOSTI. He or she will be the Chairman of the Board;

(ii) Deputy Secretary General of the Ministry in charge with science and technology (Section 5(2)(b), Malaysian Space Board Act 2022 (Act 834).[12] This refers to the Deputy Secretary General of MOSTI. He or she will be the Deputy Chairman of the Board;

(iii) One representative from Ministry in charge with responsibility for defense (Section 5(2)(c), Malaysian Space Board Act 2022 (Act 834).[13] This refers to one representative from Ministry of Defense Malaysia;

(iv) One representative from Ministry in charge with responsibility for communications and multimedia (Section 5(2)(d), Malaysian Space Board Act 2022 (Act 834).[14] This refers to one representative from Ministry of Communication and Digital Malaysia;

(v) One representative from Ministry in charge with responsibility for home affairs (Section 5(2)(e), Malaysian Space Board Act 2022 (Act 834).[15] This refers to one representative from Ministry of Home Affairs Malaysia;

(vi) One representative from Ministry in charge with responsibility for transport (Section 5(2)(f), Malaysian Space Board Act 2022 (Act 834).[16] This refers to one representative from Ministry of Transport Malaysia;

(vii) One representative from Ministry in charge with responsibility for international trade and industry (Section 5(2)(g), Malaysian Space Board Act 2022 (Act 834).[17] This refers to one representative from Ministry of International Trade and Industry Malaysia;

(viii) One representative from the National Security Council (Section 5(2)(h), Malaysian Space Board Act 2022 (Act 834). This refers to one representative from Malaysian National Security Council.

When the Chairman's office is vacant or the Chairman is unable to perform his functions, hence, the Deputy Chairman will act and can be regarded as the Chairman (Section 7(1) and (2), Malaysian Space Board Act 2022 (Act 834).[18] The Minister, on the advice of the Chairman, may appoint a 'Space Regulator' from the public officer (Section 14(1), Malaysian Space Board Act 2022 (Act 834).[19] The Space Regulator will then be the Executive Secretary to the Space Board. The Executive Secretary will responsible for the management of the Board's affairs, the implementation of the Board's decision and performing any other duties as directed by the Board (Section 8(1), (2) and (3), Malaysian Space Board Act 2022 (Act 834).[20]

The Space Board is permitted by the law to delegate any of its functions, as its thin fit, to the Space Regulator. Thus, such Space Regulator is bound to observe to all conditions and restrictions impose by the Board. Hence, any functions and tasks shall be performed and exercised in the name and on behalf of the Board (Section 12(1), (2) and (3), Malaysian Space Board Act 2022 (Act 834).[21]

The Space Board will have its annual meeting at least once a year. The quorums of the Board are five members including the Chairman of the meeting. If the Chairman is absent, the Deputy Chairman is allowed to replace the Chairman. The law allows the Board to decide its own procedure of the meeting (Section 8(1), (3), (4), and (7), Malaysian Space Board Act 2022 (Act 834).[22] The Board also has power to invite any

other person to attend its meeting and to advise the Board on any relevant issues. However, such person is not entitled to vote at the meeting (Section 10, Malaysian Space Board Act 2022 (Act 834).[23]

Apart of the above, the Space Board has been given the legal power to establish any committee as its think necessary to assist the Board. The Board may appoint any of its member or any other person to be the Chairman of the committee and assign any person to be a member of the committee. This committee shall meet as often as necessary. The committee can also invite any person to attend its meeting (Section 11(1), (2), (3), (5), and (7), Malaysian Space Board Act 2022 (Act 834).[24]

Authorisation: Licensing and Procedures

The international space law (Article VI, Outer Space Treaty 1967; Liability Convention 1972)[25] states that the space activities shall require authorization especially when the activities involve the non-governmental entities (Che Zuhaida, 2014). Thus, the Malaysian Space Board Act 2022 introduces three types of authorization for the Malaysian space activities. They are namely, (1) licence; (2) launch permit; and (3) launch certificate (Section 21, 22, and 23, Malaysian Space Board Act 2022 (Act 834).[26] The first mode of authorization of Malaysian space activities is the issuance of a licence (Section 21, Malaysian Space Board Act 2022 (Act 834).[27] It is one of the most eminent modes of authorisation practiced by many states. The term 'licence' used in the Space Board Act 2022 refers to the licence granted under Part IV of the Malaysian Space Board Act 2022.[28]

The application for space licence in Malaysia can be made by submitting the application to grant a space licence to the Malaysian Space Board. This application should be submitted with payment of the prescribed fee (Section 19(1) and (2), Malaysian Space Board Act 2022 (Act 834).[29] For this submission, the Board has the right to ask for additional document or information, if they consider it is necessary (Section 20(1), (2), and Section 21(1) Malaysian Space Board Act 2022 (Act 834).[30] The licence will be issued and granted by the Board to the applicant when the Board has satisfied with all requirements (Section 21(2), Malaysian Space Board Act 2022 (Act 834).[31]

Regarding the activities that require the issuance of licence, the Malaysian Space Board Act 2022 prescribes the requirement of licence for conducting three space activities. They are: (1) building or manufacturing any space object; or (2) owning or operating any facility for the integration or testing of any space object; or (3) owning or operating any launch facility (Section 16(1)(a), (b), and (c), Malaysian Space Board Act 2022 (Act 834).[32] At this juncture, 'space object' means a spacecraft and launch vehicle, including the spacecraft and launch vehicle component parts (Section 2 (Interpretation), Part I (Preliminary), Malaysian Space Board Act 2022 (Act 834),[33] Whereas 'launch facility' means any launch pad, space port, sea platform or other structures or any ship, aircraft or other conveyances, from which a space object may be launched into space, including any equipment or installation at the launch pad, space port, sea platform or other structures or on the ship, aircraft or other

conveyances, which are necessary to launch a space object into space (Section 2 (Interpretation), Part I (Preliminary), Malaysian Space Board Act 2022 (Act 834).[34]

In the event of failing to comply this requirement, such person will be regarded as committing an offence under the Act. Hence, the offence is categorised into two types: (1) where the offender is an individual, he is liable to a fine not exceed 15 million ringgits or imprisonment for a term not exceed 10 years or both; (2) where the offender is a corporate body, it will be liable to a fine not exceed 30 million ringgits (Section 16(2)(a), and (b), Malaysian Space Board Act 2022 (Act 834).[35]

The space licence will be granted by the Malaysian Space Board subject to the conditions as the Board thinks fit to impose. The Board may vary or revoke such conditions at any time (Section 24(1), and (2), Malaysian Space Board Act 2022 (Act 834).[36] The Board may also impose additional conditions and vary or revoke them, as they think appropriate (Section 25(1)(a), and (b), Malaysian Space Board Act 2022 (Act 834).[37] Anyone who contravene such conditions will be liable to a fine not exceeding 1 million ringgits if the offender is an individual, and a fine not exceeding 3 million ringgit if the offender is a body corporate (Section 24(4)(a), and (b), and Section 25(2)(a) and (b), Malaysian Space Board Act 2022 (Act 834).[38]

A licence certificate will specify the duration of the licence (Section 26, Malaysian Space Board Act 2022 (Act 834).[39] It can be renewed from time to time by submitting the renewal application to the Space Board. The Board has power to approve or refuse the application. When the licence renewal has been approved, the applicant must make payment of the fees prescribed (Section 28(1), (2), and (3), Malaysian Space Board Act 2022 (Act 834).[40] It can also be surrendered to the Board by the Licensee at any time, with a written notice made by him based on the requirement in the licence. Such surrender shall take effect on the date the Board receives the licence (Section 29(1), and (2), Malaysian Space Board Act 2022 (Act 834).[41] The licence can be suspended or revoked also by the Board, with the written notice, if it fulfils certain conditions such as, the licensee fails to comply with the provisions of the Act; conviction of an offence under the Act; conviction of fraud, corruption, dishonesty, or moral turpitude and so forth; or in the interest of the public, national security, or international relation (Section 31(1)(a), (b), (c) and (d), Malaysian Space Board Act 2022 (Act 834).[42]

The second mode of authorization for the Malaysian space activities is the issuance of a launch permit (Section 22, Malaysian Space Board Act 2022 (Act 834).[43] Any launch service provider, or any person who provides services for the launching of a space object into space (Section 2, Malaysian Space Board Act 2022 (Act 834),[44] who intends to launch a space object into space from any launch facility in Malaysia must apply for a launch permit (Section 17(1), Malaysian Space Board Act 2022 (Act 834).[45]

Those who fail to comply, are regarded as committing an offence and shall be liable to a fine not exceeding 30 million ringgit or imprisonment for a term not exceeding 10 years or both for an individual offender. However, for a body corporate

offender, they will be liable to a fine not exceeding 60 million ringgit (Section 17(2)(a), and (b), Malaysian Space Board Act 2022 (Act 834).[46]

A person may apply for a launch permit by submitting the application to the Space Board (Section 19(1), Malaysian Space Board Act 2022 (Act 834).[47] Upon receipt the application and payment of the prescribed fee, the Board may consider the application. If the Board has satisfied with all the requirements, the Board may by written notice communicate to the applicant about the Board's intention to grant the launch permit (Section 22(1), and (2), Malaysian Space Board Act 2022 (Act 834).[48]

It should be noted that the Board will only grant the launch permit to the applicant if they satisfied that the requirement for insurance has been fulfilled. In other words, the applicant has to ensure that he shall cause to be insured in respect of any liability for any damage to a third party which may result from the launch of the space object into space (Section 22(3), and (4), Malaysian Space Board Act 2022 (Act 834).[49]

The third mode of authorization is the issuance of a launch certificate (Section 23, Malaysian Space Board Act 2022 (Act 834).[50] Any Malaysian citizen, permanent resident, or any corporate body in Malaysia who or which is an owner of a space object and intends to launch the space object into space from any launch facility in or outside Malaysia must apply for the launch certificate (Section 18(1), Malaysian Space Board Act 2022 (Act 834).[51]

Failure to comply, the person will be regarded as committing an offence and shall be liable to a fine not exceeding 30 million ringgit or imprisonment for a term not exceeding 10 years or both for an individual offender. However, for a body corporate offender, they will be liable to a fine not exceeding 60 million ringgit (Section 18(2)(a), and (b), Malaysian Space Board Act 2022 (Act 834).[52]

To apply a launch certificate, a person must submit the application to the Space Board (Section 19(1), Malaysian Space Board Act 2022 (Act 834).[53] Upon receipt the application and payment of the fee, and any additional document, if necessary, the Board may then consider the application. If the Board has satisfied with all the requirements, the Board may grant the launch certificate (Section 23(1), and (2), Malaysian Space Board Act 2022 (Act 834).[54]

(3) Registration Obligation

The Malaysian Space Board Act 2022 imposes a condition of registration of a space object with the Malaysian Space Regulator. The Space Regulator[55] refers to the public officer appointed by the Minister on the advice of Chairman of the Space Board under section 14, Malaysian Space Board Act 2022 (Section 2, Malaysian Space Board Act 2022 (Act 834).[56]

Registration is a legal requirement to the Malaysian citizens, whether they are permanent resident or a body corporate registered in Malaysia. This requirement is obligatory when the object has been launched into the earth orbit or beyond, from a launch facility in or outside Malaysia (Section 36(1), Malaysian Space Board Act 2022 (Act 834).[57] Those who contravene this obligation shall commit an offence and convicted under Section 36 and will be liable to a fine not exceeding 25 thousand

ringgit for a case involving an individual. However, if it involves a body corporate, the punishment is a fine not exceeding 50 thousand ringgits (Section 36(2), Malaysian Space Board Act 2022 (Act 834).[58]

When the process of registration has been done, the Space Regulator must keep and maintain the register of the space object. The Space Regulator may, on his own accord, remove the name and particulars of the objects from the register or even can amend it in the register, upon notification given to him (Section 38(1), (2) and (3), Malaysian Space Board Act 2022 (Act 834).[59] The owner of the registered space object must notify the Space Regulator in the event of these situations happen: (a) the space object has stopped to be in operation; (b) the space object is physically destroyed; or (c) there is any change in the particulars relating to the space object for the registration purposes (Section 37(1), Malaysian Space Board Act 2022 (Act 834).[60] Those who contravene this legal obligation shall be liable to a fine not exceeding 25 thousand ringgit when it involves an individual. However, if it involves a body corporate, the punishment is a fine not exceeding 50 thousand ringgits (Section 37(2), Malaysian Space Board Act 2022 (Act 834).[61]

(4) Liability and Indemnification

With respect to the liability matters, the Space Board Act 2022 imposes an absolute liability to a launch service provider for any damage done resulting from the launch of the space object from a launch facility in Malaysia (Section 39(1), Malaysian Space Board Act 2022 (Act 834).[62]

The launch service provider refers to those who provides services for the launching of a space object into space (Section 2, Malaysian Space Board Act 2022 (Act 834).[63] While the launch facility means any launch pad, space port, sea platform or other structure or any ship, aircraft, or other conveyances, from which a space object may be launched into space, including any equipment or installation at the launch pad, space port, sea platform, or other structures or on the ship, aircraft or other conveyances, which are necessary to launch a space object into space (Section 2, Malaysian Space Board Act 2022 (Act 834).[64]

Apart from the launch service provider's absolute liability, the owner of the space object shall also be absolutely liable for any damage resulting from the operation of his or its space object which has been launched into the earth orbit or beyond (Section 39(3), Malaysian Space Board Act 2022 (Act 834).[65] It is also similar in the situation when the damage happens resulting from the launch of his or its space object from the launch facility outside Malaysia (Section 39(2), Malaysian Space Board Act 2022 (Act 834).[66] The owner of the space object may either refer to a Malaysian citizen, permanent resident, or body corporate incorporated established or registered in Malaysia (Section 39(2), and (3), Malaysian Space Board Act 2022 (Act 834).[67]

In regard of indemnification matters, the Malaysian Space Board Act 2022 imposes a legal obligation to the launch service provider, as well to the owner of the space object, to indemnify the Malaysian Government. At this point, the launch service provider shall indemnify the Government of Malaysia against any claims and

proceedings brought against the Government when any damage happens from the launch of a space object from a launch facility in Malaysia (Section 40(1), Malaysian Space Board Act 2022 (Act 834).[68]

The owner of a space object must also indemnify the Government against any claims and proceedings brought against the Government when the damage occurred resulting from the operation of his or its space object which has been launched into the earth orbit or beyond (Section 40(3), Malaysian Space Board Act 2022 (Act 834).[69] The same obligation applies when the damage happens resulting from the launch of his or its space object from the launch facility outside Malaysia by which the owner of space object must bear the obligation to indemnify the Government (Section 40(2), Malaysian Space Board Act 2022 (Act 834).[70] Again, the owner of the space object may either refer to a Malaysian citizen, permanent resident, or body corporate incorporated established or registered in Malaysia (Section 40(2), and (3), Malaysian Space Board Act 2022 (Act 834).[71]

It should be noted that such indemnification due and payable at this juncture is regarded as civil debt due to the Government (Section 40(4), Malaysian Space Board Act 2022 (Act 834).[72]

(5) Prohibition of Activities and Offences

The Malaysian Space Board Act 2022 prescribes clearly in its clause that the space area must be used for peaceful purpose only. Therefore, in such circumstance, it is prohibited for any person to place, install, launch, or operate in space, any weapon of mass destruction. It is also prohibited to perform any testing of weapon of mass destruction. The law does not also permit anyone to form a military base in space, as well to do installation, fortification and carry out any weapon testing and conduct any military manoeuvres in such area (Section 15(1)(a), (b), and (c), Malaysian Space Board Act 2022 (Act 834).[73]

On top of that, the Act does not allow any person to conduct any activities which can affect the security and safety of any other activity that is carry out in space lawfully. Similarly, it is legally prohibited to perform any activities that may cause harmful contamination to space, or will result to adverse changes to the Earth's environment (Section 15(1)(d), and (e), Malaysian Space Board Act 2022 (Act 834).[74]

Those persons who commit such prohibited activities will be regarded as committing an offence under the Malaysian Space Board Act 2022. They shall be liable under the Act based on two categories: (a) if the offender is an individual, he will be imposed a fine not exceeding 50 million ringgits, or imprisonment for a term not exceeding 30 years, or both; (b) if the offender is a corporate body, it will be liable to a fine not exceeding 100 million ringgit (Section 15(2)(a), and (b), Malaysian Space Board Act 2022 (Act 834).[75]

Apart from the prohibitions, the Act enforces certain actions to be regarded as offences under the Malaysian Space Board Act 2022. These include the discovery of either the space object, personnel, or passenger of spacecraft, and tampering with the space object.

At this point, any person who discovers any object that he has reason to believe it is originated from space, or any person whom he has reason to believe to be a personnel or passenger of a spacecraft shall notify the Space Regulator, or any authorised officer about his discovery (Section 41(1), Malaysian Space Board Act 2022 (Act 834).[76] Any individual person who contravenes this requirement is regarded as committing an offence and will be liable to a fine not exceeding 5 thousand ringgit. Whereas, for a body corporate, the fine is not exceeding 10 thousand ringgits (Section 41(2)(a), and (b), Malaysian Space Board Act 2022 (Act 834).[77]

In respect of tampering with the space object, it is an offence for any person who discovers the object which he has reason to believe it is the object originated from space, if he either tampers with the object, remove, damage, or destroy it unless it is necessary to do so in order to prevent any immediate danger that may affect the safety of life or property of public (Section 42(1), Malaysian Space Board Act 2022 (Act 834).[78] Those who commits the offence shall be liable to a fine not exceeding 10 thousand ringgit, if the offender is an individual, and a fine not exceeding 20 thousand ringgit if the offender is a body corporate (Section 42(2)(a), and (b), Malaysian Space Board Act 2022 (Act 834).[79]

(6) Event of Incident and Accident

The Malaysian Space Board Act 2022 prescribes certain legal procedures and matters in dealing with the event of incident and accident that may happen in relation to the space activities.

At this point, incident means any occurrence associated with the space object or launch facility which affects or likely to affect the safety of the space object or launch facility or involving circumstances where an accident nearly happened (Section 2, Malaysian Space Board Act 2022 (Act 834).[80] Whereas, accident refers to any occurrence associated with a space object or launch facility which causes damage, including fall or collapse, or collision or explosion, of a space object or launch facility (Section 2, Malaysian Space Board Act 2022 (Act 834).[81] For the purpose of the Act, damage denotes loss of life, any injury or impairment of health to any person, or loss of or damage to any property (Section 2, Malaysian Space Board Act 2022 (Act 834).[82]

The first legal procedure deals with the occasion of incident and accident are an immediate notification by the relevant person to the relevant authority. The licensee, launch permit holder, and launch certificate holder must immediately notify the Space Regulator of any incident or accident in respect of the space object or launch facility that relate either to their licenses, launch permits, or launch certificates (Section 43(1), Malaysian Space Board Act 2022 (Act 834).[83] Any person contravenes this order is regarded as committing an offence and will be liable to a fine not exceeding 25 thousand ringgit if the offender is an individual, and not exceeding 50 thousand ringgit if the offender is a corporate body (Section 43(2)(a)(b), Malaysian Space Board Act 2022 (Act 834).[84]

Next, it is regarding the safe custody of the space object. Upon receiving the information about the incident or accident, the Space Regulator must take all

reasonable actions to maintain the custody of the space object or launch facility, or any other evidence relating to the incident or accident. This task must be upheld until the investigator[85] is appointed to conduct the investigation (Section 45(1), Malaysian Space Board Act 2022 (Act 834). The Minister shall appoint number of investigators to investigate any incident or accident (Section 44(1), Malaysian Space Board Act 2022 (Act 834).[86]

Upon the appointment of the investigator, it shall then be the duty of him to maintain the safe custody of the space object, launch facility, or other evidences relating to the incident or accident (Section 45(2), Malaysian Space Board Act 2022 (Act 834).[87] When the investigator determines that the space object, launch facility, or other evidences is no longer necessary for the purpose of investigation, the investigator can release them to the owner or any person authorized by the owner to take custody of the object, facility, or other evidence (Section 45(3), Malaysian Space Board Act 2022 (Act 834).[88]

Any person who tampers or interferes with, removes, damages, or destroys any of these space objects, launch facility, or other evidences in the Space Regulator or investigator's custody, will be regarded as committing an offence. Upon conviction, the offender will be held liable to a fine not exceed 10 thousand ringgits for an individual offender, and not exceed 20 thousand ringgits for a body corporate (Section 45(4), Malaysian Space Board Act 2022 (Act 834).[89]

Next procedure is the appointment of investigators. After the Government gained the knowledge about the incident or accident, the Minister shall appoint in writing several investigators to investigate the incident or accident. These investigators are regarded as authorized officers who hold all the necessary powers to conduct the investigation. Such investigation must be conducted for the purpose of preventing the incident or accident in the future, and not for the purpose of apportioning the blame or liability (Section 44(1), (2), (3), and (5), Malaysian Space Board Act 2022 (Act 834).[90]

Another legal matter is the suspension of the licence, launch permit, or launch certificate. In respect of the licence, launch permit, or launch certificate granted by the authority, they must be deemed suspended for a period from the date of the accident until the date of the Space Board revokes the suspension (Section 46(1), Malaysian Space Board Act 2022 (Act 834). For such suspension, there are several legal effects to the licence, launch permit, or launch certificate. Firstly, the licence, launch permit, or launch certificate shall have no effect during the period of suspension. Secondly, the suspension shall not affect the expiry date of the licence, launch permit, or launch certificate as specified or granted by the authority. Thirdly, the Space Board can revoke, or vary the conditions of the suspended licence, launch permit, or launch certificate (Section 46(2), (3), and (4), Malaysian Space Board Act 2022 (Act 834).[91]

(7) Power of Enforcement of Public Officer
The Malaysian Space Board Act 2022 provides an authorization of public officer. The Minister of Ministry of Science, Technology and Innovation may, in writing, authorize

any public officer to exercise the power of enforcement under the Act (Section 47, Malaysian Space Board Act 2022 (Act 834).[92] The Act further prescribes the power of investigation to the authorized officer. The officer shall have all the necessary powers to perform the relevant investigation (Section 49(1), Malaysian Space Board Act 2022 (Act 834).[93]

In any case of commission of offence during the investigation process, such officer may exercise all or any of the special powers in relation to the police investigation in seizable cases provided by the Criminal Procedure Code [Act 593] (Section 49(2), Malaysian Space Board Act 2022 (Act 834).[94]

Each authorized officer will be issued an authority card that signed by the Minister. This card must be produced, on demand, when the authorized officer carrying out his duty under the Act (Section 48(1), and (2), Malaysian Space Board Act 2022 (Act 834).[95]

The Malaysian Space Board Act 2022 prescribes two kinds of search and seizure. They are, with warrant and without warrant. The search and seizure with warrant can be performed by the authorized officer upon the submission of a written information on oath by him to a Magistrate. When the Magistrate considers it is necessary to enter the site, premises, or conveyance, and if it is needed be by force, the Magistrate may issue a warrant authorizing the authorized officer named in the warrant to perform his duty at any reasonable time by day or by night and with or without assistance (Section 50(1), Malaysian Space Board Act 2022 (Act 834).[96]

However, the search and seizure without warrant can be legally conducted when the authorized officer has reasonable cause to believe that if by delaying the search and seizure to obtain the warrant, it can adversely affect the evidence of the commission of offence, such as the evidence is likely to be tampered with, removed, damaged, or destroyed (Section 51, Malaysian Space Board Act 2022 (Act 834).[97]

In the event of seizure is made, the authorized officer must prepare a list of the space object, launch facility, book, accounts, document, computerized data, signboard, card, letter, pamphlet, leaflet, notice, facility, apparatus, vehicle, equipment, device, thing, or matter seized. Such list must be signed by the authorized officer and shall be delivered immediately to the owner or person in control of the site, premises or conveyance which has been search, or to the owner's agent or employee (Section 52(1), and (2), Malaysian Space Board Act 2022 (Act 834).[98]

With respect to the seized space objects, they are held in the custody of the Government pending the completion of any proceedings under the Act. The cost of holding the seized space objects in custody shall be regarded as a debt due to the Government and must be recoverable accordingly (Section 53, Malaysian Space Board Act 2022 (Act 834).[99]

Other legal rules regarding powers of enforcement of public officer are: the power to release the seized space object at any time which can take place after referring to the Space Regulator (Section 54, Malaysian Space Board Act 2022 (Act 834);[100] power to forfeiture the seized space object (Section 55, Malaysian Space Board Act 2022 (Act 834);[101] the legal status of the property in forfeited space object (Section 56, Malaysian

Space Board Act 2022 (Act 834);[102] power to access to computerized data (Section 57, Malaysian Space Board Act 2022 (Act 834);[103] power to require the attendance of person acquainted with the disputed case (Section 59, Malaysian Space Board Act 2022 (Act 834);[104] power to conduct examination of persons acquainted with the case (Section 60, Malaysian Space Board Act 2022 (Act 834);[105] and so forth.

(8) Other Relevant Legal Rules

Some others relevant legal rulings are, among others, protection against suits and any legal proceedings in any court. The Malaysian Space Board Act 2022 prescribes that it is not allowed to bring, institute, or maintain any legal action, suit, prosecution, or other proceeding in any court against any member of the Malaysian Space Board, members of a committee, the Space Regulator, an authorized officer the Launch Safety Officer, and any investigators, in respect of any act ordered or conducted for the purpose of the Act. This legal rule applies if the act was done in good faith and in a reasonable belief that is was necessary for the purpose intended by the Act. This situation also applies to other person in which his action done or purported to be done by him under the order, direction, or instruction of those prescribed above (Section 64(a), and (b), Malaysian Space Board Act 2022 (Act 834).[106]

Other relevant rule is with respect to the service of legal documents on the affected person. The service of the legal documents on any person shall be affected by three ways. Firstly, by delivering the document to that person personally, or by delivering it to an adult member of his family at the last-known address of residence of that person (Section 66(1)(a), Malaysian Space Board Act 2022 (Act 834).[107] Secondly, the service is affected as well, by leaving the document at the usual or last known address of residence or business of that person in a cover addressed to that person (Section 66(1)(b), Malaysian Space Board Act 2022 (Act 834);[108] or thirdly, by forwarding the document by registered post addressed to that at his usual or last known place of residence or business (Section 66(1)(c), Malaysian Space Board Act 2022 (Act 834).[109]

Regarding the formulation of relevant space regulations, the Act prescribes the Minister power to make any necessary regulations in order to expedite the carrying out of the Act and ensuring the effectiveness of implementation of its provisions (Section 72(1), Malaysian Space Board Act 2022 (Act 834).[110] The regulations that may be constructed are for the purposes of, among others, to prescribe for the manner for licence application, launch permit and launch certificate; to prescribe for the requirements for licence issuance, launch permit, and launch certificate including requirements relating to financial and technical resources; to prescribe for fees payable under the Act; to prescribe for the manner of application for renewal of licence; to prescribe for the manner of registration of space object; to prescribe for the manner the liability for any damage resulting from the launch of a space object is insured; to prescribe for the manner in which the investigation into any accident or incident shall be conducted (Section 72(2)(a), (b), (c), (d), (e), (f), and (g), Malaysian Space Board Act 2022 (Act 834).[111]

COMMENTARIES AND CONCLUDING REMARKS

After scrutinizing the legal frameworks of the Malaysian Space Board Act 2022, it is observed that the Act comprises several similar major legal frameworks of other states' national space legislations. These include the Australian Space (Launches and Returns) Act 2018, the United Kingdom Outer Space Act 1986, and the Space Act of the Republic of Indonesia (Act 21/2013). The major legal frameworks concerned are, for instances in respect of the competent authority dealing with the states' space activities, the authorization of national and international space activities, the registration obligation of the space object, the liability, and indemnification clauses.

However, it is noted that there are certain legal rules that have not been prescribed clearly in the Act. For instance, the legal obligation of constant monitoring and supervision of the space activities from the state's relevant authority. This obligation has been mentioned in Article VI of the Outer Space Treaty 1967,[112] by which it is the legal responsibility of the State Party (or the State Government) to continue supervise and monitor the space activities of their nationals, especially the non-governmental sector's activities. This must be done after the non-governmental entities have obtained the authorization from the state's authority to carrying out the space activities.

This clause is important in order to ensure the states' nationals or their non-governmental entities constantly comply with all the provisions and rules of the United Nations space treaties[113] as imposed by the Outer Space Treaty 1967 in its Article III.[114]

Another concern matter is regarding the indemnification and liability insurance clauses. Since the international space law imposes rules that a state shall be internationally responsible for the activities of its nationals in outer space (Article VI, Outer Space Treaty 1967; Che Zuhaida, 2014),[115] as well as internationally liable for any damage or loss caused by a space object launched by the state or whose launch has been procured by the state (Article VII, Outer Space Treaty 1967).[116] Such rules have, in fact, exposed the States Government to the financial risk of having to compensate for any liability or loss resulting from their national space activities at the international level.[117]

Thus, the Malaysian Space Board Act 2022 prescribes in specific, in its Section 40,[118] that the launch service provider and owner of the space object have a legal obligation to indemnify the Malaysian Government against any claim or legal proceedings brought against the Government in respect of any loss or damage done during conducting their space activities. This clause is seen as a kind of protection to the Government from any possible liability arising from the space activities performed by the private entities.

However, in respect of the liability insurance, it is observed that the Malaysian Space Board Act 2022 only imposed such requirement in Section 22(3), and (4)[119] that is one of the requirements for granting the launch permit application. The applicant or the launch service provider will only be granted the launch permit, after the Space

Board has satisfied with the fulfillment of the liability insurance requirement for the launch permit holder.

In contrast, it is noted that there is no specific liability insurance requirement imposed by the Act for granting the application of space licence and launch certificate by the authority (Section 21, and 23, Malaysian Space Board Act 2022 (Act 834).[120] Whereas, it should be noted that the holder of the space licence and the launch certificate, might as well be exposed to the space liability during conducting their space activities nationally or internationally. This can happen based on their position either as an owner of the space object or operator of the space facility. Furthermore, Section 40 of the Malaysian Space Board Act 2022 has imposed the legal obligation to indemnify the Government in respect of any loss happens. This situation is supposed to be supported by the insurance coverage requirement.

Therefore, it is strongly suggested that in granting the space licence and the launch certificate to the applicant, the requirement of having the liability insurance must be imposed also as like the requirement of launch permit holder. With this condition, then Malaysian Government financial risk in term of her space liability will then be secured and more protected.

It is hoped that by having the Malaysian Space Board Act 2022, it will flourish and boom the Malaysian space activities at the national and international level. In addition, it will attract the foreign investors to involve the Malaysian space activities confidently. With a good space legislation, Malaysia can maintain, grow, and expand her space activities and exploration with certainly and securely.

REFERENCES

Australian Space (Launches and Returns) Act 2018.

Che Zuhaida Saari. (2014). National Space Legislation: Future Perspectives for Malaysian Space Law. Doctoral Thesis. Leiden: International Institute of Air and Space Law, Leiden University.

Che Zuhaida Saari. (2017, 17 February). Pertimbangan Kajian Penggubalan Undang-Undang Angkasa Lepas. *Berita Harian.* https://www.pressreader.com/malaysia/berita-harian-malaysia/20170217/281917362837267.

Liability Convention 1972: Convention on International Liability for Damage Caused by Space Objects (1972) (Resolution 2777 (XXVI)), adopted on 29 November 1971, opened to signature on 29 March 1972, entered into force on 1 September 1972. 24 UST 2389, 961 UNTS 187, TIAS 7762.

Malaysian Space Board Act 2022 (Act 834).

Moon Agreement 1979: Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (1979) (Resolution 34/68), adopted on 5 December 1979, opened to signature on 18 December 1979, entered into force on 11 July 1984. 18 ILM 1434, 1363 UNTS 3.

Space Act of the Republic of Indonesia (Act 21/2013).

Outer Space Treaty 1967: Treaty on Principles Governing the Activities of States in the Exploration and Use of the Outer Space, Including the Moon and Other Celestial Bodies (1967) (Resolution 2222 (XXI)), adopted on 19 December 1966, opened to signature on 27 January 1967, entered into force on 10 October 1967. (1967) 610 UNTS 205, 18 UST 2410, TIAS 6347; (1967) 6 ILM 386; (1967) 61 AJIL 644.

Registration Convention 1975: Convention on Registration of Objects Launched into Outer Space (1974) (Resolution 3235 (XXIX)), adopted on 12 November 1974, opened to signature on 14 January 1975, entered into force on 15 September 1976. 28 UST 695, 1023 UNTS 15, TIAS 8480.

Rescue Agreement 1968: Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space (1968) (Resolution 2345 (XXII)), adopted on 19 December 1967, opened to signature on 22 April 1968, entered into force on 3 December 1968. 19 UST 7570, 672 UNTS 119, TIAS 6599.

Outer Space Act (United Kingdom, 1986).

United Nations Charter: Charter of the United Nations, San Francisco, done 26 June 1945, entered into force on 24 October 1945, 24 UST 2225, TIAS No. 7739, TS 993.

---

[1] Minister means the Minister charged with the responsibility for science and technology. Section 2 (Interpretation: Minister), Part I (Preliminary), Malaysian Space Board Act 2022 (Act 834).

[2] Section 1(Short Title and Commencement), Part I (Preliminary), Malaysian Space Board Act 2022 (Act 834).

[3] Section 2 (Interpretation), Part I (Preliminary), Malaysian Space Board Act 2022 (Act 834).

[4] Section 2 (Interpretation: Space), Part I (Preliminary), Malaysian Space Board Act 2022 (Act 834).

[5] The legal rules related to the establishment of the Malaysian Space Board are prescribed in Section 5 - Section 14, Part II (Malaysian Space Board), Malaysian Space Board Act 2022 (Act 834).

[6] Section 5 (Establishment of the Board), Part II (Malaysian Space Board), Malaysian Space Board Act 2022 (Act 834)

[7] Section 6 (Functions of the Board), Part II (Malaysian Space Board), Malaysian Space Board Act 2022 (Act 834).

[8] Section 6 (Functions of the Board), Part II (Malaysian Space Board), Malaysian Space Board Act 2022 (Act 834).

[9] Section 2 (Interpretation: Minister), Part I (Preliminary), Malaysian Space Board Act 2022 (Act 834).

[10] Section 5 (Establishment of the Board), Part II (Malaysian Space Board), Malaysian Space Board Act 2022 (Act 834).

[11] Section 5 (Establishment of the Board), Part II (Malaysian Space Board), Malaysian Space Board Act 2022 (Act 834).

[12] Section 5 (Establishment of the Board), Part II (Malaysian Space Board), Malaysian Space Board Act 2022 (Act 834).

[13] Section 5 (Establishment of the Board), Part II (Malaysian Space Board), Malaysian Space Board Act 2022 (Act 834).

[14] Section 5 (Establishment of the Board), Part II (Malaysian Space Board), Malaysian Space Board Act 2022 (Act 834).

[15] Section 5 (Establishment of the Board), Part II (Malaysian Space Board), Malaysian Space Board Act 2022 (Act 834).

[16] Section 5 (Establishment of the Board), Part II (Malaysian Space Board), Malaysian Space Board Act 2022 (Act 834).

[17] Section 5 (Establishment of the Board), Part II (Malaysian Space Board), Malaysian Space Board Act 2022 (Act 834).

[18] Section 7 (Temporary Exercise of Functions of Chairman), Part II (Malaysian Space Board), Malaysian Space Board Act 2022 (Act 834).

[19] Section 14 (Appointment of Space Regulator), Part II (Malaysian Space Board), Malaysian Space Board Act 2022 (Act 834).

[20] Section 8 (Executive Secretary to the Board), Part II (Malaysian Space Board), Malaysian Space Board Act 2022 (Act 834).

[21] Section 12 (Delegation of Functions of the Board), Part II (Malaysian Space Board), Malaysian Space Board Act 2022 (Act 834).

[22] Section 9 (Meetings of the Board), Part II (Malaysian Space Board), Malaysian Space Board Act 2022 (Act 834).

[23] Section 10 (Board may Invite Others to Meeting), Part II (Malaysian Space Board), Malaysian Space Board Act 2022 (Act 834).

[24] Section 11 (Board may Establish Committees), Part II (Malaysian Space Board), Malaysian Space Board Act 2022 (Act 834).

[25] Article VI, Outer Space Treaty 1967 stipulates: *'States Parties to the Treaty shall bear international responsibility for national activities in outer space ... whether such activities are carried on by governmental agencies or by non-governmental entities ...'*. See also Liability Convention 1972.

[26] Section 21 (Grant of Licence), Part IV (Licensing, etc), Malaysian Space Board Act 2022 (Act 834); Section 22 (Grant of Launch Permit), Part IV (Licensing, etc), Malaysian Space Board Act 2022 (Act 834); Section 23 (Grant of Launch Certificate), Part IV (Licensing, etc), Malaysian Space Board Act 2022 (Act 834).

[27] Section 21 (Grant of Licence), Part IV (Licensing, etc), Malaysian Space Board Act 2022 (Act 834).

[28] Section 2 (Interpretation: Licence), Part I (Preliminary), Malaysian Space Board Act 2022 (Act 834).

[29] Section 19 (Application for Licence, etc), Part IV (Licensing, etc), Malaysian Space Board Act 2022 (Act 834).

[30] Section 20 (Additional Document or Information), Part IV (Licensing, etc), Malaysian Space Board Act 2022 (Act 834); Section 21 (Grant of Licence), Part IV (Licensing, etc), Malaysian Space Board Act 2022 (Act 834).

[31] Section 21 (Grant of Licence), Part IV (Licensing, etc), Malaysian Space Board Act 2022 (Act 834).

[32] Section 16 (Licence Requirement), Part IV (Licensing, etc), Malaysian Space Board Act 2022 (Act 834).

[33] Section 2 (Interpretation: Space Object), Part I (Preliminary), Malaysian Space Board Act 2022 (Act 834).

[34] Section 2 (Interpretation: Launch Facility), Part I (Preliminary), Malaysian Space Board Act 2022 (Act 834).

[35] Section 16 (Licence Requirement), Part IV (Licensing, etc), Malaysian Space Board Act 2022 (Act 834).

[36] Section 24 (Conditions of Licence. etc), Part IV (Licensing, etc), Malaysian Space Board Act 2022 (Act 834).

[37] Section 25 (Additional Conditions of Licence. etc), Part IV (Licensing, etc), Malaysian Space Board Act 2022 (Act 834).

[38] Section 24 (Conditions of Licence. etc), and Section 25 (Additional Conditions of Licence. etc), Part IV (Licensing, etc), Malaysian Space Board Act 2022 (Act 834).

[39] Section 26 (Duration of Licence. etc), Part IV (Licensing, etc), Malaysian Space Board Act 2022 (Act 834).

[40] Section 28 (Renewal of Licence), Part IV (Licensing, etc), Malaysian Space Board Act 2022 (Act 834).

[41] Section 29 (Surrender of Licence), Part IV (Licensing, etc), Malaysian Space Board Act 2022 (Act 834).

[42] Section 31 (Suspension or revocation of Licence), Part IV (Licensing, etc), Malaysian Space Board Act 2022 (Act 834).

[43] Section 22 (Grant of Launch Permit), Part IV (Licensing, etc), Malaysian Space Board Act 2022 (Act 834).

[44] Section 2 (Interpretation: Launch Service Provider), Part I (Preliminary), Malaysian Space Board Act 2022 (Act 834).

[45] Section 17 (Launch Permit Requirement), Part IV (Licensing, etc), Malaysian Space Board Act 2022 (Act 834).

[46] Section 17 (Launch Permit Requirement), Part IV (Licensing, etc), Malaysian Space Board Act 2022 (Act 834).

[47] Section 19 (Application for Licence, etc), Part IV (Licensing, etc), Malaysian Space Board Act 2022 (Act 834).

[48] Section 22 (Grant of Launch Permit), Part IV (Licensing, etc), Malaysian Space Board Act 2022 (Act 834).

[49] Section 22 (Grant of Launch Permit), Part IV (Licensing, etc), Malaysian Space Board Act 2022 (Act 834).

[50] Section 23 (Grant of Launch Certificate), Part IV (Licensing, etc), Malaysian Space Board Act 2022 (Act 834).

[51] Section 18 (Launch Certificate Requirement), Part IV (Licensing, etc), Malaysian Space Board Act 2022 (Act 834).

[52] Section 18 (Launch Certificate Requirement), Part IV (Licensing, etc), Malaysian Space Board Act 2022 (Act 834).

[53] Section 19 (Application for Licence, etc), Part IV (Licensing, etc), Malaysian Space Board Act 2022 (Act 834).

[54] Section 23 (Grant of Launch Certificate), Part IV (Licensing, etc), Malaysian Space Board Act 2022 (Act 834).

[55] The Space Regulator must perform the functions and duties imposed and exercise the power conferred upon him under the Malaysian Space Board Act 2022 (Act 834); Section 14 (Appointment of Space Regulator), Part II (Malaysian Space Board), Malaysian Space Board Act 2022 (Act 834).

[56] Section 2 (Interpretation: Space Regulator), Part I (Preliminary), Malaysian Space Board Act 2022 (Act 834).

[57] Section 36 (Registration of Space Object), Part V (Registration of Space Object), Malaysian Space Board Act 2022 (Act 834).

[58] Section 36 (Registration of Space Object), Part V (Registration of Space Object), Malaysian Space Board Act 2022 (Act 834).

[59] Section 38 (Register of Space Objects), Part V (Registration of Space Object), Malaysian Space Board Act 2022 (Act 834).

⁶⁰ Section 37 (Notification of Changes in relation to Space Object), Part V (Registration of Space Object), Malaysian Space Board Act 2022 (Act 834).

⁶¹ Section 37 (Notification of Changes in relation to Space Object), Part V (Registration of Space Object), Malaysian Space Board Act 2022 (Act 834).

⁶² Section 39 (Absolute Liability), Part VI (Liability), Malaysian Space Board Act 2022 (Act 834).

⁶³ Section 2 (Interpretation: Launch Service Provider), Part I (Preliminary), Malaysian Space Board Act 2022 (Act 834).

⁶⁴ Section 2 (Interpretation: Launch Facility), Part I (Preliminary), Malaysian Space Board Act 2022 (Act 834).

⁶⁵ Section 39 (Absolute Liability), Part VI (Liability), Malaysian Space Board Act 2022 (Act 834).

⁶⁶ Section 39 (Absolute Liability), Part VI (Liability), Malaysian Space Board Act 2022 (Act 834).

⁶⁷ Section 39 (Absolute Liability), Part VI (Liability), Malaysian Space Board Act 2022 (Act 834).

⁶⁸ Section 40 (Obligation to Indemnify Government), Part VI (Liability), Malaysian Space Board Act 2022 (Act 834).

⁶⁹ Section 40 (Obligation to Indemnify Government), Part VI (Liability), Malaysian Space Board Act 2022 (Act 834).

⁷⁰ Section 40 (Obligation to Indemnify Government), Part VI (Liability), Malaysian Space Board Act 2022 (Act 834).

⁷¹ Section 40 (Obligation to Indemnify Government), Part VI (Liability), Malaysian Space Board Act 2022 (Act 834).

⁷² Section 40 (Obligation to Indemnify Government), Part VI (Liability), Malaysian Space Board Act 2022 (Act 834).

⁷³ Section 15 (Prohibition), Part III (Prohibition), Malaysian Space Board Act 2022 (Act 834).

⁷⁴ Section 15 (Prohibition), Part III (Prohibition), Malaysian Space Board Act 2022 (Act 834).

⁷⁵ Section 15 (Prohibition), Part III (Prohibition), Malaysian Space Board Act 2022 (Act 834).

⁷⁶ Section 41 (Discovery of Space Object, etc., and personnel, etc., of spacecraft), Part VII (Other Offences), Malaysian Space Board Act 2022 (Act 834).

⁷⁷ Section 41 (Discovery of Space Object, etc., and personnel, etc., of spacecraft), Part VII (Other Offences), Malaysian Space Board Act 2022 (Act 834).

⁷⁸ Section 42 (Tampering, etc., with space object), Part VII (Other Offences), Malaysian Space Board Act 2022 (Act 834).

⁷⁹ Section 42 (Tampering, etc., with space object), Part VII (Other Offences), Malaysian Space Board Act 2022 (Act 834).

⁸⁰ Section 2 (Interpretation: Incident), Part I (Preliminary), Malaysian Space Board Act 2022 (Act 834).

⁸¹ Section 2 (Interpretation: Accident), Part I (Preliminary), Malaysian Space Board Act 2022 (Act 834).

⁸² Section 2 (Interpretation: Damage), Part I (Preliminary), Malaysian Space Board Act 2022 (Act 834).

⁸³ Section 43 (Notification of Incident and Accident), Part VIII (Incident and Accident), Malaysian Space Board Act 2022 (Act 834).

⁸⁴ Section 43 (Notification of Incident and Accident), Part VIII (Incident and Accident), Malaysian Space Board Act 2022 (Act 834).

⁸⁵ Investigator means an investigator appointed under Section 44, Malaysian Space Board Act 2022 (Act 834); Section 2 (Interpretation: Investigator), Part I (Preliminary), Malaysian Space Board Act 2022 (Act 834);

⁸⁶ Section 44 (Appointment of Investigator), Part VIII (Incident and Accident), Malaysian Space Board Act 2022 (Act 834).

⁸⁷ Section 45 (Safe Custody of Space Object, etc), Part VIII (Incident and Accident), Malaysian Space Board Act 2022 (Act 834).

⁸⁸ Section 45 (Safe Custody of Space Object, etc), Part VIII (Incident and Accident), Malaysian Space Board Act 2022 (Act 834).

⁸⁹ Section 45 (Safe Custody of Space Object, etc), Part VIII (Incident and Accident), Malaysian Space Board Act 2022 (Act 834).

⁹⁰ Section 44 (Appointment of Investigator), Part VIII (Incident and Accident), Malaysian Space Board Act 2022 (Act 834).

⁹¹ Section 46 (Licence, etc. Deemed Suspended in the Event of Accident), Part VIII (Incident and Accident), Malaysian Space Board Act 2022 (Act 834).

⁹² Section 47 (Authorization of Public Officer), Part IX (Enforcement), Malaysian Space Board Act 2022 (Act 834).

⁹³ Section 49 (Power of Investigation), Part IX (Enforcement), Malaysian Space Board Act 2022 (Act 834).

⁹⁴ Section 49 (Power of Investigation), Part IX (Enforcement), Malaysian Space Board Act 2022 (Act 834).

⁹⁵ Section 48 (Authority Card), Part IX (Enforcement), Malaysian Space Board Act 2022 (Act 834).

⁹⁶ Section 50 (Search and Seizure With Warrant), Part IX (Enforcement), Malaysian Space Board Act 2022 (Act 834).

[97] Section 51 (Search and Seizure Without Warrant), Part IX (Enforcement), Malaysian Space Board Act 2022 (Act 834).

[98] Section 52 (List of Seized Space Object, etc), Part IX (Enforcement), Malaysian Space Board Act 2022 (Act 834).

[99] Section 53 (Cost of Holding Seized Space Object), Part IX (Enforcement), Malaysian Space Board Act 2022 (Act 834).

[100] Section 54 (Release of Seized Space Object, etc), Part IX (Enforcement), Malaysian Space Board Act 2022 (Act 834).

[101] Section 55 (Forfeiture of Seized Space Object, etc), Part IX (Enforcement), Malaysian Space Board Act 2022 (Act 834).

[102] Section 56 (Property in Forfeited Space Object, etc), Part IX (Enforcement), Malaysian Space Board Act 2022 (Act 834).

[103] Section 57 (Access to Computerized Data), Part IX (Enforcement), Malaysian Space Board Act 2022 (Act 834).

[104] Section 59 (Power to Require Attendance of Persons Acquainted with Case), Part IX (Enforcement), Malaysian Space Board Act 2022 (Act 834).

[105] Section 60 (Examination of Persons Acquainted with Case), Part IX (Enforcement), Malaysian Space Board Act 2022 (Act 834).

[106] Section 64 (Protection Against Suits and Legal Proceedings), Part X (General), Malaysian Space Board Act 2022 (Act 834).

[107] Section 66 (Service of Document), Part X (General), Malaysian Space Board Act 2022 (Act 834).

[108] Section 66 (Service of Document), Part X (General), Malaysian Space Board Act 2022 (Act 834).

[109] Section 66 (Service of Document), Part X (General), Malaysian Space Board Act 2022 (Act 834).

[110] Section 72 (Regulations), Part X (General), Malaysian Space Board Act 2022 (Act 834).

[111] Section 72 (Regulations), Part X (General), Malaysian Space Board Act 2022 (Act 834).

[112] Article VI, Outer Space Treaty 1967 stipulates: '… *The activities of non-governmental entities in outer space, including the Moon and other celestial bodies, shall require authorisation and continuing supervision by the appropriate State Party to the Treaty'*.

[113] The five major treaties are the Outer Space Treaty 1967; the Rescue Agreement 1968; the Liability Convention 1972; the Registration Convention 1975; the Moon Agreement 1979.

[114] Article III, Outer Space Treaty 1967 specifies: '*States Parties to the Treaty shall carry on activities in the exploration and use of outer space, including the moon and other celestial bodies, in accordance with international law, including the Charter of the United Nations …'*

[115] Article VI, Outer Space Treaty 1967 stipulates: '*States Parties to the Treaty shall bear international responsibility for national activities in outer space ... whether such activities are carried on by governmental agencies or by non-governmental entities …'*. See also Liability Convention 1972

[116] Article VII, Outer Space Treaty 1967 specifies: '*Each State Party to the Treaty that launches or procures the launching of an object into outer space ... , and each State Party from whose territory or facility an object is launched, is internationally liable for damage to another State Party …'*. See also Liability Convention 1972.

[117] Article II, Liability Convention 1972 mentions: '*A launching State shall be absolutely liable to pay compensation for damage caused by its space object on the surface of the Earth or to aircraft in flight'*. See also Article VII, Outer Space Treaty 1967; Article VI, Outer Space Treaty 1967.

[118] Section 40(1), Malaysian Space Board Act 2022 (Act 834) stipulates: '*A launch service provider shall indemnify the Government against any claim and proceedings brought against the Government in respect of any damage resulting from the launch of a space object from a launch facility in Malaysia.'*; Section 40(2), Malaysian Space Board Act 2022 (Act 834) reads: '*Any citizen of Malaysia, permanent resident or body corporate incorporated, established or registered in Malaysia who is an owner of a space object shall indemnify the Government against any claim and proceedings brought against the Government in respect of any damage resulting from the launch of his or its space object from a launch facility outside Malaysia'*; Section 40(3), Malaysian Space Board Act 2022 (Act 834) reads: '*Any citizen of Malaysia, permanent resident or body corporate incorporated, established or registered in Malaysia who is an owner of a space object shall indemnify the Government against any claim and proceedings brought against the Government in respect of any damage resulting from the operation of his or its space object which has been launched into the earth orbit or beyond.'*

[119] Section 22(3), Malaysian Space Board Act 2022 (Act 834) reads: '*The applicant for a launch permit shall cause to be insured in respect of any liability for any damage to a third party resulting from the launch of the space object to which the launch permit relates to in such manner as may be prescribed*;' Section 22(3), Malaysian Space Board Act 2022 (Act 834) reads: '*Where the Board is satisfied that the requirement for insurance under subsection (3) has been fulfilled, the Board may grant a launch permit.'*

[120] Space licence can be applied for those who intend to: (a) build or manufacture any space object; (b) own or operate any facility for the integration or testing of any space object; or (c) own or operate any launch facility (Section 16(1)(a), (b), and (c), Malaysian Space Board Act 2022 (Act 834). Whereas, the space launch certificate

can be applied by either the Malaysian citizen, or permanent resident, or body corporate registered in Malaysia who or which is an owner of a space object and intends to launch the space object from any facility in or outside Malaysia (Section 18(1), Malaysian Space Board Act 2022 (Act 834).

JURISDICTIONAL CONFLICT BETWEEN SYARIAH AND CIVIL LAWS IN IKI PUTRA CASE: THE WAY FORWARD FOR MALAYSIAN LEGAL SYSTEM

Nisar Mohammad Ahmad

Faculty of Syariah and Law, Universiti Sains Islam Malaysia.
nisar@usim.edu.my

Abstract

The existence of Syariah and civil laws that operate side by side in Malaysian legal system has much to do with the historical development of this country, starting from ancient Malay/Islam customary laws until the introduction of English laws during the colonization era. Against this backdrop, this article aims to analyse the conflict of jurisdictions between Syariah and civil laws in Malaysia by focusing on the Iki Putra case. At the onset, this article examines the general overview of the Syariah-civil laws jurisdictional conflicts in Malaysia including the impacts of the amendment on Article 121 (1A) of the Federal Constitution. This is followed by a special analysis on the Iki Putra case particularly on the jurisdictional conflict between the provisions in Syariah criminal code of the State of Selangor and the Penal Code which lies under the federal law. This article uses qualitative methods through document analysis of books, journal articles, newspaper articles, court cases and other internet sources related to Syariah-civil laws jurisdictional conflict in Malaysia and the Iki Putra case. The study in this article found that, despite does not totally stop the jurisdictional conflict between the Syariah and civil laws, the inclusion of Article 121 (1A) in the Federal Constitution that highlights the exclusive jurisdiction of Syariah court have brought some improvements to the application of Syariah law in Malaysia. The Iki Putra case is an example that exemplified this scenario. Nonetheless, based on this case, this article believes that there is always a way forward for the effort to harmonise the Syariah and civil laws in the Malaysian legal system.

Keywords: *Jurisdictional conflict, Syariah and civil laws, Malaysian legal system, Iki Putra case.*

INTRODUCTION

The jurisdictional conflict between Syariah and civil laws in Malaysia which continues to exist until today has attracted much attention and debates from various segments of communities in particular legal scholars and practitioners. The recent judgment made by Federal Court judges in the case of *Iki Putra Mubarrak v Selangor State Government* has reignited similar debates. In its judgment, the Federal Court's nine-judge panel unanimously declared that that Section 28 of the Syariah Criminal Offences (Selangor) Enactment 1995 which provides unnatural sex a Syariah offence is invalid and unconstitutional. This is because such offences fall under Parliament's powers to make laws and not under the state legislatures' law-making powers (Lim, 2021).

Hence, this article aims to analyse the Iki Putra case in more detail to understand the nature of jurisdictional conflict between Syariah and civil laws in

Malaysia and finally to recommend some suggestions for improvement as the way forward. This article is divided into three parts, the first of which will discuss about the overview of Syariah-civil law jurisdictional conflicts in Malaysia including its historical perspectives which have shaped the current Malaysian legal system. In the same vein, this article will also examine the jurisdictions of Syariah and civil courts provided by the Federal Constitution through the amendment of Article 121 (1A). Accordingly, the second part of this article will analyse the judgment of the Iki Putra case and its impacts to the Syariah court's jurisdiction in Malaysia. Finally, this article will propose some improvements mechanisms and new approaches to resolve the ongoing jurisdictional conflicts including the possibilities of harmonising the two legal systems as the way forward.

OVERVIEW OF SYARIAH-CIVIL JURISDICTIONAL CONFLICT IN MALAYSIA

Islam came to the Peninsula of Malaya by the fourteenth century (al-Attas, S.M N., 1969). It is perceived that Parameswara, Malacca's first ruler, had converted to Islam because of his marriage to a Pase (*Pasai*) princess (Tan, 1997). Parameswara was later known as Sultan Iskandar Shah. Malacca became well known as a trading port between India and China. One of the facts that promoted the rapid growth of Malacca was its acceptance of Islam. Its strategic geographical position and Chinese patronage which helped in resisting the claims of nearby Siam were other factors that contributed to the rapid growth. Islam spread rapidly in Malacca and in the entire Peninsula of Malaya, perhaps due to the conversion of Parameswara to Islam (Mohamed Adil, M. A. & Ahmad, N. M., 2014).

Since Islam came to the soil of Malacca, it rapidly changed the law. Historians and legal writers have unanimously agreed that the influence of Islamic law together with Malay customs contributed largely to the application of law in Malacca. *Hukum Kanun Melaka* or the Malacca law is one of the best examples that could prove this claim. The significance and contribution of this law, in certain extent, had largely shaped the drafts of other Malay laws in other respective states in the Peninsula of Malaya. This could be seen in Johore Law, Pahang Laws, Kedah Laws and the *Undang-undang Sembilan Puluh Sembilan* (Ninetynine Laws of Perak), where most of the provisions in these laws originated from the *Hukum Kanun Melaka* (Ahmad Ibrahim and Ahilemah Joned, 1995). The recognition to Islamic law was even more evident when it was acknowledged as law of the land for Malay States based on the case of *Ramah v Laton* [1927] FMSLR 116 and *Reg v Willans* (1858) Ky 16.

The golden era of Islamic law in Malay States however come to its diminishing trend when the British arrived since 1795. The British residential and advisory systems through administrative and legal approaches based on 'divide and rule' concept have indirectly influenced the system of the Malay state government and the people are forced to obey it (Saat, 2010). Ever since, the Islamic law and the Syariah Court have gradually been isolated, their role reduced and their jurisdiction limited to personal matters only such as marriage, divorce and inheritance. The modus operandi used by the British by prioritising English law and procedure in the administration of justice

makes local civil law adapted from English civil law dominate all state administration of justice (Che Pa, H., Nor Muhammad, N. H., & Mustar, S., 2016).

English law has been adopted due to the absence of written codification of Islamic law in some matters related to freedom and human rights. Syariah Courts only function to hear about Muslim matters and are not considered to have become part of civil law. The civil court has broad jurisdiction, surpassing the jurisdiction of sharia judicial institutions. Interference in the jurisdiction of the Syariah court is common by making decisions that differ from the judgment of the Syariah court. The civil court will refer to binding precedents, while the Syariah court will refer to Islamic authoritative sources (Abu Bakar, Z. R., 2007).

The jurisdiction of the Syariah court become less significant because cases related to Muslims can be intervened by the civil court as happened in *Ainan bin Mahamud v. Syed Abu Bakar* [1939] MLJ 209. In this case, the decision of the Syariah court has been revised by the civil court judgment which subsequently recognised the child of a Muslim woman four months after marrying a Muslim man as a legitimate child of that man. In addition, civil court intervention also occurred in the court of appeal case *In re Maria Hertogh* [1951] MLJ 64. The civil court in this case made a decision based on the principle of English domicile law which caused a marriage that had been declared valid according to Islamic law to be declared to be invalid. The intervention of the civil court in the jurisdiction of the Syariah court in the pre-independence period has caused a contradiction in the judgments made by the civil court judges because they do not have knowledge of Islamic law before making a decision, making the decision made not in accordance with the requirements of Islamic law (Shuaib, F. S., 2008).

After achieving independence, the interventions of the civil court on the jurisdiction of the Syariah court still continue as in the case of *Re Maria Menado* (1964) MLJ 266 where the approach used by the civil court is not in line with the decision of the Syariah court against the prohibition order issued by the Syariah court. In the case of breach of Muslim engagement contract, *Nafsiah v. Abdul Majid* [1969] 2 MLJ 175, the civil court used English contract law as the basis of judgment and had jurisdiction to hear Muslim personal and family law cases, including Islamic engagement contract matters. In the case of *Commissioner for Religious Affairs, Trengganu & Anor v. Tengku Mariam & Anor* [1970] 1 MLJ 222 the Federal Court has ruled that they are bound by the decision of the Privy Council in matters of Islamic waqf and have the authority to decide the case. This decision of the civil court overruled the decision of the mufti on the grounds of being bound by the doctrine of binding precedent which had been decided by the Privy Council.

Likewise, in the case of *Myriam v. Mohamed Ariff* [1971] 1 M.L.J. 265, the civil court judge has decided that the civil court still has jurisdiction over Muslims (even though the authority has been given to the Syariah court) in matters related to child custody. These scenario indicated that the civil court is not parallel to the jurisdiction of the Syariah court and there was a tendency of the civil court to interfere with the jurisdiction of the Syariah court by using the approach of English legal principles. This

situation has caused a conflict of different jurisdictions in an issue of Islamic law between the Civil and Syaria Courts (Shuaib, F. S., 2008).

ARTICLE 121(1A) AND ITS IMPLICATIONS TO COURTS JURISDICTION IN MALAYSIA

The different jurisdiction between the Syariah court and the civil court often raises conflicts, and it is not a new issue. Most of the time, the civil court often interfered with the jurisdiction of the Syariah court. This issue has been going on for so long. However, the amendment made in 1988 through the addition of subsection (1A) to Article 121 of the Federal Constitution was a good move to resolve the conflict. Article 121(1A) provides the exclusive jurisdiction of the Syariah court thus it is incomplete to discuss jurisdictional conflict issues without rereferring to this provision (Mohamad, A. H., 2017; Yahya, I., 2017; Mohamed Adil, M. A, 2018a). This is because this amendment was made to remove the High Court's jurisdiction over matters that are under the jurisdiction of the Syariah court. Literally, this means that the High Court can no longer interfere in the jurisdiction of the Syariah court. (Ahmad, N. M. et. al., 2019).

The amendment of Article 121A (1A) has restored the rights of Muslims that have been lost for a long time even though Islamic law is the *lex loci* and it has an impact on the legal system in Malaysia. Among the impacts of this amendement are the civil courts are not allowed to interfere with the jurisdiction of Syariah courts and the Syariah court shall have exclusive jurisdiction through separation of powers between the civil and Syariah judicial institutions (Che Pa, H., Nor Muhammad, N. H., & Mustar, S., 2016).

In addition, the Syariah court becomes an independent and exclusive body in conducting adjudication matters without the need for the intervention of the civil court. The purpose of this separation of jurisdictions is to resolve legal conflicts between the civil and Syariah courts. Most recently, based on this provision, a judge is a High Court in Georgetown, Penang has rejected 57-year-old woman's attempt to challenge the Syariah court's decision on her application to renounce Islam (Free Malaysia Today, 2023).

Indeed, the Article 121 (1A) amendment has indirectly given judicial recognition to all judgments made by the Syariah Court to avoid any interference or conflict of judgments later (Mansor, M. H., 2021). Although exclusive authority has been given to the Syariah court, the effect of the amendment of Article 121(1A) remains in some matters for example in determining that applications such as Letters of Inheritance and Probate must be made in the civil court. The Syariah court has no authority to issue, except in matters related to faraid. The concept of justice between Civil Court judgments which touch on Muslims is different from the principles of Islamic justice based on God's revelation, while British justice is a concept derived from the ideas of judges and legislators.

The reality is that the civil court can still interfere with the jurisdiction of the Syariah court since Article 121 of the Federal Constitution actually still gives room for

the civil court to interfere with the power of judicial review over all courts and partial courts, including the Syariah court. This shows the real fact that the Syariah court still does not have absolute power and exclusive jurisdiction in its judgment because the civil court can still intervene in the affairs of the Syariah court in the event of a judicial review (Mohamed Adil, M. A. 2018a). Overall, the main effect of the amendment is to avoid conflict between the Syariah Court and the Civil Court in making a decision in the future as has happened in several cases such as the issue of property inheritance, the status of illegitimate children, wills, child custody and embracing Islam. Accordingly, if a matter falls within the jurisdiction of the Syariah Court, the Civil Court will not have jurisdiction to hear the matter (Ahmad, N. M. et. al., 2019).

On the other hand, according to Former Chief Justices of Malaysia Tun Abdul Hamid Mohamad (2017), the Syariah-civil jurisdictional conflict does not solely happen because the civil court always attempt to intervene the Syariah court's jurisdiction but also because the tendency of the State's legislative body to intentionally contravene the limits set by the Federal Constitution (see also (Mohamed Adil, M. A. 2018a). This happen due to the 'misunderstanding', 'intention to expand the jurisdiction of the court in the name of Islam', and to the extent that there has been State government which intended to take over the Federal power and jurisdiction relating criminal laws (Mohamad, A. H., 2017). In addition, this conflict of jurisdiction also occurs because the jurisdiction of the Syariah court is only limited to hearing of offenses committed by Muslims alone. If a Syariah criminal offense occurs involving non-Muslims, then the Syariah court is no longer eligible to hear the case (Mohamad, A. H., 2017; Yahya, I., 2017).

THE IKI PUTRA CASE

The case of *Iki Putra Mubarrak v Selangor State Government & Anor* involves an application filed by the Applicant pursuant to Article 4(4) of the Federal Constitution to obtain from a Federal Court Judge, a permission to challenge the validity of Section 28 of the Syariah Criminal Enactment (Selangor) 1995. This case is among recent cases that have overlapping jurisdictions of civil and Syaria laws. The decision of the Federal Court in this case has sparked a long debate especially among legal practitioners and academics.

Fact of the Case

In August 2019, Iki Putra was charged in the Selangor Shariah High Court under Section 28 of the 1995 Selangor state law read together with Section 52 for attempted offences, where he was alleged to have in November 2018 in a house in Bandar Baru Bangi attempted to commit sexual intercourse against the order of nature with other men (Lim, 2021). In his trial at the Selangor Syariah High Court, he pleaded not guilty and challenged the validity of the provision in the Federal Court on the grounds that the Selangor State Legislature did not have the authority to make the provision. The petition for this case was filed under the original jurisdiction of the Federal Court, which is related to the challenge of the competence of the relevant legislative body as

provided in Article 4(3) and Article 128(1). Laws made incompetently can be annulled under Article 4(1).

The petition was heard by Yang Amat Arif-Yang Amat Arif (YAA) Tengku Maimun, Rohana Yusuf, Azahar Mohamed, Abang Iskandar, Zawawi Salleh, Nallini Pathmanathan, Vernon Ong, Zabariah Mohd and Hasnah Hashim. YAA Tengku Maimun wrote the majority judgment and 2 other judges, YAA Azhar and YAA Zabariah wrote separate judgments upholding the decision from the YAA Tengku Maimun judgment (Wook, I., Ghulam Khan, I. N. & Md Yusof, A. F., 2023). In the Federal Court's judgments on 25 February 2021, two lists in the Federal Constitution's Ninth Schedule were examined, with these two lists stating the different matters that the federal government and state governments have powers to make laws on. In the Federal Constitution's Ninth Schedule, List I which is also known as the Federal List states what the federal government via Parliament can make laws on, while List II which is also the State List states the matters which state governments through their respective state legislative assemblies can make laws on (Lim, 2021).

Issues

Essentially, the court case was about whether the Selangor state government should not have made a state law — via Section 28 — which makes unnatural sex a Shariah criminal offence, if unnatural sex is a matter which comes under Parliament's power to make laws on instead, based on the Federal Constitution.

Applicant's Argument

Among the applicant's arguments is that 'in essence' the provision in Section 28 of Syariah Criminal Enactment (Selangor) 1995 has also been provided as an offense under Section 377A of the Penal Code. Next, the Selangor State Legislature ("SSL") has exceeded its jurisdiction when making provisions in List II of the Ninth Schedule that have violated Article 74 of the Federal Constitution because it is under the jurisdiction of the Federal and not the State. In general, criminal law is the jurisdiction of the federal government under the Federal List. Under the State List, the Federal Constitution has specifically provided for a long (but limited) list regarding the jurisdiction of the state and the Syariah Court in criminal offences, namely "...creation of punishment of offenses by persons professing the religion of Islam against the precepts of Islam..." (Mohamed Hadi, 2021).

Courts' Decision

The court ruled that the provision of Section 28 of the Selangor State Syariah Criminal Enactment 1995 related to the crime of sodomy is unconstitutional and illegal. The Federal Court judges unanimously granted the Applicant's application without costs.

Grounds of Judgment

After going through judgments by the Federal Court in three other relevant court cases, Justice Tengku Maimun said that the nine-member panel is of the view that

these judgments show that the issue is not about the "co-existence" of federal and state laws, but instead more about the independent application of the two streams of laws — civil and Shariah laws — within their respective jurisdictions. The judge then concluded that it could be put forward that when Parliament and the state legislature make laws on the same subject matter of criminal law, the two laws cannot co-exist even if the offence is said to be against the precepts of Islam, due to the "preclusion clause" in Item 1 of the State List.

"Given the above, the natural consequence is that the subject-matter upon which section 28 of the 1995 Enactment was made falls within the preclusion clause of Item 1 of the State List. "As such, it is our view that the said section was enacted in contravention of item 1 of the State List which stipulates that the state legislatures have no power to make law 'in regard to matters included in the Federal List'. To that extent, section 28 of the 1995 Enactment is inconsistent with the Federal Constitution and is therefore void," the judge said when noting that Section 28 in the Selangor state law had went against the Federal Constitution.

Justice Azahar, on the other hand, noted that there are three categories of Shariah criminal offences in Malaysia that would remain valid as state laws, despite the "preclusion clause", namely offences relating to *"aqidah"* or the Muslim faith (including wrongful worship, deviating from Islamic belief, teaching false doctrines), offences relating to the sanctity of Islam and its institution (including insulting the Quran, failure to perform Friday prayers, disrespecting Ramadan and not paying zakat), offences against morality (including consuming intoxicating drinks, khalwat or close proximity and zina or sexual intercourse outside marriage).

"As can be seen, these are offences in relation to Islamic religion practiced in this country that must conform to the doctrine, tenets and practice of the religion of Islam. In short, I refer to these offences as religious offences," he said, adding that this is a non-exhaustive list of examples of religious offences that can be validly enacted by state legislatures, based on the facts of each case. "In my opinion, all these offences are purely religious in nature that is directly concerned with religious matters or religious affairs," he said, citing Article 74(2) when saying that these religious offences which regulate Muslims' beliefs and practices can only be created through laws passed by state legislatures and that such religious offences would not fall under the category of "criminal law" in the Federal List. He noted that such religious offences come under the Shariah courts' jurisdiction and only apply to Muslims.

Justice Azahar pointed out that Section 28 of the Selangor state law which only applies to Muslims is punishable by a maximum sentence of jail up to three years, fine up to RM5,000, or whipping up to six strokes or any combination, while Section 28 would not apply to non-Muslims and the non-Muslims could instead be charged in the civil courts under the Penal Code's Section 377 which is punishable with a maximum jail term of up to 20 years and also fine or whipping. With Article 8 of the Federal Constitution providing for all persons to be equal before the law and no discrimination against citizens only on grounds such as religion, the judge had said it would be hard to deny that a non-Muslim would be discriminated in such a situation

as a Muslim would have the benefit of a lesser sentence for a substantially similar offence. Hence, according to Justice Azahar, this was among the reasons why he concluded that Section 28 is invalid as it was ultra vires or went beyond the Federal Constitution, noting that the state legislature had made Section 28 when it had no power to make law on the unnatural sex offence and that "only Parliament could enact such a law".

Implication of the Case

The decision of the Federal Court in the Iki Putra case will have an impact on the state's Syariah criminal enactment. First, states can no longer enact laws related to sexual intercourse contrary to natural law, such as adultery or *ityan al-bahimah*. The President of Syarie Lawyer Association of Malaysia, Musa Awang in a statement stated that the decision of this Iki Putra case will open the 'floodgate' up space for any other party to challenge other provisions contained in the State Syariah Criminal Enactment (Ali, 2021). This shows that as long as there is provision for a criminal offense in Federal law, it is very difficult for the state government to enact laws related to Syariah criminal offenses even if the offense is in the category of offenses committed by Muslims against the prohibitions in Islam.

In addition, the decision of the Federal Court is also a preliminary impression of "closing the door" to the proposal to implement laws related to hudud and qisas in this country. This is because hudud offenses such as stealing (sariqah), robbery (hirabah), qisas offenses such as murder (al-qatl) are also found in the Penal Code (Nordin et. al., 2021). The decision in the Iki Putra case is like a domino effect. This is because it not only affects other provisions in the Selangor State Syariah Criminal Enactment but will also involve all other states that have the same provision. However, it is more important to look at the entire judgment of the Federal Court which emphasises the importance of Federalism in the Federal Constitution.

Articles 73-95E of the Federal Constitution explain the relationship between the Federal and State governments. This provision has established jurisdiction between the Federal and State governments in enacting laws. The Ninth Schedule of the Federal Constitution has also outlined matters that are within the jurisdiction of the Federal and State governments as well as joint jurisdiction. Through this provision, it can be clearly seen that if there is a conflict in any law made then the law enacted by the Federal government will prevail over the law made by the State government. This means that the law of the state will be invalid to the extent that the conflict exists.

In Article 76 of the Federal Constitution, it was also stated that the Federation can make laws on behalf of the State government according to the Second List, Ninth Schedule if it aims to create uniformity in the law as it currently exists, namely the National Land Code and the Local Government Act 1976. In addition, Article 76A provides that the Parliament can make any law that gives power to the State government to enact laws that are within the jurisdiction of the Federal government. As a result, it can be seen that through the judgment made in the case of Iki Putra, any sharia criminal law that is similar or contrary to the Federal Constitution is null and

void. Therefore, it is appropriate for the state government to revise the law that has been enacted to avoid the risk of being challenged in Court. This is because the State Syariah Criminal Enactment for example Selangor was in 1995 which has not been renewed or amended after 28 years have passed. The review can examine whether there are provisions that need to be added, removed, and amended (Nordin et. al., 2021).

THE WAY FORWARD

As the way forward, legal practitioners have proposed some forms of recommendations that can be done, namely;

1.   Focus on the current structural changes in the legal framework. One example is the appointment of Islamic Judges to judge cases related to the importance of Islamic law in the civil court, in addition to the establishment of only one form of Court. The participation of judges of both chambers will allow to coordinate the jurisdiction of both chambers in hearing such cases.

2.   Use existing provisions but need to be improved by the responsible party so that the law is consistent and so that there will be no conflict of jurisdiction in the future.

3.   Allow Non-Muslims to appear in Syariah courts as Parties. The law needs to provide flexibility to allow non-Muslims to appear in Sharia courts as parties so that the wishes and needs of both parties can be heard by the judge. This can reduce friction between disputing parties, help the sharia court in understanding the needs of the parties and increase the trust and confidence of the parties in the sharia court.

4.   In matters involving syariah questions or syariah courts, it is proposed to allow the involvement of the Chief Judge of the Shariah Court in the composition of the Court of Appeals and allow the involvement of civil court judges in syariah courts in the same matters. Such involvement allows the interests of Muslim and non-Muslim parties to be preserved in both courts. In this way, it gives more meaning to the co-existence of these two entities in the administration of the national justice system.

In addition, Tun Abdul Hamid Mohamad (2017) suggests that if there are syariah issues in a case in a civil court where the case is outside the jurisdiction of the syariah court because:
  i.   one or all of the parties in the case are not Muslim; or
  ii.   there are constitutional issues; or
  iii. there are civil law issues (eg land law, company law or common law principles) in addition to sharia issues such as waqf,
  iv.   then the civil court must sit together with a sharia court judge.

If the case is a High Court case, a Syariah High Court Judge can be borrowed. If the case is in the Court of Appeal or in the Federal Court, we can borrow a Chief

Syarie Judge where the court is sitting. The role of the syar'ie judge is to advise the civil court judges on a syariah issue. The civil court judge will adopt the syar'ie judge's decision on the syariah issue in deciding the case. We do not need to create new positions. Existing syar'ie judges can be borrowed. Such cases arise very rarely, perhaps only a few times a year. It will not involve reducing the jurisdiction of the sharia court because the cases are indeed outside the jurisdiction of the sharia court. In fact, it will increase the authority of sharia judges and will give sharia court judges exposure to the experience of sitting in civil courts (Mansor, M. H., 2021).

In addition, State governments do not need to worry because it does not in the least reduce the jurisdiction of the Syariah courts, but rather increases the powers of Syariah judges. The Federal Government also has nothing to lose. All political parties should support because there is no politics in this matter and it will solve problems that have not been overcome so far while benefiting all parties. Muslims and non-Muslims will benefit from this rule. If in the past non-Muslims (including the Islamic Religious Council) did not have an avenue to be heard in court if the issue involving them was a syariah issue because the case was under the jurisdiction of the syariah court and they were not Muslim and could not appear in the court , today the case will be heard in a civil court assisted by a sharia court judge.

If this were to be done, only a few amendments need to be made to the Constitution and the Court of Justice Act 1964. This rule will also not involve any additional expenses. This proposal is the only and easiest way for us to overcome the problems we have faced since Independence. The amendment to Article 121(1)(A) of the constitution has improved the situation a little but the mentioned problem continues to be faced. As long as we do not make this amendment, this problem will continue (Mohamad, A. H., 2021 & Mohamed Hadi AH, 2021). Meanwhile, the approach of using the term "harmonisation" leads to a wise approach in response to the clash that occurred between the two jurisdictions of the court (Mohamed Adil, M. A. 2018b). It is also important to ease jurisdictional conflicts that have occurred after a long time (Mohd Zin, N., 2017). Some legal figures have proposed that the civil court and Syariah court are unified (Mohamad, A. H., 2017; Yahya, I 2017 and Mohd Zin, N., 2017). The basis of this approach is to ensure that both Syariah and civil court judges can sit together in determining the decision, especially in cases that need guidance from Islamic law to judge it. The approach makes Malaysia as a single legal system needs to be evaluated on aspects of Islamic and universal justice and does not involve religious matters whether a person is Muslim or not (Yahya, I., 2017).

In addition, the form of punishment found in the Penal Code should be harmonised with the Syariah law in the existing criminal law contained in the Penal Code is indeed part of Islamic criminal law. Use of punishment which fulfills the spirit of Islamic law needs to be the core of the implementation framework the law contained in the Penal Code so that it is in line with the requirements of the Sharia in addition to ensuring that the harmonisation process can be achieved (Mohamed Adil, M. A., 2018).

CONCLUSION

The conflict between the civil and Syariah courts continues to this day, with the Iki Putra case illustrating the civil court's interference with the jurisdiction of Syariah law. However, there are two sides of view with the position of the offense of sodomy whether it is under the civil court alone, or both courts have jurisdiction to try it. The debate about which courts have jurisdiction over Syariah crimes shows that it is not entirely within the jurisdiction of civil courts. The intention of the framers of the Constitution clearly shows that Syariah crimes are not included under the definition of "criminal law" found in the Federal List.

When there is a conflict of jurisdiction between the Syariah court and the civil court, the recognition of the jurisdiction of the Syariah court is clearly guaranteed when it involves an issue whose "subject matter" is clearly related to Islamic law/Syariah law. This is because, in most cases, the court looks at the "pith and substance" or "remedy approach" when there is a dispute over an issue from the point of view of the clash of legislative powers between the state and the federal government as in the Iki Putra case.

This article has highlighted that in reality, the effort to dignify the legal institution of the Syariah court has passed a difficult journey of 35 years starting with the amendment of Article 121 (1A) in 1988. All the sincere efforts of the legislators to see the Syariah court develop in line with the civil court have been on the right track. Nevertheless, continuous efforts need to be made to empower the Syariah court institutions either at the state or federal level. This effort is needed to increase the credibility and level of professionalism of all parties involved, starting with staff, prosecutors, judges and Syarie lawyers. So, it is important to ensure that everyone understands Islamic law and the principles of universal justice, so that they gain a better understanding of how Islamic law works and what are its goals. This responsibility does not only rest on the shoulders of Islamic judicial institutions, but it is an integrated responsibility and commitment from the Executive and government in general.

REFERENCE

Abu Bakar, Z. R (2007) *Mahkmah Syariah Tak Praktis 'Stare Decisis' (Duluan Mengikat)* Berita Harian, 7 Julai 2007.

Ahmad, N. M. et al. (2019). *Pengantar pentadbiran undang-undang Islam di Malaysia.* Nilai, Negeri Sembilan: Penerbit USIM.

al-Attas, S. M. N. (1969). *Preliminary Statement on a General Theory of the Islamization of the Malay-Indonesia Archipelago.* Kuala Lumpur: Dewan Bahasa dan Pustaka.

Ali, S. (2021, Februari 25). *Kes Iki Putra beri implikasi besar kepada perundangan syariah negara.* Retrieved from Wacana: https://wacana.my/kes-iki-putra-beri-implikasi-besar-kepada-perundangan-syariah-negara/

Che Pa, H., Nor Muhammad, N. H., & Mustar, S. (2016). Bidang Kuasa Eksklusif Mahkamah Syariah Selepas Pindaan Perkara 121(1a) Perlembagaan Persekutuan: Satu Penilaian. *Malaysian Journal of Syariah and Law*, 4(1), 1-13. Available at <https://doi.org/10.33102/mjsl.vol4no1.12> Accessed 2 August 2023.

Free Malaysia Today. (2023, August 4). Convert fails in bid to challenge shariah court's ruling on renunciation. Available at <https://www.freemalaysiatoday.com/category/nation/2023/08/04/convert-fails-in-bid-to-challenge-shariah-courts-ruling-on-renunciation/> Date accessed 4 August 2023

A.H., Mohamed Hadi (2021, Feb 25). *Apa maksud keputusan mahkamah isu seks luar tabii?* Malaysiakini. Available at <https://www.malaysiakini.com/news/564324> Date accessed: 26 February 2021.

Ibrahim, A & Joned, A. (1995). *The Malaysian Legal System.* Kuala Lumpur: Dewan Bahasa dan Pustaka, 2nd ed.) 15-16.

Lim, Ida (2021, Feb 25). *Federal Court unanimously declares Selangor Shariah law criminalising 'unnatural sex' void, unconstitutional.* Malay Mail. Available at <https://www.malaymail.com/news/malaysia/2021/02/25/federal-court-unanimously-declares-selangor-shariah-law-criminalising-unnat/1952701> Date accessed 3 August 2023.

Mansor, M. H. (2021). Ulasan kes Iki Putra dalam kesalahan liwat dan harmonisasi bidang kuasa mahkamah sivil dan syariah. *Perspektif*. Available at <https://www.tsis.my/wp-content/uploads/PERSPEKTIF-Ulasan-Kes-Iki-Putra-dalam-Kesalahan-Liwatdan-Harmonisasi-Bidang-Kuasa-Mahkamah-Sivil-dan-Syariah-.pdf> Accessed 11 January 2023.

Mohamad, A. H. (2017). *Artikel 121 (1A): Sejauh Manakah Ianya Menyelesaikan Konflik Bidang Kuasa Antara Mahkamah Syariah dan Mahkamah Sivil.* Penerbitan Khas Sempena Forum Undang-undang Universiti Islam Malaysia, 11 April 2017. Available at <https://tunabdulhamid.me/2017/04/artikel-121-1a-sejauh-manakah-ianya-menyelesaikan-konflik-bidang-kuasa-antara-mahkamah-syariah-dan-mahkamah-sivil-2/> Date accessed: 1 July 2023

Mohamed Adil, M. A. & Ahmad, N. M. (2014). *Islamic Law and Human Rights in Malaysia*. ICR Journal 5 (1):43-67. Available at <https://doi.org/10.52282/icr.v5i1.421.> Accessed on 3 August 2023.

Mohamed Adil, M. A. (2018a). Konflik Bidang Kuasa Mahkamah Syariah-Mahkamah Sivil di Malaysia. In Mohamed Adil, M. A., *Perlaksanaan Undang-undang di Malaysia: Khayalan atau Realiti?* (hlm. 119-144). Kuala Lumpur: International Institute of Advance Islamic Studies (IAIS) Malaysia.

Mohamed Adil, M. A. (2018b). Pengharmonian Undang-undang Sivil dan Syariah. In Mohamed Adil, M. A. *Perlaksanaan Undang-undang Islam di Malaysia: Khayalan*

atau Realiti? (hlm. 1-22). Kuala Lumpur: Ilham Books & International Institute of Advanced Islamic Studies (IAIS) Malaysia.

Mohammad Hazim Shah, M. H. S. & Buang, A. H. (2021). Penambahbaikan undang-undang jenayah syariah dalam menangani isu transgender di Malaysia: Cabaran dan cadangan. *Sains Insani*, *6*(3). Available at <https://doi.org/10.33102/sainsinsani.vol6no3.356> Accessed on 13 January 2023.

Mohd Zin, N. (2017). Conflict of Jurisdiction Between Civil and Shariah Court: Dichotomy and Harmonisation. Dalam A. M. Zainal, *Artikel 121 (1A) Perlembagaan Persekutuan: Sejauh Manakah Artikel Ini Menyelesaikan Konflik Antara Mahkamah Syariah dan Mahkamah Sivil* (hlm. 47-68). Cyberjaya: Universiti Islam Malaysia.

Nordin, N., Hafiz, N. W, Mohd Adanan, N. A. A, Fakhri, F. F. & Badarudin, N. N (2021) *Konflik Bidangkuasa Antara Mahkamah Sivil Dan Syariah Di Dalam Kes Iki Putra*, Student Written Task for DIJAP program, Faculty of Syariah and Law, Universiti Sains Islam Malaysia, Nilai.

Saat, I. (2010) *Caturan Politik Pelbagai Kaum Di tanah Melayu 1946-1957*. Jebat Malaysian Journal of History, Politic & Strategic Studies, Vol.37 (2010).

Shuaib, F. S. (2008). *Powers and Jurisdiction of Syariah Courts in Malaysia* (2nd ed.) Petaling Jaya: LexisNexis.

Tan, P. L. ed. (1997). *Asian Legal Systems – Law, Society and Pluralism in East Asia.* Butterworths: Lexis Nexis.

Wook, I; Ghulam Khan, I. N. & Md Yusof, A. F. *Iki Putra Bin Mubarrak v. Kerajaan Negeri Selangor* [2021] 2 MLJ 323. Kanun: Jurnal Undang-undang Malaysia, [S.l.], v. 35, n. 2, p. 379-388, june 2023. ISSN 2682-8057. Available at: <https://jurnal.dbp.my/index.php/Kanun/article/view/8795>. Date accessed: 02 August 2023.

Yahya, I. (2017). Peruntukan Perkara 121 (1A) Perlembagaan Persekutuan: Sejauh Manakah Artikel Ini Menyelesaikan Konflik Antara Mahkamah Syariah dan Mahkamah Sivil. Dalam A. M. Zainal, *Artikel 121(1A) Perlembagaan Persekutuan: Sejauh Manakah Artikel Ini Menyelesaikan Konflik Antara Mahkamah Syariah dan Mahkamah Sivil* (hlm. 1-24). Cyberjaya: Universiti Islam Malaysia

IMPACT OF IMPORT AND EXPORT OF ENERGY SUPPLY ON THE TOTAL ELECTRICITY GENERATION IN MALAYSIA

Husna Hayati Ahmad 1[i] & Noor 'Adilah Ibrahim 2[ii]

Faculty of Science and Technology, Universiti Sains Islam Malaysia, Bandar Baru Nilai, 71800 Nilai, Negeri Sembilan. husnaahmad2005@gmail.com
[ii] (*Corresponding author*) Dr, Faculty of Science and Technology, Universiti Sains Islam Malaysia, Bandar Baru Nilai, 71800 Nilai, Negeri Sembilan. nooradilah@usim.edu.my

Abstract

Renewable and non-renewable sources are crucial especially in the production of electricity. In Malaysia, we are mainly use fossil fuels to generate electricity. To ensure a sufficient amount of energy sources, we require to import these energy supplies. Since, Malaysia has a large amount of petroleum and crude oil, we need to export the resources and indirectly, it can contribute by increasing our country's income. Thus, the main purpose of this study is to explore any significant impact of import and export of energy on the total electricity generation in Malaysia. All of the data are taken from Energy Commission (Malaysia). Range from 1980 until 2017 on a yearly basis. Ordinary least square (OLS) and correlation analysis have been implemented to achieve the objectives of our study. The energy supply was found to be significant with the total electricity generation exclude the export of crude oil which shows it is insignificant. Then, our findings proved that the highest correlation is between import of petroleum and import of coal. On the contrary, import of crude oil is the lowest negatively correlated to the export of crude oil. For K-S test, it justified that the residuals are normally distributed. Our results confirm the energy supply influences either in positive or negative impact to the total production of electricity in Malaysia.

Keywords: *Electricity generation, energy supply, import, export.*

INTRODUCTION

Electricity is one of the fundamental needs in our daily life. The electricity is progressively the "fuel of choice" to the economy especially for the countries that rely heavily on the light industrial sectors, services as well as digital technologies. The fuel of choice means the electricity is increasingly essential for well-being daily life which exponentially increase the demand of electricity. This is mainly due to the development of global industrialization starting in the middle of the 18th century. As reported by the International Energy Agency (2018), the final production of electricity worldwide is approximately 20% and is expected to increase in the future to fulfil the high electricity demand. Undeniably, the increasing electricity production will certainly pressure the earth's finite resources and ecosystem. Thus, the human needs

and maintaining the natural system should run in parallel. In other words, the energy should be generated at lower environmental costs to effectively fulfil the high energy demand.

To the best of our knowledge, many countries around the world are highly depending on the fossil fuels to produce electricity, where 85% of the global energy consumption relies on the fossil fuels (Killingtveit, 2012). Over-consumption of fossil fuels may induce many bad impacts to the world. Excessive burning of fossil fuels may cause a high percentage of greenhouse gases (GHG) emissions such as carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O). These gases may increase the percentage of absorption of outgoing radiation which will significantly increase the global temperature. Based on the Intergovernmental Panel on Climate Change (2007) report, the average temperature of the earth is approximately 15°C and it could increase by 2-4°C or more during this century if the utilization of fossil fuels keeps increasing.

In addition, high utilization of fossil fuels also may threaten the resources. The high demand for electricity has forced the energy producers to extract the finite reserves of fossil fuels at excessively high rate which leads to fast depletion of resources. The fossil fuels are exhaustible, and the reserves are decreasing over time. As been reported by Shafiee and Topal (2009) and Samsudin and Rahman (2016), it is approximated that the reserves of oil and natural gas can only supply for another 40 years, and coal can be used for another 100 years if they are consumed at today's rates. Due to these deficiencies of fossil fuels, people around the world are encouraged to transform their conventional energy sources to safer, cleaner and naturally replenished renewable energy.

The utilization of renewable energy in producing electricity may provide a huge benefit especially to the development of social and economic, energy supply, as well as environmental and health. However, its deployment also may induce several critical challenges. The first factor is distributed nature of renewable resources where some of the potential renewable resources are isolated and located away from the demand centers. In Europe, for instance, solar and wind energy are much generated in southern and northern Europe, but the demand is primarily in its central continent. This is certainly leading to a mismatch in the energy demand and supply. To avoid the issue of energy surplus and to fulfill the energy demand, a high transmission cost is required to transmit the energy produced to the energy needed places.

The second factor is environment and social impacts. For instance, the installation of wind turbines requires a huge land which may lead to environment degradation, noise pollution, and bat's and bird's fatalities as well as degradation of

wildlife habitats. Apart from these, another great challenge is non-storable and intermittent behavior of some renewable energy resources. To cope with the intermittency problem, the energy producers are required to build more effective tools or strategy such as creating batteries which can store a large amount of energy generated. Indeed, that is one of the main challenges in the renewable energy world where the energy produced cannot be stored and has to be used immediately. If many effective batteries can be built up, the energy produced can be stored and utilized whenever the renewable energy source is unavailable (for example, solar energy cannot be generated during night hours).

Despite the utilization of fossil fuels may induce many bad consequences to the environment, fossil fuels are still crucial to the electricity system as a backup plan of intermittent renewable energy production. As for a rapidly developing country in Southeast Asia, Malaysia, its economic growth is highly dependent on its abundant energy resources, mainly natural gas and crude oil. Over the past 30 years, Malaysia has been using oil, natural gas and coal in its energy generation and involved in the international business of export and import of these energy supplies. Knowingly, Malaysia is the major oil exporter among ASEAN countries. However, it is becoming a net importer of oil due to the significant rise of oil consumption and declining in oil production within the country (Khattak et al., 2018). As for natural gas, Malaysia is ranked as the world's fourth largest exporter of liquified Natural Gas (LNG) as reported in TheStar (2019). On the other hand, Malaysia has been the major importer of coals which primarily obtained from Indonesia and Australia (Khattak et al., 2018). Furthermore, based on the statistics reported by Energy Commission (2018), as of 2016, Malaysian export and import of oil are approximately 60.5% and 39.5%, respectively. Meanwhile, LNG has been exported by about 78.2% and imported by 3.6%. As mentioned previously, Malaysia is the major importer of coals where its total import is almost 100%.

There are voluminous previous studies investigated various issue of energy such as energy security (Shaikh et al., 2017 and Khattak et al., 2018) and the relationship between energy and macroeconomic factors (Begum et al., 2015, Shahbaz et al., 2015, and Bhattacharya et al., 2016). However, there are very limited resources of literature emphasizing on the impact of export and import of fossil fuels supply on electricity generation. Since Malaysia is blessed with a lot of energy resources such as oil, gas and coal, they could be used to supply energy and power the economy of a nation. Furthermore, they can be exported which may increase the GDP of the country. Nevertheless, these resources are depletable and may insufficiently fulfill the high energy demand. If this happens, the export of resources should be hold and may

require some import of energy supply. The upward and downward trend of export and import of fossil fuels may significantly affect the total electricity production. Thus, in this study, we are highly motivated to investigate this trend issue towards Malaysian electricity production. The annual data is taken from Malaysia Energy Information Hub (MEIH) range from 1980 to 2017 for empirical analysis.

The structure of this paper is structured as follows: The Section 2 explains the methodology used in the study. The Section 3 explains the empirical results and the limitation. The final section of the paper provides the overall conclusion and suggests some implication for future research.

METHODOLOGY
Augmented Dickey-Fuller Test (Adf)
Before doing the empirical analysis, we perform Augmented Dickey-Fuller Test (ADF) to check the stationarity of the data. If the ADF test rejects the null hypothesis, it means the series is stationary in its mean and variance and does not has unit root:

H_0 : The series is not stationary and has unit root.

H_1 : The series is stationary and has no unit root.

To carried out the ADF test, we used EViews software. The ADF test function is given as (Hussain & Malik, 2011):

$$\Delta y_t = \alpha + \gamma t + \beta y_{t-1} \sum_{i=1}^{n} \delta_i \Delta y_{t-1} + \varepsilon_t \tag{1}$$

where

t = time index,

α = intercept constant called a drift,

γ = coefficient on a time trend,

β = coefficient presenting process root,

n = lag order of the first- differences autoregressive process,

ε_t = independent and identically distributed residual term.

Multiple Linear Regression
After checking the stationarity of the data, we examine the relationship of independent and dependent variables using Ordinary Least Squares (OLS). OLS is a

technique for estimating the unknown parameters in a linear regression model. It has been applied in voluminous study due to its effectiveness and efficiency in estimating the statistical relationship and impact of one independent variable on the dependent variable. There are a few classical linear regression (CLRM) assumptions that must be followed. The assumptions consist of the constant variance assumption, the assumption of correct functional form, the normality assumption and the independence assumption. If these assumptions hold, the OLS procedure creates the best possible estimates. In our study, we use logarithmic transformation in order to have a nicer data. So, we propose a model as follows:

$$lny_t = \beta_0 + \beta_1 lnx_1 + \beta_2 lnx_2 + \beta_3 lnx_3 + \beta_4 lnx_4 + \beta_5 lnx_5 + \varepsilon_t$$

(2)

where,

lny_t	= log of total electricity generation,
lnx_1	= log of export of crude oil,
lnx_2	= log of export of petroleum,
lnx_3	= log of import of coal,
lnx_4	= log of import of crude oil,
lnx_5	= log of import of petroleum,
β_0	= intercept,
$\beta_1, \beta_2, \beta_3, \dots, \beta_5$	= estimated oefficient of independent variables,
ε_t	= 0.

Test of Significance

Next, we test the significance of the independent variables in the model using *t*-test or also known as a significance partial test. Mathematically, the *t*-test is stated as (Abebe, 2020):

$$t = \frac{\bar{x} - \mu_0}{s/\sqrt{n}}, \sim t_{(n-1)} \text{ where } s = \frac{\Sigma (x - \bar{x})^2}{n-1}$$

(3)

where

$\bar{x}$	= sample mean
μ	= population mean,
n	= sample size,
s	= sample standard deviation.

If *p*-value < significance level, then we reject the null hypothesis, H_0, where our H_0 is the independent variable not statistically significant to the total electricity generation. We set the significance level, α, to be 0.05.

F-Test

While t-test is to test the partial significance, the F-test is often used to test the overall significance of the model. In other words, F-test is a statistical test to find the best linear model which gives better fit of the population, by assessing multiple coefficients simultaneously. The hypothesis is as follows:

H_0: $\beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = 0$
H_1: at least one of β_1, β_2, β_3, β_4 and β_5 does not equal to 0.

If the F-statistics (model) less than $F_{[0.05]}$, it fails to reject the null hypothesis and vice versa. The F-test is stated as below (Abebe, 2020):

$$F = \frac{(SSR_r - SSR_{ur})/q}{SSR_{ur}/[n-(k+1)]} \sim F_{q,n-(k+1)} \qquad (4)$$

where,
SSR_r = sum of squared residuals (restricted),
SSR_{ur} = sum of squared residuals (unrestricted),
q = number of restrictions,
n = number of observations,
k = parameters in unrestricted model.

Pearson Correlation

To examine the strength of the linear relationship between variables, we use Pearson Correlation, where its values ranging from -1 to +1. The formula for correlation is as stated below (Cui, Caravelli, & Ududec, 2018):

$$C_{ij} = Corr[X_i, X_j] = \frac{Cov[X_i, X_j]}{\sigma_i \sigma_j} \qquad (5)$$

where

$$Corr[X_i, X_j] = (n(\textstyle\sum ij) - (\textstyle\sum i)(\textstyle\sum j)) \qquad (6)$$

where,
n = number of observations,

$\sum ij$ = total of i and j,

$\sum i$ = total of i,

$\sum j$ = total of j,

σ_i = standard deviation of i,

σ_j = standard deviation of j.

RESULTS AND DISCUSSION

Brief Description

Figure 3.1 illustrates the plot of total electricity generation in Malaysia based on import and export of energy supply. Based on the plot, we can clearly see that there is an increasing trend against years from years 1980 until 2017. This is highly due to an increase in number of population which leads to a massive increase in the demand for electricity.

More specifically, Figure 3.1 shows the trend between the total electricity generation and import and export of energy supply. The variables export of crude oil (x_1) and import of coal (x_3) seems to rise against years in the total production of electricity. While, a decreasing trend from 1980 to 1984 in export of petroleum (x_2) and it starts to increase along with the total electricity generated until 2017. Next, x_4 which is import of crude oil starts to increase in early 1980 otherwise decrease in the production of electricity. Then, in 2000, both export of petroleum (x_2) and import of crude oil (x_4) rise until 2017. Lastly, import of petroleum (x_5) is increasing year by year until in 2000, both plots rise in same value. In conclusion, all of the variables illustrate the increasing and decreasing trend in certain period of years against the total electricity generation in Malaysia.
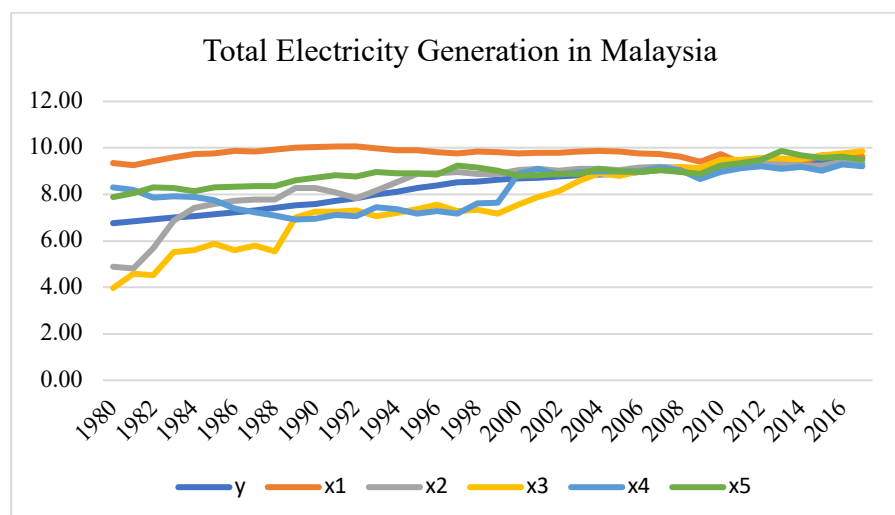
Figure 3.1 Total Electricity Generation and Import and Export of Energy Supply

Augmented Dickey- Fuller Test

Table 3.1 summarizes the result of all variables after doing ADF test. The ADF test is an important step before all of the variables undergo regression analysis to ensure the stationarity of the data. If the data is found not in stationarity state, we should proceed with differencing process.

<div align="center">

Table 3.1 Result for ADF test

</div>

Variables	Level form		First Difference		Series, $I(n)$
	t-test	**p-value**	**t-test**	**p-value**	
y	0.1121	0.9963	-4.1263	0.0130	$I(1)$
x_1	-2.6041	0.2808	-7.5470	0.0000	$I(1)$
x_2	-2.6100	0.2789	-5.2492	0.0008	$I(1)$
x_3	-3.2668	0.0877	-7.3439	0.0000	$I(1)$
x_4	-2.3548	0.3958	-5.6232	0.0003	$I(1)$
x_5	-2.8015	0.2058	-6.3377	0.0000	$I(1)$

For the ADF test, the null hypothesis, H_0 is the series is not stationary and has unit root whereas for the althernative hypothesis, H_1 is the series is stationary and has no unit root. Based on the Table 3.1 above, all the variables in the model fail to reject the null hypothesis at the level form since their p-values are larger than 0.05 at 0.05 significance level. Thus, we can conclude that they are not stationary and have unit root at the level form. To transform into stationary state, we find the first difference and the result shows that the p-values are smaller than 0.05 at 0.05 level of significance. It means that the variables in the model are stationary and do not have unit root at first difference, $I(1)$. Thus, we have a strong evidence to reject the null hypothesis.

Multiple Linear Regression

<div align="center">

Table 3.2 RStudio Output of a Regression Analysis

</div>

Variables	Estimated Coefficients	t	Prob
β_0	0.99908	0.35042	0.7283
x_1	-0.25977	-1.25600	0.2168
x_2	0.24412	3.67964	0.0009

x_3	0.14185	2.16950	0.0376
x_4	0.22373	3.43851	0.0016
x_5	0.55106	3.57354	0.0011
Multiple R-squared: 0.9702 Adjusted R-squared: 0.9655 F-statistic: 208.3 on 5 and 32 DF p-value: < 2.26e-16			

Estimated Parameters

In estimated parameters, it employs more than one regressor to explain the regressand in the model. In our case, $\beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5$ are the mean values of dependent variable, y_t, when the values of independent variables of the export of crude oil is x_1, export of petroleum is x_2, import of coal is x_3, import of crude oil is x_4 and import of petroleum is x_5. Apart from that, β_0, β_1, β_2, β_3, β_4 and β_5 are the regression parameters relating the mean value of y_t to x_1, x_2, x_3, x_4 and x_5. In addition, ε_t is an error term where we assume ε_t to be 0.

Table 3.2 shows the output of RStudio. Based on the regression analysis, we obtain:

$$lny = 0.99908 - 0.25977 lnx_1 + 0.24412 lnx_2 + 0.14185 lnx_3 + 0.22373 lnx_4 + 0.55106 lnx_5$$

The point estimate β_1 = -0.25977. It means we estimate that the mean of total electricity generation in Malaysia decreases since β_1 is negative sign by 0.25977 ktoe for export of crude oil when the other four independent variables do not change. Each of the coefficients have a positive sign which means we can estimate the mean of total production in Malaysia raise by the predicted coefficients when the other variables remain unchanged. For β_2, the total production will increase by 0.244212 ktoe of petroleum to be exported while the rest of the independent variables will be constant.

Same goes to other variables as well. The total electricity generated rises by 0.14185 ktoe from imported coal when others keep unchanged. For variable β_4, import of crude oil, it contributes to 0.22373 ktoe increases to the total generation of electricity. Lastly, increasing of 0.55106 ktoe of import of petroleum leads to increase the production of electricity as well and at the same time the other independent variables in constant.

$$R^2$$

Apart from that, multiple coefficient of determination which is denoted R^2 is one of the important elements that must be considered in doing a regression analysis. Definition of R^2 is the proportion of the total variation in the total number of observed values of the dependent variable that is described by the overall regression model. The R^2 defines the strength of the model's relationship with the response variable. Based on the result obtained from Table 3.2, R^2 is 0.9702 declares that the total electricity generation in Malaysia model with five independent variables explains 97% of the total variation in the thirty-eight estimated total production of electricity. Based on this result, we may conclude that the proposed regression model explained the suggested factors well.

F-Test

The F-statistic for the model is 208.3 based on 5 independent variables and 32 degree of freedom. Since F-statistics (model) = 208.3 is more than $F_{[0.05]}$ = 2.5336, we reject the H_0 in favour of H_1 at 0.05 level of significance. This gives us strong evidence to conclude that the total electricity generation in Malaysia model is significant. Since the p-value of F-test is significant, the regression model predicts the response variable better than the mean of the response.

Fitted Curve

Curve fitting is required to see the differences between the fitted values and the observed values. Based on Figure 3.2, the blue line represents the electricity production while the red line represents the fitted data after undertaking a regression analysis. We can clearly see the pattern of the graphs. Roughly, in 1982, it has been predicted that the total electricity generation in Malaysia is increasing significantly but the real data show us a slightly increase than previous years. In 2009, the result shows conversely, whereby the values are increasing over the years. To estimate the trend in future, it can be one of the guidelines in preparing the strategy to maintain the energy supplies sufficiently.

Total Electricity Generation
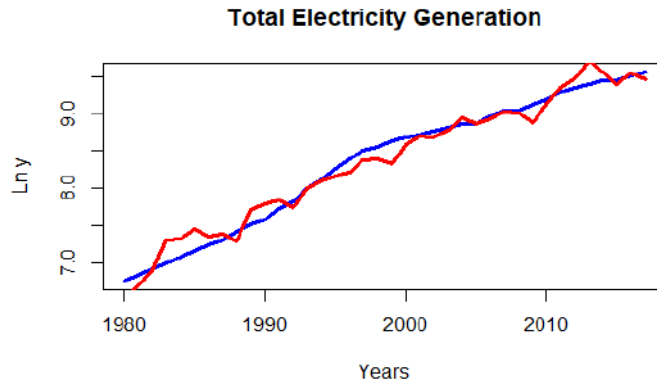
Figure 3.2 Total Electricity Generation in Malaysia from 1980 to 2017 against Fitted Data

Residual Analysis

Residual analysis is vital to check the validity of the regression assumptions. Figure 3.3(a) displays the scatterplot of the residuals. The seasonality pattern is clearly observed in the residuals plot. We show quantile-quantile plot in Figure 3.3(b) to show the correlation between the sample and the normal distribution. There is an orange line which is called as $45°$ reference line. Basically, all the residuals must be in a straight line and followed the $45°$ reference line. Based on the Figure 3.3(b), most of the residual points fall nearly on the reference line. In general, we can conclude that the residuals follow the normal distribution.
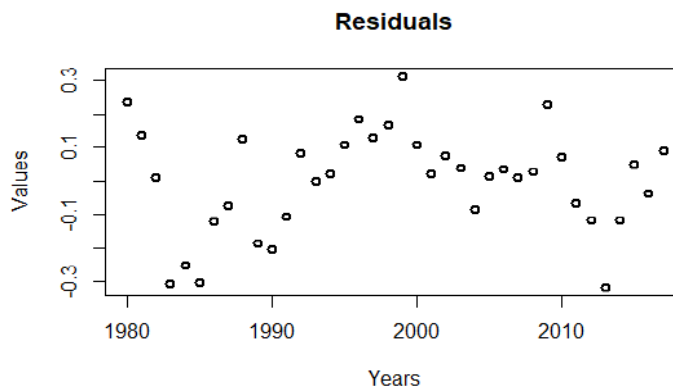
Residuals

Figure 3.3(a) Scatterplot of Residuals

Normal Q-Q Plot
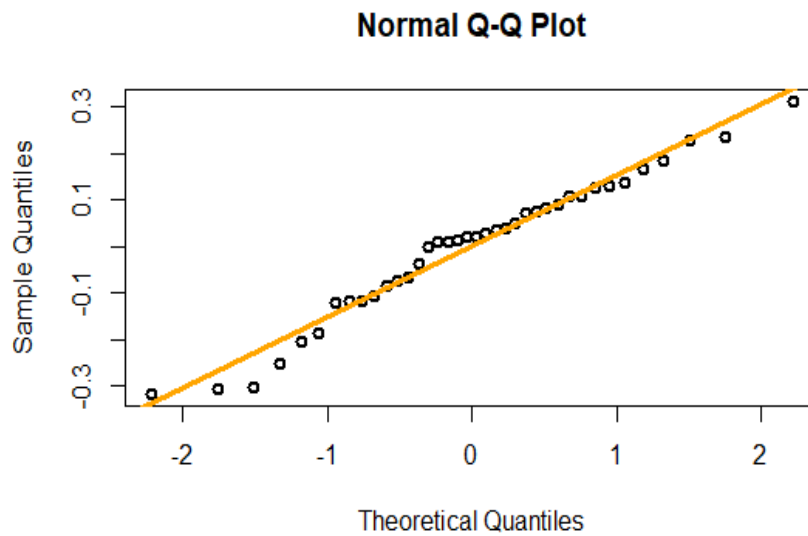
Figure 3.3(b) Normal Residuals Plot

KS Test

Kolmogorov-Smirnov (KS) test is used to quantify the difference between cumulative distributions of the data sets, which often used to check the normality of the data. The null hypothesis, H_0 for the test is the residuals have a normal distribution while alternative hypothesis, H_1 is the residuals are not normally distributed. We do not reject the H_0 if p-value of the KS test is more than $\alpha = 0.05$ whereas accept the H_1 if p-value is less than $\alpha = 0.05$ at 0.05 significance level. The p-value of KS test is found to be 0.5159. Thus, we have a strong evidence to not reject the null hypothesis at 0.05 significance level. We may conclude that the residuals are normally distributed.

Test of Significance

Based on the result reported in Table 3.2, all variables are found to be statistically significant on total electricity generation in Malaysia except the export of crude oil. On the basis of the result, we can conclude that we have a strong evidence to say that export of petroleum (x_2), import of coal (x_3), import of crude oil (x_4) and import of petroleum (x_5) are significantly related to the total generation of electricity in Malaysia (y_t). All of these variables are important and statistically significant to be included in the model. Conversely, we do not have enough evidence to prove the significance of the export of crude oil (x_1). The p-value of this variable is 0.2168 which is much higher than our significance level, $\alpha = 0.05$.

Table 3.3 Pearson Correlation

Variables	Correlation between Variables					
	y	x_1	x_2	x_3	x_4	x_5
y	1.0000	-0.1810	0.8672	0.9640	0.7108	0.9184
x_1	-0.1810	1.0000	0.2211	-0.0906	-0.5578	-0.1424
x_2	0.8672	0.2211	1.0000	0.8811	0.3976	0.8177
x_3	0.9640	-0.0906	0.8811	1.0000	0.6674	0.9017
x_4	0.7108	-0.5578	0.3976	0.6674	1.0000	0.5213
x_5	0.9184	-0.1424	0.8177	0.9017	0.5213	1.0000

Table 3.3 presents the Pearson correlations to measure the correlation of two variables. The result shows that the export of crude oil, x_1 is negatively correlated with total electricity generation in Malaysia while the export of petroleum, x_2, the import of coal, x_3, import of crude oil, x_4 and the import of petroleum, x_5, are positively correlated with the total electricity generation. It can be seen clearly in Table 3.3 that the Pearson correlation between the export of crude oil and the total production of electricity is -0.1810, revealing a weak relationship. In general, we may conclude that all of the variables are correlated to each other. Coal, crude oil and petroleum are the main sources for electricity generation. All variables except export of crude oil have a significant positive relationship to the total electricity generation. The highest correlation between the independent variables is between import of petroleum (x_5) and import of coal (x_3). On the contrary, import of crude oil (x_4) shows the lowest negative relationship with the export of crude oil (x_1).

Limitation
Lack of data is one of the reasons of non-stationarity of the actual data. Based on the ADF test, all variables used are found to be stationary and do not have unit root at first difference. We use the annual data and we believe the result will improve if we have large data available such as monthly or quarterly. Secondly, as widely known, Malaysia is highly use coal as our energy source to generate electricity. But since we lack of data, we exclude it in our study. Thirdly, the fitted curve does not give a smooth line. For any curve fitting, it should have a smooth fit curve. This is most

probably due to insufficient data. The data should be more than 30 data to get an accurate and better result.

CONCLUSION

Currently, our main energy sources to generate electricity in Malaysia are non-renewable energy. Coal, crude oil and petroleum are the important energy supplies where its quantity should be sufficient to fulfil the high electricity demand. Hence, importing and exporting the sources are essential to make sure the availability of the energy sources in adequate amount for the purpose of production. Using OLS and correlation methods, our results show the positive impact of export of petroleum, import of coal, import of crude oil and import of petroleum to the electricity generation in Malaysia exclude for export of crude oil. The export of crude oil seems to give an adverse effect on the total production. Our study proves that the import of petroleum is highly influence the total generation of electricity since 1980. Lastly, all of the independent variables are correlated to each other. For future research, we recommend expanding the model by introducing additional independent variables. For instance, one may include the export and import of natural gas and coal. Due to the lack of the availability of the data, we do not include these two variables in the model to be studied. Lastly, we also recommend to use more frequent time range such as monthly or quarterly data to get more accurate result and clearly observe the pattern of seasonality in the total production of electricity in Malaysia.

REFERENCE

Abebe, T. H. (2020). The Derivation and Choice of Appropriate Test Statistic (Z, t, F and Chi-Square Test) in Research Methodology. *Mathematics Letters*, *5*(3), 33–40. https://doi.org/10.11648/j.ml.20190503.11

Begum, R. A., Sohag, K., Abdullah, S. M. S., & Jaafar, M. (2015). CO2 emissions, energy consumption, economic and population growth in Malaysia. *Renewable and Sustainable Energy Reviews*, *41*, 594–601. https://doi.org/10.1016/j.rser.2014.07.205

Bhattacharya, M., Reddy, S., Ozturk, I., & Bhattacharya, S. (2016). The effect of renewable energy consumption on economic growth : Evidence from top 38 countries. *Applied Energy*, *162*, 733–741. https://doi.org/10.1016/j.apenergy.2015.10.104

Cui, T., Caravelli, F., & Ududec, C. (2018). Correlations and clustering in wholesale electricity markets. Physica A: Statistical Mechanics and Its Applications, 492, 1507–1522. https://doi.org/10.1016/j.physa.2017.11.077

Energy Commission. (2018). Malaysia Energy Statistics Handbook 2018. Energy Commission, Malaysia.

International Energy Agency. (2018). 2018 World Energy Outlook: Executive

Summary. *Oecd/Iea*, 11. Retrieved from www.iea.org/t&c/

Hussain, S., & Malik, S. (2011). Inflation and Economic Growth: Evidence from Pakistan. *International Journal of Economics and Finance*, *3*(5), 1–20. https://doi.org/10.5539/ijef.v3n5p262

IPCC. (2007). Fourth assessment report: Climate Change 2007: the AR4 Synthesis Report. IPCC: Geneva. Retrieved from http://www.ipcc.ch/ipccreports/ar4-wg1.htm.

Khattak, M. A., Keat, L. J., Anwar Bapujee, K., Hui, T. X., Othman, A. S., Danial, A., … Kazi, S. (2018). Progress in Energy and Environment Global Energy Security and Malaysian Perspective: A Review. *Progress in Energy and Environment*, *6*, 1–18.

Killingtveit, Å. (2012). On the transition from fossil to renewable energy in Europe - How can Norway contribute? Det Norske Videnskaps-Akademi - Norges Tekniske Vitenskapsakademi, pp. 53-81.

M. S. N. Samsudin, M. M. Rahman, M. A. W. (2016). Power Generation Sources in Malaysia : Status and Prospects for Sustainable Development. *Journal of Advanced Review on Scientific Research*, *25*(September), 11–28.

Shahbaz, M., Loganathan, N., Sbia, R., & Afza, T. (2015). The effect of urbanization, affluence and trade openness on energy consumption: A time series analysis in Malaysia. *Renewable and Sustainable Energy Reviews*, *47*(62743), 683–693. https://doi.org/10.1016/j.rser.2015.03.044

Shaikh, P. H., Nursyarizal, M. N., Anwer, A. S., Perumal, N., Irraivan, E. & Shaik, M. S (2017). "Building energy for sustainable development in Malaysia: A review." *Renewable and Sustainable Energy Reviews* 75 (2017): 1392-1403.

Shafiee S. & Topal, E. (2009). When will fossil fuel reserves be diminished? Energy Policy, 37, pp. 181-189.

TheStar. (2019). Malaysia closer to opening up natural gas market. Retrieved from https://www.thestar.com.my/business/business-news/2019/06/27/malaysia-closer-to-opening-up-natural-gas-market. [accessed on 25 May 2020].

THE IMPACT OF ONLINE LEARNING ON STUDENTS' STRESS DURING PANDEMIC COVID-19 IN UNIVERSITI SAINS ISLAM MALAYSIA

Jaafar Mahmud[i], *Rezki Perdani Sawai[ii], Joki Perdani Sawai[iii], Abdul Rashid Abdul Aziz[iv], Anita Ismail[v] & Amnah Zanariah Abd Razak[vi]

*[ii] (*Rezki Perdani Sawai*). Senior Lecturer, Universiti Sains Islam Malaysia. email: rezki@usim.edu.my

[i] Universiti Sains Islam Malaysia. jaafarmahmud23@gmail.com
[iii] Senior Lecturer, Universiti Malaysia Sabah, email: joki@ums.edu.my
[iv] Senior Lecturer, Universiti Sains Islam Malaysia. email: rashid@usim.edu.my
[v] Senior Lecturer, Universiti Sains Islam Malaysia. email:anita@usim.edu.my
[vi] Senior Lecturer, Universiti Sains Islam Malaysia. email:amnahz@usim.edu.my

Abstract

Although the COVID-19 pandemic which strikes Malaysia has now entered the endemic phase, the implications from it remain especially in mental health aspects. Students are a group that is at risk of experiencing stress due to the changes that occurred in the educational system. Therefore, this study was conducted to investigate the impact of online learning on students' stress during pandemic COVID-19 in Universiti Sains Islam Malaysia. The total number of respondents involved was 360 students. The Student Stress Inventory (SSI) has been used to identify the level of student's stress among undergraduate students. Descriptive statistical analysis in the form of percentage frequency, Pearson correlation and t-test were conducted using the Statistical Package for the Social Sciences (SPSS) Version 26 software. Analysis showed that majority of the student had moderate stress score of student stress as the results of online learning. Independent t-test was used to identify the gender differences in terms of stress as a result of online learning. This study shows there was significant difference between males and females in aspect stress. Besides that, the study was concluded that there was significant impact and small effect on students' academic achievement before and during Movement Control Order. The implication of the study, suggestions, and future direction was also discussed.

Keywords: *online learning, stress, mental health, university students*

INTRODUCTION

We were horrified in 2019 by the Covid-19 virus, which struck the country of China at the end of the year. Furthermore, the virus has spread swiftly around the planet. The advent of this virus has sparked worry and even fear among Malaysians, as this illness can be fatal to those infected. To solve this issue, Malaysia's Prime Minister announced

the implementation of the Movement Control Order throughout the country on 18 March 2020.

In Malaysia, one of the prevention techniques enshrined in the Movement Control Order is the value placed on social isolation and sanitation. To halt the spread of the Covid-19 virus, all types of physical contact are prohibited. Due to the implications of the government's Movement Control Order, all businesses, educational institutions at the primary or secondary level, and religious institutions have been ordered to close in order to prevent the virus from spreading, except for those providing essential services, as determined by the government. Malaysians have embraced a new way of life in the midst of the Covid-19 outbreak.

Following the closure of educational institutions, Malaysia's government ordered online learning to replace face-to-face sessions as an initiative for the continuity of learning, whether at primary, secondary, or tertiary levels. One of the government's strategies to restrict the spread of Covid-19 is through the changes of traditional classroom instruction to online instruction. Internet technology had to be implemented for stakeholders and the administration of higher education institutions in order to secure the continuation of educational events in all institutes across the world. There was no other option.

The Movement Control Order's implementation has impacted students in Malaysia and other affected countries because students are not permitted to perform physical learning. Students need to continue online learning to make it easier for them to continue their learning to avoid being left behind. Online learning is defined as learning that occurs via the internet and is capable of generating a number of various forms of learning interactions (Sadikin & Hamidah, 2020).

The majority of teaching and learning practices have been digitised. The Malaysian Ministry of Studies has produced a guide on implementing teaching and learning during the Movement Control Order period commencing April 1, 2020. This strategy covers online learning utilising Google Classroom to ensure that students do not fall behind in their education. Numerous universities have also begun offering online lectures and courses (Nor Hidayati Mokhtar, 2020).

On 1st June 2020, students at Universiti Sains Islam Malaysia began their online studying and teaching procedure (Baharum et al., 2020). Thus, more teaching and learning tasks are conducted in the new norm and this online learning takes place at home. This presents a new difficulty for students and educators adapting to the new norm of online learning.

In light of the current circumstances during online learning, students have experienced a variety of types of stress throughout the COVID-19 pandemic. It has contributed to some degree of stress following multiple semesters of conducting teaching and learning, with the bulk of students following the class online and a few students attending face-to-face lectures in accordance with university standards. Disruptions in face-to-face learning and the transition to online distance learning have

created a number of challenges (Abdullah et al., 2021). This circumstance undoubtedly provides the individual with a variety of experiences and stresses. Therefore, this study was conducted to identify the stress level of university students towards online learning during the COVID-19 pandemic. This study also done to investigate the level of stress faced by different genders of student.

LITERATURE REVIEW

Among the sources of stress for students engaged in online learning are disruptions in obtaining stable internet access, limited internet usage quotas, financial constraints associated with providing appropriate devices for teaching and learning, and burdensome and unattractive methods for teaching and learning implementation. According to Yahaya and Hayat Adnan (2021), the study discovered that the significant obstacles to online learning for students at the Institute for Public Higher Education are internet access, internet costs, an unconducive learning environment, and the effectiveness of online learning.

For internet access, one of the considerations while utilising online learning methods was the availability of internet access. They must participate in online classes from their homes and towns. Certain students must travel in order to obtain fast internet. This makes it more challenging for them to participate in online lectures. The majority of students receive access to the internet; nonetheless, those students are those who live in urban regions. Meanwhile, some students who live in remote locations have difficulty accessing reliable internet. Certain students must relocate in order to obtain fast internet access. This makes it more challenging for them to participate in online lectures.

Next, high internet costs. Students also confront financial difficulties. Numerous students feel overwhelmed when they are required to purchase internet data in order to attend online classes, take online examinations, and even submit assignments. To enable students to participate in online learning, they must have a fast, reliable, and hassle-free internet connection, which is not inexpensive.

Other external factors contribute to stress is unconducive residential learning environment. Each student is a member of a unique family. This hostile learning environment is prevalent among students from impoverished or modest backgrounds. This is because their parents are unable to provide basic educational resources such as study desks, fans, and separate study rooms.

According to a study conducted by Woon et al. (2021), the most common stress experienced by students is due to disruption of learning during COVID-19 such as anxiety about the future due to the possibility of a delay in graduating, lack of practical learning, difficulty participating in online classes due to internet problems, difficulty adapting with a new learning style, and lost of the momentum to learn. However, there are other sources of stress faced by university students. Among them, not being

able to do the daily routine during COVID-19, experiencing fear when having physical symptoms such as fever, flu, and cough that lead to the thought that they are infected with COVID-19. While a small number of students have other issues that cause stress such as household problems, worries about family, and having a history of being quarantined due to being infected with COVID-19.

On the other hand, a study discovered that students face additional stress in terms of time management, self-management, and academic management (Norhana Ahad et al., 2020). Residential environment is unsuitable for students to concentrate on teaching and learning and doing their assignments. This is because their attention is divided between lessons and supporting their family if they reside at home. Woon et al. (2021) believe that learning disruptions during COVID-19 are the most common cause of stress among students. These disruptions include worry over graduation delays, a lack of hands-on experience, technical difficulties with online classes, difficulties with a change in learning style, and an overall lack of motivation for learning.

Students are facing increased stress and anxiety, as well as signs of depression, as a result of changes in learning, uncertainty about university education, declining family income, and technological hurdles associated with online classes (Aristovnik et al., 2020). This stressful level may vary between male and female students.

Graves et al., 2021 did a study that included 448 respondents and examined gender differences in perceived stress and coping among college students. The instruments used in this study are the Perceives Stress Scale (PSS) and the Brief Cope. The findings of this study indicate that there was a significant gender difference, with females reporting a higher overall Perceived Stress Scale score. Additionally, females reported experiencing more mild levels of stress than males.

Meanwhile, Aziz et al. (2021) found that in a survey of university students' stress levels during the covid-19 pandemic, which included 400 students from Universiti Sains Islam Malaysia, the degree of stress faced by students did not differ significantly between males and females.

Introducing these new online teaching and learning effect on students' mental and physical health. Rashid (2020) argues that if individuals find it difficult to self-adjust to such drastic changes, this may give detrimental effect on psychological aspects. Students must maintain and manage their mental and physical health in order to avoid developing more severe mental or physical health problems. The effect of online learning during the pandemic affects the emotions of female students greater than male students (Babicka et al, 2021; Sundarasen et al, 2020; Azad et al., 2017). In general, women are known for being more emotional than men and this pandemic has added the impact to that. Women also have a lower level of emotional tolerance than men, making it difficult for them to control their feelings for inappropriate things. This causes most female students to experience anxiety and stress during online learning.

This shows that more focus needs to be done on women in dealing with psychological problems that may occur.

Objectives of the Study

The objectives of the study are:

1.   To examine the contribution of online learning towards stress among students at Universti Sains Islam Malaysia.
2.   To identify the gender differences in terms of stress as a result of online learning.

METHODOLOGY

Material and Methods

A.   *Study Design*
This study used a quantitative and used cross sectional as the research design.

B.   *Respondent*
Males and females from third- and fourth-year undergraduate students at Universiti Sains Islam Malaysia comprise the population for this study. There were 4,794 undergraduate students at Universiti Sains Islam Malaysia in the population (2,550 of third year and 2,244 of fourth year). The sample of this study was 360 samples would be chosen by using the convenience sampling.

C.   *Instruments*
Students Stress Inventory (SSI) was used to measures stress among university students. This SSI was developed by Arip, Kamaruzaman, Roslan, Ahmad, and Rahman (2015). The SSI was designed with Likert scale: 1 for 'Never', 2 for 'Somewhat Frequent', 3 for 'Frequent', and 4 for 'Always'. Student Stress Inventory contained 40 items with subscales, 1: Physical (10 items), subscale 2: Interpersonal relationship (10 items), subscale 3: Academic (10 items), and subscale 4: Environmental factor (10 items). In terms of score analysis and interpretation, the Student Stress Inventory indicated that those who obtained the 122-160 score reflect severe stress, 81-121 reflects moderate stress, and those who obtained the 40-80 score reflect mild stress.

D.   *Procedure*
The data was collected through an online survey tool or survey-based through Google Form. Respondents can complete this online survey on their own schedule and at their own pace. On the other hand, it was a more expedient method of reaching the

intended audience. In comparison to traditional survey methodologies, such as pen-and-paper surveys, internet surveys obtain feedback from respondents extremely quickly. Additionally, it is simple for respondents to comprehend. Online surveys are typically fairly simple to complete because they arrive via email or social media and can be completed with a single click. After completing the web questionnaire online, the data was automatically recorded in an analysable format in a Google spreadsheet, with tabulation and graphical representation of data statistics following. Questionnaires were used as data collection methods based on the study's objectives. The participants were asked to provide demographical data and completed the questionnaires. This survey included both males and females. All signed consent/assent forms as all the questionnaires and inventories gathered were stored in a safe and secure location.

E.   *Data Analysis*

The data was analyzed using IBM SPSS version 25.0 software. Descriptive analysis were used to measure the demographics of respondents. Next, Pearson correlations was used to analyze the relationship between online learning and stress. As for the differences between genders, t-Test were used to analyze the differences in the stress between the sexes.

RESULT AND DISCUSSION

A.   *Background Information*

Table 1: *Background Information*

	Frequencies (N)	Percentages (%)
Gender		
Male	110	30.6
Female	*250*	*69.4*
Year of study		
Third year	*189*	52.5
Forth year	*171*	47.5

Table 1 show the frequency and percentage of the sample according to gender. There are 110 males (30.6%) and 250 females (69.4%). In addition, there are 189 students from the third year (52.5%) and 171 students from the fourth year (47.5%).

B. The contribution of online learning towards stress among students at Universti Sains Islam Malaysia

Table 2: *Frequency and percentage the level of stress among students at Universiti Sains Islam Malaysia*

Level of stress	Frequency	Percentage
Mild stress	81	22.5
Moderate stress	244	67.8
Severe stress	35	9.7
Total	360	100.0

Table 2 shows the stress level among students at Universiti Sains Islam Malaysia. 81 students have mild stress (22.5%), 244 students have moderate stress (67.8%), and 35 students have severe stress (9.7%).

Thawabieh and Qaisy (2012) found that university students experienced a moderate stress level and the main factor is the social factor, and this may be because students come from different cities and they have new relations. contrast, the findings of the present research indicated that the majority of the students experienced a low level of stress inflicted as a result of social stressors such as unhealthy relations with their families and teachers. On the other hand, based on the previous study (Yikealo et al., 2018), most of the participants reported a lower level of stress due to various psychological problems.

According to Arnett (2000), university students show a moderate level of stress in facing the COVID-19 pandemic because their level of thinking is more mature than students in primary and secondary schools. University students still have to face drastic adjustments due to the spread of the virus such as social distancing, restrictions of movement and quarantine period and facing the discomfort of leaving the house wearing a face mask (Zhang, 2020). However, through Erikson's developmental theory, in this phase students are searching for identity, and are more likely to try to face the transition by becoming independence and exploring various roles as an individual.

According to Kashmoola (2016), the overall stress levels of all the respondents were relatively low. This further validates the problem stressed by students until they feel pressure from their associated financial and academic problems (Kashmoola,

2016). However, the level of student stress among third-year and fourth-year students in Universiti Sains Islam Malaysia during online learning was moderate stress score, probably because they do not experience any problem resulting in high student stress. On the other hand, probably they have their own coping mechanism in facing stress. Among the coping mechanism were students implement self-paced learning management. They are creative and smart in adapting information related to self-paced learning and live online learning. Students need to be smart in aspects of time management related to learning activities and assignments given (Aziz et al., 2020).

Besides that, students having emotionally focused coping strategies have the advantage of reducing stress levels when students can find ways to deal with stress by simply accepting what is happening. For example, crying is sometimes something that is needed to provide temporary relief (Aziz et al., 2020). This also has a spiritual component. Religious and spiritual aspects of online learning are one of the coping mechanisms for students experiencing stress. This is because it acts as a readily available orientation system, particularly when the stress level exceeds the student's capacity to deal (Pargament et al., 2013).

Additionally, religion gives a framework for comprehending emotional and physical pain, fostering contentment in the face of adversity (Wortmann, 2020). This spiritual dimension is especially critical when students are confronted with the stress of online learning. This act of worship can be performed by reciting the Quran. Tadabbur is to appreciate the Qur'an's verses in order to obtain guidance from the proof and to apply the verses in knowledge and acts. Tadabbur is also one of the ways to apply the knowledge and lessons of Allah SWT's (Al-Quran) verses in daily life. It is a religious affair. According to the Quran, Allah SWT says in Surah Muhammad, verse 24: "Then do they not reflect upon the Qur'ān, or are there locks upon [their] hearts?

In addition, students practice zikr which can act as a shield in strengthening the inner spirit of the self in the face of this online learning. Zikr means an act of remembering Allah. It also refers to mentioning the name of Allah SWT, repeating, and zikr either explicitly through orally and words nor secretly in the heart. The practice of zikr should be applied in the activity all day. By practice zikr with sincerity simply because of Allah SWT as well as with full confidence in Him that is by appreciating the meaning contained in remembrance in order to have a positive effect in life, morals, and behaviour. Finally, prayer is a form of worship that can aid in the treatment of mental illness. Every Muslim should not forego prayer. Prayer is a major pillar of religion. Thus, students who practise and utilise prayer in their daily lives were a treatment for anxiety and stress. Prayer is a source of nourishment for the soul and a means of therapy for the spirit being (Al Khin, 2003).

C.   The gender differences in terms of stress as a result of online learning

Gender	N	df	Mean	SD	t	Sig
Male	110	358	1.7545	0.62349	-2.697	0.007
Female	250		1.9240	0.51311		

Table 3 shows there are difference mean score among male (M = 1.7545, SD = 0.62349) and female (M = 1.9240, SD = 0.51311). From the result of the independent T-Test analysis has shown that there was significant difference level of stress based on gender of the respondent t (358) = -2.697, p = 0.007. The significant value show was p = 0.007 < 0.05.

As had been found from different findings, the results of this study do support the earlier studies. The consequences of online learning throughout the pandemic more substantially influenced the emotions of female students than male students (Babicka et al., 2021). In a study conducted by Thawabieh & Qaisy (2012), it demonstrated that female students are more sensitive to stress than male students. Additionally, women have a lower emotional threshold than men, making it more difficult for them to manage their emotions toward things they should avoid (Babicka et al., 2021). This results in the majority of female students experiencing worry and stress during their online learning experience. This indicates that a larger emphasis should be placed on women when addressing potential psychological disorders. This could be explained by the fact that females were subjected to greater community pressure and were still subject to cultural pressure (Yikealo et al., 2018).

Despite of that, there are a total of 15 meta-analyses conducted to examine the significance of gender on individual stress levels and the study found that there is no difference in stress levels between men and women. In addition, the theory of psychological research on sex and gender, also concludes that, research variations on gender are very few sources (Deaux, 1984). For the level of stress faced by individuals, the gender factor is only an aspect that is not emphasized because there are other factors that are more significant. This statement is supported by a survey conducted in the United Kingdom, where a study entitled 'The Bristol Stress and Health at Work Study', received responses from the majority of 17,000 people in Bristol published in 2000 stating that the level of stress is divided into two levels, namely the level of stress high and low pressure levels. However, if measured by gender, it is concluded that there is no significant difference between males and females overall.

CONCLUSION

This study aimed to identify the impact of online learning on students' stress during the pandemic of Covid-19 at Universiti Sains Islam Malaysia. This study examined the levels of student stress experienced by third- and fourth-year undergraduate students studying with various faculty members at Universiti Sains Islam Malaysia (USIM).

According to the study, undergraduate students at USIM exhibited a moderate stress level. The study discovered a significant difference in aspect stress between males and females. On the other hand, it was found that there was a significant effect on students' academic achievement before and during the Movement Control Order. Additionally, there was no significant difference in aspect cumulative grade point average (CGPA) between males and females before and during Covid-19. This study took a quantitative approach and surveyed 360 third- and fourth-year undergraduate students at Universiti Sains Islam Malaysia who participated in eight faculties. The Student Stress Inventory was employed (SSI).

This study was significant in identifying the issue of student stress caused by online learning. According to an earlier study, disruptions in learning during COVID-19 are the most common source of stress for students. Hopefully, this research will contribute to the advancement of knowledge since the study's findings will serve as important reference materials and instructions for several stakeholders, including students. Additionally, it can utilise the study's results and information to reference university administration when performing crucial responsibilities for students who meet this condition. On the other hand, the study's relevance will add to the practical contribution as well.

Additionally, this research can have a significant impact by supporting counsellors, therapists, and educators in designing treatments to address the impacts of online learning on student stress. This study may be used to assist students in identifying the degree of stress experienced by their peers and grasp how online learning affects their stress levels. Students are becoming increasingly concerned with preparing for various possible future challenges. Finally, this research will ideally increase community awareness of students' stressful situations during online learning, particularly among educators. Consequently, the community and educators can sympathise with and comprehend students' circumstances. Finally, this conclusion may be used to influence the development of methods to improve students' well-being through increased happiness, particularly for higher education institutions.

REFERENCE

Abdullah, A. S., Abirami, R. M., Gitwina, A., & Varthana, C. (2021). Assessment of academic performance with the e-mental health interventions in virtual learning environment using machine learning techniques: A hybrid approach. Journal of Engineering Education Transformations, 34(SP ICTIEE), 79-85.

Al-Khin, M., & al-Bugha, M. Ali al-Syarbaji.(2013). Al-Fiqh al-Manhaji Mazhab al-Imam as-Syafi'ie.

Arnett, J. J. (2000). Emerging adulthood: A theory of development from the late teens through the twenties. American psychologist, 55(5), 469.

Aristovnik, A., Keržič, D., Ravšelj, D., Tomaževič, N., & Umek, L. (2020). Impacts of the COVID-19 pandemic on life of higher education students: A global perspective. Sustainability, 12(20), 8438.

Azad,M. B., Abou-Setta, A. M., Bhupendrasinh F., MPharm, C., Rabbani, R., Lys, J., Copstein, L., Mann, A., Jeyaraman, M. M., Reid, A. E., Fiander, M., MacKay, D. S., McGavock, J., Wicklow, B., Zarychanski, R. (2017). Nonnutritive sweeteners and cardiometabolic health: a systematic review and meta-analysis of randomized controlled trials and prospective cohort studies. : CMAJ; 189:E929-39. doi: 10.1503/cmaj.161390

Aziz, A. R. B. A., Ali, Z., Noor, N. M., & Sulaiman, S. B. (2021). Exploring the Compliance Behaviour During COVID-19 Pandemic from Social Psychology Perspectives. International Journal of Academic Research in Business and Social Sciences.

Babicka-Wirkus A, Wirkus L, Stasiak K, Kozłowski P (2021) University students' strategies of coping with stress during the coronavirus pandemic: Data from Poland. PLoS ONE 16(7): e0255041. https://doi.org/10.1371/journal.pone.0255041

Baharon, M., Atan, N., Rosli, M., Yusof, S., & Abd Hamid, M., (2020). Integration of Science Learning Apps based on Inquiry-Based Science Education (IBSE) enhances Students Process Skills (SPS). International Association of Online Engineering.https://www.learntechlib.org/p/217832

Deaux, K. (1984). From individual differences to social categories: Analysis of a decade's research on gender. American Psychologist, 39(2), 105.

Graves, B. S., Hall, M. E., Dias-Karch, C., Haischer, M. H., & Apter, C. (2021). Gender differences in perceived stress and coping among college students. PloS one, 16(8), e0255634.

Kashmoola, B. (2016). Level of Stress among Students Studying in Higher Education Institutes (HEIs) in Dubai. Arabian J Bus Manag Review, 1, 003

Norhana Ahad, Hamid, M. F. A., Noor, A. M., & Lazin, Z. (2020). Analisis faktor tekanan yang mempengaruhi pelajar kolej komuniti negeri Johor ketika perintah kawalan pergerakan. Jurnal Dunia Pendidikan, 2(3), 158-172.

Nor Hidayati Mokhtar. (2020, April 27) Pembelajaran dalam talian untuk pembelajaran sepanjang hayat. Newshub. https://news.utm.my/ms/2020/04/pembelajaran-atas-talian-untuk-pembelajaran-sepanjang-hayat/

Pargament, K. I., Falb, M. D., Ano, G. G., & Wachholtz, A. B. (2013). The religious dimension of coping: Advances in theory, research, and practice.

Rashid, T. (2020). Positive psychotherapy. In Encyclopedia of Quality of Life and Well-Being Research (pp. 1-8). Cham: Springer International Publishing.

Sadikin, A., & Hamidah, A. (2020). Online Learning in the Middle of the Covid-19 Pandemic. Biodik: Jurnal Ilmiah Pendidikan Biologi, 6(2), 214–224.

Sundarasen, S., Chinna, K., Kamaludin, K., Nurunnabi, M., Baloch, G. M., & al., e. (2020). Psychological Impact of COVID-19 and Lockdown among University Students in Malaysia: Implications and Policy Recommendations. International Journal of Environmental Research and Public Health, DOI:10.3390/ijerph17176206.

Thawabieh, A. M., & Qaisy L. M. (2012). Assessing stress among university students. American Malarvili Ramachandiran and Saroja Dhanapal 2128 Pertanika J. Soc. Sci. & Hum. 26 (3): 2115 - 2128 (2018) International Journal of Contemporary Research, 2(2), 110–116.

Woon, L. S.-C., Abdullah, M. F., Sidi, H., Mansor, N. S., & Jaafar, N. R. (2021). Depression, anxiety, and the COVID-19 pandemic: Severity of symptoms and associated factors among university students after the end of the movement lockdown, DOI:10.1371/journal.pone.0252481.

Wortmann, J. (2020). Religious coping. In Encyclopedia of behavioral medicine (pp. 1873-1875). Cham: Springer International Publishing.

Yahaya, M., & Hayat Adnan, W. (2021). Cabaran pelajar melalui kaedah pembelajaran atas talian: kajian institusi pengajian tinggi awam Malaysia. Journal of Media and Information Warfare (JMIW), 14, 11-20.

Yikealo, D., Tareke, W., & Karvinen, I. (2018). The level of stress among college students: A case in the college of education, Eritrea Institute of Technology. Open Science Journal, 3(4).

Zhang, J., Wu, W., Zhao, X., & Zhang, W. (2020). Recommended psychological crisis intervention response to the 2019 novel coronavirus pneumonia outbreak in China: a model of West China Hospital. Precision Clinical Medicine, 3(1), 3-8.

CONTEMPORARY IJTIHAD AS REQUIREMENT FOR MUSLIM JUDGES IN ISLAMIC JUDICIAL SYSTEM (PAKISTAN AS A CASE STUDY)

Muhammad Atiq-ur-Rehman [i] Noorfajri Ismail [ii]

[i] (*Corresponding author*), Faculty of Syariah and Law, Universiti Sains Islam Malaysia (USIM). marehmanadvocate@gmail.com

Abstract

The present research deals with Contemporary Ijtehad as Requirement for Muslim Judges in Islamic Judicial System (Pakistan as a Case Study) or qualification of a judge in the Islamic Judicial System, whether he must fulfill all the qualifications of Mujtahid or not. The Islamic judicial system is theoretically and practically being considered distinguished from conventional judicial system on the basis of principle difference of ultimate sovereignty. The sovereignty of Allah Almighty is considered the ultimate sovereignty in an Islamic judicial system and therefore, the laws for individual and society is made under the divine guidance, while in conventional states the sovereignty lies in the hands of human beings. In conventional states, these are the men who have to make laws in their understanding and opinion, however in an Islamic state; man is religiously bound to don't prefer their opinion over the divine law.

Keywords: *Ijtehad, Qazi, Judge, Judicial System, Qualification of a Muslim Judge. fiqh.*

INTRODUCTION

This principal difference of sovereignty brought the Islamic judicial system to compile its law under the guidance of divine law. The source of divine law on the earth is the sole personality of Muhammad (PBUH) in Islamic law; the Quran and the Sunnah are the forms of divine law pronounced by the Prophet Muhammad (PBUH).

During the last Hajj Pilgrimage Prophet Muhammad (PBUH) declared the lives, property and honor of people are sacred over the people. Hence, the purpose of Islamic law to achieve higher, peaceful and heavenly society on the earth and pleasure for human in this world and hereafter through good conduct and by avoiding thebad.

The scope of Islamic judicial system is wider than the conventional judicial system; it includes all aspects of human life. The sources of Islamic judicial system provide the concise principles regarding law and give freedom to human to describe, explore and elaborate in the light of its principles, hence Islamic scholars are assumed to fulfill this duty on theoretical and practical stages.

In the Islamic judicial system, the judicial decree pronouncer or judge in an Islamic state is supposed to decide the cases in the light of the Holy Quran, the Sunnah, and Islamic jurisprudence by using the tools of Qiyas (Analogy). In traditional *Fi'qa* the judges are called

Qa'zi. The *Qa'zi* has different standing as compare to conventional judge regarding its approach to decide the case, he is not free on decide the case on his sole opinion and procedure; he is under duty of sovereignty of Allah hence he has to incorporate the law and procedure prescribed in sources of Islamic law and along with his opinion ifrequired.

The study in hand is related to the requirement for *Qa'zi* or judge in an Islamic judicial system who has to decide the cases in the light of *Fi'qa* and Ijtihad according to Islamic jurisprudence. The term requirement includes the theoretical understanding of Islamic law and as well the practical approach, moreover to resolve the contemporary issues of Islamic society he must have the great sight on the modern knowledge.

In traditional age, the Muslims were in rule on majority and their laws were implemented in the states, and the judicial system was run under Qu'dat (قضاة) but in modern era, Muslim judiciary is highly influenced by the conventional theories and practices. The term Mujtahid is conversant and as well properly appreciates the requirement for a judge in Islamic judicial system.

The Mujtahid is referred to the person who has wisdom of Islamic law and well familiar with the knowledge of Islamic jurisprudence, the Quran, the Sunnah, Ijmaa, Qiyas, Istesan, Istudlal, Istishab, Urf, Arabic language and as well as has a great sight on the contemporary issues. He has the ability to utilize the Ijtihad in proper meaning and facilitate the Muslim society to enjoy the Islamic rule of law. Hence, this study tries to give answer to the question of the requirements for a judge in an Islamic judicial system as a Mujtahid.

The requirements for Muslim judges in the Islamic judicial system are obligatory and mandatory to be explored.

The necessity of such qualification for a judge being Mujtahid is an issue and especially the relation between Ijtihad and Islamic Judicial system is demonstrated that how and why Ijtihad is compulsory as qualification of a Judge?

There are three levels of judiciary working to dispense the justice to the people of Pakistan. The qualification of judges at each level is different and diverse in its nature, is this qualification is enough to pass a judgment or dispense the justice in terms of Ijtihad.

The cases decided by the judiciary of Pakistan will be evaluated to reach on the conclusion that how to overcome on flaws and faults found in the judgments and orders of the superior courts. This phenomenon indicates the weaknesses of judicial system of Pakistan that needs to be rectified.

METHODOLOGY

The research shall be carried out on the hypothetic-deductive method, simultaneously it shall also take the historical, literature survey methods to achieve the objectives of the study. The study shall be descriptive in nature and shall contribute to understand issue in consolidate perspective. The study shall be followed by different chapters to discuss the introduction of Ijtihad and Contemporary Ijtihad, explore the requirements for a Muslim Judge in an Islamic State, how Contemporary Ijtihad relates to the judicial system requirement for a Muslim judge in an Islamic judicial system, judiciary in traditional era of Islam, discover the position of judges in Pakistan in context to the Islamic Judicial System, evaluation of cases decided by Pakistan Judiciary.

Objectives

The objectives of this study are:

1.   To explore the requirements for a Muslim Judge in an Islamic judicial system.
2.   To explain how Contemporary Ijtihad relates to the judicial system.
3.   To discover the position of Judges in Pakistan in context to the Islamic Judicial System.
4.   To evaluate the judicial cases and judgements decided by Pakistan Judiciary and their impact on judicial system.

JUSTIFICATION

It was the duty of the Muslims to incorporate the discipline of Islamic law when they had rule in the states where they had power and ruled. The judiciary has major interaction with general public and plays a major role to incorporate the law with letter and spirit, hence the judge of the Islamic judicial system should be more conversant with the Islamic law, so he may decide the cases and issues in the light of the Quran, the Sunnah by using Qiyas (Analogy) under the Sha'riah law and Islamic jurisprudence. Moreover, the globalization and industrialization has brought the human civilization in a dynamic age of history, now the issues and problems are more divergent, diversified and complicated in nature, hence the judge of an Islamic state should have proper qualification of Mujtahid, so that, he may value the Islamic law in true spirit in the Muslim society. On the other hand, the Ijtihad has vital role to address all the emergent issues, problems and questions in the present age, the modern Islamic scholars are more supporters of the need of Ijtihad and it is being considered the soul of Islamic jurisprudence to revive and reconstruct the Islamic law to survive in present post-modern era as a true Muslim society.

HYPOTHESIS

In the field of Islamic jurisprudence, Islamic epistemology and philosophy requires the qualification of Muslim judges as Mujtahid in Islamic Judicial System. So that, he may understand the spirit of Islamic law and procedure laid down in the Holy Quran and the Sunnah. Islamic Judicial System demands contemporary Ijtihad (اجتهاد) for Judges in Islamic Judicial System, due to which he may be capable to decide cases and issues according to the true essence of Islamic jurisprudence theoretical and practical as well.

REQUIREMENTS FOR MUSLIM JUDGES IN AN ISLAMIC JUDICIAL SYSTEM

There is immense confusion on ground level due to distance and detachment from Islamic law in judicial practice in its true letter and spirit as the judges are less qualified and do not know the concept of Islamic jurisprudence and Ijtihad which is necessary and part and parcel of the Islamic judicial system, therefore, the judge in an Islamic state is supposed to be well-conversant with the original, primary, and secondary sources of Islamic law, Islamic jurisprudence and legislation with special focus on competence in the domain of *Ijtihad* (اجتهاد), as he is supposed to have command over a number of Arabic, English language and sciences—all this in addition to lofty character traits such as piety, righteousness, honesty, selflessness and higher sense of justice and *ihsan*.

CONTEMPORARY IJTIHAD IN THE JUDICIAL SYSTEM

The doctrine of Ijtihad was itself based on the application of some distinct principles.[1] Abu Hanifa applied the principle of *Istishan* (equity); the Malikis applied Istislah (consideration of public interest), Istishab (disclosure of sound precedent). A new principle had to conform in full with the doctrines of a specific school. Instances have been known in which a Muslim had secured some favorable position by picking the principle of another school for a specific exchange and cases also have happened in which the qazi of one school for a specific exchange and cases have also happened in which the qazi of one school had sent group to qazi of another school which was liberal on that point. But that as it may, a man can't combine the doctrine of various schools on a solitary occasion. Such a procedure is known as talfeeq (piecing together). This, however, has at some point been resort to. The learned jurists of Islam up till now have been discussing and probing the following questions:

- What is Ijtihad?
- What are the conditions of Ijtihad?
- What is the guarantee for validity of Ijtihad?
- What are the ways and means of Ijtihad?
- What is the ground for investigation?
- What is the ground of scrutiny?
- What is Qiyas (analogy), its origin, its branches (sub–analogy) and what conditions are described for Qiyas?

By indicating these points, there is valid ground for necessity of *Ijtihad* with its terms and conditions which are related to the intellectual and philosophical reason that pertains to the evaluator aspects of Ijtihad. Ijtihad is also necessary[2] in the area of beliefs, actions and Shariah-based ahkam, as it is essential in the field of what is technically called ikhlas (devotion) and ihsan, in view of the fact that Shariah is divided into three branches:

a.   The science of beliefs;
b.   The science of Ahkam;
c.   The science of ikhlas and ihsan.

Shah Waliullah was the first Muslim mastermind to propound a hypothesis of alerts activity of Ijtihad. Then it was trailed by Sir Syed Ahmad Khan and Allama Muhammad Iqbal. According to Allama Iqbal, Ijtihad (اجتهاد) can be attempted by an individual law specialist as well as by an authoritative gathering perceiving the significance of Ijtihad (اجتهاد). In present time, the Sharia law had endowed the errand of making the law in the nation to adjust to the Quran and Sunnah to the judiciary in Pakistan.

It is in view of this apprehension that the learned scholars of Islam have had to resort to Ijtihad. The term Mujtahidian applies to those scholars and doctors of Islamic Shariah who undertake the review and examination of the previous applied form of legislation with

---

[1] Iqbal, Muhammad. 2004. *The Reconstruction of Religious Thought in Islam.* Lahore: Sang e Meel Publications.

[2] Nadvi, Abu al-Hassan Ali. 1987. *Fikr o Nazar.* Aligarh: Aligarh Muslim University.

amendments so that they become valid for the contemporary time.

From this view point; it is possible to categorize those Mujtahidian into the following categories:

(a)   Mujtahid in the domain of Shariah branches;

(b)   Mujtahid in the area of particular school of thought;

(c)   Mujtahid in the field of jurisprudential problems, issues and questions;

(d)   Mujtahid restricted to certain conditions;

(e)   Muqallid who follows a Mujtahid;

In this way, we may conclude that Ijtihad has special reasons: namely, jurisprudential, intellectual and philosophical.

The Quran and the Sunnah are the chief source of law in Islam. As such, they have permanent constant and unconditional status not liable to change. When an activity of in the process of Ijtihad acquires the degree after continues applications in any course of time, it would be the attained the finality in the eye of Islamic jurisprudence.

Judge in an Islamic judicial system as Mujtahid should have the following distinct traits and characteristics:

1.   Strong conviction and courage in condemnation and declaration of somebody as guilty.

2.   He must be of sound mind, possessing the understanding and of sufficient intellectual to grasp the subject.

3.   The Mujtahid must understand abrogation (Naskh) and identifies the occasions on which rules have been repealed by law-giver.

4.   He should have quality of Justice between bad and piety.

5.   Complete knowledge of the Quran and the Sunnah and the sciences relevant to the both.

6.   Thorough grounding in the science and hadith and other matters related to the sciences of Hadith.

7.   Comprehensive understanding of fiqh with its basic principles and other matters related to fiqh.

8.   Competence and proficiency in, and hire knowledge of Arabic Knowledge and its literature.

9.   Deep knowledge of systems and laws and the spirit of Shariah with their overlapping and complications.

10.   Satisfactory understanding of the recent developments and logical evaluation of the contemporary urgent and emergent needs.

11.   A Mujtahid must be conversant with the science of Islamic jurisprudence and the rules of law applied in various department.

JUDGES IN PAKISTAN AND NATURE OF ISLAMIC JUDICIAL SYSTEM

Judicial System in Pakistan:

There are three levels of judiciary in the judicial system of Pakistan.

a.   Subordinate Judiciary

b.   High Courts

c.   Supreme Court of Pakistan

Subordinate Judiciary: Subordinate Judiciary consists of two stages;

i.   Civil Judges / Magistrate
ii.   District Judges / Session Judges

High Courts: There are five High Courts in Pakistan;

i.   Lahore High Court
ii.   Peshawar High Court
iii.   Sindh High Court
iv.   Baluchistan High Court
v.   Islamabad High Court[3]

Supreme Court of Pakistan[4]: The Highest Court of Pakistan is called Supreme Court of Pakistan. It has its main court at Islamabad including Registry offices at Lahore, Karachi and Quetta.

Federal Shariat Court[5]: The Court shall consist of not more than eight Muslim judges, among them; there shall be a Chief Justice, who shall be a person who is qualified, to be, a Judge of the Supreme Court or who is or has been a permanent Judge of a High Court.

The requirement for four judges; who are qualified to be a judge of a High Court.

And not more than three shall be Ulema (علماء) [Islamic Scholars who has fifteen years' experience in Islamic law, research or instruction].

The expression "Islamic law is large connected to allude to the entire arrangement of law associated with Islam. It is in this way utilized as a broad term incorporating both the essential source of law, which is additionally alluded to as the *shariah* and the principles which are gotten from the *shariah* by Islamic legislative science.

Allah Almighty is the sole master and sovereign of universe, as well as He is the sovereign of the entire kingdom. He, who is the sovereign over all animals. All members of humanity equal before Him, and none appropriate special privileges and rights – a concept which is recurrently mention in the *Quran*, for example the Quran says:

> Say; individuals of the Book! Come now to a word regular in the
> middle of us and you, that is we serve none but God, and associates
> none with him, and that we take none for master besides Allah.

According to the Divine concept, the source of law cannot be other than the power that has created the entire universe and ruling it. In this connection the *Quran* explains:

To Him belongs creation and directive command.

---

[3] The Islamabad High Court Act 2012.
[4] The Constitution of the Islamic Republic of Pakistan 2018.
[5] The Constitution of the Islamic Republic of Pakistan 2018.

He manages the directive command from the sky to the earth.

As such, it is God's will which is the source of ultimate laws both natural and social. The Arabic expression *shariah* in the religion setting alludes to the way Allah Almighty has stipulated for men which are heralded by his messenger, the Prophet Muhammad PBUH. The *shariah*is composed of the two primary sources the *Quran* and the *Sunnah*. The first is the blessed book of Islamic confidence though the second term alludes to customs of the life of Muhammad PBUH in his capacity as the flag-bearer of Allah Almighty, i.e. actions, sayings, implicit endorsements or oversights ascribed to him. In his capacity as prophet, Muhammad PBUH is viewed as flawless by Islamic regulation.

EVALUATION OF JUDICIAL CASES & JUDGMENTS AND THEIR IMPACT ON JUDICIAL SYSTEM

There are many judgments of superior courts i.e. High Courts, Supreme Court and Federal Shariat Court, in which the flaws and faults are found. They are not comprehensive in their nature because the decree pronouncer is not qualified as mentioned in Islamic judicial system.

Many petitions had been filed in the Federal Shariat Court in 1990 against the interest, (usury ربا), and against those acts and ordinances which carry the interest like Cooperative Societies Laws,[6] Insurance Laws,[7] State Bank of Pakistan Laws,[8] West Pakistan Money Lenders Laws,[9] West Pakistan Money Lenders Rules,[10] Punjab Money Lenders Laws,[11] Sindh Money Lenders Laws,[12] NWFP Money Lenders Laws,[13] Balochistan Money Lenders Laws,[14] Agricultural Development Bank Rules,[15] Banking Companies Laws,[16] and interest laws[17] in the year 1991, those were decided by three members bench of Federal Shariat Court and interest (usury ربا) held repugnant to the Injunction of Islam. The government filed an appeal before the Shariat Appellate Bench which hold the decision of the Federal Shariat Court, the case remanded back by saying that the interest (usury ربا) had not been defined properly in the judgment of Federal Shariat Court and directed the Court to define the interest (usury ربا) with complete explanation and details.[18]

What is the basic reason to remand back the case? The sole reason is that; the Bench of Federal Shariat Court was not competent and qualified, not as per the qualification of written in the constitution, but the judges were not competent as they were not scholar of Islamic jurisprudence, Islamic law, even they did not know the concept of Islamic legal thought and

---

[6] Cooperative Societies Act 1925.
[7] The Insurance Act 1938.
[8] State Bank of Pakistan Act 1956.
[9] The West Pakistan Money Lenders Ordinance 1960.
[10] The West Pakistan Money Lenders Rules 1965.
[11] The Punjab Money Lenders Ordinance 1960.
[12] The Sindh Money Lenders Ordinance 1960.
[13] The NWFP Money Lenders Ordinance 1960.
[14] The Balochistan Money Lenders Ordinance 1960.
[15] Agricultural Development Bank Rules 1961.
[16] Banking Companies Ordinance 1962.
[17] The Interest Act 1839.
[18] Khan, Khalil ur Rehman. 2008. *The Supreme Court's Judgments on Riba.* Islamabad: Shariah Academy.

philosophy and have knowledge of classical scholars like Ibn Arabi[19] etc. and also did not have the basic knowledge of the Quran, the Sunnah, Ijmaa, Qiyas (Analogy) and Ijtihad.[20]

CONCLUSION

The current study is first in its nature, the contemporary Islamic scholars are undertaking the studies on the understanding, need and importance of Ijtihad theoretically but rare literature is being produced on its practical orientation especially in judiciary.

On one hand, the contemporary era requires revival of Islamic legal and judicial system and on the other hand, there is ample need to reconstruct the legal thoughts and judicial system in Islam as well, this study will contribute in both prospective. It is also the core and central point of the study and main target and goal of the research that the gap must be filled and the system may be reconstructed as the appeal of the Federal Shariat Court goes to the Supreme Court and the Supreme Court does not comprise on such kind of judges who have the knowledge of Ijtihad or Islamic Law. The study is about the gap which has been mentioned above.

---

[19] Ibn Arabi, Abd Allah Muḥammad. 2012. *Ahkam ul Quran.* Cario: Dar al-Maarif.
[20] *M/S Farooq Brothers v UBL etc.*

REFERENCE

Iqbal, Muhammad. 2004. *The Reconstruction of Religious Thought in Islam.* Lahore: Sang e Meel Publications.

Nadvi, Abu al-Hassan Ali. 1987. *Fikr o Nazar.* Aligarh: Aligarh Muslim University.

The Islamabad High Court Act 2012.

The Constitution of the Islamic Republic of Pakistan 2018.

The Constitution of the Islamic Republic of Pakistan 2018.

Cooperative Societies Act 1925.

The Insurance Act 1938.

State Bank of Pakistan Act 1956.

The West Pakistan Money Lenders Ordinance 1960.

The West Pakistan Money Lenders Rules 1965.

The Punjab Money Lenders Ordinance 1960.

The Sindh Money Lenders Ordinance 1960.

The NWFP Money Lenders Ordinance 1960.

The Balochistan Money Lenders Ordinance 1960.

Agricultural Development Bank Rules 1961.

Banking Companies Ordinance 1962.

The Interest Act 1839.

Khan, Khalil ur Rehman. 2008. *The Supreme Court's Judgments on Riba.* Islamabad: Shariah Academy.

Ibn Arabi, Abd Allah Muḥammad. 2012. *Ahkam ul Quran.* Cario: Dar al-Maarif.

M/S Farooq Brothers v UBL etc.

A REVIEW OF DIGITAL SOLUTIONS TO DRIVE MICROTAKAFUL DEMAND

Jamhuri Talib[i] & Maizaitulaidawati Md Husin[ii]

[i](Corresponding author). PhD Scholar, Azman Hashim International Business School, Universiti Teknologi Malaysia (UTM), Kuala Lumpur, Malaysia. jamhuriphd@gmail.com
[ii] Associate Professor, Azman Hashim International Business School, Universiti Teknologi Malaysia (UTM), Kuala Lumpur, Malaysia. maizaitulaidawati@gmail.com

Abstract

Small and Medium Enterprises (SMEs) face unique challenges when it comes to obtaining takaful coverage. The advent of digital solutions has revolutionized the takaful industry, presenting new opportunities for SMEs to access affordable, tailored, and efficient takaful products. This research aims to review digital solutions offered by takaful operators in Malaysia. Search and selection procedures yielded 5 takaful operators (TO's) products and services and digital solutions for SMEs. The identification and understanding of microtakaful products would provide much-needed direction for the businesses, industry players and policy makers. As this will benefit each party in supporting each other to materialize, micro takaful as a powerful tool for poverty alleviation strategies to empower SMEs to have financial back up and retain financial ground.

Keywords: Microtakaful, Digitalization, Takaful Operators, Digital Solutions

INTRODUCTION

In recent years, the concept of microfinance has gained significant recognition for its role in promoting financial inclusion among underserved communities (M.F, Jalil, 2021). However, an often-overlooked aspect is the inclusion of insurance services for these vulnerable populations (Md Husina, 2019). Microtakaful, addresses this gap by providing affordable and accessible insurance products in compliance with Islamic principles. Microtakaful combines the principles of takaful, an Islamic form of cooperative insurance, with the objectives of microfinance. It seeks to protect low-income individuals and micro-entrepreneurs from unforeseen risks by pooling their contributions (Md Husin & Haron, 2020). Similar to conventional insurance, participants pay regular premiums, which are then used to create a fund to cover potential losses (Md Husin & Haron, 2020). However, unlike conventional insurance, microtakaful operates on a cooperative basis, emphasizing mutual assistance and solidarity among participants. Small and Medium Enterprises (SMEs) are the backbone of many economies, contributing to job creation, innovation, and economic growth. However, SMEs often face significant challenges in accessing financial services, including insurance (Md Husin & Haron, 2020). Microtakaful offers a unique solution to

bridge this gap by providing risk protection, access to financing and allowing business continuity.

Research Objective
The objective of the research is to review digital solutions employed by microtakaful operators in Malaysia.

Problem Statement
Bank Negara Malaysia (BNM) aims to enhance the financing ecosystem for takaful operators in Malaysia, through digital ecosystem initiatives. Digital Insurance and Takaful Operators (DITOs) have been established by BNM to drive transformation for the insurance and takaful industry. DITO enables TO's to differentiate themselves by offering on-demand, tailored, and innovative products and services (BNM,2022). Businesses, including SMEs are exposed to high-risk and large-scale perils, such as floods and the Covid-19 pandemic, and must take a proactive approach to ensure their survival. Governments, regulators, and industry players must have clear digitalization strategies to promote microtakaful adoption to ensure that the digital vision of financial protection can meet the needs of takaful operators themselves (Md Husin & Haron, 2020). The insurance industry faces new opportunities to increase customer engagement and be more responsive to customer preferences, lifestyles, and demographics, leading to a competitive insurance and takaful industry. Digital technology will enable digital players to provide more innovative solutions, value-added services, and a better customer experience.

RESEARCH METHODOLOGY
This research applied quantitative content analysis based on desktop reviews. The data was systematically collected from takaful operator's website. Search and selection procedures yielded 5 TO's products and services and digital solutions for SMEs.

RESULT AND DISCUSSION
Out of 14 only 6 TOs were identified to provide microtakaful products and services and digital solutions to SMEs. The results were summarized in Table 1 below:
Table 1. List of Takaful Operators (TOs) and digital solutions for SMEs.

Bil	1	2	3	4	5	6	7	8	9	10	11	12	13	14
TAKAFUL OPERATOR (TOs)	TAKAFUL AIA PUBLIC Takaful Bhd	AmMetLife Takaful Berhad	Etiqa Family Takaful Berhad	Etiqa General Takaful Berhad	FWD Takaful Berhad	Great Eastern Takaful Berhad	Hong Leong MSIG Takaful Berhad	Prudential BSN Takaful Berhad	Sun Life Malaysia Takaful Berhad	Syarikat Takaful Malaysia Am Berhad	Syarikat Takaful Malaysia Keluarga Berhad	Takaful Ikhlas General Berhad	Zurich General Takaful Malaysia Berhad	Zurich Takaful Malaysia Berhad

Bil	1		2	3	4	5						6
TAKAFUL OPERATOR (TOs)	AIA PUBLIC Takaful Bhd		Prudential BSN Takaful Berhad	FWD Takaful Berhad	Syarikat Takaful Malaysia Am Berhad	Takaful Ikhlas General Berhad						Zurich General Takaful Malaysia Berhad
Microtakaful Products Name	A-Essential Business	A-Essential JMB	PruBsn Microtakaful	FWD Group Protection	Takaful mySME Partner	IKHLAS Contractor Clinic Niaga Takaful	IKHLAS Retail Niaga Takaful	IKHLAS Commercial Niaga Takaful	IKHLAS Office Niaga Takaful	IKHLAS SME Protect zTakaful		Optimuz V2 / Takaful
Digital solution Apps (Personal)	**AIA mobile apps** (Only for family & personal products undisclosed		**Prudential mobile apps** (only for family & personal products)	**FWD SMART mobile apps** (only for family & personal products)	undisclosed	undisclosed	undisclosed	undisclosed	undisclosed	undisclosed		undisclosed
Digital Solution Apps (SMEs)	none	none	none	none	none	none	none	none	none	none		none

147

Based on the above, the researcher noticed that there is much lacking information provided by Takaful Operators' (TOs) websites in terms of microtakaful products that are available across Malaysia. For example, there is no available digital solution information on the portal or website of the respective TOs as the process still progresses through manual processes, i.e., payment process, claim process, and complaint process, as well as the form still needing to be downloaded and manually submitted via email. In conclusion, out of the six identified TOs that have microtakaful products, only three TOs, namely AIA Public Takaful Berhad, Prudential BSN Takaful and FWD Takaful Berhad appeared to have Digitalization platform via mobile apps mentioned on their website. However, all the three respective mobile apps can only be utilized for life and family insurance digitalization applications, while not catered for SMEs clients. Furthermore, the other three TOs show no digitalization solution for SMEs clients.

EXPECTED CONTRIBUTION

Digitalization has emerged as a transformative force across various sectors in today's rapidly evolving technological landscape. This review provides insights into the digitalization of microtakaful products and services. The digital solutions are able to improve efficiency, transparency and enhance customer experience, especially to SMEs. Businesses and policymakers will benefit from this research by having more Takaful Operators (TOs) and the insurance industry attract and encourage more participation in providing the Microtakaful digital service to SMEs in Malaysia.

ACKNOWLEDGEMENT

CONCLUSION

Microtakaful have the potential to bring the financially excluded into the mainstream economy Microtakaful has the potential to revolutionize the lives of millions of people, and Muslim countries are facing economic, security, and unity challenges. Digital financial inclusion has numerous benefits for Muslim countries, including innovating, removing barriers, saving time and money, and eliminating the shadow economy. However, it presents its own challenges. Digitalization and digital tools assist businesses in lowering costs, standardizing and automating business processes, and reducing their reliance on human resources. A digital solution is also required to stay competitive in a world that is constantly being transformed by technology, from the way one can now enjoy their entire shopping (e.g. retail automation) or dining experience (i.e. robotic restaurants) without a single human employee, to the way one can now communicate with another despite the distance (including topographical barriers). Businesses can innovate and become more efficient as a result of digitalization. The financing costs associated with all of the hardware and software are one of the most significant barriers to widespread digital adoption among Malaysian business owners.

REFERENCE

Bank Negara Malaysia. (2023). Financial Sector Participants Industry, *Takaful Operators List* .

Availableat:https://www.bnm.gov.my/regulations/fsp-directory?p_p_id=com_liferay_asset_publisher_web_portlet_AssetPublisherPortlet_INSTANCE_jXC730NRlqU0&p_p_lifecycle=0&p_p_state=normal&p_p_mode=view&p_r_p_tag=takaful-operator

Jalil, M.F. Microfinance towards micro-enterprises development in rural Malaysia through digital finance. *Discov Sustain* 2, 55 (2021).

Md Husina, M. (2019). The dynamics of Malaysian takaful market: Challenges and prospects. Journal of Islamic Finance, 8, 131–137.

Md Husin, M., & Haron, R. (2020). Micro, small and medium enterprises' competitiveness and micro-takāful adoption. *ISRA International Journal of Islamic Finance*, *12*(3), 367-380.

Paper, D. (2022). Licensing Framework for Digital Insurers and Takaful Operators. *BNM Report Discussion Paper*, *2013*(January).

Post-COVID-19 Assessment of Time Management in Malaysian University Students: A Psychometric Exploration of the Time Management Behaviour (TMB)

Yee Chin Yip[i], Nurhasma Muhammad Saad[ii] & Nurul Ain Chua [iii]

[i] *(Corresponding author)*. Lecturer, Universiti Sains Islam Malaysia. cyyee_cool@yahoo.com
[ii] Senior Lecturer, Universiti Sains Islam Malaysia. nurhasma@usim.edu.my.
[iii] Senior Lecturer, Universiti Malaysia Terengganu, Malaysia. ain.chua@umt.edu.my

Abstract

Effective time management is crucial for students to optimize their academic performance. However, many university students struggle with inadequate time management skills, particularly in the context of the post-pandemic COVID-19 era. This study aims to address this issue by developing and validating an instrument that examines the factors influencing students' time management skills. Drawing on the Time Management Behavior (TMB) proposed by Macon et al. (1994), this research seeks to gain deeper insights into the specific factors that contribute to effective time management in the current educational landscape. The cross-sectional study collected 126 responses for a pilot study, which underwent exploratory factor analysis (EFA) using SPSS. The findings of the EFA identified six (6) items for deletion. Subsequently, 269 responses were gathered during the actual data collection phase, and the data were subjected to confirmatory factor analysis (CFA) using AMOS. The results confirmed that the TMB instrument met the requirements for CFA and demonstrated validity in measuring university students' time management skills in the post-pandemic COVID-19 era. The TMB instrument provides valuable insights for educational institutions to support students in improving their time management skills, enabling targeted interventions for better academic outcomes and personal growth. It empowers institutions to develop effective strategies and resources to address time management challenges, ultimately promoting student success and facilitating personal and professional development.

Keywords: *time management skills, university students, post-pandemic era, TMB instrument and academic outcomes.*

INTRODUCTION

The COVID-19 pandemic has fundamentally disrupted traditional methods of education across the globe, leading to unprecedented challenges in managing time for students, and Malaysian universities are no exception. The abrupt transition from classroom-based learning to online platforms demanded students adapt rapidly to a new way of learning (Adnan & Anwar, 2020; Dhawan, 2020). Time management, a critical skill in academic success, has gained even more importance in this transformed landscape of education. Online learning requires students to independently structure their learning time, increasing the need for effective time management skills.

This sudden shift may have led to issues such as procrastination, irregular study schedules, and difficulty in balancing academic and personal life, thus highlighting the need for robust interventions and support systems in time management (Besser & Zeigler-Hill, 2020). However, any intervention's efficacy is predicated on the ability to measure the issue accurately. Currently, assessing time management skills in the university student population, particularly in a post-COVID-19 context, presents its own set of challenges (Kerres, 2020; Sahu, 2020). It is crucial that the measures employed capture the unique circumstances that the pandemic has created, such as blended learning environments and increased digital interactions.

In this regard, the pressing need for a strong, reliable, and context-specific time management behaviour (TMB) model becomes apparent. A robust psychometric scale would provide an accurate assessment of students' time management skills, allowing for targeted interventions. By recognizing the nuances of the post-COVID-19 learning environment, it could provide the necessary insights to empower students with better time management strategies. Moreover, understanding the time management skills of Malaysian university students in a post-pandemic era could offer valuable insights not only for Malaysian education stakeholders, but for other regions with similar experiences as well. It is an essential step towards fostering academic resilience in students, equipping them to navigate the evolving education landscape effectively (Besser et al., 2020; Croucher & Davydenko, 2021).

LITERATURE REVIEW

Time management, a vital skill in academic settings, requires students to adeptly handle multiple tasks and deadlines (Abraham et al., 2018; Adams, 2019). To measure these competencies, researchers have developed various scales over the years, each with its unique strengths and challenges. One of the earliest tools to be developed is the Time Structure Questionnaire (TSQ) by Bond and Feather (1988), which evaluates how individuals perceive their use of time. It measures purpose, structure, and achievement concerning time but does not address practical time management behaviors, making it a less appropriate choice for assessing practical academic skills. In the same vein, another notable scale is the Time Management Behavior Scale (TMBS) created by Macan et al. (1990). The researchers conducted an Exploratory Factor Analysis on this scale, yielding four key dimensions: goal setting and

151

prioritization, mechanics of time management, preference for organization, and perceived control of time. While this scale has found extensive application in professional settings, its validity and reliability in academic populations have been questioned (Britton & Tesser, 1991). It has been criticized for its narrow focus, overlooking vital aspects such as procrastination and planning for leisure.

These components are particularly relevant to student populations, as evidenced by the work of Claessens et al. (2004). In addition to these critiques, researchers have challenged the factorial validity of the scale. Studies, such as those conducted by Hellsten and Rogers (2009), have been unable to confirm the original four-factor structure posited by Macan et al. This inconsistency raises questions about the robustness of this scale when employed in academic contexts. In simpler terms, while the TMBS by Macan et al. serves as an important stepping-stone in understanding time management, it appears to have significant limitations in its application to student populations. The criticisms surrounding its validity, reliability, and factorial structure necessitate a cautious approach to its use and interpretation in academic settings.

Additionally, the Time Management Inventory (TMI) developed by Britton and Tesser (1991) provides an in-depth evaluation of time management. It explores dimensions such as short-range planning, time attitudes, long-range planning, and goal setting and prioritization. Despite demonstrating strong internal consistency (as evidenced by a high Cronbach's alpha value), the inventory's validation process has been critiqued due to its shortcomings. Specifically, it lacks robust evidence of construct validity and does not provide a factor analysis to support its proposed factor structure (Kelly, 2002). This absence of factorial validation presents significant challenges in consistently interpreting results and subsequently generalizing them across diverse populations. In simpler terms, this scale may encounter generalizability issues, suggesting that its applicability might be compromised when deployed across different cultural contexts or time periods. The essence of these critiques underscores the pressing need for rigorous validation processes when developing and employing such inventories, to ensure their reliability, validity, and broader relevance.

Subsequently, another tool came into existence: the Time Management Questionnaire developed by Lahmers and Zulauf (2000), specifically tailored for student populations. This scale gauges dimensions such as goal setting, time management mechanics, and preference for organization. Despite the merits of a student-centric approach, the TMQ's factorability has not been extensively validated across diverse student populations (Kearns & Gardiner, 2007). Moreover, its validity and reliability in digital learning environments, particularly post-COVID-19, remain unexplored. These existing measures, while invaluable, emphasize the importance of validating time management scales within the intended population and context. Several scales lack thorough validation for student populations, despite students being a primary demographic requiring time management skill. The factorial validity of these scales is often unclear, complicating the consistent interpretation of results. Furthermore, the evolution of learning environments, particularly the rise of online

learning during the COVID-19 pandemic, accentuates the need for scales capable of assessing time management in digital contexts. Traditional scales may not fully encapsulate the nuances and demands of online learning, underscoring the need for more relevant tools.

In the same vein, Suzanne et al. (2013) introduced another novel scale: The Adolescent Time Management Scale (ATMS). Designed to assess time management in adolescents, it comprises dimensions such as planning, time wasting, and punctuality. While the ATMS is a beneficial tool for younger populations, it carries significant limitations. Primarily, its validity and reliability have not been extensively tested outside its developmental context. This constraint raises questions about its generalizability to different cultural contexts and age groups, including university students in Malaysia. Additionally, the scale was developed before the COVID-19 pandemic and does not consider the unique time management challenges posed by remote learning, which has become commonplace since the pandemic's onset. Given these gaps, there exists an urgent need for a comprehensive time management scale that is valid and reliable across diverse student populations, particularly in a post-COVID-19 context.

The study conducted by David et al. (2019) focused on investigating the mediating role of TMB. While the findings of the study yielded fruitful insights, it is important to note that the researchers did not validate the suitability, validity, and reliability of the TMB instrument used in their research. This raises concerns about the generalizability of the findings and the overall robustness of the instrument.

The TMB instrument, which has been in use for the past 30 years, lacks sufficient validation and has not undergone rigorous testing to establish its psychometric properties. This raises questions about the validity of the items, the reliability of the instrument, and its factorability in different contexts. Without proper validation, it is challenging to ascertain the accuracy and generalizability of the findings derived from the TMB instrument. To ensure the reliability and validity of research outcomes, it is crucial to utilize measurement instruments that have been thoroughly validated and proven to be suitable for the specific context of the study. The lack of validation in the case of the TMB instrument calls for further research to establish its psychometric properties, including its suitability, validity, reliability, factorability, and generalizability. Such research will contribute to a better understanding of time management behaviors and enhance the overall quality of research in this field.

Recently, Judith et al. (2022) embarked on a study to investigate time management during the COVID-19 pandemic. They adapted and adopted Britton and Tesser's (1991) Time Management Questionnaire (TMQ), originally created over 30 years ago. While the study delivered insightful findings, it is important to spotlight a few methodological considerations. Firstly, the TMQ may not capture the intricacies of time management in today's drastically changed environment, especially during the COVID-19 pandemic, when life largely moved online. Secondly, the researchers did not employ Exploratory Factor Analysis (EFA) to validate the TMQ's factor

structure for their sample. Cultural and contextual variations could significantly influence time management, making it challenging to confirm the TMQ's applicability in the present context without an EFA. Lastly, the researchers did not establish the psychometric properties of the TMQ for their sample, raising concerns about the questionnaire's reliability and validity within this context. In simpler terms, the study reveals potential knowledge and practical gaps that warrant attention. Researchers should emphasize the importance of using updated, culturally relevant, and psychometrically validated tools when studying time management in rapidly evolving post-pandemic landscape.

Hence, the current landscape of time management scales exhibits substantial limitations, particularly in aspects of validity, reliability, and factorability. This assessment underscores the need for future research to prioritize the development of psychometrically robust, contextually pertinent scales validated for the specific demographic and environment they aim to serve. These novel scales should integrate contemporary aspects of time management, such as digital proficiency, aligning better with the evolving academic landscapes, especially in the wake of the COVID-19 pandemic. The need for reliable and valid scales becomes more pressing in a post-pandemic context in Malaysia, where educational practices have dramatically shifted towards online learning (Alias, 2020).

METHODOLOGY

This research utilizes a cross-sectional study design, as recommended by Sekaran and Bougie (2016), collecting data at a single point in time. The data was sourced from students at three public universities in the bustling areas of Kuala Lumpur and Selangor. The fast-paced nature of city life brings its own challenges. Several studies have pointed out that students living in larger cities often face a crowded job market, longer work hours, extensive commutes, and a wide range of social and cultural activities (Chatzitheochari & Arber, 2009; Peen, 2010). These factors may increase the perceived need for effective time management among city students. Thus, exploring time management in this specific context of city students is particularly important. A simple random sampling technique was used to select respondents from the university's student population.

This approach ensures that all individuals within the target demographic have an equal chance of being selected, enhancing the representativeness of the study and minimizing sampling bias. For this study, Macan et al. (1994) time management behaviour (TMB) instrument was adapted and adopted. The model consists of four dimensions: perceived control of time, setting goals and priorities, mechanisms of time management behaviour and preference for organization. The questionnaire was validated by five experts, including professors and lecturers from various local universities, to establish content validity.

After the validation process, the TMB questionnaire was pre-tested on five (5) randomly selected respondents. This allowed for the assessment of response consistency, identification of any ambiguous terms, evaluation of question clarity, and

feedback on the questionnaire design. These issues were addressed and resolved before the pilot study and actual data collection (Zikmund & Babin, 2010). Following the revisions based on expert panel comments and the pre-test, a pilot study was conducted, and 126 valid responses were obtained. This exceeded the required minimum sample size of 100 (Awang, 2015; Bahkia et al., 2019). The pilot study data were then subjected to exploratory factor analysis (EFA) before the actual survey was conducted. These steps were taken to ensure the reliability and validity of the research instrument and to refine the questionnaire for the subsequent survey phase.

The final version of the TMB instrument consisted of 34 items, excluding demographic questions. A 10-point interval scale was used, ranging from 'strongly disagree' (1) to 'strongly agree' (10), following the recommendation of Awang (2015) and Coelho & Esteves (2007) to ensure data independence. A total of 298 responses were collected during the survey, and after data screening and cleaning, 269 responses were considered valid and included in the analysis. The sample size was deemed sufficient for robust structural equation modeling (SEM) (Kline, 2011). Data analysis was conducted using the Statistical Package for Social Sciences (SPSS) for data screening and exploratory factor analysis (EFA), and Analysis of Moment Structures (AMOS) was used to validate the measurement model through confirmatory factor analysis (CFA) to assess construct unidimensionality, validity, and reliability (Awang, 2015; Awang et al., 2018; Afthanorhan et al., 2019).

RESULTS AND DISCUSSION

EXPLORATORY FACTOR ANALYSIS (EFA)

The primary objective of conducting EFA was to analyze and summarize the data by identifying underlying dimensions and grouping together variables that exhibit correlation (Zikmund & Babin, 2010). In this study, EFA was performed using the data collected from the pilot study to identify the four dimensions related to perceived control of time, setting goals and priorities, mechanisms of time management behaviour and preference for organization. To ensure the appropriateness of the EFA, several conditions were taken into consideration. First, the Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy (MSA) value should exceed 0.50, indicating a satisfactory level of sampling adequacy. Additionally, Bartlett's test of sphericity results should be significant at p < 0.001, as recommended by Hair et al. (2014). By adhering to these criteria, the EFA process helped uncover the underlying dimensions and relationships among the variables in the study, shedding light on the factors influencing critical reading participation. The findings derived from EFA will contribute to a better understanding of the constructs and guide further analyses in the subsequent stages of the research (Awang, 2015; Bahkia et al, 2019).

Table 1 presents the KMO values and Bartlett's test of sphericity results for perceived control of time, setting goals and priorities, mechanisms of time management behavior, and preference for organization. All constructs had KMO values exceeding 0.5, indicating sampling adequacy. The Bartlett's test of sphericity

for all constructs yielded significant results (p < 0.001), aligning with the recommendations of Hair et al. (2014), Bahkia et al. (2019), Rahlin et al. (2019), and Shkeer and Awang (2019).

Table 1: Results of KMO and Bartlett's Test of Sphericity

Construct	KMO (>0.50)	Bartlett's Test of Sphericity (p<0.001)
Perceived control of time (PCOT)	0.826	0.00
Setting goals and priorities (SGAP)	0.796	0.00
Mechanisms of time management behavior (MTMB)	0.863	0.00
Preference for organization (PFOR)	0.829	0.00

In the exploratory factor analysis (EFA), the principal component analysis was employed to extract factors and determine which items to retain or eliminate. For enhanced interpretability, varimax rotation, the most widely used orthogonal factor rotation method, was applied (Hair et al., 2014; Shkeer & Awang, 2019). Factor loadings below 0.50 were removed, while loadings exceeding 0.50 were retained for analysis (Hair et al., 2014). Table 2 displays the results of the EFA, including the number of items for each construct before and after analysis. Furthermore, Table 1 indicates that a total of 6 items need to be removed from the analysis, with 2 items each from the constructs of setting goals and priorities, mechanisms of time management behavior, and preference for organization. All the results have been presented in Table 2 below:

Table 2: Item Retention Result after EFA

No	Construct	Items before EFA	Number of Items Dropped	Number of Items Retained after EFA
1	Perceived control of time (PCOT)	5	-	5
2	Setting goals and priorities (SGAP)	10	2	8
3	Mechanisms of time management behavior (MTMB)	11	2	9
4	Preference for organization (PFOR)	8	2	6

CONFIRMATORY FACTOR ANALYSIS (POOLED-CFA)

The study aimed to validate the measurement models of latent constructs, focusing on its unidimensionality, validity, and reliability (Afthanorhan et al., 2017; Aimran et al., 2017; Awang, 2015; Hair et al., 2014; Kashif et al., 2016; Mohamad et al., 2018). This validation process involved conducting CFA. The measurement model was subjected to three types of validity assessment: convergent validity, construct validity, and discriminant validity (Awang, 2015; Hair et al., 2014; Yusof et al., 2017). Convergent validity was evaluated using the average variance extracted (AVE). Construct validity was assessed by examining the fitness indices of the measurement model. Discriminant validity was established through the development of the Discriminant Validity Index Summary. To evaluate the reliability of the Time Management Behavior (TMB) construct, Composite Reliability (CR) was utilized as a more suitable alternative to the traditional method of computing Cronbach's Alpha (Awang, 2015; Aziz et al., 2016; Hair et al., 2014; Noor et al., 2015; Yusof et al., 2017).

Figure 1 illustrates the simultaneous validation of all constructs in the model using a pooled confirmatory factor analysis (Pooled-CFA). The constructs are represented by double-headed arrows to indicate the pooling process. As highlighted by Awang (2015) and Awang et al. (2018), model identification is not a concern when employing Pooled-CFA, even if certain constructs have fewer than four items (Awang, 2015). This is because combining the constructs increases the degree of freedom for the model. In this study, the Pooled-CFA approach was chosen for its efficiency in validating the measurement models, eliminating the need to run separate CFA for each construct.

Figure 1: Result from Pooled CFA Procedure
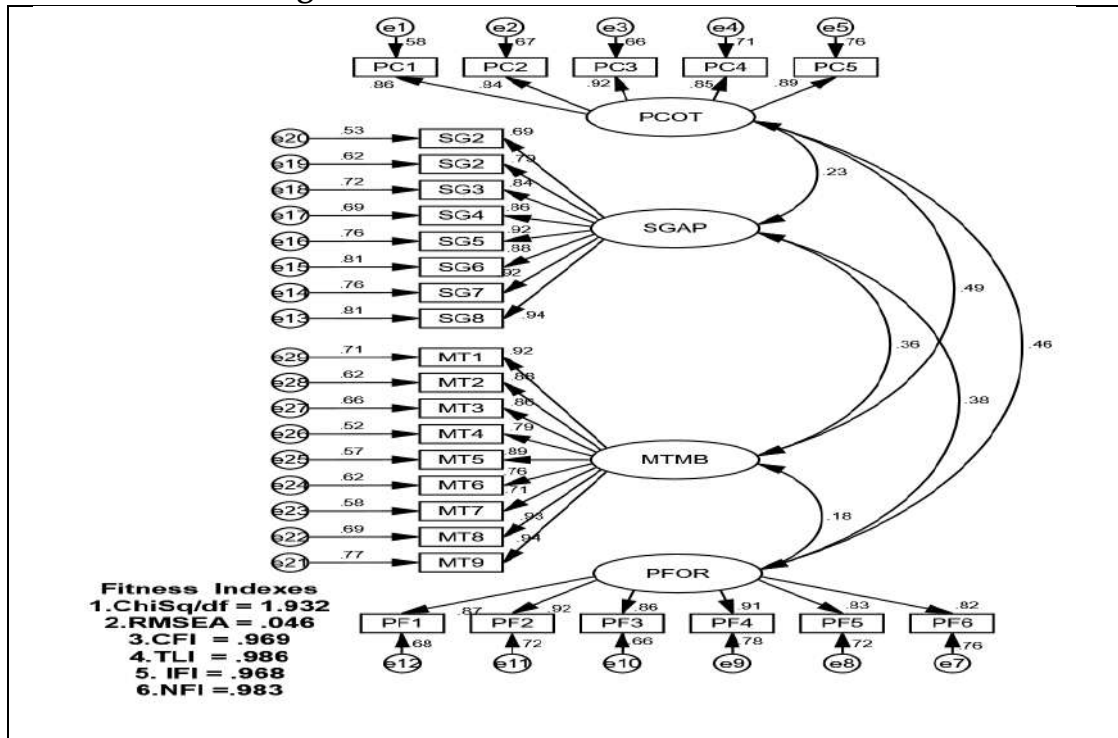
Unidimensionality

Unidimensionality refers to the ability of a set of variables to be explained by a single construct (Hair et al., 2014). Achieving unidimensionality requires that all the measuring items for each construct obtain acceptable factor loadings (Awang, 2015). In the context of confirmatory factor analysis (CFA), items with low factor loadings should be removed from the measurement model until the fit indices reach acceptable levels (Afthanorhan et al., 2017; Asnawi et al., 2019; Awang, 2015; Hair et al., 2014; Kashif et al., 2016). Awang (2015) and Awang et al. (2018) identified two conditions that must be met before considering item deletion.

For newly developed items, the factor loading should be 0.5 or higher. This indicates that the item is strongly associated with the underlying construct and contributes significantly to its measurement. For established items that have been previously validated, the factor loading should be above 0.6 or higher. This higher threshold reflects the expectation that established items should demonstrate a stronger association with the construct. These conditions help ensure that only items with strong and meaningful relationships to the construct are retained in the measurement model, enhancing the validity and reliability of the scale.

Table 3: Factor Loading of All Items

No	Construct/Item	Factor Loading
	Perceived Control of Time (PCOT)	
1	I underestimate the time that it will take to accomplish tasks (Reverse scored).	.86
2	I feel in control of my time.	.84
3	I must spend a lot of time on unimportant tasks (Reverse scored).	.76
4	I find it difficult to keep to a schedule because others take me away from my work (Reverse scored).	.86
5	I find myself procrastinating on tasks that I do not like but that must be done (Reverse scored).	.89
	Setting Goals and Priorities (SGAP)	
1	When I decide on what I will try to accomplish in the short term, I keep in mind my long-term objectives.	.69
2	I review my goals to determine if they need revising.	.79
3	I break complex, difficult projects down into smaller manageable tasks.	.84
4	I set short-term goals for what I want to accomplish in a few days or weeks.	
5	I set deadlines for myself when I set out to accomplish a task.	.92
6	I finish top priority tasks before going on to less important ones.	.88
7	I review my daily activities to see where I am wasting time.	.92
8	I set priorities to determine the order in which I will perform tasks each day.	.94
	Mechanisms of Time Management Behaviour (MTMB)	
1	I carry a notebook to jot down notes and ideas.	.92
2	I schedule activities at least a week in advance.	.88
3	When I find that I am frequently contacting someone, I record that person's name, address, and phone number in a special file	.86
4	I block out time in daily schedule for regularly scheduled events.	.79
5	I write notes to remind myself of what I need to do.	.89
6	I make a list of things to do each day and check off each task as it is accomplished.	.76
7	I carry an appointment book with me.	.71
8	I keep a daily log of my activities.	.93
9	If I know I will have to spend time waiting, I bring along something I can work on.	.94
	Preference For Organization (PFOR)	
1	At the end of the workday, I leave a clear, well-organized workspace.	.87
2	When I make a things-to-do list at the beginning of the day, it is forgotten by the end of the day. (Reverse scored)	.92
3	I can find things I need for work more easily when my workspace is messy (reverse scored)	.86
4	The time I spend scheduling and organizing my workday is time wasted. (Reverse scored)	.91
5	My workdays are too unpredictable for me to plan and mange my time to any great extent. (Reverse scored)	.83
6	When I am somewhat disorganized, I am better able to adjust to unexpected events. (Reverse scored)	.82

Table 3 demonstrates that all items within each construct have exceeded the recommended factor loading values, as suggested by Awang (2015) and Awang et al. (2018). Consequently, no items were eliminated from the survey, signifying that all items have exhibited a strong association with their respective constructs. This outcome reinforces the validity and reliability of the measurement model utilized in this study.

Convergent Validity

Convergent validity refers to the degree to which a set of indicators accurately measures a specific construct (Hair et al., 2014; Kline, 2011; Awang, 2015; Awang et al., 2018). It indicates the strength of the relationships among items that are expected to represent a single latent construct (Brown, 2006). Convergent validity is typically assessed by calculating the average variance extracted (AVE), with a threshold value of 0.5 often considered acceptable (Awang et al., 2018; Awang, 2015; Fornell & Larcker, 1981; Hair et al., 2014). Table 4 displays the AVE values for all the constructs, with each construct surpassing the minimum threshold of 0.5.

Table 4: Average Variance Extracted for All Constructs

Codes	Construct	AVE (Above 0.5)
PCOT	Perceived Control of Time	0.711
SGAP	Setting Goals and Priorities	0.737
MTMB	Mechanisms of Time Management Behaviour	0.734
PFOR	Preference For Organization	0.772

CONSTRUCT VALIDITY

Construct validity is established when all the fitness indices for a model meet the required criteria (Awang, 2015; Awang et al., 2018). To assess construct validity, three categories of model fit indices are commonly considered: absolute fit indices, incremental fit indices, and parsimonious fit indices (Awang et al., 2015, 2018; Kashif et al., 2015, 2016; Yusof et al., 2018; Asnawi et al., 2019). The most widely used indicators for evaluating model fit are the root mean square error of approximation (RMSEA), the comparative fit index (CFI), and the normed chi-square (χ^2/df) (Awang, 2015; Awang et al., 2018).

According to Table 5, the TMB scale demonstrated satisfactory performance across all three categories of fitness indices: (1) the root mean square error of approximation (RMSEA) value of 0.046 indicated a good absolute fit; (2) the comparative fit index (CFI) value of 0.969 exceeded the recommended threshold of 0.90, confirming a strong incremental fit; and (3) the normed chi-square (χ^2/df) value of 1.932 met the criterion of being below 3.0, demonstrating a satisfactory

parsimonious fit as suggested by Bentler (1990). Therefore, the construct validity of the CRIS model has been successfully established in this study.

Table 5: Fitness Indices

Name of category	Name of index	Level of acceptance	Result	Status
Absolute Fit Index	RMSEA	RMSEA < 0.08 (Hu & Bentler, 1999)	0.046	Achieved
Incremental Fit Index	CFI	CFI > 0.90	0.969	Achieved
	TLI	TLI > 0.90	0.986	
	IFI	IFI > 0.90	0.968	
	NFI	NFI > 0.90 (Awang, 2012)	0.983	
Parsimonious Fit Index	Chi-Square/df	Chi-Square/df < 3.0 (Hu & Bentler, 1990)	1.932	Achieved

DISCRIMANT VALIDITY

To assess the discriminant validity of the survey, the discriminant validity index summary (Table 6) was developed. The diagonal values, indicated in bold, represent the square root of the average variance extracted (AVE) for each construct. The other values in the table represent the correlation coefficients between pairs of constructs. The discriminant validity index summary allows us to evaluate whether there are any redundant constructs in the model by examining the correlation coefficients (Awang, 2015).

If the correlation coefficients between constructs are higher than the square roots of the AVE, it suggests a lack of discriminant validity and the presence of redundant constructs. Based on Table 6, it can be observed that the correlation coefficients between constructs are lower than the square roots of the AVEs for each respective construct. This indicates that there is sufficient discriminant validity among the constructs, as all items not highly correlated with each other. Therefore, the survey successfully establishes discriminant validity, ensuring that no redundant constructs or items are present in the model.

Table 6: Discriminant Validity Index Summary

Construct/ Codes	PCOT	SGAP	MTMB	PROR
Perceived Control of Time	*0.711*			
Setting Goals and Priorities	0.233	*0.737*		
Mechanisms of Time Management Behaviour	0.492	0.363	*0.734*	
Preference For Organization	0.461	0.384	0.182	*0.772*

The discriminant validity of each construct was successfully achieved, as evidenced by the square root of its average variance extracted (AVE) being higher

than its correlation value with other constructs in the model (Table 6) (Awang et al., 2018; Awang, 2015; Hair et al., 2014). The diagonal values (in bold) in the table represent the AVE for each construct, and they are higher than any other value in their respective rows and columns.

The achievement of discriminant validity is demonstrated by the fact that the diagonal values in Table 6 meet the threshold for discriminant validity. This indicates that the constructs in the TMB are distinct from each other and do not share substantial common variance. Therefore, the survey has successfully established discriminant validity for all the constructs, ensuring their independence and contributing to the robustness of the measurement model.

COMPOSITE RELIABILITY

Composite reliability is a measure utilized to assess the reliability of constructs within a structural equation model (Awang et al., 2018; Awang, 2015; Hair et al., 2014). A composite reliability value of 0.7 or higher indicates good reliability, while a value between 0.6 and 0.7 is considered acceptable (Awang, 2015; Hair et al., 2014). According to Hair et al. (2017), when employing structural equation modeling (SEM) with AMOS, composite reliability (CR) is regarded as a more appropriate measure of reliability compared to Cronbach's alpha. This is because CR considers the factor loadings of the latent variables and provides a more accurate estimation of internal consistency reliability in SEM. Therefore, the researcher has emphasized the use of CR over Cronbach's alpha in this study.

The analysis conducted in this study reveals that the composite reliability scores for all the constructs in the TMB exceeded the minimum threshold of 0.6 (Table 7). The construct with the highest composite reliability was mechanisms of time management behaviour (0.961), indicating strong reliability of the measurements within this construct. On the other hand, the perceived control of time obtained the lowest composite reliability score (0.925), but it still met the acceptable threshold. Overall, the TMB demonstrated satisfactory composite reliability across all constructs. These findings suggest that the measurement items within each construct are reliable and can be used with confidence in further analyses. The high composite reliability scores support the overall internal consistency and dependability of the TMB instrument, providing researchers with reliable data to determine the effects and hypotheses of interest.

Table 7: Composite Reliability

Codes	Construct	CR (Above 0.6)
PCOT	Perceived Control of Time	0.925
SGAP	Setting Goals and Priorities	0.951
MTMB	Mechanisms of Time Management Behaviour	0.961
PFOR	Preference For Organization	0.944

NORMALITY ASSESSMENT

In the final step of the analysis, the normality distribution of the items measuring the constructs in the TMB was evaluated. It is important for the skewness values of the items to fall within an acceptable range, indicating a normal distribution (Asnawi et al., 2019; Awang, 2015; Hair et al., 2014; Kashif et al., 2015, 2016; Mohamad et al., 2016, 2018). Typically, skewness values ranging from -2 to 2 are considered acceptable.

By examining the skewness values of the items in the TMB, it can determine whether the data significantly deviate from normality. If the skewness values fall within an acceptable range, it indicates that the data distribution is relatively symmetrical and does not violate the assumption of normality. This is crucial for conducting statistical analyses and accurately interpreting the results. Assessing the skewness values of the items in the TMB ensures that the data conform to the assumption of normality, establishing a robust basis for further analysis and interpretation of the study findings. The results of the skewness analysis are presented in Table 8, demonstrating the adherence of the data to the assumption of normality.

Table 8: Factor Loading of All Items

No	Construct/Item	Skewness
	Perceived Control of Time (PCOT)	
1	I underestimate the time that it will take to accomplish tasks (Reverse scored).	-0.326
2	I feel in control of my time.	-0.266
3	I must spend a lot of time on unimportant tasks (Reverse scored).	-0.169
4	I find it difficult to keep to a schedule because others take me away from my work (Reverse scored).	-0.368
5	I find myself procrastinating on tasks that I do not like but that must be done (Reverse scored).	-0.696
	Setting Goals and Priorities (SGAP)	
1	When I decide on what I will try to accomplish in the short term, I keep in mind my long-term objectives.	-0.268
2	I review my goals to determine if they need revising.	-0.568
3	I break complex, difficult projects down into smaller manageable tasks.	-0.679
4	I set short-term goals for what I want to accomplish in a few days or weeks.	-0.866
5	I set deadlines for myself when I set out to accomplish a task.	-0.903
6	I finish top priority tasks before going on to less important ones.	-0.755
7	I review my daily activities to see where I am wasting time.	-0.509
8	I set priorities to determine the order in which I will perform tasks each day.	-0.786
	Mechanisms of Time Management Behaviour (MTMB)	
1	I carry a notebook to jot down notes and ideas.	-0.671
2	I schedule activities at least a week in advance.	-0.547
3	When I find that I am frequently contacting someone, I record that person's name, address, and phone number in a special file	-0.832
4	I block out time in daily schedule for regularly scheduled events.	-0.995
5	I write notes to remind myself of what I need to do.	-0.817
6	I make a list of things to do each day and check off each task as it is accomplished.	-0.904

7	I carry an appointment book with me.	-0.846
8	I keep a daily log of my activities.	-0.893
9	If I know I will have to spend time waiting, I bring along something I can work on.	-0.978
	Preference For Organization (PFOR)	
1	At the end of the workday, I leave a clear, well-organized workspace.	-0.762
2	When I make a things-to-do list at the beginning of the day, it is forgotten by the end of the day. (Reverse scored)	-1.226
3	I can find things I need for work more easily when my workspace is messy (Reverse scored)	-1.348
4	The time I spend scheduling and organizing my workday is time wasted. (Reverse scored)	-1.181
5	My workdays are too unpredictable for me to plan and mange my time to any great extent. (Reverse scored)	-0.995
6	When I am somewhat disorganized, I am better able to adjust to unexpected events. (Reverse scored)	-1.066

Based on table 8, the skewness values for all the components in the model were within the acceptable range of -2 to 2 (Hair et al., 2022). This indicates that the distribution of the data did not deviate significantly from normality. Therefore, the data distribution in the TMB met the requirement of normality distribution.

CONCLUSION

In conclusion, this study aimed to develop and validate a survey instrument for assessing students' time management skills in the post-COVID-19 era. The findings from the exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) indicate that the instrument successfully captures the factors influencing students' intention in time management and planning, referred to as the Time Management Behaviour (TMB). The EFA revealed the removal of six items from the initial version, specifically two items each from the constructs of setting goals and priorities, mechanisms of time management behavior, and preference for organization. These items were eliminated due to their failure to meet the minimum factor loading requirement of 0.50 based on the pilot study data. The CFA results further confirmed the convergent validity, construct validity, and discriminant validity of the TMB instrument. Additionally, the assessments of unidimensionality and normality provided evidence of the instrument's validity. Based on these findings, it can be concluded that the TMB instrument is reliable for measuring students' time management skills in the post-pandemic COVID-19 context. The instrument provides a valuable tool for researchers and educational institutions to assess and enhance students' time management abilities, ultimately promoting their academic success and personal development.

This study recommends applying time management behaviour (TMB) in various research settings, including universities located in semi-urban areas, particularly those situated far away from major cities. Future research should explore additional factors influencing students' time management skills, such as self-

discipline, learning environment, and life circumstances (Richardson et al., 2012; Galla, & Duckworth, 2015). Investigating the role of moderating variables like gender, ethnicity, and university policies can enhance the understanding of how these factors interact with time management behaviors. Moreover, incorporating a mixed-methods approach combining qualitative and quantitative data can provide a more comprehensive understanding of students' time management skills. By expanding the scope of the TMB instrument and considering different contexts and variables, future research can contribute to enhancing students' time management skills and academic performance in the post-COVID-19 era.

REFERENCE

Abraham, R., Ummer, S., Elman, Z., Sobri, L., Saha, M.D.S., Ghazali, M., Bakar, A. & Hussain, A. (2018). Exploring time management skills of first year undergraduate medical and allied health science students. *Journal of Clinical and Diagnostic Research*, 12 (10), 7–10.

Adams, R. V. & Blair, E. (2019). Impact of time management behaviors on undergraduate engineering students' performance. *SAGE Open*, 9 (1), 1–11.

Adnan, M., & Anwar, K. (2020). Online Learning amid the COVID-19 Pandemic: Students' Perspectives. *Journal of Pedagogical Sociology and Psychology*, 2(1), 45-51.

Afthanorhan, A., Awang, Z., & Fazella, S. (2017). Developing the patients' loyalty model for medical tourism industry: The case of Malaysia. *International Journal Society Systems Science*, 9 (2), 139–164.

Afthanorhan, A., Awang, Z., Rashid, N., Foziah, H., & Ghazali, P. L. (2019). Assessing the effects of service quality on customer satisfaction. *Management Science Letters*, 9 (1), 13–24.

Alias, N. A., Siraj, S., & Aziz Khan, N. (2020). Student Learning Preferences and Online Education during Pandemic Covid-19: An Asian Perspective. *International Journal of Advanced Research,* 8(08), 11-16.

Asnawi, A. A., Awang, Z., Afthanorhan, A., Mohamad, M., & Karim, F. (2019). The influence of hospital image and service quality on patients' satisfaction and loyalty. *Management Science Letters*, 9 (6), 911–920.

Awang, Z. (2015). SEM Made Simple: *A gentle approach to learning structural equation modeling. Malaysia*: MPWS Rich Resources.

Awang, Z., Lim, S. H., & Zainudin, N. (2018). *Pendekatan mudah SEM - Structural equation modeling*. Malaysia: MPWS Rich Resources.

Aziz, M. I., Afthanorhan, A., & Awang, Z. (2016). Talent development model for a career in Islamic banking institutions: A SEM approach. *Cogent Business & Management*, 2(1), 1–11.

Bahkia, A. S., Awang, Z., Afthanorhan, A., Ghazali, P. L., & Foziah, H. (2019).

Exploratory factor analysis on occupational stress in context of Malaysian sewerage operations. *AIP Conference Proceedings, 2138(1), 050006. doi: 10.1063/1.5121111.*

Bentler, P. M. (1990). Comparative fit indexes in structural models. *Quantitative Methods in Psychology,* 107 (2), 238–246.

Besser, A., Flett, G. L., & Zeigler-Hill, V. (2020). Adaptability to a sudden transition to online learning during the COVID-19 pandemic: understanding the challenges for students. *Scholarship of Teaching and Learning in Psychology,* 8 (2), 85–105.

Britton & Tesser. (1991). Effects of Time-Management Practices on College Grades. *Journal of Educational Psychology,* 83 (3), 405-410.

Brown, T. A. (2006). *Confirmatory factor analysis for applied research.* New York City: The Guilford Press.

Chatzitheochari, S., & Arber, S. (2009). Lack of sleep, work and the long hours culture: Evidence from the UK Time Use Survey. Work. *Employment and Society,* 23(1), 30-48.

Claessens, Brigitte & Eerde, Wendelien & Rutte, Christel & Roe, Robert. (2004). Planning behavior and perceived control of time at work. *Journal of Organizational Behavior,* 25. 937 - 950.

Coelho, P. S., & Esteves, S. P. (2007). The choice between a five-point and a ten-point scale in the framework of customer satisfaction measurement. *International Journal of Market Research,* 49 (3), 313–339.

Croucher, S. M., & Davydenko, M. (2021). The impact of COVID-19 on higher education: A comparison of online and in-person instruction. *Communication Education,* 70 (4), 520-532.

David, Stacy & Dann. (2019). The Mediating Effects of Time Management on Accounting Students' Perception of Time Pressure, Satisfaction with the Major, and Academic Performance. *Journal of Accounting and Finance,* 19 (9), 46-63.

Dhawan, S. (2020). Online Learning: A Panacea in the Time of COVID-19 Crisis. *Journal of Educational Technology Systems,* 49(1), 5–22.

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research,* 18(1), 39–50.

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2014). *Multivariate data analysis (7th ed.).* Harlow: Pearson Education Limited.

Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2017). *A primer on partial least squares structural equation modeling (PLS-SEM).* Sage Publications.

Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2022). *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)* (3e). Thousand Oaks, CA: Sage.

Galla, B. M., & Duckworth, A. L. (2015). More than resisting temptation: Beneficial habits mediate the relationship between self-control and positive life outcomes. *Journal of Personality and Social Psychology,* 109 (3), 508-525.

Hellsten, Laurie & Rogers, W.. (2009). Development and Preliminary Validation of the

Time Management for Exercise Scale. *Measurement in Physical Education and Exercise Science*, 13 (1), 13-33.

Kashif, M., Samsi, S. Z. M., Awang, Z., & Mohamad, M. (2016). EXQ: Measurement of healthcare experience quality in Malaysian settings. *International Journal of Pharmaceutical and Healthcare Marketing*, 10(1), 27–47.

Kelly, W. E. (2002). Harnessing the River of Time: A Theoretical Framework of Time Use Efficiency with Suggestions for Counselors. *Journal of Employment Counseling*, 39, 12-21.

Kerres, M. (2020). Against all odds: Education in Germany coping with Covid-19. *Postdigital Science and Education*, 2, 690–694.

Kline, R. B. (2011). Principles and practice of structural equation modeling (3rd ed.). New York City: Guilford Press.

Lahmers, A. K. and Zulauf, C. R. (2000). Factors Associated with Academic Time Use and Academic Performance of College Students. A Recursive Approach. *Journal of College Student Development*, 41(5), 544-556.

Macan, T. H., Shahani, C., Dipboye, R. L., & Phillips, A. P. (1990). College Students' Time Management: Correlations With Academic Performance And Stress. *Journal Of Educational Psychology*, 82 (1), 760-768.

Mohamad, M., Mohammad, M., Azman, N., Ali, M., & Awang, Z. (2016). Measuring positive youth development: Confirmatory factor analysis. *International Journal of Applied Business and Economic Research*, 14(13), 9441–9451.

Mohamad, M., Mohammad, M., Mat Ali, N. A., & Awang, Z. (2018). The impact of life satisfaction on substance abuse: Delinquency as a mediator. *International Journal of Adolescence and Youth*, 23(1), 25–35.

Noor, N. M., Aziz, A. A., Mostapa, M. R., & Awang, Z. (2015). Validation of the Malay version of the inventory of functional status after childbirth question. *Biomed Research International,* 19 (5), 32-53.

Peen, J., Schoevers, R. A., Beekman, A. T., & Dekker, J. (2010). The current status of urban-rural differences in psychiatric disorders. *Acta Psychiatrica Scandinavica*, 121(2), 84-93.

Rahlin, N. A., Awang, Z., Afthanorhan, A., & Aimran, N. (2019b). The art of covariance-based analysis in behaviour-based safety performance study using confirmatory factor analysis: Evidence from SMES. *International Journal of Innovation, Creativity and Change*, 7(10), 351– 370.

Richardson, M., Abraham, C., & Bond, R. (2012). Psychological correlates of university students' academic performance: A systematic review and meta-analysis. Psychological Bulletin, 138(2), 353-387.

Sahu, P. (2020). Closure of Universities Due to Coronavirus Disease 2019 (COVID-19): Impact on Education and Mental Health of Students and Academic Staff. *Cureus,* 12(4), 45-71.

Sekaran, U., & Bougie, R. (2016). Research methods for business: *A skill-building Approach (6th ed.).* United Kingdon: John Wiley and Sons Ltd.

Shkeer, A. S., & Awang, Z. (2019). Exploring the items for measuring the marketing

information system construct: An exploratory factor analysis. *International Review of Management and Marketing, 9(6), 87–97.*

Suzanne, White & Riley, Anne & Flom, Peter. (2013). Assessment of Time Management

Skills (ATMS): A Practice-Based Outcome Questionnaire. *Occupational Therapy in Mental Health.* 29. 215-231.

Yusof, Y., Awang, Z., Jusoff, K., & Ibrahim, Y. (2017). The influence of green practices by non-green hotels on customer satisfaction and loyalty in hotel and tourism industry. *International Journal of Green Economics*, 11(1), 1–14.

Zikmund, W. G., & Babin, B. J. (2010). *Essentials of marketing research* (4th ed.).

DEVELOPMENT OF CAREER INTEREST AND MULTIPLE INTELLIGENCE MODULE FOR MUSLIM GIFTED AND TALENTED STUDENTS

Amirah Zainun[i] , Rezki Perdani Sawai [ii] & Amnah Zanariah Abd Razak [iii]

*[ii] (*Rezki Perdani Sawai*). Senior Lecturer, Universiti Sains Islam Malaysia. email: rezki@usim.edu.my

[i] Faculty of Leadership and Management, Universiti Sains Islam Malaysia.
amirahzainun@usim.edu.my
[ii] Faculty of Leadership and Management, Universiti Sains Islam Malaysia. rezki@usim.edu.my
[iii] Kolej GENIUS Insan, Universiti Sains Islam Malaysia. amnahz@usim.edu.my

Abstract

Gifted and Talented Student (GTS) refers to student with diverse potential and vary in term of their nature and abilities. Despite of privileges having multiple abilities, GTS often faces challenges in identifying and pursuing a career path that aligns with their diverse interests and abilities which referred to as multipotentiality. Various related studies have been conducted by previous researchers, both quantitatively and qualitatively, but less reference has been made to intervention studies on module development. Hence, this research is attended to develop a module in assisting GTS with their career decision. The basic foundation in developing this module are based on two theories namely Holland RIASEC Theory (1997) and Gardner's Theory of Multiple Intelligence (1999). The sample of this study consist of GTS from one of the Gifted High School in Negeri Sembilan. This study will adopt the design and development research (DDR) and guided by the ADDIE model. Phases in ADDIE Model involved in this research are need analysis, design phase, development phase, implementation phase and evaluation phase. This module will be conducted by falitators in assisting students in making career decisions. It is hoped that this study will provide guidance in supporting career aspirations among GTS and help expanding students' potential.

Keywords: *gifted and talented, career interest, multipotentiality, multiple intelligences*

INTRODUCTION

Education system plays an important role in shaping future generations and leaders. As Malaysia becomes a developed country, grooming top talents become increasingly important. On September 2012, Ministry of Education (MoE) Malaysia has launched Malaysia Educational Development Plan 2013-2025 that outlines one of the critical directions in this plan is to constitute a national strategy of education for gifted and talented students. According to Gagne (2014), Gifted and Talented Students (GTS) are those whose potential is distinctly above average in one or more of the following domains of human ability, in intelligence, creativity, sociability and physical health. GTS often display advanced cognitive abilities and enabled them to excel in various areas of study. GTS may have a strong desire to explore diverse field and engage in a wide range of activities.

Having a wide range of abilities and interests often causes GTS to face an issue known as multipotentiality. Researches have shown that GTS undergoes unique experiences and high challenges in exploring and planning their career path due to multipotentiality issues (Chen & Wong, 2013; Greene, 2002). Eventhough multipotential open up a variety of career option due to the multiple abilities owned by GTS, abundance of options may also lead to indecision and difficulty in committing to one particular career. As career decision is a critical process for most students especially GTS, it shows that GTS require an assistance in planning their career pathway that suits with their talents and abilities. Following that, this study propose to develop a module in assisting GTS with career decision.

CAREER INTEREST AMONG GTS

GTS with multipotentiality are struggle to identify a career path that allows them to utilize all of their strengths and interests leading to indecision and uncertainty. GTS with wide range of interests and talents always find it challenging to narrow down their career options to a single path as they may feel torn between pursuing different passions and struggle with making a definitive choice. GTS may also fear of missing out on opportunities or regretting their career choices. They may worry that by pursuing one career may neglecting other areas of interest, leading to feelings of uncertainty and dissatisfaction

In helping GTS identifying their career interest, a few career interest theory can be referred to. The most commonly referred theory is a theory developed by John Holland, known as Holland RIASEC theory (1997). This theory has been widely used in career counseling and guidance, and it can be particularly helpful for individuals who have multiple interests and talents. According to the theory, personalities and work environments can be classified into six categories which are realistic (R), investigative (I), artistic (A), social (S), enterprising (E), and conventional (C). These personality types correspond to various work environments, and individuals can use this theory to identify which work environments match their interests and strengths. One of the strengths of Holland's theory is that it emphasizes the importance of matching individuals with work environments that align with their interests and personality traits. This approach can be helpful for gifted students as they may have unique needs when it comes to work environments. Thus, by exploring these personality types GTS can gain a better understanding of their strengths and limitations. This can be helpful in setting realistic career goals and making planning on educational and career paths.

MULTIPLE INTELLIGENCE AMONG GTS

In exploring career paths among GTS, identifying personal strength and intelligence is important. Different types of intelligences may play a role in determining career

interest and aptitudes. According to Gardner (1999), there are nine types of intelligence which are Linguistic Intelligence, Logical-Mathematical Intelligence, Musical Intelligence, Spatial Intelligence, Bodily-Kinesthetic Intelligence, Naturalist Intelligence, Interpersonal Intelligence, Intrapersonal Intelligence and Existential Intelligence or Spiritual Intelligence where GTS will be more interested in careers that aligns with their dominant intelligences.

GTS who are known for their exceptional abilities and potential, often exhibit strengths in one or more of Gardner's multiple intelligences. The concept of multiple intelligence is particularly relevant to gifted students because it acknowledges and validates their diverse talents and areas of exceptional ability. Different intelligences are associated with different career fields, and GTS may be particularly talented in certain areas, making them more likely to pursue careers in those fields.

For example students with high spatial intelligence were more likely to be interested in STEM fields, while those with high linguistic intelligence were more likely to be interested in communication or writing careers. (Gubbins & Siegle, 2018). Another study by Chiu & Chen (2015) also found that students with high linguistic intelligence are more likely to express interest in careers related to communication, writing, and journalism.

In brief, multiple intelligences can play a significant role in shaping career interests and aptitudes among GTS, unfortunately, limited studies are focusing on the integration of these two theories, especially in gifted education. Hence, a study integrating these two theories can be done to help GTS with multipotentiality issues in planning their future careers based on their intelligence.

MODULE DEVELOPMENT USING ADDIE MODEL
The development of the module is adopting a Design and Development Research (DDR) approach using ADDIE model and mixed method model. ADDIE stands for Analysis, Design, Development, Implementation, and Evaluation, and each phase represents a critical step in the instructional design process. There are three major phases in ADDIE Development model which are (1) Need Analysis (2) Design and Development (3) Implementation and Evaluation. Based on the different purposes of each phase, various data collection methods are used in determining the study methodology.
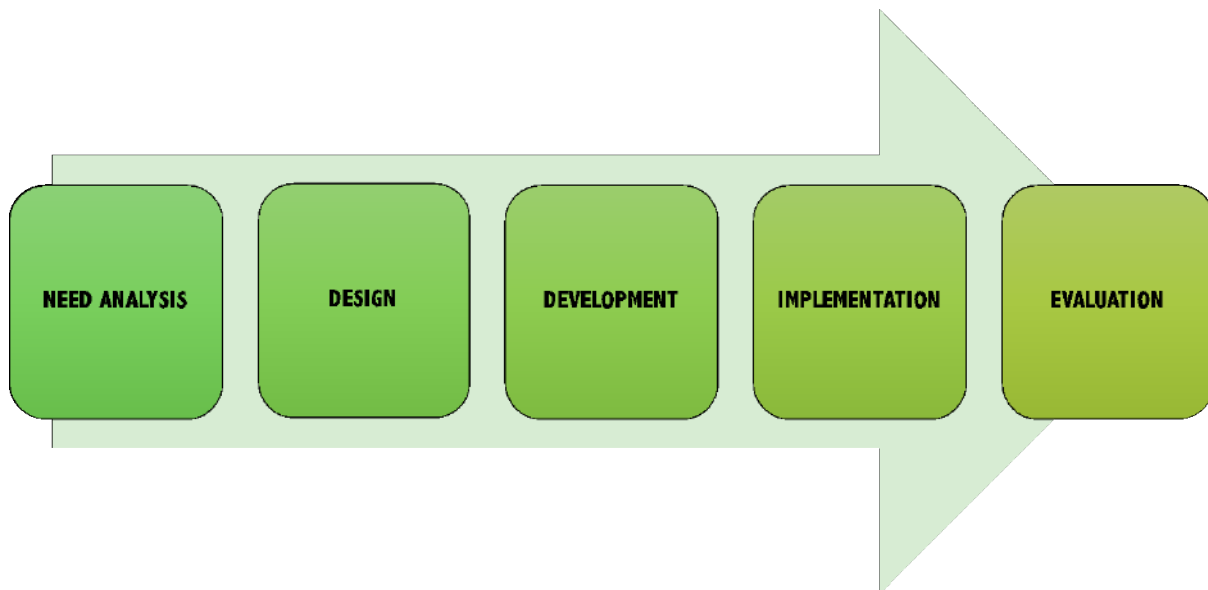
Figure 1: Design and Development Research (DDR) using ADDIE Model

According to Richey and Klein (2007) and Saedah et al. (2013), the study of module design and development focuses on the product development process which involves several phases and each phase uses a different methodology for the purpose of data collection.

In the need analysis phase, information about the requirements and specifications of the module is obtained from the user's point of view, which is before the module is developed. According to Richey and Klein (2007), the purpose of need analysis is to determine product specifications. Throughout this phase, researcher will collect information on the needs of the module from the target user and identify the elements needed in this module's development. Consequently, a needs analysis study is critical in determining the appropriate product to develop in order to solve issues among GTS.

The second phase, which is the design and development phase, involves the planning, development and evaluation content of the module and evaluation of the appropriateness of module development. In this phase, the validity and reliability of the module will be evaluated. At least six experts need to be involved in the validity process for the contents of the module. Experts selected by purposive sampling who have a heterogeneous field background (various fields) and have more than five years of work experience will be choose to provide feedback from diverse perspectives (Shahlan 2012). The selection of a line of experts from various fields will help to provide constructive comments and suggestions to improve the content of the module before this module is used in the implementation of the actual experiment. The chosen

Experts for this study involving experts from Counselling field, Gifted Education and Special Need Education.

The implementation and evaluation phase, which is the last phase of the study, will be testing the usability of the module in the actual training context. This phase will involve 30 GTS to measure the usability of the module using the USE instrument. The next step for evaluating module's usability is to use the interview method. Interviews is conducted to explore and enrich the findings of the usability study. These interviews will be conducted with student respondents (student-focused interviews) as users and also conducted with teachers (act as facilitators) who run the module. The selection for the respondents of this study is selected based on purposive sampling by conducting individual interview sessions to obtain information.

THEORETICAL APPROACH IN MODULE DEVELOPMENT PROCESS
This module was developed on two approaches, particularly the Psycho-Spiritual Counseling Theory approach and the Cognitive Behavioral Model approach;

a.   Holland RIASEC Theory (1997)
Holland's theory and research have contributed in innumerable and significant ways to the field of psychology, by helping to generate core knowledge related to career development, assessment, and practice (Nauta, 2010). The first theory developed by John Holland in 1958 is a theory of vocational personalities and work environments that consist of six types of career preferences namely motoric, intellectual, esthetic, supportive, persuasive, and conforming.
In 1997, he later change the theory into RIASEC Thoery. According to this theory, personalities and work environments can be classified into six categories: realistic (R), investigative (I), artistic (A), social (S), enterprising (E), and conventional (C). As a result, individuals frequently seek out environments in which to express their interests, abilities, and values. According to Holland (1992) factors which influence career choices and the influences found to be important is; family; peers, teachers and other adult role models; school, work, and leisure experiences; and socio-economic status and ethnic background. Holland's theory is an interactive model based on a typology of persons and environments. Individuals can be characterized by different personality types and the environments in which those people live, and work can be classified by the same types.

b.   Gardner Theory of Multiple Intelligence (1999)
Gardner (1999) defines intelligences as an individual's ability to create a product that is valued in one or more cultures; the ability to devise effective solutions to real-time problems; and the ability to discover new or complex problems that must be solved.

According to Gardner's theory, paying equal attention to each type of intelligence will help the recognition of sources of strengths, weaknesses and divergent abilities of each individual. Gardner initially identified seven distinct ways people learn and comprehend reality by employing eight criteria. Linguistic, Logical Mathematical, Visual Spatial, Bodily Kinesthetic, Musical, Interpersonal, and Intrapersonal are the seven intelligences. Gardner has reviewed the evidence for two additional attributes, naturalistic and existential or spiritualism, over the last two years and declared that they also meet the criteria for intelligences.

Gardner theory of Multiple Intelligence has been referred and used by many studies involving various level of education including GT education field. According to Gardner's theory, paying equal attention to each type of intelligence will help the recognition sources of strengths, weaknesses and divergent abilities of each individual. Most of the literature related to Multiple Intelligence and GT students are concerning on the implementation of multiple intelligence in classroom or curriculum for gifted learners' identification process. There are also an empirical study focusing on correlation of Multiple Intelligence with other traits namely learning style, academic achievement and self-efficacy. Above all the studies, intervention studies involving module development are still lacking concerning multiple intelligences in determining career interest among GT students.

CONCLUSION

As a conclusion, the development of career interest and multiple intelligence module for GTS is hoped to provide a wealth of information that should be emphasized in the development of the gifted and talented education field. This is critical in order to help individuals reach their full potential. In relation to that, the theory that has been expressed in this study is necessary to explain the important elements that need to be emphasised in the development of the module. With a clear research basis, this study is expected to be able to contribute to the desired results as planned. Therefore, it is hoped that the innovative alternatives in this module can help GTS in the process of understanding and making career choices.

REFERENCES

Book

Holland, J.L. (1997) Making vocational choices: a theory of vocational personalities and work environments. 3rd Edition, Psychological Assessment Resources, Odessa.

Gardner, H. (1999). Intelligence Reframed: Multiple Intelligences for the 21st Century. New York: Basic Books.

Journal

Chen, C. P., & Wong, J. (2013). Career counselling for gifted students. *Australian Journal of Career Development, 22*, 72-81.

Chiu, Y. L., Tsai, H. M., & Chen, W. P. (2015). The relationship between multiple intelligences and career interests among high school students. *Journal of Career Development, 42(1),* 23-34.

Gagne, F. (2014). Academic talent development within the DMGT-CMTD framework. International Conference for Gifted and Talented Education (IC-GATE). PERMATApintar National Gifted Centre. Universiti Kebangsaan Malaysia. 8-10 December 2014.

Gubbins, E. J., & Siegle, D. (2019). Gifted education research: Its impact and future directions. Psychology in the Schools, 56(7), 1189-1201. https://doi.org/10.1002/pits.22293

Richey, R. C., Klein, J. D. & Nelson, W. A. (n.d.). 41-DEVELOPMENTAL RESEARCH.pdf.

Saedah Siraj. Norlidah Alias, Dorothy DeWitt, & Zaharah Hussin. (2013). Design and developmental research: Emergent trends in educational research. Pearson Malaysia.

Shahlan Surat. 2012. (*Keberkesanan Strategi 4-Meta Dalam Penulisan Karangan Bahasa Melayu Pelajar Tingkatan 4)*. Universiti Kebangsaan Malaysia.

V.Kail, R. 2016. (*Children and thier development)* hlm.7th Edisi . Edinburgh Gate, England: PEARSON.

Nauta, M. M. (2010). The Development, Evolution, and Status of Holland's Theory of Vocational Personalities: Reflections and Future Directions for Counseling Psychology . *Journal of Counseling Psychology* , 57 (1), 11-22.

I-BIODIVERSITY WITH INAQ (I-BIODI) : E-LEARNING PLATFORM FOR FOUNDATION STUDENTS IN UNIVERSITI SAINS ISLAM MALAYSIA

Halimaton Sa'adiah Ariffin[i], Aiza Azrin bt Mohd Zain[ii], Noorrezam bin Yusop[iii], Nur Ilyana Ismarau Tajuddin[iv], Nurasyikin bt Abd Rahman[v] & Siti Khadijah bt Togin[vi]

[i] (*Corresponding author*). Guru Tamhidi, Pusat Tamhidi, Universiti Sains Islam Malaysia. halimaton@usim.edu.my
[ii] Guru Tamhidi, Pusat Tamhidi, USIM. aiza@usim.edu.my
[iii] Senior Lecturer, Faculty of Information and Communication Technology, UTeM. noorrezam@utem.edu.my
[iv] Lecturer, Pusat Tamhidi, Universiti Sains Islam Malaysia. nur_ilyana@usim.edu.my
[v] Guru Tamhidi, Pusat Tamhidi, Universiti Sains Islam Malaysia. nurasyikin@usim.edu.my
[vi] Guru Tamhidi, Pusat Tamhidi, Universiti Sains Islam Malaysia. ctkhadijah.togin@usim.edu.my

Abstract

The use of information and communication technology in the world of Education continues to develop various strategies and patterns. In higher education, e-learning is gaining more impact in teaching and learning that can be practiced in many ways. The advantages of developing and implementing e-learning in education increased learning effectiveness and flexibility, and much easier for teachers and students. Biodiversity is one of the Biology's topic that need a lot of reading to be memorize by students. This innovation aims to develop a web-based system by using wix.com known as Interactive Biodiversity with INAQ (i-BioDi). INAQ is the Integration of Naqli and Aqli, also included to the related contents with the interactive learning memorizing tools such as mind maps, videos, and games. This website will be used as a hub for the biology subject for foundation students in Universiti Sains Islam Malaysia (USIM). While we acknowledge the importance of memorizing at this level of study, we have tried to focus our approach more toward understanding and explaining the rationale underlying many concepts of Biology. This website can also become a suitable reference for Malaysian Matriculation Programme, Sijil Tinggi Persekolahan Malaysia (STPM), and A-Level as well as any other pre-university Biology course. In this innovation, the Rapid Application Development was adapted as the development methodology. By using this interactive learning website, it will be more enjoyment and can helps the students to memorize using the interactive learning tools, learn and study the contents of the topic with element of INAQ.

Keywords: Web-Based System, Interactive, Biology, Biodiversity, Rapid Application Development, Naqli and Aqli Knowledge.

INTRODUCTION

E-learning, short for electronic learning, is a revolutionary educational approach that harnesses the power of digital technology to deliver engaging and effective learning experiences. It encompasses a wide range of online tools, platforms, and resources that

facilitate learning and skill development beyond the confines of traditional classrooms. With the rapid advancement of technology, e-learning has become an integral part of modern education, revolutionizing how people of all ages access and acquire knowledge (Donahoe et al. 2019). E-learning platforms have revolutionized the landscape of education by offering a wide array of benefits that contribute to enhanced learning experiences and opportunities (Affouneh et al. 2020). E-learning takes many forms, including interactive multimedia presentations, video lectures, simulations, virtual labs, online quizzes, and discussion forums. These tools not only enhance the learning process but also cater to different learning styles, ensuring that information is comprehensible and engaging for a wide range of learners (Jaafar et al. 2022).

One of the foremost advantages of e-learning platforms is their inherent flexibility. Learners can access course materials, lectures, and resources at their own pace and convenience, accommodating various learning styles and schedules (Jaafar et al. 2022). This convenience is particularly valuable in today's fast-paced world where individuals juggle multiple commitments. Moreover, e-learning platforms transcend geographical barriers, enabling students to engage with educational content from virtually anywhere. This accessibility fosters inclusivity, making education available to those who may have faced challenges attending traditional in-person classes due to distance or other constraints.

The interactive nature of e-learning platforms further engages learners through multimedia elements such as videos, simulations, and interactive quizzes. This dynamic approach not only enhances comprehension but also caters to diverse learning preferences (Affouneh et al. 2020). Additionally, e-learning often promotes self-directed learning and critical thinking as students take more responsibility for their education, navigating through modules and engaging actively with the material. E-learning platforms also allow for efficient tracking and assessment of progress. Instructors can monitor individual performance and adjust teaching strategies accordingly, while learners can gauge their own advancement and areas for improvement. Furthermore, collaborative features, such as discussion boards and virtual group projects, facilitate peer interaction and knowledge exchange, simulating the social aspect of traditional classrooms and nurturing a sense of community among learners.

In essence, e-learning platforms offer a dynamic and accessible approach to education, catering to the diverse needs of modern learners. Through their flexibility, interactivity, inclusivity, and cost-effectiveness, these platforms empower individuals to embark on personalized learning journeys, shaping a more versatile and adaptable educational landscape.

However, e-learning also comes with its own set of challenges, such as ensuring equitable access to technology, maintaining engagement and motivation in a virtual environment, and addressing issues related to assessment and authenticity.

It's essential to keep in mind that the landscape of e-learning is continually evolving, so some of these challenges might have been addressed or changed since then. Nonetheless, here are some common issues:

- **Technical Issues**: Technical problems can impede the learning process, especially for students who do not have access to reliable internet connections or suitable devices. Those in some rural areas are not even connected to the national grid. This limits access and usage of e-learning resources for biology students within the college and outside. (Lauratu, 2021)

- **Digital Literacy:** Students and even some educators might not be adequately familiar with the digital tools and platforms used in e-learning, leading to difficulties in navigating the online environment and utilizing available resources effectively. (Supratiwi et al., 2021).

- **Lack of Hands-On Experience:** Biology courses often involve hands-on laboratory work and discussions that can be challenging to replicate in an online setting. The absence of physical interactions and face-to-face discussions may hinder students' ability to engage deeply with the subject matter. Students may miss out on critical learning opportunities without direct access to lab equipment and experiments. (Aung & Khaing, 2016)

- **Engagement and Motivation:** E-learning may require higher levels of self-motivation and discipline, and some students may struggle to stay engaged and focused without the structure of a traditional classroom. (Esra Meşe, 2021)

- **Limited Interaction and Engagement**: E-learning platforms can sometimes lack the interactivity and engagement needed to keep biology students motivated and interested. Passive learning experiences, such as reading static texts or watching videos, may not be sufficient to fully grasp complex biological concepts. (Atmojo & Nugroho, 2020; Purwanto et al., 2020; Putri et al., 2020).

- **Assessment Challenges**: Effective assessment is crucial for evaluating student understanding and progress. Creating reliable and fair assessments in an online environment can be difficult, and there is a risk of cheating and plagiarism. (Gillett-Swan & Jenna, 2017)

−	**Content Quality:** online learning becomes boring. Although online learning is meant to provide a solution to the boredom of classroom-based learning, this is not always the case. Many e-learning courses consist of never-ending texts followed by a long list of multiple-choice questions that fail to engage students. More than e-learning, it feels like e-reading. (Sari, 2021)

−	**Motivation and Time Management**: Self-paced e-learning can require strong self-discipline and time management skills. Some students may struggle to stay motivated without the structure and accountability of traditional classrooms.
(Zhu, M., Bonk, C. J., Berri, S. ,2022)

Addressing these issues requires a combination of technological solutions, pedagogical adjustments, and supportive policies to ensure that e-learning in biology courses is effective, equitable, and engaging for all students. Educators and e-learning platforms are continuously working to address these issues by implementing innovative technologies, improving content quality, and enhancing interactive features. Additionally, the integration of virtual labs, simulations, and real-time collaborations can help to bridge the gap between traditional and online biology education.

Literature Review (Previous Research)
Research by Nurlia Zahara & Rizky Ahadi (2022) implemented of e-learning as a media for biology learning by high school teachers in bireuen district. The study focuses on the integration of e-learning into biology education by high school teachers in the Bireuen District. The aim is to investigate the implementation of e-learning as a teaching tool in biology classrooms. The research likely includes examining the attitudes, challenges, and experiences of teachers as they adopt e-learning methods. The findings could offer insights into the effectiveness and feasibility of using digital platforms for biology education in this specific region.

Research by Almareta and Paidi (2021) discusses the application of a Learning Management System (LMS) in the field of biology education, specifically focusing on its role in facilitating collaborative learning among biology teachers. The study explores how these educators integrate the LMS into their teaching methods to enhance collaboration and shared learning experiences. The finding shows Moodle can be used by teachers for collaborative learning with the interaction between the teacher and students through the system on Moodle. Forms of learning biology using Moodle, namely quizzes, exercises, group discussions, distribution of teaching material so that there is a collaborative interaction between teachers and students or collaboration fellow students.

Research by Rizqa (2021) examines the impact of technology on biology education, both during and after the pandemic. It discusses the challenges and opportunities associated with using technology to teach biology, highlighting its evolving role in the educational landscape. The study underscores the importance of adapting to technological advancements to enhance biology teaching methods and explores the potential benefits and hurdles in this context. The result explains that teachers have been implementing synchronous learning by using various video conference platforms and asynchronous learning using various types of LMS. Teachers also use various learning media, especially to help them conducting laboratory work.

Applying the integration of Naqli and Aqli (INAQ) in online biology learning can offer several advantages for students who share the Islamic faith or are interested in incorporating ethical and moral perspectives into their scientific studies. Islamic teachings emphasize the concept of creation as a sign of Allah's wisdom and power. Studying biology from an Islamic perspective can lead students to marvel at the intricate design and complexity of life, fostering a deeper appreciation for the natural world. Many biological topics raise ethical dilemmas, such as genetic engineering, cloning, and animal testing. Incorporating Islamic values can enrich discussions on bioethics by introducing alternative viewpoints that stem from religious teachings (Hezefa, 2022). In this study, we chose Biodiversity topic for our website because this topic is very important to be taught. According to Jalil & Mat Sharif (2018), knowledge of the Biodiversity is one of the factor that will influence university students' awareness of Biodiversity conservation. This topic is also integrated with INAQ as it will make students become more responsible to take care of the environment. This is supported by Abdillah, Effendy & Saribanon (2023), who stated that modern science and Islamic teaching on nature conservation have positive impact on the practical level.

Overall, e-learning helps eliminate barriers of communication, provides efficacy of knowledge, and qualifications via ease of access to a huge amount of information. Thus, this research focuses on the development of a web-based system known as i-BioDi to enhance the learning process and skills in biology field for foundation student at Tamhidi Centre, Universiti Sains Islam Malaysia.

METHODOLOGY

i- BioDi was developed using the Rapid Application Development (RAD) approach, utilizing in the Wix.com platform. The primary advantage of the RAD methodology provide its ability to swiftly complete projects, making it an appealing option for developers operating in fast-paced environments such as software development. RAD places emphasis on minimizing the planning stage while maximizing prototype development that is achieveable and called a accleration pace.
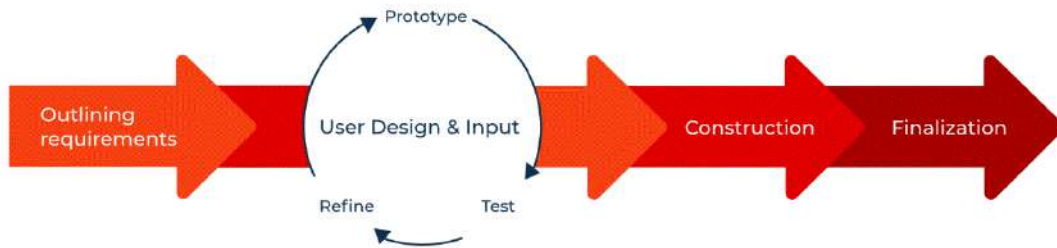
Figure 1: Rapid application development (Source: Creatio.com, 2022)

Figure 1 illustrates the RAD model adapted from creatio.com, consisting of four phases namely 1) initial planning (outlining requirements), 2) user-oriented design and input, 3) construction, and 4) finalization. First, during the initial planning phase, engineers and analysts collaborate to define the system's objectives and gather requirements from client stakeholders. This step aims to address the needs of these stakeholders. Next, in the user design phase, users work alongside systems analysts to craft models and prototypes that accurately depict all system functions, inputs, and outputs. This stage involves software engineers communicating with systems analysts to refine requirements, enabling users to understand, modify, and ultimately approve a functional system model. Subsequently, in the construction phase, programmers take the lead in system programming, encompassing application development and coding. Finally, the initialization phase marks the creation, construction, and deployment of the new system. This phase is also referred to as the finalization phase, during which all components are prepared for use.

RESULTS AND DISCUSSION

The website was developed by using wix.com. Wix is a website builder with easy-to-use tools which enable users to quickly create an online presence via a drag-and-drop interface. Additionally, elements of the interactive tools, such as online laboratory, videos, quizzes, and games will also be incorporated on the website.

i-   BioDi will be able to be used in helping students to acquire sufficient biodiversity knowledge in line with the requirements provided by universities. The user interface design gives a visualization of the users interaction with the system. The developed interactive i-BioDi website is easy to access, understand, and use in order to facilitate the e-learning process. i-BioDi is a user-friendly website containing interactive notes, animation, virtual experiment, quizzes, and games for each topic. These interactive tools will help the students to memorize the the contents for each sub topic with fun learn. The combination of these activities can enhance the learning patterns of students.

Figure 2 shows the homepage of i-BioDi platform. This homepage provides the main contains i-Biodiversity information. This homepage also has menu page that

guide student to select the type of kingdom that student prefer to study. The name of kingdom in i-BioDi namely, kingdom of Monera, Protista, Fungi, Plantae, and Animalia.

Figure 2: The homepage of I-BioDi

As shown in Figure 3 , students can make real interaction with the Biology lecturers in Tamhidi Centre, Universiti Sains Islam Malaysia through chatting or email.
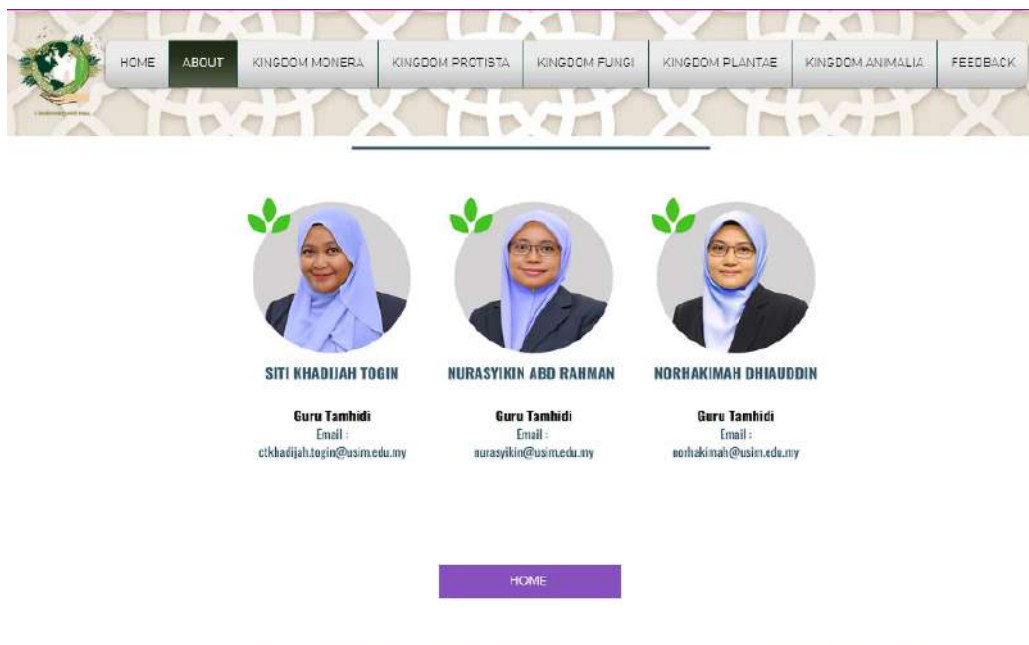

Figure 3: Real interaction with the Biology teachers

Figure 4 shows the flipsnack that provides information for biodiversity. This flipsnack is interpreted in slideshow visualization so student can view in slideshow view.
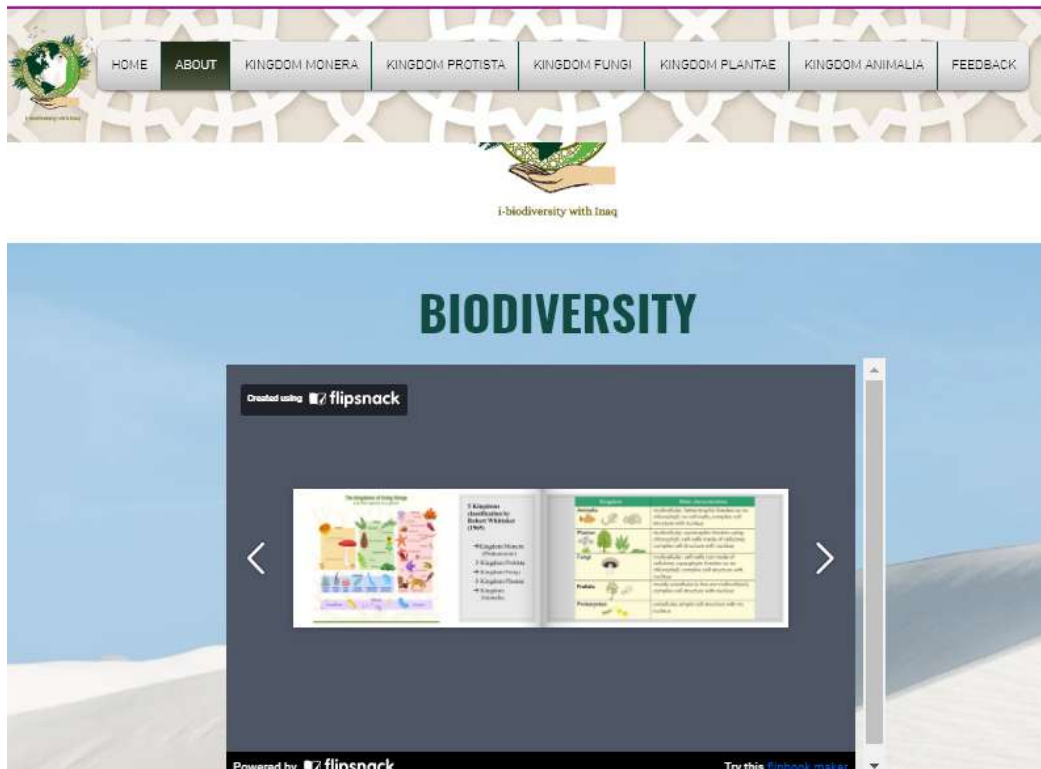
Figure 4: i-BioDi Flipsnack

Figure 5 shows the feedback that allows users give feedback regarding their opinion using this i-BioDi website. The purpose of this feedback is to get their perception of this tool.

Figure 5: Feedback form

Figure 6 shows the Kingdom Monera page. This kingdom provides the INAQ element which is to accomplish our objective of our research to provide INAQ in Biodiversity topics. All the kingdoms for each menu page are integrated with INAQ elements.

Figure 6: INAQ Element

Figure 7: Kingdom Fungi
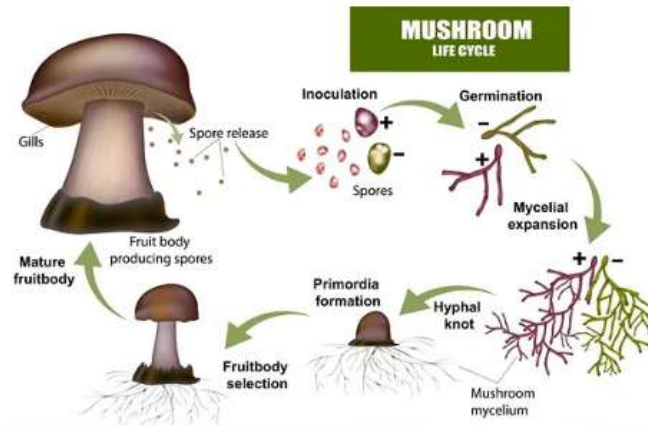
Figure 8: Kingdom Fungi
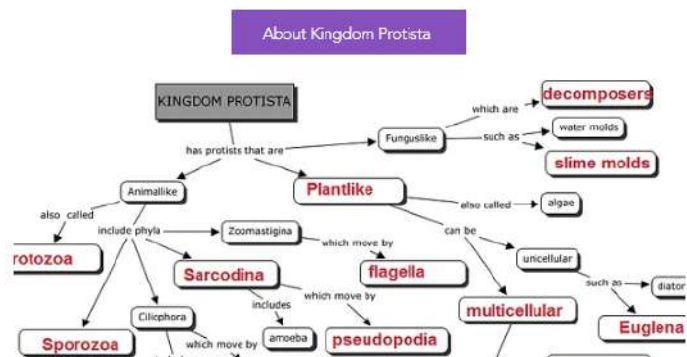
Figure 9: Kingdom Protista
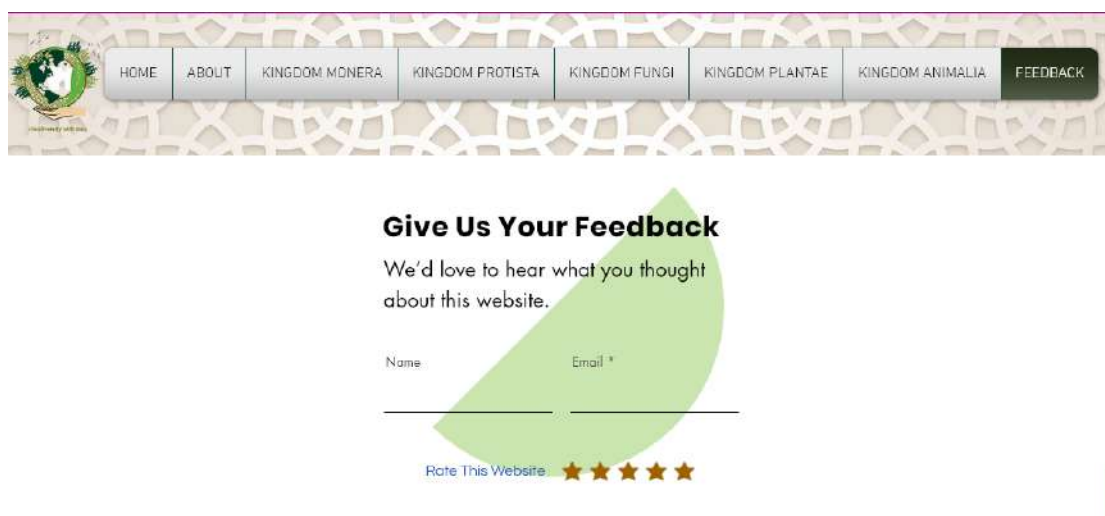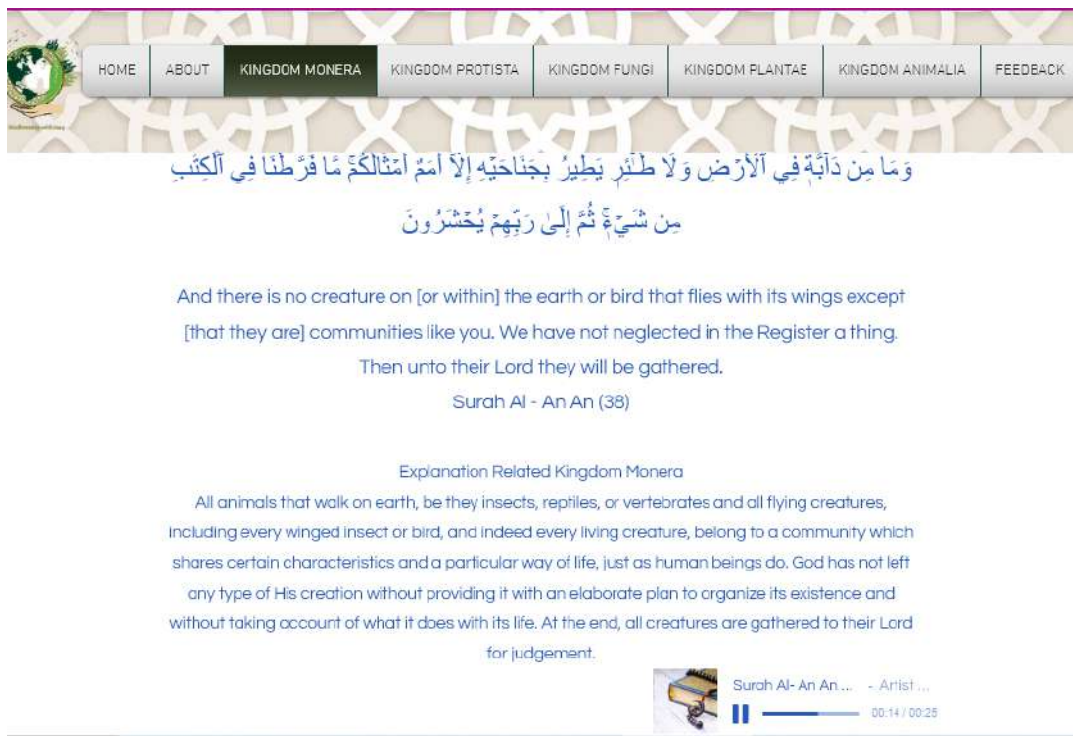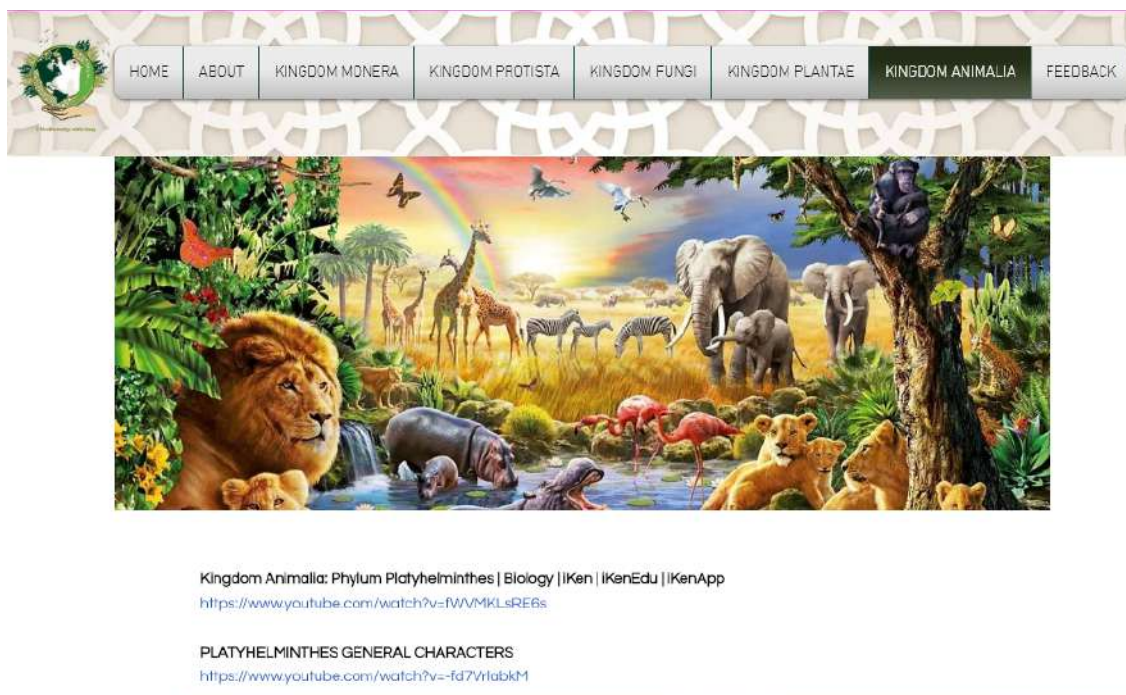
Figure 7,8 and 9 show the information that illustrated for each kingdom, which have descriptions of kingdom, related diagram, and also provided with the mind map for each kingdom.
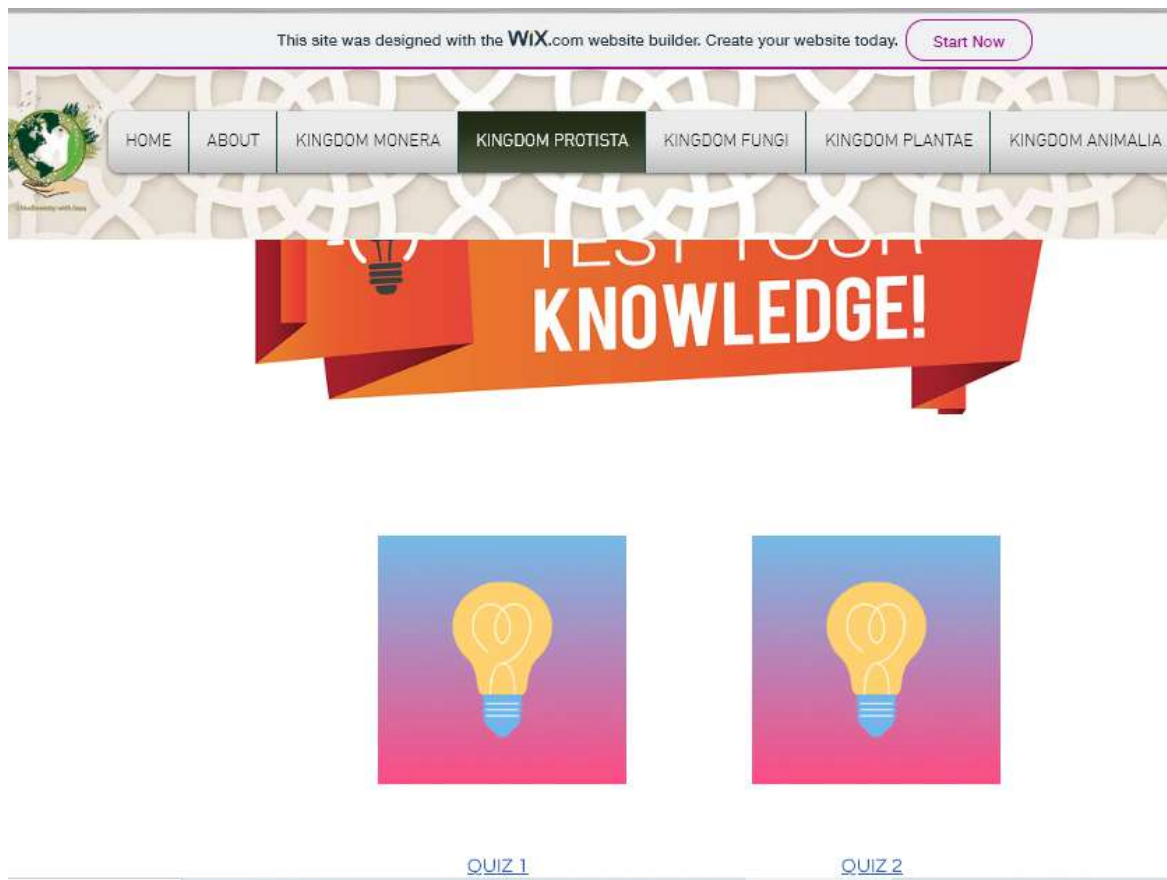
Figure 10: Online Quiz

Figure 10 shows the online quiz provided. Students can do their self-learning practice to test their understanding. There are several quizes were created of each kingdom.

Thus, the uniqueness of the i-BioDi website comes from the integration of naqli and aqli elements related to Biodiversity, which is one of the topic for Biology subject offered at foundation level in Universiti Sains Islam Malaysia. Naqli reveals the source of knowledge that comes from the Quran and Sunnah whereas aqli is a conventional knowledge. The combination of both elements can help to instill islamic values while learning Biodiversity through i-BioDi. This website can also become a suitable reference for Malaysian Matriculation Programme, Sijil Tinggi Persekolahan Malaysia (STPM), and other pre-university biology course.

CONCLUSION

In higher education, e-learning is gaining more impact in teaching and learning that can be practiced in many ways that could increase learning effectiveness and

flexibility, and much easier for teachers and students. Especially in Biodiversity is one of the Biology's topic that need a lot of reading to be memorize by students. Therefore, the purpose of this study to develop a -web-based system using wix.com. To realise this objective, the methodology of Rapid Application Developed (RAD) were developed. Thus, the i-BioDi were implemented that are provide the contents with the interactive memorizing learning tools such as mind maps, notes, videos, quiz and games. This i-BioDi developed to be use as a hub for biology foundation level students in Tamhidi Universiti Sains Islam Malaysia (USIM) and as reference Malaysian Matriculation Programme, Sijil Tinggi Persekolahan Malaysia (STPM), and A-Level that is to improve their memorizing for biology term. Thus, this i-BioDi could be beneficial among foundation student as well as to learn and study the INAQ contents that will be value added in their learning journey.

REFERENCE

Abdillah, K., Efendy, O., & Saribanon, N. (2023). Perspective Chapter: Integration of Science and Islamic Teachings by the PPI-Unas to Fight Environmental Degradation. IntechOpen. doi: 10.5772/intechopen.109453

Affouneh, S., Salha, S. and Khlaif, Z. N. (2020). Designing quality e-learning environments for emergency remote teaching in coronavirus crisis. *Interdisciplinary Journal of Virtual Learning in Medical Sciences*, 11(2), 135–137.

Almareta and Paidi (2021). Biology Teachers Used Learning Management System (LMS) for Collaborative Learning. *Journal of Physics: Conference Series.* 1788, 012029.

Aung, T.N.; Khaing, S.S. Challenges of Implementing e-Learning in Developing Countries: A Review. In Genetic and Evolutionary Computing; Zin, T.T., Lin, J.C.-W., Pan, J.-S., Tin, P., Yokota, M., Eds.; Springer International Publishing: Cham, Switzerland, 2016; pp. 405–411. ISBN 978-3-319-23206-5

Creation (2022 July 7). Rapid Application Development methodology. Retrieved from https://www.creatio.com/rapid-application-development.

Donahoe, B., Rickard, D., Holden, H., Blackwell, K. and Caukin, N. (2019). Using EdTech to enhance learning. *International Journal of the Whole Child*, 4(2), 57–63.

Esra Meşe, Çiğdem Sevilen (2021). Factors influencing EFL students' motivation in online learning: A qualitative case study; Journal of Educational Technology & Online Learning, 4(1), 11-22. ISSN: 2618-6586.

Gillett-Swan & Jenna (2017). The challenges of online learning: supporting and engaging the isolated learner; *Journal of Learning Design*, 10(1), pp. 20-30.

Huzefa Jivanjee (2022). Teaching Biology From An Islamic Perspective And Students' Holistic Development In The Higher Secondary Section Of Aljamea-Tus-Saifiyah University, Nairobi Campus, Kenya.

Jaffar, M. N., Mahmud, N. H., Amran, M. F. Rahman, N. H. Aziz, A. and Noh, M. A. C. (2022). Online learning and teaching technology services: USIM's experience during COVID-19 pandemic. *Frontiers in Education*, 7, 1–7.

Jalil, N.J & Mat Sharif, Z (2018). FActor Affecting The Awareness of Biodiversity Conservation Among Students in Malaysia Private University. International Journal of Engineering and Technology, 791-795.

Lauratu (2021). E-Learning for Biology Delivery in Colleges of Education: Challenges and Prospects; Journal of Qualitative Education, Volume 14 No. 1, March, 2021: ISSN 0331-4790.

Nurlia Zahara & Rizky Ahadi. (2022). Implementation Of e-Learning as a Media For Biology Learning By High School Teachers In Bireuen District. *Biotik: Jurnal Ilmiah Biologi Teknologi Dan Kependidikan*, 10(2), 197-205.

Rizqa Devi Anazifa (2021). The Role of Technology in Biology Teaching During and Post Pandemic Era: Challenges and Opportunities. *Advances in Social Science, Education and Humanities Research*, 40. 46-51. Atlantis Press.

Sari, F. M., & Oktaviani. L. (2021). Undergraduate students' views on the use of online learning platform during Covid-19 pandemic. Teknosastik: Jurnal Bahasa dan Sastra, Volume 19(1), 2021.

Supratiwi, M., Yusuf, M., & Anggarani, F. K. (2021). Mapping the Challenges in Distance Learning for Students with Disabilities during Covid-19 Pandemic: Survey of Special Education Teachers. International Journal of Pedagogy and Teacher Education, 5(1), 11-18. https://dx.doi.org/10.20961/ijpte.v5i1.45970

Zhu, M., Bonk, C. J., Berri, S. (2022). Fostering self-directed learning in MOOCs: Motivation, learning strategies, and instruction. Online Learning, 26(1), 153-173. DOI: 10.24059/olj.v26i1.2629

FACILITATING DIGITALIZATION ADOPTION FOR SMALL AND MEDIUM ENTERPRISES IN MALAYSIA

Mohammad Noorizzuddin Nooh [i]

[i] (*Corresponding author*). Senior Lecturer, Faculty of Economics and Muamalat, Universiti Sains Islam Malaysia. noorizzuddin@usim.edu.my

Abstract

This article discusses how digitalization has become a driving force for economic and social progress in Malaysia, particularly in creating new opportunities for Small and Medium Enterprises (SMEs) to expand their market reach and enhance productivity. The article emphasizes the importance of creating a business model that incorporates the appropriate strategy, processes, and infrastructure to succeed in the digital economy. The article also examines the advantages of digital technology and data, and how they streamline corporate operations and enhance productivity and efficiency. The article proposes a conceptual framework based on existing models and identifies four gaps that can support the digitalization process in SMEs more effectively. Overall, this article highlights the significance of embracing digitalization in today's entrepreneurial environment to create new opportunities for SMEs and enhance their competitiveness in the global market.

Keywords*: SME; digitalization; economic success; entrepreneurship*

INTRODUCTION

Today, digitalization in numerous sectors of life is driving the country's economic and social progress. The global labor market, particularly in Malaysia, expands as a result of community engagement in the digital economy. Digital technology has a significant impact on the corporate environment by expanding the labor market, enhancing economic development, and extending existing advances to faster advancements. In keeping with the aspirations of the Fourth Industrial Revolution, Malaysian entrepreneurs are justified in taking efforts to digitize their enterprises. This step must also be taken seriously by Malaysian Small and Medium Enterprises (SMEs) in order to assure their survival by expanding market reach, enhancing productivity, and stimulating the expansion of the SME sector, particularly in rural regions. A business model that incorporates the appropriate strategy, processes, and business infrastructure must be tailored to the digital economy (Blaschke, Cigaina, Riss, & Shoshan, 2017).

Digitalization is a change associated with the use of digital technology in all aspects of individuals, organizations and even a country (Hasan, Jamalolail, Abd Rahman, Ahmad, & Amaris, 2022). It transforms commercial transactions such as buying and selling, customer support, and feedback into a fully digital environment (Ulas, 2019). According to the OECD (2018), transformation refers to a shift in attitudes

and how things are enhanced or diminished. Furthermore, transformation denotes a change or new creation in various forms, functions, or structures (Rouse & Baba, 2006). The advantages of digital technology and digital data, such as the usage of artificial intelligence, the internet, and computers, will streamline corporate operations while enhancing a company's productivity and efficiency. Digitalization aids in the improvement of existing business processes without the need for changes. Processes that were previously conducted by the workforce will now be conducted via the efficiency of software such as the internet and computers. To do business conveniently and swiftly, company digitization requires only a computer and a broadband network.

Today's entrepreneurial environment is increasingly centered on digital or online company platforms. The use of digital technology or digitization has the potential to alter company paradigms and create new opportunities for SME entrepreneurs to provide value to customers (Giotopoulos, Kontolaimou, Korra, & Tsakanikas, 2017). Digital technology is the foundation of information and communication technology (ICT) systems that enable businesses to store, process, and transmit information so that organizational choices and internal control become more structured and manageable (Markus, Steinfield, Wigand, & Minton, 2006).

A digital platform is a socio-technical grouping in an organization that incorporates technical aspects such as software, hardware, procedures, and standards (Tilson, Sorensen, & Lyytinen, 2012). A digital platform, according to Ghazawneh and Henfridsson (2015), is a software-based platform that provides fundamental functionalities shared by modules and interfaces that communicate with one another. This digitalization will change corporate activities such as advertising, customer interactions, transactions, payments, order taking, services, and feedback into a fully digital environment.

Science and technological advancements have caused changes in the global industrial environment. Now, a shift in the industrial environment has occurred, popularly known as Industry 4.0 which will decide the performance of the industrial sector in the face of changing economic, social, and increasingly demanding business environments (Lasi, Fettke, Kemper, Feld, & Hoffmann, 2014; Sreedharan & Unnikrishnan, 2017). This transition will undoubtedly have a significant influence on the global industrial sector, particularly on SMEs (Lu, 2017; Mittal, Khan, Romero, & Wuest, 2018).

E-commerce is a game changer for SMEs since it has opened up new options for SMEs to break away from limited market limits and access the global market with billions of clients. Building an online presence is a fraction of the expense of opening a physical store, and it requires little investment in e-commerce solutions. Furthermore, social media, cloud-based services, and digital marketplaces level the playing field between SMEs and major corporations in terms of greater productivity in company operations such as marketing, accounting, sales, payroll, and inventory management. Because of developments in technology, the rise of Industry 4.0 has faced organizations with hurdles. Information has economic ramifications that will

transform the basis of value creation and drive firms to move to digital platforms (Kenney & Zysman, 2016). According to Muller (2019), the platform may integrate consumers, suppliers, and partners to build a new ecosystem.

Furthermore, this paper intends to propose a conceptual framework based on the existing models. From the literature analysis conducted, four gaps have been identified and can become the factors that can support the digitalization process in SMEs more effectively.

LITERATURE REVIEW
Small and Medium Enterprises

SMEs are often characterized by the number of workers and the company's yearly revenue. According to the European Commission, the SME requirements are as follows: i) the organization is at the enterprise level, ii) it has less than 250 people, iii) it has an annual turnover of less than €50 million, and iv) it is an independent firm (Berisha & Pula, 2015). Each country defines SMEs using different criteria, allowing them to be compliant with that country's needs, expectations, and desires. SMEs are defined in Malaysia based on total yearly revenue and the number of full-time workers. In the manufacturing sector, SMEs are defined as enterprises with annual sales of less than RM50 million "OR" less than 200 full-time workers. In the service and other industries, SMEs are defined as businesses with annual revenues of less than RM20 million "OR" less than 75 full-time employees (Madanchian, Hussein, Noordin, & Taherdoost, 2015). One of the methods to reduce poverty rates is to encourage economic development through employment opportunities and wealth (Chen & Sivakumar, 2021). In any developing country, SMEs are the primary source of revenue, a steppingstone for entrepreneurs, and a source of employment.

According to the Ministry of Entrepreneur Development and Cooperatives (MEDAC), Malaysia's economy added RM341.7 billion to GDP in the first quarter of 2019 compared to the same period the previous year (Kementerian Pembangunan Usahawan dan Koperasi (MEDAC), 2019). In general, entrepreneurial activities such as those conducted by SMEs, hawkers, cooperatives, franchise networks, start-ups, social enterprises, and internet businesses contribute to economic generation. In 2015, 920,624 new business entities were created in Malaysia, with SMEs accounting for 908,065 (98.5 percent) of the total figures (Kementerian Kewangan, Malaysia., 2017). This figure comprises 693,670 micro businesses (76.5 percent), 192,783 small businesses (21.2 percent), and 20,612 larger businesses (2.3 percent).Despite the huge number, micro and small businesses must compete with bigger organizations for market share in order to enhance the firm's success (Acquaah & Agyapong, 2015).

Analysis on Previous Models

In the literature review process, several previous and existing readiness models were studied and compared. The author has reviewed four model associated with the topic. The models are; Technology Acceptance Model (TAM), Nolan Model, Galliers Model, and Fink Model.

Technology Acceptance Model and Theory of Reasoned Action
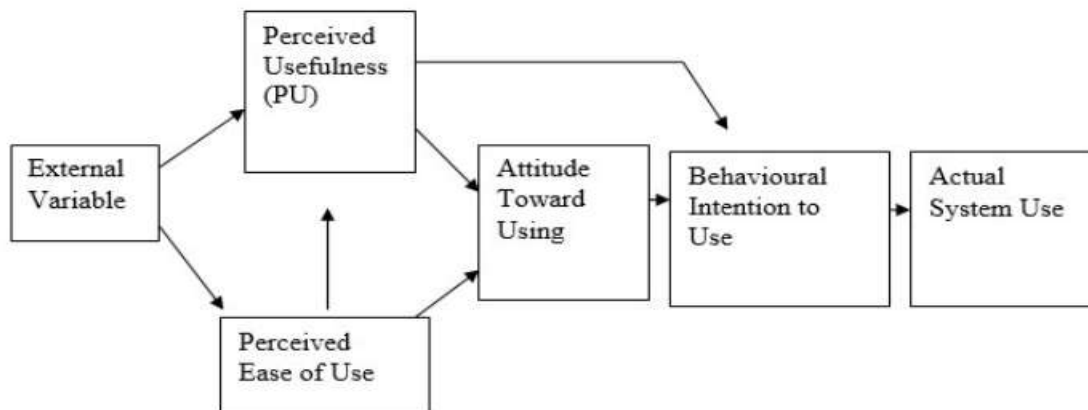
Figure 1: Technology Acceptance Model *(Davis, 1989)*

The Technology Acceptance Model (TAM) describes the relationship of the trust between user attitudes, aims, and "actual computer acceptance behavior" and trust in the usage of information systems. The TAM model's goal is to explain and forecast the user's acceptance of the information system based on the steps performed by the user after a brief encounter with the system. External elements such as tasks, user characteristics, political influence, organizational factors, and the development process were discovered to have a direct impact on acceptance attitudes through influencing beliefs, attitudes, and intentions. This technique is still commonly used to assess user acceptability of information technologies. The TAM model is seen in Figure 1.

TAM model is a hypothesis that evolved from Fishbein and Ajzen's Theory of Reasoning Action (TRA) (1975). TRA is constructed on three primary constructs, namely behavioral intention (BI), attitude towards behavior (AT), and subjective norms (subjective norms-SN). TRA discusses a person's conduct (actual behavior) as a function of behavioral intention (BI), where behavioral intention is a function of an individual's attitude toward behavior (AT) and subjective norms (SN) around behavioral performance. The TRA model is seen in Figure 2.

Figure 2: Theory of Reasoned Action (Fishbein & Ajzen, 1975)

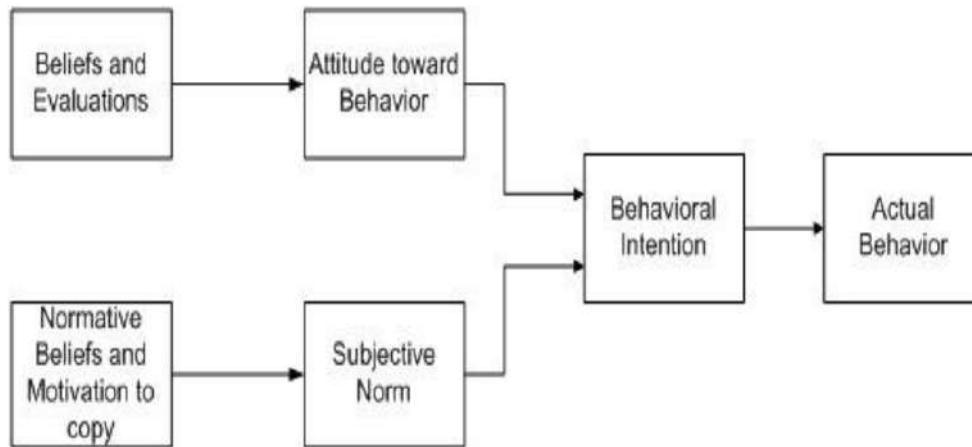Meanwhile, TAM, a more advanced TRA theory, explains why people adopt or reject information technology. TAM is developed based on two variables: The main cognitive variable is usefulness (perceived of usefulness–PU) and Easy to use (perceived ease of use–PEU). According to TAM, the use of information technology by a user actually derived directly or indirectly from the intention behavior (BI), attitude (AT), usefulness (PU) and ease of use (PEOU) of the system.

Nolan Stages Theory
Nolan's paradigm gives meaning to the evolution of IT in organizations. The model was created on the basis of the notion that the development of IT in an organization includes six stages of growth and building (Mutsaers, van der Zee, & Giertz, 1998). Each level's IT management strategy is distinct because each level has unique difficulties and issues linked to user information systems, technology, personnel, and management practices. According to Nolan's thesis, there are six phases of IT development that entail changes in the information age: initiation, contagion, control, integration, data, and maturity as shown in Figure 3.

Nolan's model is not a precision instrument, and company executives cannot use it to track their Computer Based Information System development (Montazemi, 1988). In any case, the executives indicated that computer usage becomes more complex over time and that the organization must attain a particular degree of sophistication in the sphere of data control, integration, and administration (Nolan, 1973).
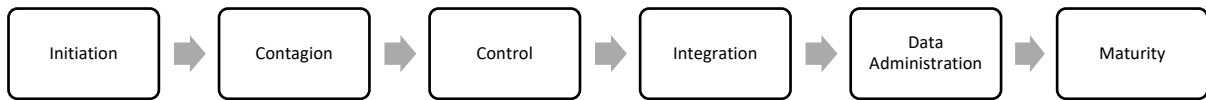
Figure 3: Nolan Stage Theory (Nolan, 1973)

Galliers Model

Galliers' model divides organizational evolution into six distinct stages of expansion (Jackson & Sloane, 2003). The higher the level attained by the organization, the bigger the incentives it receives. Table 1 illustrates a breakdown of Galliers' development phases according on the factors listed.

Element		II	Ill	IV	V	VI
Strategy	Acquisition of hardware, software etc.	IT audit **Find out and** **meet user needs (reactive)**	Top-down IS planning	**Integration , co-ordination** and control	Environmental scanning and opportunity seeking	Maintain comparativ e strategic **advantage** **Monitor futures** **Interactive** planning
Structure	**None**	Label or IS Often subordinate **to accounting or 6nance**	Data processing department Centralized DP shop **End users running free at stage 1**	**Information centers** Library records, **OA etc. in same unit** Information **services**	SBU coalition(s) (many but separate)	Centrally **coordinated coalitions** (corporate & SBU views **concurrently**)
Systems	Ad hoc, **unconnected** **Operational** Multiple manual and IS Uncoordinated **Concentration** on financial **systems** Little **maintenance**	**Many applications** Many gaps Overlapping **systems** Centralized Operational Mainly financial **systems** Many areas unsatisfied Large backlog Heavy **maintenance** load	Still mostly **centralized** Uncontrolled **end user** computing **Most major business activities covered**	Decentralized **approach with some controls,** but mostly lack **of coordination** Some DSS (ad hoc) Integrated office technology **systems**	Decentralized systems **central control and coordination** Added value **systems (more marketing** oriented) More DSS (internal, less ad hoc) Some strategic **systems (using external** data) Lack of **external and internal data integration** **Integration of communications** technologies with **computing**	**Inter•organizational systems** (supplier, **customer. government links** New IS based products **External/intern al data integration**
Staff	Programmers/ **contractors**	Systems **analysts** **DP manager**	IS planners **IS manager**	**Business analysts** **Information resource manager (chief information** officer)	Corporate / business/ IS planners (one role)	**IS director- member of** board of **directors**

Style	Unaware	Don't bother me (I'm too busy)	Abrogation Delegation	Democratic Dialectic	Individualistic (product champion)	Business team
Skills	Technical (very low level) (individual expertise)	Systems development methodology	IS believes it knows what the business needs Project management	Organizational integration IS knows how the business works Users know how IS works (for their area) Business management (for IS staff)	IS manager-member of senior executive team Knowledgeable users in some IS areas Entrepreneurial/marketing skills	All senior management understand IS and its potentialities
Super-ordinate goals	Obfuscation	Confusion	Senior management concern DP defense	Cooperation	Opportunistic Entrepreneurial intrapreneurial	Interactive planning

Table 1: Galliers Growth Model (Gallier, 1991)

It is a paradigm for determining how far an organization has progressed toward becoming matured (in this example, making progress) at the organizational and managerial levels. This model may be used to represent the technical aspects found in the organization as well as how the effect of information technology on the organization affects its growth. This model has seven critical elements: strategy, structure, processes, personnel, style, skills, and superordinate goals, all of which are beneficial to the organization's success. These seven parts are interconnected and clearly documented so that the organization may analyses its development. Each of these parts provides a clear picture, allowing the organization to choose which elements are currently strong and should be developed and preserved, as well as which elements are still weak and need to be improved. Furthermore, this model features six stages that are highly valuable for companies, with each stage being a unity with the seven elements. The organization will be able to see where it is in each of the elements.

Organizational culture has a significant impact. When an organization refuses to modify its old behaviors, this approach will be tough to adopt since the company refuses to adapt in order to become more sophisticated. Poor communication between top management and subordinates causes the organization to lack objectivity in its judgments, resulting in employees not reaching their full potential or being placed in positions they should not be in. The organization disregards the principle of having the right people in the right place at the right time (Lin, Huang, & Cheng, 2007). The organization does not want to expose itself to the advancement of information technology and continues to use an out-of-date system, so applying the model will be difficult because information technology has a large impact on the organization's progress (Lin, Pervan, & McDermid, 2005).

Fink Model

Fink's model is based on ten success factors identified in the success of IT and SMEs (Fink, 1998). Table 2 shows the author's summary on Fink's model. Each factor is broken down into several measures related to that factor. Internal variables like as perceived ICT advantages, corporate culture, and in-house ICT skills and resources, according to Fink, impact ICT adoption.

	Source of income
	Top management assistance/support
1. Internal Source	IT skills
	The use of IT
	Learning
	Operational efficiency
2. IT Benefits	Management effectiveness
	Competitive advantage
	Expert consultants from outside
	Consultant's expert knowledge
3. External assistance	Ability of expert consultants
	IT vendor support/assistance
	Information on IT
	Cost of information on IT
	Approval from the government
4. External source	Industry associations
	Ready to compete
	Use of IT by competitors
5. Extenal Environment	Use of IT by trading partners
	Organizational image
	IT knowledge by upper management
6. Internal IT expert	IT knowledge by employees
	IT knowledge by supervisors
	Recruitment of IT training
	Make flexible decisions
7. Organization culture	A positive attitude in using IT
	Ability to manage change
	Strategic planning

	Hardware costs	
	Cost of software	
8. Readiness	New features of IT	
	Internet connection	
	Product evaluation	
	Acquisition criteria	
9. IT Selection	Selection based on criteria	
	Justification for IT recruitment	
	Successful past projects	
10. IT Implementation	New IT integration	
	Training for IT recruitment	
	Support/help to introduce IT	

Table 2: Author's Summary on Fink's Model

DISCUSSION

As a consequence of the literature analysis covered in the preceding sections, a table was created to compare the key aspects of the four IT readiness models reviewed. There are needs and recommendations to design a new IT Readiness Model based on the study between the comparisons reported in Table 3. Essentially, Fink and Galliers' IT readiness model may be utilized as a foundation for developing a new IT readiness model, even if other readiness elements and current demands are applied. In comparison to other models, IT readiness models are believed to be involved with the IT readiness element and ready to absorb IT.

Model/	TAM	Nolan	Gallier	Fink
IT readiness factor				/
Organizational Culture	/		/	/
External variables/resources	/			/
Internal Factors			/	/
Selection and implementation of IT				/
Suitable for SMEs				/
Focus on business			/	/

| User involvement in IT | / | / | / | / |
| Readiness for IT | | | | / |

From the literature analysis conducted, four gaps have been identified and can become the factors that can support the digitalization process in SMEs more effectively. Thus, this will lead to a conceptual framework which can lead to further research. Figure 4 represents these factors. The four factors are: digital literacy, infrastructure and digital facilities, digital application skills and digital environment preparation. These four factors, if studied and mastered by the firm can help SMEs to improve their competitiveness. These four factors are suggested by the author to complement a new model developed based on Fink dan Galliers model.
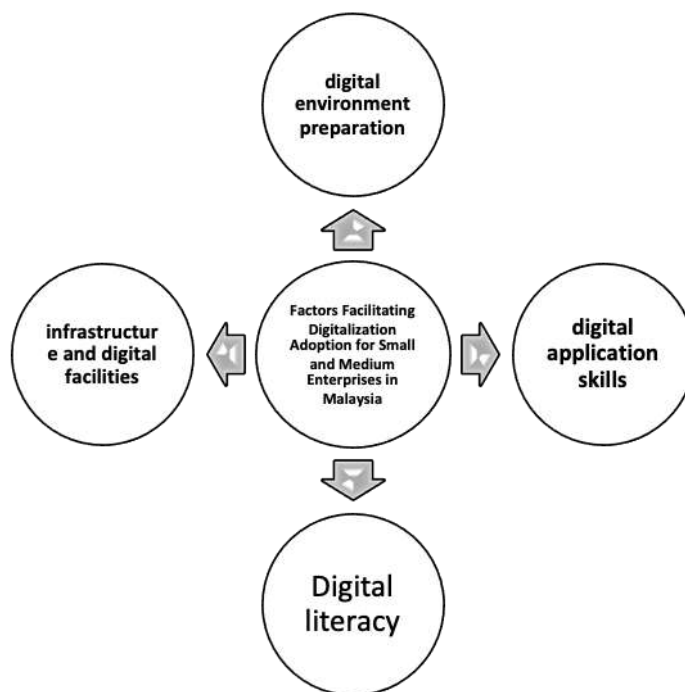

Figure 4: Conceptual Framework on Factors Facilitating Digitalization Adoption for Small and Medium Enterprises in Malaysia

Digital literacy

Discussions on the usage of digital platforms may be seen from two angles in terms of digital literacy. The first is the requirement for knowledge in order to benefit from the usage of digital platforms, and the second is new information gained by mastering digital platforms (Helfat & Raubitschek, 2018; Teece, 2018). This is due to the fact that the digitization problem demonstrates that the use of digital platforms cannot directly increase firm performance but requires dynamic capability mechanisms that can support the adoption of digital platforms (Kroh, Luetjen, Globocnik, & Schultz, 2018;

Ravichandran, 2018.). As a result of the availability of new information coming from a combination of existing knowledge and external knowledge, the usage of digital platforms is able to launch commercial operations that are capable of generating revenue. As a result of the availability of new knowledge arising from the integration of current knowledge and external knowledge, the use of digital platforms is able to start commercial operations that can more effectively exchange information with partners (Wan, Cenamor, Parker, & Van Alstyne, 2017; Cenamor, Parida, & Wincent, 2019). As a result, efficient use of digital platforms will improve information exchange with industry, partners, and customers.

The emphasis is not only on training the use of applications such as Facebook, Instagram, and other social media platforms, but also on knowledge related to the content that will be displayed on the digital platform such as copywriting, product images/images, branding, managing customer feedback, and others. In other words, knowledge includes not only technical knowledge of how to use the platform, but also knowledge of how to provide relevant resources and communication expertise of how to manage relationships with stakeholders. Firms, for example, must add material content that can attract customers, such as concise information, short films, visual pictures, and distinctive words that can successfully communicate and offer feedback with customers, rather than focusing just on marketing. The usage of digital platforms to boost company performance is thus influenced by knowledge. Companies who understand how to use digital platforms correctly, according to Scuotto et al. (2017), may surely have an influence on the firm's success. Furthermore, familiarity with digital platforms will surely aid in the adoption of Industry 4.0. (Kiel, Muller, Arnold, & Voigt, 2017). Specifically, the usage of effective digital platforms may help organizations become more inventive in line with the Industry 4.0 trend (Muller J. B.-I., 2018). Once this is understood, the company will reap additional benefits such as improved customer connections and the development of a digital ecosystem that improves commercial procedures.

Individual desire in acquiring relevant knowledge and the seriousness of management must exist in order to strengthen the firm's ability to grasp the usage of digital platforms. It is important to practice and act diligently in order to make the best use of digital platforms. However, some businesses continue to overlook the enormous potential of digital platforms for commercial growth (Muller J. , 2019; Muller, Pommeranz, Weisser, & Voigt, 2018). This is because there are still businesses that do not understand how to utilize digital tools and are unaware of the value of using digital platforms (SME Corp. Malaysia., 2018). As a result, digital literacy is a vital basis for using digital platforms.

Infrastructure and digital facilities

The rise in online purchases corresponds to customers' comfort and trust in doing commercial transactions in today's society. As a result, some people prefer to use this digital platform to purchase expensive or branded items online. In digitization, infrastructure includes physical components like as computers and smartphones, software, and a network of components that may be utilized by an individual or a corporation to do business online. The convenience of digitization is similar to broadband networks and line connections that may be found in any location.

The effective use of technology and communication has created new options for businesses to conduct business more flexibly, minimize manufacturing costs, and boost corporate efficiency (Tang & Konde, 2019). Small businesses may develop worldwide through internal strength such as financial aid, digital tool training, talented and experienced staff, R&D skills, and strong internet quality. In general, when confronted with the Industry 4.0 transformation, the usage of digital platforms is a useful option for improving the performance of micro and small businesses (Kementerian Pembangunan Usahawan dan Koperasi (MEDAC), 2019). Cataldo, Pino, and Mcqueen (2019) stated that efficient use of information and communication technology by micro and small businesses. Thus, efficient use of information and communication technology by micro and small businesses will create several chances for organizations to make more lucrative income and compete with larger businesses.

According to the SME Annual Report (2019), despite the fact that 90.1 percent of respondents have an internet connection, they confront challenges such as excessive costs, slow internet speeds, and bad connections. In terms of affordability, the majority of respondents in the Northern Region and the East Coast reported that internet costs are fairly high. Furthermore, slow internet speeds remain a worry, emphasizing the need to expand broadband infrastructure, since broadband remains a barrier to SMEs' digitalization. According to the study results, fixed broadband channels such as Streamyx, Unifi, and Time are the preferred broadband channels in all locations of Malaysia (SME Corp. Malaysia, 2019). Meanwhile, mobile broadband, which is wireless internet connection via a smartphone, is becoming more popular.

Digital application skills

Even if the enterprise has adequate infrastructure and facilities, it becomes a difficulty for the firm if the business owners do not have the necessary skills. If you have the expertise to promote online, digitization in business might increase business marketing. According to a study conducted by Rohayu Roddin et al. (2011), the average female entrepreneur in Malaysia faces a variety of obstacles and problems, including a lack of capital and marketing skills, a lack of education and training, a lack of motivation and self-confidence, and a lack of financial capital support. Alauddin Sidal (2014) agrees on this point, stating that women entrepreneurs have a lack of understanding when it comes to marketing and employing information and communication technologies in business.

Information and communication technology may be characterized as a complex and complete system containing various networks on a global scale and undergoing a dynamic development process in unison with the development of innovative technology. Speed and time savings may be recognized when contemporary technology develops and is enhanced over time by technical advancement. According to Siti Masayu Rosliah (2016), individuals' use of information and communication technology is impacted by factors such as their level of expertise in use, understanding in managing equipment, and stagnant thinking about advantages. While entrepreneurs understand the importance of information and communication technology in business, many do not employ it in their operations.

The availability of developing and thriving information technology is the greatest way for a company to stay competitive. As a result, it is vital for organizations to understand the responsibilities of digitalization in making organizational operations more responsive. They must overcome obstacles such as a lack of digital media understanding and skills.

Preparation of the digital environment

As merchants, they must take efforts to digitize their businesses in order to meet the government's Industrial Revolution 4.0 goals. There are several conditions that might hinder a company's operations if just human resources are anticipated. As a result, it is critical for a company to engage in e-commerce and embrace digitization. Infrastructure barriers, legal and administrative costs, a lack of finance, and a lack of digital skills in the workforce make it hard to develop a digital environment.

Internet participation in the realm of entrepreneurship is becoming increasingly popular in Malaysia. Furthermore, the availability of many apps that can be accessible via the internet allows a firm to develop more worldwide and effectively (Talib, Yusof, Zan, & Ngah., 2017). Shopping applications have played an important role in the expansion of e-commerce as customers increasingly use mobile phones.

Entrepreneurs have been advised to use the digital economy to do different business tasks online, as well as to improve operations through the use of technology to improve customer service. The latest trend of online ordering and e-commerce has also motivated businesses to invest in suitable digitization infrastructure, including internet connectivity. This digital strategy assists entrepreneurs in selling their items while also reducing business expenses. The majority of enterprises require finance support to build a conducive digitalization ecosystem, followed by technology and staff skill development. Government parties and agencies play an important role in creating a digital environment in which this online business may be supported and accessible by all people, particularly those living in cities and rural areas.

CONCLUSION

Overall, this paper explains how the usage of digital platforms may be critical in increasing the competitiveness of micro and small businesses. It is obvious that mastery of knowledge in the use of digital platforms may lead companies to compete

with larger firms. However, mastery necessitates knowledge backed up by enthusiasm and dedication. Although using digital platforms entails fees, the fast evolution of technology has reduced the prices and made them more accessible. Micro and small entrepreneurs can still reap the benefits of good usage of digital platforms with little or no expenditure.

Micro and small businesses may take advantage of the growth of digital platform capabilities to build solid customer interactions and create a digital ecosystem that can reduce operating expenses. Knowledgeable merchants will be able to use the available applications to engage with clients and so build strong relationships, which are essential for customer retention. Firms can also utilize consumer information to analyze and predict client wants. The company will then be more proactive in seizing chances arising from consumer communication. There is no disputing that mastering the use of digital platforms may assist micro and small businesses not only develop consumer connections, but also create a digital ecosystem comprising suppliers, retailers, and other stakeholders. To put it another way, knowledge and mastery of digital platforms become a dynamic skill for enterprises to create company enablement.

The domination of digital platforms becomes a unique resource that other businesses may find challenging to replicate. In reality, it becomes a dynamic capability as a result of its changing character in response to current technological advancements. The utilization of digital platforms necessitates the support of dynamic capabilities in order to achieve higher performance (Parida, Lahti & Vincent 2016; Ravichandran 2018). This discovery has aided the research of dynamic capabilities (Helfat et al. 2018; Teece 2018) by demonstrating the significance of leveraging digital platforms as a trigger that pushes enterprises to develop current dynamic capabilities. In particular, the usage of digital platforms may boost a firm's efficiency and creativity, facilitating the integration and reconfiguration of management in connections with stakeholders.

From the aspect of management implications, this paper emphasizes that firms need to look at the use of digital platforms from a strategic perspective, not just marketing. The sophistication of software technology and user involvement in the digital world create a situation where digital platforms are no longer limited to communication functions. Software such as Google Analytics helps firms in making strategic decisions using big data based on user behavior using social media. In addition, this paper proposes a more accurate information to develop more effective programs for entrepreneurs by stakeholders such as SME Corporation Malaysia and the Ministry of Entrepreneur Developmentand Cooperatives (MEDAC). Digital workshops such as e-entrepreneurs and e-rezeki organized by Malaysia Digital Economy Corporation Sdn Bhd (MDEC) need to consider aspects of the knowledge level of the participants and what is required by the participants in developing appropriate programs.

There are several limitations that have been identified in this paper. The proposals of this paper cannot be generalized due to the approach used. This paper is also only focused on small and medium firms, and it is possible that if it is extended to large enterprises, more factors that encourage firms to use digital platforms can be identified.

Future research might look into quantitatively created proposals to determine whether there is a link between digital platform capabilities and company competitiveness. Aside from quantitative investigations, large-scale corporate studies may be able to identify distinct aspects based on different degrees of expertise. Comparative study could also be planned to look at other factors that encourage the use of digital platforms in foreign countries, taking cultural issues as well as varying levels of knowledge and experience into account. Finally, the key aim for micro and small businesses is to expand expertise in order to improve the firm's capacity to use digital platforms. Firms may master use, cultivate customer connections, and create a successful digital ecosystem with digital literacy accompanied by interest and dedication.

REFERENCE

SME Corp. Malaysia. (2019). Laporan Tahunan PKS 2018/19. Kuala Lumpur: Perbadanan Perusahaan Kecil dan Sederhana Malaysia.

Acquaah, M., & Agyapong, A. (2015). The relationship between competitive strategy and firm performance in micro and small businesses in Ghana: The moderating role of managerial and marketing capabilities. Africa Journal of Management, 1(2), 172-193.

Berisha, G., & Pula, J. S. (2015). Defining Small and Medium Enterprises: a critical review. Academic Journal of Business, Administration, Law and Social Sciences, 1(1), 17-28.

Blaschke, M., Cigaina, M., Riss, U. V., & Shoshan, I. (2017). Designing business models for the digital economy. In O. Gerhard, & K. Michael, Shaping the digital enterprise (pp. 121-136). Cham: Springer.

Cataldo, A., Pino, G., & Mcqueen, R. J. (2019). Size matters: The impact of combinations of ICT assets on the performance of Chilean micro, small and medium enterprises. Information Technology for Development, 25(4), 1-24.

Cenamor, J., Parida, V., & Wincent, J. (2019). How entrepreneurial SMEs compete through digital platforms: The roles of digital platform capability, network capability and ambidexterity. Journal of Business Research, 100, 196-206.

Chen, Y., & Sivakumar, V. (2021). Investigation of finance industry on risk awareness model and digital economic growth. . Annals of Operations Research, 1-22.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. ,MIS Quarterly, 13(3), 319–340.

Fink, D. (1998). Guidelines for the successful adoption of IT in small and medium enterprises. International Journal of Information Management, 18(4), 243-253.

Fishbein, M., & Ajzen, I. (1975). Belief, Attitude, Intention and Behaviour: An Introduction to Theory and Research. Reading, Mass: Addison Weseley.

Gallier, R. (1991). Strategic information systems planning: myths, reality and guidelines for successful implementation. European Journal of Information Systems, 1, 55-64.

Ghazawneh, A., & Henfridsson, O. (2015). A Paradigmatic Analysis of Digital Application Marketplaces. Journal of Information Technology, 30(3), 198–208.

Giotopoulos, I., Kontolaimou, A., Korra, E., & Tsakanikas, A. (2017). What drives ICT adoption by SMEs? Evidence from a large-scale survey in Greece. Journal of Business Research, 81, 60-69.

Hasan, A., Jamalolail, F. N., Abd Rahman, A., Ahmad, F., & Amaris, I. (2022). Kesan Pandemik COVID-19 Terhadap Trajektori Ekonomi Malaysia. International Journal of Interdisciplinary and Strategic Studies, 3(4), 206-216.

Helfat, C., & Raubitschek, R. (2018). Dynamic and integrative capabilities for profiting from innovation in digital platform-based ecosystems. Research Policy, 47(8), 1391-1399.

Jackson, M., & Sloane, A. (2003). Modelling information and communication technology in business. Business Process Management, 9(1), 81-113.

Kementerian Kewangan, Malaysia. (2017). Laporan Ekonomi 2017/2018. . Putrajaya: Kementerian Kewangan, Malaysia.

Kementerian Pembangunan Usahawan dan Koperasi (MEDAC). (2019). Dasar Keusahawanan Nasional 2030. Putrajaya: Kementerian Pembangunan Usahawan dan Koperasi (MEDAC).

Kenney, M., & Zysman, J. (2016). The rise of the platform economy. Issues in Science and Technology, 32(3), 61- 69.

Kiel, D., Muller, J. M., Arnold, C., & Voigt, K.-I. (2017). Sustainable industrial value creation: Benefits and challenges of industry 4.0. International Journal of Innovation Management, 21(8), 1-34.

Kroh, J., Luetjen, H., Globocnik, D., & Schultz, C. (2018). Use and efficacy of information technology in innovation processes: The specific role of servitization. Journal of Product Innovation Management, 35(5), 720-741.

Lasi, H., Fettke, P., Kemper, H.-G., Feld, T., & Hoffmann, M. (2014). Industry 4.0. Business & Information Systems Engineering, 6(4), 239-242.

Lin, C., Huang, Y. A., & Cheng, M. S. (2007). The adoption of IS/IT investment evaluation and benefits realization methodologies in service organizations: IT maturity paths and framework. Contemporary Management Research, 2, 173-194.

Lin, C., Pervan, G., & McDermid, D. (2005). IS/IT investment evaluation and benefits realization issues in Australia. Journal of research and practice in information technology, 37(3), 235-251.

Lu, Y. (2017). Industry 4.0: A survey on technologies, applications and open research issues. Journal of Industrial Information Integration, 6, 1-10.

Madanchian, M., Hussein, N., Noordin, F., & Taherdoost, H. (2015). The role of SMEs in economic development: Case study of Malaysia. International Journal of Academic Research in Management, 4(3), 77-84.

Markus, M. L., Steinfield, C. W., Wigand, R. T., & Minton, G. (2006). Industry-wide information systems standardization as collective action: The case of the U.S. residential mortgage industry. MIS Quarterly, 30, 439–465.

Mittal, S., Khan, M. A., Romero, D., & Wuest, T. (2018). A critical review of smart manufacturing & Industry 4.0 maturity models: Implications for small and medium-sized enterprises (SMEs). Journal of Manufacturing Systems, 49, 194-214.

Montazemi, A. R. (1988). Factors affecting information satisfaction in the context of the small business environment. MIS quarterly, 239-256.

Muller, J. (2019). Antecedents to digital platform usage in Industry 4.0 by established manufacturers. Sustainability, 11(4), 1-23.

Muller, J. B.-I. (2018). Fortune favors the prepared: How SMEs approach business model innovations in Industry 4.0. Technological Forecasting and Social Change, 132, 2-17.

Muller, J., Pommeranz, B., Weisser, J., & Voigt, K.-I. (2018). Digital, social media, and mobile marketing in industrial buying: Still in need of customer segmentation? empirical evidence from Poland and Germany. Industrial Marketing Management, 73, 70-83.

Mutsaers, E., van der Zee, H., & Giertz, H. (1998). The evolution of information technology. Information Management & Computer Security, 6(3), 115-126.
Nolan, R. (1973). Managing The Computer Resource: A Stage Hypothesis. Communications of the ACM, 16(4), 399–405.

OECD. (2018). Empowering Women in the Digital Age. Where do we stand? New York City.

Ravichandran, T. (2018.). Exploring the relationships between IT competence, innovation capacity and organizational agility. The Journal of Strategic Information Systems, 27 1, 22-42.

Roddin, R., Sidi, N. S., Yusof, Y., Mohamed, M., & Razzaq, A. R. (2011). Poverty alleviation among single mother in Malaysia: Building entrepreneurship capacity. International Journal of Business and Social Science, 2(17), 92-99.

Rouse, W. B., & Baba, M. L. (2006). Enterprise transformation. Communications of the ACM, 49(7), 67-72.

Scuotto, V., Caputo, F., Villasalero, M., & Del Giudice, M. (2017). A multiple buyer–supplier relationship in the context of SMEs' digital supply chain management. Production Planning & Control, 28(16), 1378-1388.

Sidal, A. (2014). Taksonomi keupayaan usahawan wanita Melayu. Journal of Human Capital Development, 7(2), 63-78.

Siti Masayu Rosliah, A. (2016). Keupayaan ICT dalam meningkatkan pencapaian usahawan wanita: satu kajian kes usahawan luar bandar Malaysia. Journal of Social Science and Humanities, 11(2), 79-103.

SME Corp. Malaysia. (2018). Laporan Tahunan PKS 2017/18. . Kuala Lumpur: Perbadanan Perusahaan Kecil dan Sederhana Malaysia.

Sreedharan, A., & Unnikrishnan, A. (2017). Moving towards Industry 4.0: A systematic review. International Journal of Pure and Applied Mathematics, 117(20), 929-936.

Talib, A., Yusof, M. N., Zan, Z. M., & Ngah., K. (2017). e-Bisnes, Pemangkin Penyertaan Kaum Wanita dalam Keusahawanan Luar Bandar. Journal of Advanced Research in Business and Management Studies, 9(1), 54-66.

Tang, Y., & Konde, V. (2019). Differences in ICT use by entrepreneurial micro-firms: Evidence from Zambia. Information Technology for Development, 25(4), 1-24.

Teece, D. (2018). Profiting from innovation in the digital economy: Enabling technologies, standards, and licensing models in the wireless world. Research Policy 47(8):, 1367-1387.

Tilson, D., Sorensen, C., & Lyytinen, K. (2012). Change and Control Paradoxes in Mobile Infrastructure Innovation: The Android and iOS Mobile Operating Systems Cases. In 45th Hawaii International Conference on System Science (HICSS 45) (4 ed., Vol. 11, pp. 1-23). Maui, HI: Sustainability.

Ulas, D. (2019). Digital transformation process and SMEs. Procedia Computer Science, 158, 662-671.

Wan, X., Cenamor, J., Parker, G., & Van Alstyne, M. (2017). Sustainability. Unraveling platform strategies: A review from an organizational ambidexterity perspective., 9(5), 1-18.