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SME AND ARTIFICIAL INTELLIGENCE (AI) TECHNOLOGY ADOPTION ON SME INDUSTRY IN MALAYSIA

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Abstract:

This study examines the challenges faced by small and medium enterprises (SMEs) in adopting Artificial Intelligence (AI) technology in Malaysia. Business sectors have actively embraced the usage of Artificial Intelligence (AI). However, the rate of adoption of AI within the SME sectors is low or slow as compared to larger business corporations. This study proposes a conceptual framework that outlines eight (8) factors that could influence the decision of the SMEs sectors to adopt AI technology in their business process, which will give a positive impact on SMEs growth and development. These factors are Top Management Support, Employee Adaptability, Organization Preparedness, Business Operation Support, Competitive Pressure, Partner Support, Perceived Usefulness, and Perceived Ease of Use. The principles for the framework is the Technology Organization Environment (TOE) model integrated with Technology Acceptance Model (TAM). It is hope that this conceptual framework could provide direction for future additional research on this topic.

Keywords:

Artificial Intelligence, AI adoption, SME Technology-Organization-Environment (TOE), Technology Acceptance Model (TAM)

Introduction

Prioritizing the adoption of Artificial Intelligence (A1) technology and development of AI skills culture among small and medium enterprise (SME) is a strategic decision by the Malaysian government (A1-RMAP 2021-2025, Lada et al; 2023). Malaysia's National

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Artificial Intelligence RoadMap 2021-2025 (AI-RMAP) documented and to be implemented during the Twelfth Malaysia Plan (2021-2025) aims to transform the SME sector and the economy to be new driver of economic growth leveraging on digitalization which necessitate the adoption of the Fourth Industrial Revolution (4.1R) technology Artificial Intelligence (A1). The Malaysian Government's mission is to transform the country into a high-tech nation and become a regional leader or ASEAN Digital Centre by 2030 (Economic Planning Unit (EPU) (2019).

To accelerate this transformation, the government launched Malaysia's Digital Economy Blueprint (MYDIGITAL) under the Ministry of Science, Technology, and Innovation (MOSTI) in 2021, with Malaysia Digital Economy Corporation (MDEC) being the lead agency to ensure SMEs are able to undergo this transformation. Also, the A1-RMAP 2021-2025, strategies were implemented to enable the objective of SMEs adoption of AI technology within the five-year period. Due to this digitalization process in the economy, there is a need for the SME sectors to shift from their traditional ways of doing business and adopt digital tools and technology such as Artificial Intelligence (AI). Adoption of new technology is necessary to enhance productivity, increase efficiency, reduce cost of production, and be able to attain a competitive advantage for the SME industry as well as against the global market (SME Corporation Malaysia 2019, Ikumoro & Jawad, 2019).

However scholarly studies have highlighted that SMEs in Malaysia are slow in adopting digital tools and Artificial Intelligence (A1) for their business process (Lada et al., 2023; Ambad et al., 2020; Hamid et al., 2019; Ikumoro & Jawad 2019, Jagenathan et al., 2018; SME Corporation Malaysia 2018). Research works have attributed this phenomenon to the existence of barriers such as shortage of AI expert, lack of a digital-skilled workforce, lack of awareness, inadequate funding, insufficient infrastructure, low managerial support, and regulatory issues. The World Bank Report 2022 on Malaysia and the OECD Report 2021, stated that because of the existence of these barriers SMEs' low digital adoption especially for small firms (10-49 number of employees) as compared to larger firms' gaps have widened.

Therefore, this study wishes to propose the conceptual model that supports the adoption of Artificial Intelligence (AI) by SMEs in terms of Top Management Support (TMS), Employee Adaptability (EA), Organisation Preparedness (OP), Business Operation Support (BOS), Partner Support (PS), Competitive Pressure (CP), Perceived Usefulness (PU), and Perceived Ease of Use (PEOU) variables base on the Technology Organization Environment (TOE) model integrated with Technology Acceptance Model (TAM). It is hoped that future research can be undertaken to further identify socio-environmental and technological factors that will help organizations and SMEs to make decision to adopt AI and the benefit from this technology usage to create competitive advantage in the business.

Literature Reviews

Small and medium enterprises (SMEs) formed 98.5 percent of business establishments in Malaysia, with total number of 1069,831 in 2023 (SME Corporation Malaysia, 2024). Its contribution to Malaysia's Gross Domestic Product (GDP) was RM 613.1 billion (38.4%), a total export of RM 152.2 billion (12.20%), and employment of 7.86 million workers (48.5%) as reported by the Department of Statistics of Malaysia (DOSM) 2023.

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Definition of SMEs in Malaysia is illustrated in Figure 1 below by SME Corporation Malaysia 2022. Regarded as the backbone of the Malaysian economy.

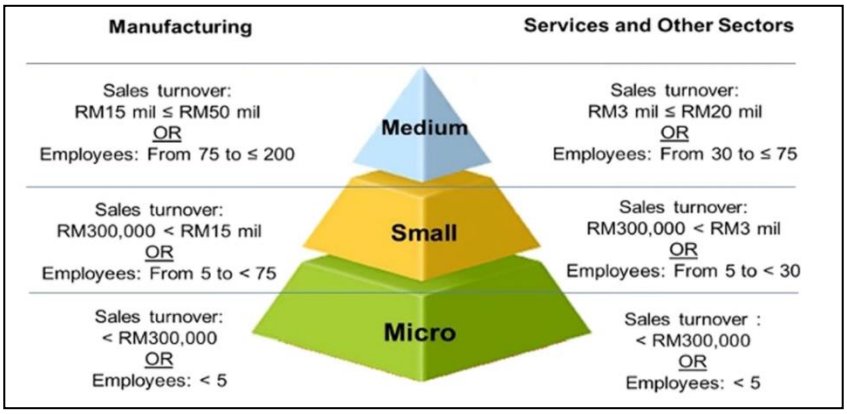

Figure 1: Malaysia SME Definition (SME Corporation Malaysia, 2022).

Small and Medium Enterprise (SME) is defined based on either annual sale or the number of full-time employees. For manufacturing sector, medium sized SME sales turnover not exceeding RM 50 million or up to 200 full-time employees. For medium sized SME in the service sectors and other sectors sales turnover not exceeding RM 20 million or up to 75 full-time employees. The other category are classified as small sized SME with sales turnover not exceeding RM 3 million or number of employee not more than 30 for service sector. For manufacturing sector small sized SME sales turnover is less than RM 15 million and number of employees not more than 75 as shown in figure 1 above.

Distribution of SME by economic sectors are largest in the service sector 87.5 percentage comprising wholesale and retail trade services, which include food and beverages, transportation and storage services, repair of motor vehicles and motorcycles. Followed by construction (6.4%) manufacturing (4.9%), agriculture (1.1%), mining & quarrying (0.1%). SME by economic sector is categorised in the following industry as shown in Table 1.

Table 1: Distribution of SMEs by Economic Sectors.

Type of SME Sector	Total SME	Percentage
1. Service sector	936,793	87.5
2. Construction	69,015	6.4
3. Manufacturing	51,481	4.9
4. Agriculture	11,372	1.1
5. Mining & Quarrying	1,170	0.1
Total	1069,831	100

Source: SME CORP Malaysia 2024

However, the SME landscape in Malaysia is characterised with lower number of medium-sized enterprise as compared to micro and small-sized as shown in the pyramid diagram Figure 2. The medium sized category are identified as Driver of growth, while the small and medium sized category SME and Enabler of growth. The Micro business enterprise represents more

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than 76.5 percents of the SME group providing a Balance growth in the economy (SME Master Plan 2012-2020).

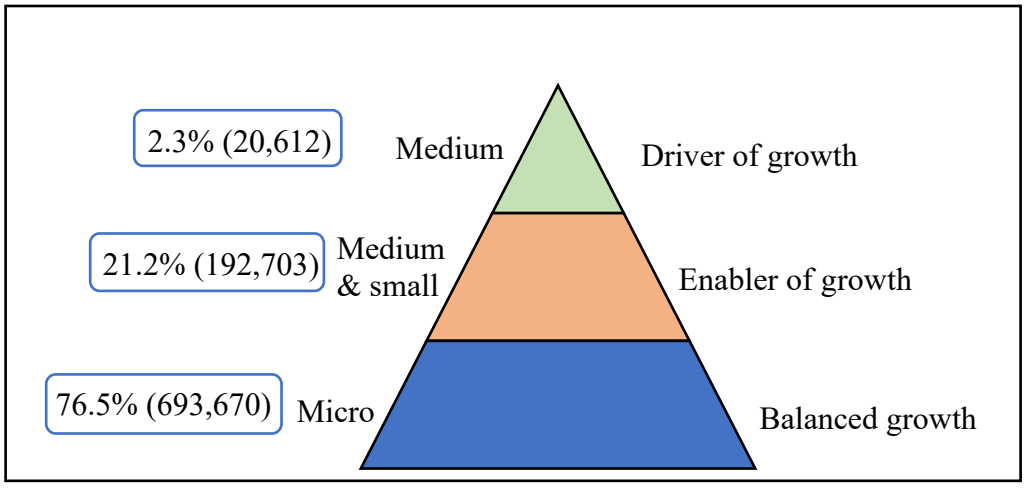

Figure 2

Source: SME Master Plan (2012-2020)

Key Challenges for SME in Malaysia.

The World Bank Productivity and Investment Climate Survey (2010-2011) report stated that SMEs in Malaysia were not achieving high performances because they face six (6) key challenges which needed to be address. These challenges are shown in the diagram below.

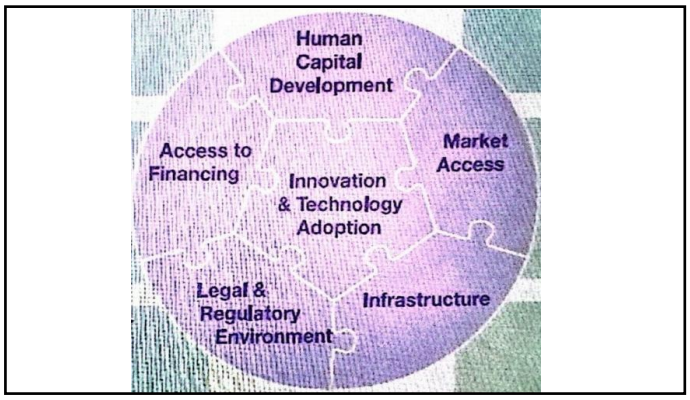

Figure 3: Key Challenges Faced by SMEs in Malaysia

Source: SME Master Plan (2012-2020)

According to the World Bank Productivity and Investment Climax Survey Report (2010-2011), SMEs in Malaysia faced six key challenges that hinder their growth performance. This are in aspect of Innovation & Technology Adoption, Access to Financing, Legal & Regulatory Environment, Human Capital Development, Market Access and Infrastructure. All these key challenges must be address simultaneously in order for the SMEs to achieve high performance.

The Malaysian government through their main agency SME Corporation Malaysia is committed to implementing initiatives to overcome the key challenges to boost the growth and development for the SMEs sector in Malaysia. The fundamental policy enabler in Malaysia

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Twelfth Malaysia Plan (2021-2025) will catalyse growth in all sectors of the economy plus the SMEs sectors, is in strategies for adoption and innovation, accelerating the digitalization process and adoption of the Fourth Industrial Revolution (4IR) technologies such as Artificial Intelligence, Financial Technologies (FinTech) to develop talents and skills required to drive the digital economy, Research and Development to attract investment for the digital economy. The Twelfth Malaysia Plan (2021-2025) focus to transform SMEs sector to become the new driver of growth leveraging on accelerating the digitalization of the SME industry that would create competitive advantage, improve business ecosystem and further increase SME's contribution toward Malaysian economy.

However, according to the report by SME Bank Biz Pulse Issue 17 by Entrepreneur Development Division SME Bank, only 30 % of Malaysia manufacturing SMEs have adopted advanced technology (Abod, 2016). The Malaysia Productivity Corporation (MPC) reported that adopting IT among Malaysian manufacturing SMEs is low at only 10% compared to some developed Asian countries such as Singapore, Japan and South Korea, Malaysia is far from the total adoption of 50% recorded by the country (Eleventh Malaysia Plan, 2018). Low level of automation and modernization in manufacturing process inhibit awareness and knowledge regarding Industrial Revolution (IR4.0) technologies (Ling et al., 2020).

Apart from the SME Master-Plan (2012-2020), the Malaysian government formulated the National Entrepreneurship Policy 2030 (NEP 2030) to help SMEs overcome these challenges. The strategies was to shift the nation from traditional economy to the new economy, which is defined as knowledge-intensive with high-skilled talents, innovation-driven, market-driven, less reliant on material resources, collaborative, and sustainable. SMEs participation towards making this new economy is vital (NEP 2030, Asmy and Mohamed, 2015). Technology and innovation factor is defined as the most important growth lever with it's high impact on productivity and employment. Artificial Intelligence technology assumes a central and pioneering role for SMEs to growth and development amidst Malaysia's digitalization policy for the economy (Lada et al., 2023; Lu et al., 2022).

To accelerate digital transformation in the Malaysian economy, the government launched Malaysia Digital Economy Blueprint (MYDIGITAL) in February 2021 aimed to transform Malaysia into a digital-driven, high-income nation and a regional leader or Asean Digital Centre by 2030 (Economic Plan Unit (EPU) 2019). Malaysia Digital Economy Corporation (MDEC) as Malaysian lead digital economy agency aimed to ensure that SMEs are able to undergo multiple level of digital adoption by providing digitalization grants such as SME Digitalization grant, 4IR Catalyst Grant and other initiatives under the Short-Term Economic Recovery Plan (PENJANA 2020) to accelerate digital adoption by SMEs (MDEC 2022/2023). The rise of digital economy is the outcome of the fourth industrial revolution (4IR) accompanied by new digital technologies that are constantly challenging and changing old ways of doing business (Vitezic & Peric 2023, Enshassi et al., 2024; Ikumoro & Jawad 2019). The key digital technologies that can promote transformation and economic growth for SMEs are, Artificial Intelligence (AI), Mobile Internet, Cloud computing, big data, Financial Technologies (FinTech), Internet of Things (IoT) and Remote Serving, Advance Robotics and Additive manufacturing.

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Artificial Intelligence (AI) and SMEs in Malaysia

Amidst Malaysia's digitalization policy for the economy, Artificial Intelligence (AI) technology assumes a central and pioneering role for the SMEs growth and development (Lada et al., 2023; Lu et al., 2022). The benefit of digitalization and adoption of digital technologies such as AI, for SME would result in reduction in production cost, increase productivity and efficiency, better access to information and communication between staff, suppliers and network (OECD 2021). In Malaysia, the need for digital technologies is not the same among sectors, because of different nature of activity. However, in the service sector the productivity gap between firm using digital tools and firms not using digital tools is more pronounced among smaller firm than larger firm (OECD- Economic Survey, Malaysia 2021). The service industry is impacted by digital transformation with Artificial Intelligence (AI) identified as the key new technology usage to improve production especially in the industry of travel, healthcare, finance, tourism and hospitality (Fernandes & Oliveira, 2021, Pillai & Sivathany, 2020, Lee & Lee 2020, Belanche et al., 2021; Cohen & Hopkins, 2014).

Artificial Intelligence (AI) are the technology in the field of computer science that creates intelligent machines that can perform tasks that require human intelligence (Joiner, 2018). AI systems are designed to analyse and interpret data, make decisions and solve problems like human cognition by relying on algorithms, large data base and machine learning techniques to improve business performance (Xu et al., 2001). AI encompasses various subfields like computer visions, robotics, natural language processing expert system, neural network to be applied to domains such as marketing strategy, finance, healthcare and transportation within the SME industry and other business sectors (Baabdullah et al.,2020,2021; Ma & Sun,2020; Mikalef et al., 2023; Moradi & Dass, 2022; Thayyib et al., 2023).

The primary goal for SMEs and businesses to adopt AI technologies is to facilitate sales, increase on-line marketing, develop employee skill in AI technologies and develop new product and services (SME Corp Malaysia, 2017; Kontane et al., 2019). Integration of AI and the development of machine learning, big data analytics, where productivity is expected to increase by 60 percent in 2021 in Malaysia (Get IT Admin, 2022). The Malaysian National Artificial Intelligence RoadMAP 2021-2025 (AI-RMAP) vision and mission is to create a self-sustaining AI innovation ecosystem for AI development. Leveraging quadruplex helix collaboration guided by the Responsible AI principle a five (5) year goal. With the implementation of AI-RMAP, 2021-2025 Malaysia hopes to achieve the following objectives through the strategies below: -

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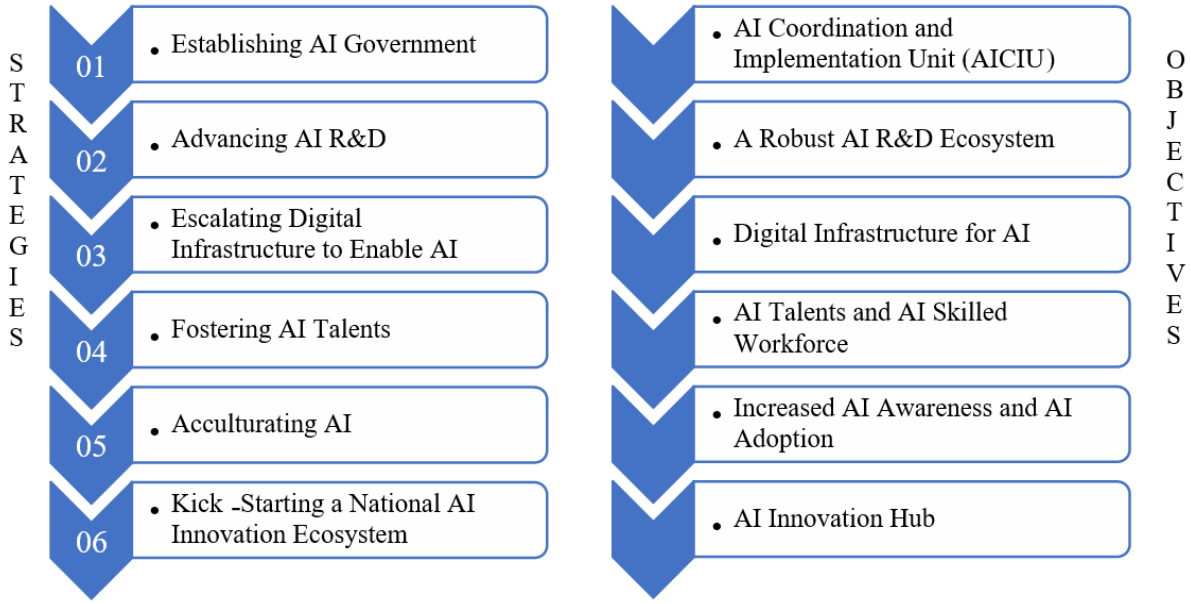
Table 3: Strategies AI-RMAP (2021-2025)



Source: Malaysia National Artificial Intelligence ROADMAP 2021-2025 (AI-RMAP) Ministry of Science, Technology and Innovation)

Under the AI-RMAP (2021-2025) strategies to escalate digital infrastructure and AI ecosystem are by Fostering AI Talents through Reskilling and upskilling existing workforce, Acculturating AI by Cultivating Awareness of the role of AI in the economy and Accelerating Adoption for the SME sectors top management, stakeholders and creating a National AI Innovative Ecosystem through Quadruple helix collaboration of Government Academic, Industry and Society (GAIS).

Barriers in SMEs AI Adoption.

According to the World Bank Report (2010-2011), SMEs low adoption rate in digital technology is attributed to the existence of constraints or barriers that may hinder its progress toward full AI development. These barriers are identified as lack of capabilities or skills of business operators, lack of information about digital technology, inadequate access to finance, aspects of institutional and regulatory environments, lack of awareness on AI technologies and its benefit which affect decision on AI adoption. Scholars highlighted, despite Malaysian government efforts to give support in terms of training, financial access and creating awareness, adoption of digital tools and Artificial Intelligence (AI) technologies remains low (Idris, 2019; Hamid et al., 2019; Ismail et al., 2018; SME Corp Malaysia, 2018). Studies by Moilanen and Laatikainer (2023) emphasized lack of skill for AI work as main barrier for AI adoption, while other research identify high-cost purchase and implementation costs, lack of technological infrastructure, Data Security laws, lack of governance model for AI (at Laat, 2021; Regona et al., 2002; Goasduft, 2019; McKinsey, 2018; Rounberg Areback, 2020). The existing technology adoption models are yet to provide sufficient insights on the significant factors capable of impacting a successful AI technology adoption within the SMEs sector (Chatterjee et al., 2021; Ikumoro & Jawad, 2019).

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Overview of Technology Adoption Theories Models and Framework in Artificial Intelligence (AI)

It is critical to examine the determinants of AI adoption by SMEs to pinpoint certain factors that could either promote or inhibit the use of AI. Research works suggest that SMEs consider different aspect before accepting Artificial Intelligence (AI) technologies and specific indicators play a significant role for SME to make decision on AI technology adoption (Aish & Mohd Noor, 2025). Nevertheless, exploration into how these indicators rank in order of importance for the SMEs is minimal by researches in the literature (Magaireah et al., 2019). Several frameworks and conceptual models by researches on technological innovation revolved around factors such as individual, organizational, technology and environmental characteristics (Aish & Mohd Noor, 2025; Getha et al., 2024; Loo et al., 2023; Ikumoro & Jawad., 2019). Some of the existing models use to investigate implementation of AI and technological innovations among SME in developing and developed countries are: Theory of Reasoned Action (TRA) by Ajzen and Fishbein (1980), Theory of Planned Behaviour (TPB) by Ajzen (1991), Technology Acceptance Model (TAM) by Davis (1989), Technology-Organizational-Environment (TOE) by Tornatzky and Fleischer (1990), Diffusion of Innovation Theory (DIT) by Rogers (1995), Resource-Based View of the Firm (RBV) by Barney et al., (2001) and Unified Theory of Acceptance and Use of Technology (UTAUT) by Venkatesh et al., (2003).

Research work has acknowledged the widely adopted model for IT user acceptance and usage is the Technology Acceptance Model (TAM) by Davis (1989) (Awa et al., 2015). The TAM model unveils external variables such as Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) as the determining factor for user's intention to use an innovation. Also, integration of TAM models with other model captures the variables of social change process capable of influencing technology adoption process (Awa et al., 2015; Legris et al., 2003; Awa et al., 2012). At the organizational or firm-level, research works recognised the Technology-Organizational-Environment (TOE) framework and Diffusion of Innovation Technology (DIT) is prominently utilized for technology adoption (Oliveira & Martins, 2011; Abdullah et al., 2013). In terms of top management characteristics in the SMEs, the internal and external characteristics explanatory power of the TOE model is said to be more viable (Awa et al; 2015).

Conceptual Framework.

Adoption of technology is regarded as the process where technology is chosen to be use by an individual or an organization. Several scholarly articles have shown that technological adoption increases the success rate of its adopters compared to non-adopters SMEs (Lahiri et al., 2018, Hamid et al., 2019, Ameyaw & Modzi, 2016, Kurnia et al., 2015, Abu et al., 2015, Awa et al., 2015, Abdullah et al., 2013). However, Abu et al states that Malaysian SMEs utilizes very restricted scopes of technologies and thus unable to compete in the global market. According to the writer existing models on technology adoption within Malaysian SMEs sectors have failed to yield a satisfactory understanding regarding the factors capable of influencing a successful utilization of technologies, despite Malaysian government's continuous efforts by providing support through its agencies (Abdullah et al., 2013). Thus, to help policy-makers as well as business managers formulate specific intervention and support framework, researchers need to study the effects of various challenges face by SME sectors that hinder the effective integration of Artificial Intelligence in their business process. Studies should address questions such as, firstly what factors influence AI adoption for the SME industry, what factors determine its usage by the SMEs. Secondly, what are the most relevant theories, models and framework

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in the literature that relate to primary factors AI adoption for the SMEs sectors (Aish & Mohd Noor, (2025), Loo et al, 2023).

This paper wishes to propose a conceptual framework base on the integrated Technology-Organization-Environment (TOE) model developed by Tornatzky and Fleischer (1996) integrated with Technology Acceptance Model (TAM) developed by Davis (1989). The TOE-TAM integrated model explains the link between eight (8) key factors or variables that lead to the intention to adopt Artificial Intelligence (AI) by the SME sectors in Malaysia. The proposed conceptual model consist of four (4) organization and internal environment level factors or variables under TOE model which include Top Management Support (TMS), Organization Preparedness (OP), Employee Adaptability (EA), Business Operation Support (BOS) while TOE's external environmental variables are Competitive Pressure (CP) and Partner Support (PS). Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) are constructs from Technology Acceptance Model (TAM) as technological base variables.

Technology-Organization-Environment (TOE) Framework

The TOE framework can explain factor impacting adoption decisions using technological, organizational, and environmental dimensions and can explain to any modern technology in the socio-environmental and technological context (Hossain & Quaddus, 2011). Writer's states that TOE framework has found successful application in the adoption of cloud computing (Yang et al, 2015) e-commerce (Idris, 2015), e-business in India (Agrawal et al, 2014). Other research works include for SMEs in Saudi Arabia (Jureidini, 2017, Juragenson et al., 2016), where SMEs are encouraged to adopt new technologies supported by environmentally friendly production process.

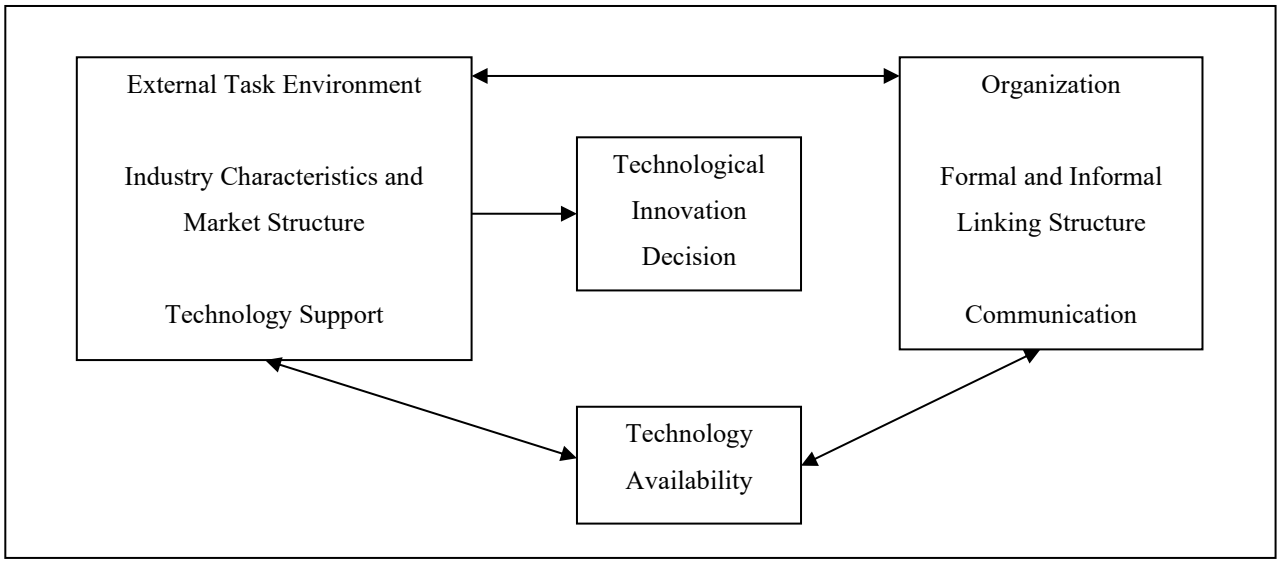

Figure 4: Technology, Organization And Environment Framework

Source: L.G Tornatzky and M.Fleischer (1990)

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Technology Acceptance Model (TAM)

Technology Acceptance Model (TAM) is considered a commonly applied influential model in the area of Information System (IS) (Lee et al., 2003). It is an IT specific and parsimonious model which can be explore and predict acceptance of wide type of technologies. Researches state that the two core variables of TAM, Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) can explain at least 40 percent of the reasons for using a system (Ifinedo, 2011)

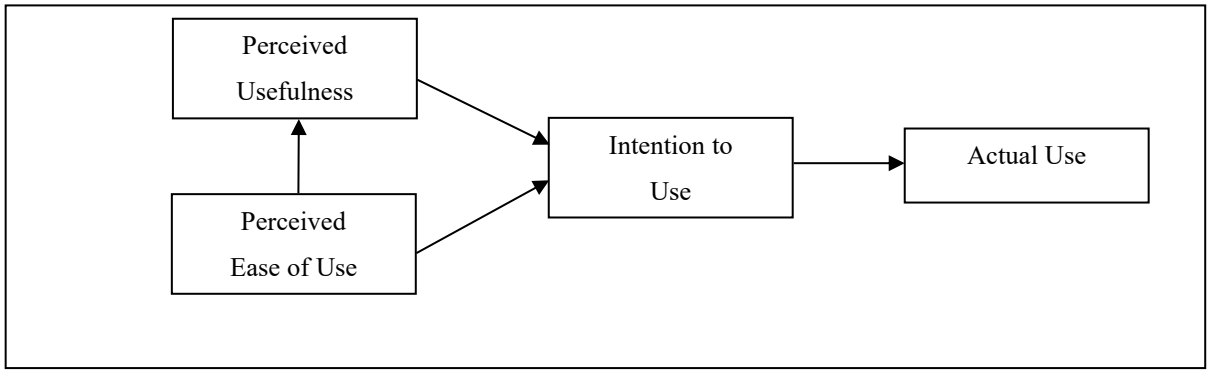

Figure 5: Technology Acceptance Model-TAM

Source: Davis Marikyan and Savvas Papagiannidis, (1989)

The existing studies argued that the use of Artificial Intelligence (AI) in organizations will effectively increase productivity and accelerate decision makings (Dwivedi et al., 2021; Duan et al.,2019). The question that arises for adoption process is whether or not most SMEs or other industries are ready to adopt this industry 4.0 technologies. Hence, studies on how business strategy of a firm could be improved by using AI, from a socio-environmental perspective is still not clear (Chen et al., 2020; Baryannis et al., 2019; Jabbour et al., 2019; Hofmann & Rusch, 2017). Thus, research works using TOE model should identify firstly the antecedents of AI adoption in the SME industry or other business organizations in the digital environment, secondly to ascertain the readiness of SME sectors to adopt AI, thirdly to determine how leadership support moderate adoption of AI in business organization (Chatterjee et al., 2021).

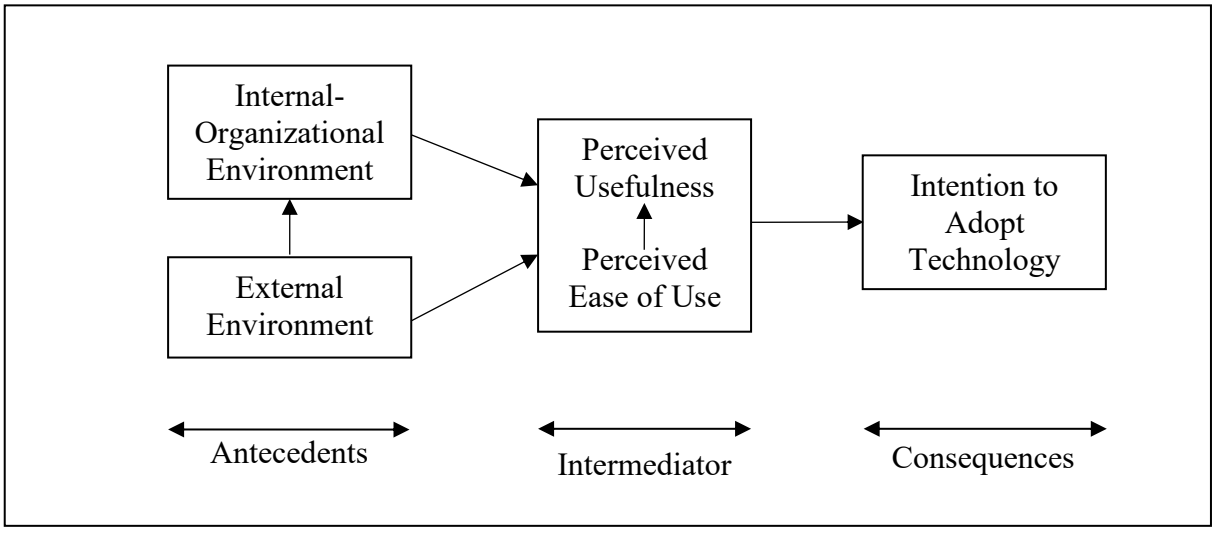

Figure 6: The TOE-TAM AI Adoption Framework

Source: Davis 1989, Tornatzy and Fleischer 1990

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The propose conceptual framework of TOE and TAM integrated theories it shown in figure 7 below.

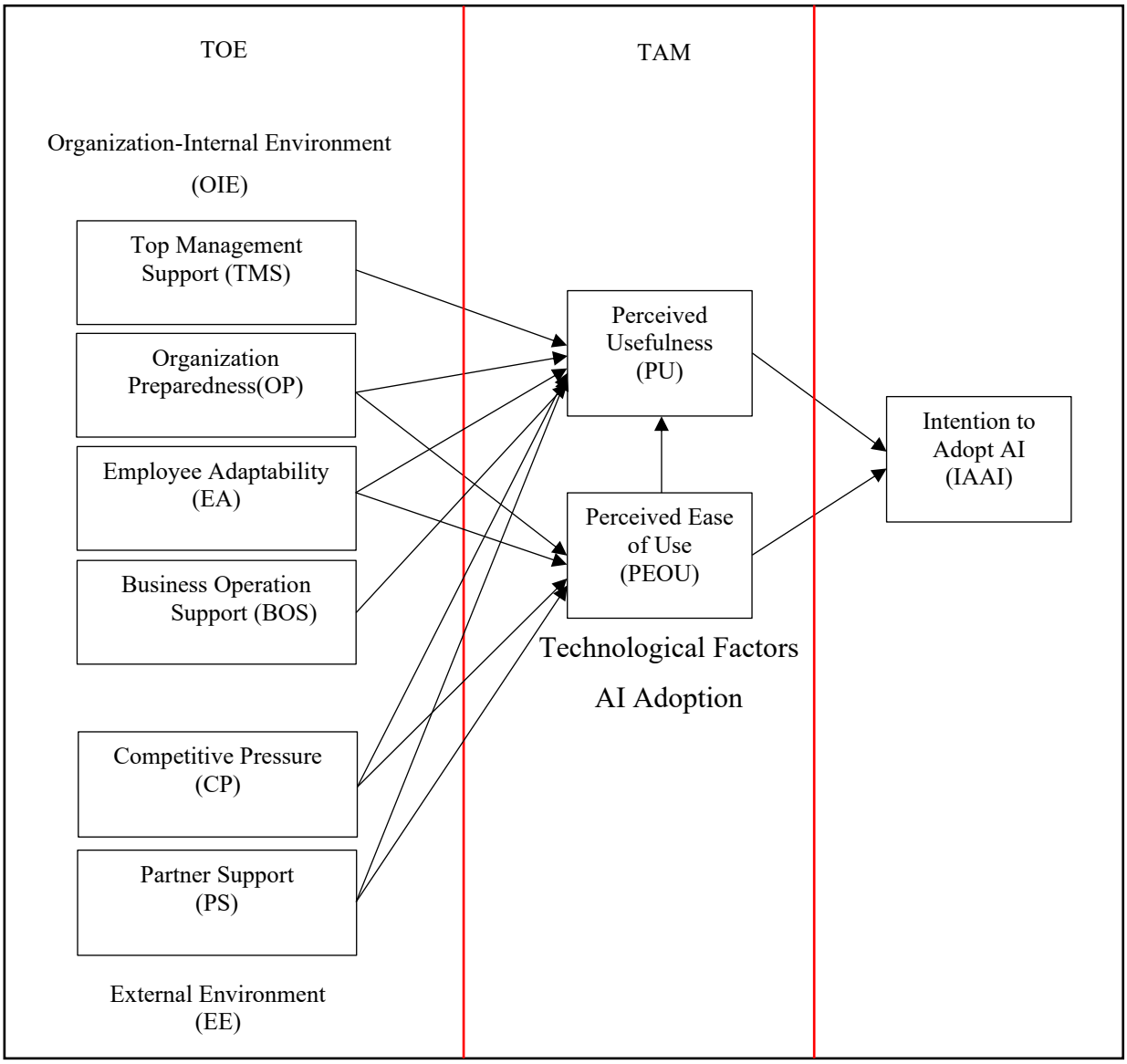

Figure 7: Proposed TOE-TAM AI Adoption Conceptual Framework

Technology Acceptance Model (TAM) and Technology-Organization-Environment (TOE) Framework (Adapted from Davis 1989, Tornatzky and Fleischer, 1990)

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According to writers (De Graaf, 2016) it is difficult to apply any existing adoption model for AI adoption in organizations because it is a complex technology. However, the integrated TOE and TAM framework as in Figure 5 explain AI adoption in business organizations and for the SMEs sectors (Chatterjee et al, 2021). The Toe model can explain adoption of technology using technological, organizational, environmental dimensions and also can explain adoption of 4.0 (4IR) Industrial technology in the socio-environmental and technological context (Hossain & Quaddus, 2011), Wang et al, 2010). The TAM model explore and predict the acceptance of a wide range of technologies using its two core variables Perceived Usefulness (PU) and Perceived Ease of Use (PEOU). Hence, researches consider the TOE-TAM hybrid model as approximate for analysing the adoption of AI in organisations (Chatterjee et al, 2021).

The propose conceptual framework contains four organizational and internal environment-level variables which include, Top Management Support (TMS), Organisation Preparedness (OP), Employee Adaptability (EA), Business Operation Support (BOS) and two external environmental variable Competitive Pressure (CP) and Partner Support (PS). For TAM technological variables are Perceived Usefulness (PU) and Perceived Ease of Use (PEOS). Based on the theoretical underpinning of TOE relevant construct to be incorporated with the construct from TAM. Hence, the proposed research framework is illustrated in Figure 5.

Top Management Support (TMS)

Top management support (TMS) is the level of commitment by top management of an organization and plays a critical role in strategic decision-making (Daoud et al., 2021). An innovative top management makes decisions to adopt new technologies, target market, develop new products and services, form partnerships, exploring international markets Deepu and Ravi (2021) state that top management support were the most influential factor impacting the adoption of digital technology such as in the electronic industry. Scholarly studies showed that there is a relationship between top management support and Al adoption (Seah et al., 2023, Lada et al., 2023, Deepu & Ravi 2021, Ikumoro & Jawad 2019).

H1: Top Management Support significantly influences Artificial Intelligence adoption

Organization Preparedness (OP)

Organizational Preparedness refers to the readiness in an organization which include it's leadership, employees, infrastructure, culture and process to contribute towards the effectiveness in adopting Artificial Intelligence (AI) technologies. Researches believes that before adopting a new technology such as AI, the system in the organization must first be ready to accept change (Hradecky et al, 2022, Hashim et al, 2021). High level of organizational preparedness/ readiness will allow AI adoption into the business strategies, ensure it's effectiveness of data management, provide sustainable infrastructure for technology, foster collaboration and employee upskilling and promote innovative culture (Aboelmaged, 2014, Hradecky et al, 2022). Hence organizational preparedness significantly influence SMEs operations and performance.

H2: Organization Preparedness Significantly influence the adoption of AI technologi

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Employee Adaptability (EA)

Employee Adaptability refers to an employee's ability to adapt and in change work environments. This include characteristics of being quick to learn, able to adapt to new work environments, processes and technologies, open-minded, flexible, and taking new roles. Drydakis (2022) in his research for SMEs in London during the economic down-turn, adoption of AI in machine learning, data analytics and automation help to improve business processes, productivity, and decision-making for the sales, marketing, and communication of the organization. Therefore, employees need to have strong adaptability skills, acquire knowledge on AI tools, to learn and acquire AI knowledge in order to make successful adoption, implementation, and utilization of AI technology (Ganlist et al., 2021).

H3: Employee Adaptability significantly influence the adoption of AI technology.

Business Operation Support (BOS)

Business Operation Support may also refer to external support which plays an important role to facilitate AI Adoption in SME business operations. These external support is vital as SMEs often lack the required expertise, technical assistance, data management, training and continuous support. Studies in Iran (Maroufkhani et al., 2020) have shown that business operation support for Big Data analytics adoption result in increase productivity, improve knowledge on innovations and help the organization to make correct decisions. Other studies made by Fountaine, Mc Carthy and Saleh (2019) supported the propositions that business operations support enable SME to achieve competitive advantage.

H4: Business Operation Support significantly influence the adoption of AI technologies.

Competitive Pressure (CP)

Competitive Pressure refers to the intensity of competition faced by business organizations in a particular product market or industry. These factors drive businesses to improve their products, services, and strategies in order to gain a competitive advantage (Abdullah et al. 2021). Competitive pressure may come from rival firms, customer demands, technological advancements, price fluctuations, and regulatory conditions. Studies highlighted that innovative adoption are associated with high levels of competitive pressure (Tajeddin et al 2023, Wu et al. 2023, McDougall et al. 2022, Gon Calves et al., 2022, Sin et al., 2016).

H5: Compressive Pressure (CP) pushes SMEs significantly for AI adaptation.

Partner Support (PS)

Partner Support act as an external agent to help an organization develop the knowledge repository of employees, through knowledge exchange (Koka & Prescott, 2002). The knowledge of employees and input from partners of the organisation facilitate adoption of AI embedded technology and help employees to realize the usefulness of AI usage in organisation (Asgari et al., 2017) and thus would increase it's perceived ease of use (Hottenrott & Lopez-Bento, 2016).

H6: Partner Support positively influence perceived usefulness
H7: Partner Support has a positive impact on perceived ease of use.

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Perceived Usefulness (PU).

Perceived Usefulness (PU) is interpreted on the potential user's possibility of using a system or technology to enhance job performance in the firm (Lee et al., 2003). Perceived usefulness of a technology such as AI, will motivate the firm to intend to use that technology (Ajzen, 1991). The TAM model explain the use intention by technology adopters. There exists a linear relationship between usefulness and intention to adopt a technology AI (Marikyan,2024, Maartje et al., 2019).

H8: Perceived usefulness has a positive impact on intention to adopt AI

Perceived Ease of Use (PEOU).

Perceived Ease of Use is interpreted as the extent to which a person believes that using a new technology would be free of effort (Davis, 1989). In TAM's model, perceived ease of use (PEOU), acts as a predictor of the intention of users to use a new technology. The sense of easiness of using a system motivates users to use the technology or system (Yousafzai. et al., 2007).

H9: Perceived Ease of Use (PEOU) positively influences the intention to adopt AI.

Research Methodology

In this study, the conceptual framework and hypotheses will be validated through quantitative methods by conducting surveys and questionnaires. Creswell (2003,1994) define quantitative methodology as an enquiry into a social or human problem based on testing a theory composed of variables, measured with numbers and analysed with statistical procedures in order to determine whether the predictive generalisation of the theory hold true. The quantitative research methodology for this study will analyse statistical correlation between eight variables that will impact the intention to adopt artificial intelligence (AI) in the SME sectors in Malaysia.

By using a deductive approach, hypothesis will be tested based on the integrated combine theories of TOE and TAM conceptual framework. The correlation analysis will examine relationships between variables such as independent variables, dependent variables and extraneous factors (Cresswell 2009). A summary of the deductive process for quantitative research below: -

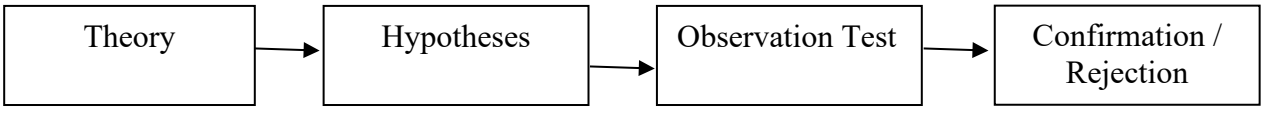

Figure 8 Summary Of The Deductive Process Within The Organisation Context

Source: David E. Gray "Doing Research in the Real World 2013.

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Research Design

Researcher will collect and analyse data and make conclusion about the population under study. Data will be collected through surveys and questionnaires on selected respondent from the SME sectors which include business owners, top and middle management employees, implementors and developer related to adoption of artificial intelligence (AI).

The survey questions will use all the items representing the construct for the proposed conceptual framework, questionnaires must be reviewed by academic expert on Artificial Intelligence and expert from the SME sector.

The survey question will be distributed to participants of the sample population in two categories, one for demographic data and secondly for effect construct or variables in the conceptual model.

Measurement Scale

To measure the respondent survey. Likert scale will be use where 1–5-point scale option will examine respondent answers to the questionnaires. Likert scale 1-5 points as shown below:

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

Participants opinion, attitude behaviour and satisfaction level is reflected where 1 is strongly disagree and number 5 is strongly agree.

Population and Effective Sampling

Sample population for this study will be representatives of the SME Business Corporation registered with the SME Corporation Malaysia by sector and by state data obtained from SME Corporation Malaysia, 2024. As at 2024 total SME establishment in Malaysia is 1,069,831 SMEs. Effective sample size is obtain based on Krejie and Morgan table.

Technique for Data Analysis

This study will use a multivariate data analytic technique which is the Structure Equation Modelling (SEM) because it can test theoretically supported and additive causes models (Hair et al,2011,2000). SEM can examine the relationship that exist among variables plus unobservable latent variables which is hard to measure (Wong, 2013; Haenlein, 2004; Chin,1996)

The PLS-SEM is appropriate for this study because the process gives better result of exploratory study (Aktar & Pangil, 2017).

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Discussion

The research work made by charterjee et al (2021) examine how SMEs amd business organisation in India are ready to utilise the best potential of Artificial Intelligence (AI) technology adoption. Using the conceptual framework of integrated Technology, Organisation and Environment (TOE) combined with the theory of Acceptance Model (TAM) the result of their study showed that the independence variable factor of organizational competency and organizational readiness have a positive influence on perceived usefulness that will influence intention to adopt AI technology. Organisational compatibility, competitive advantage and partner support also positively impact perceived usefulness and perceive ease of use (Charteje et al,2023).

In another study (Lada et al, 2023) which examine the relationship between the factors that influence the success or failure in adoption of Artificial Intelligence (AI) in the SME sector in Sabah Malaysia. The study showed that Top Management Commitment (TMC) and Organisation Readiness (OR) has a positive relationship on AI adoption. Top Management Commitment (TMC) plays a crucial role in decision- making to adopt AI technology in the SMEs sectors in Sabah. On the other hand the study discovered that competitive Pressure (CP), Employee Adaptability (EA) and External Support (ES) is insignificant in the study, indicating that efforts to change competitive pressure, employee adaptability or external support may not have effect on AI adoption (Jaganathan et al,2018).

The Malaysian Economy and Artificial Intelligence

The Malaysian Government documented the National Artificial Intelligence Roadmap (AI-RAMP) 2021-2025. The government laid down it's commitment and significant step forward in the field of Artificial Intelligence (AI) technology adoption as one of the foundation technology of the 4th Industrial Revolution. The AI-Roadmap 2021-2025 is the important document that explain the development of Artificial Intelligence (AI) and how AI can play the role to boost Malaysian economy. The emphasis of the Malaysian government is that not only business organisations, SME sector and other sectors are able to use and adopt AI technology but also to become Innovators in this new field. The AI-RAMP (2021-2025) vision is to create employment opportunities and national competitiveness also to build AI-Innovation ecosystem that will make Malaysia a high techs and high-income country. To achieve this, the country needs the strategic quadruple helix partnership and Corporation of Government, Academic, Industry and Society (GAIS). Therefore, it is important to undertake studies on Artificial Intelligence Technology adoption for the SMEs sector in Malaysia, to assist the government and stakeholders in their policy makings.

Conclusion

AI is a modern technological genre. The TOE-TAM model best explains AI adoption in an organization and the SME sectors. TAM represent the behaviour intention as the outcome of Perceived Usefulness and perceived Ease of use of the technology. The TOE framework explain adoption using technology, organizational, and environmental aspects and in the socio-environmental context. It is hoped that other research works can be undertaken to explore the factors that would make successful for adoption of AI technology in the SMEs industry, hence paving the way for growth and development.

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