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Exploring the adoption of Artificial Intelligence in SMEs: an investigation into the Malaysian business landscape

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Abstract: Artificial intelligence (AI) is gradually transforming a wide range of sectors, and small and medium enterprises (SMEs) in Malaysia are also on the rise. Artificial intelligence has the potential to exponentially increase the scale of operations of SMEs, thereby increasing productivity and minimising costs. This paper presents a conceptual framework that aims to explore the adoption of AI in these businesses. These determinants are postulated as independent variables, namely strategic orientation, resources, knowledge, culture and data. The dependent variable in this context is the intention to adopt AI into business operations. To interpret these variables comprehensively, this study uses the Technology Acceptance Model (TAM) and Theory of Reason Action (TRA) which emphasises the importance of technological, organisational and environmental context in the adoption of information technology. By developing and discussing hypotheses within these contexts, this study aims to shed more light on the dynamics that influence SMEs' intention to adopt AI in Malaysia. In doing so, it hopes to provide valuable insights that can help accelerate the adoption of AI in Malaysian SMEs.

Keywords: Artificial Intelligence; SMEs; technology acceptance model; theory of reason action; Malaysia

1. Introduction

Bob Hayes [1] pointed out that present-day businesses are harnessing the power of machine learning techniques to amplify productivity, extract high-grade information, diminish costs, and augment the value derived from their data. As the volume of data and computational capabilities continue to grow, it's anticipated that businesses will persist in integrating



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machine learning into their processes. According to a study, the rate of AI adoption stood at 50% [2]. Meanwhile, research indicated that 59% of organizations had employed machine learning in some capacity, either in production or at a proof-of-concept stage [3].

Artificial Intelligence (AI), as per Jake Frankenfield's definition [4], can be viewed as a machine endowd with human-like intelligence, capable of mimicking human actions and thought processes. In Rajendra Akerkar's perspective [5], AI encompasses a broad spectrum of technologies and tools, which when interlinked, can detect, understand, act, and crucially, learn and adapt to new experiences. Key benefits of AI include its durability, scalability, and potential to evolve over time, which are set to slash costs, curtail human errors, and augment productivity. Although still in its nascent stages, AI is predicted to redefine competitive advantage, enhance organizational productivity, and ultimately, stimulate economic growth.

Nonetheless, compared to other Southeast Asian nations, Malaysia seems to be lagging in terms of AI adoption. A study disclosed that only 32% of Malaysian companies were beginning to delve into machine learning methodologies, with no significant indication of AI adoption [6]. Moreover, a mere 26% of Malaysian enterprises have embarked on their AI journeys, as reported by The Star [7], with large enterprises primarily considering AI integration in their business. This research aims to unearth the primary factors, including strategic alignment, resources, knowledge, culture, and data, which influence the intent of SMEs to adopt AI. Through understanding these elements, the study aspires to furnish valuable insights to SME owners, managers, and employees, while also contributing to the extant literature on AI adoption in the context of digitized SMEs in Malaysia. Accordingly, this research probes the reasons for SMEs' decision to embrace or reject AI in their operations. The primary research objective is to identify: What are the factors influencing SMEs' decision to integrate or exclude AI from their business operations? The subsequent section comprises a literature review discussing the theoretical frameworks underpinning AI adoption, the determinants of AI adoption in SME businesses, and hypothesis development. The paper concludes with a summarizing section.

2. Literature review

2.1. Underlying theory

Technology Acceptance Model (TAM) will be used in this research paper. TAM is a famous and leading model widely used by many researchers to predict and define the acceptance of users towards technology [8]. TAM has been commonly cited in many research that related with user acceptance of technology [9]. To support TAM popularity, Davis and Venkatesh [8], found out that there are 424 journal citations on the first 2 TAM articles by Davis [8] in the Social Science Citation Index (SSCI). It was originally proposed by Fred Davis in 1985 when he was doing his PHD at the MIT Sloan School of Management [8]. The system he introduced is to predict and explain user's motivation had a direct influence by an external stimulus includes the actual's system's capabilities and features.

In 1986, Fred Davis combined the Theory of Reason Action (TRA) by Fishbein and Ajzen and other common research studies to further clarify his conceptual model and introduce the new TAM [8]. The model includes three factors that will affect a user's motivation, which are Perceived Usefulness, Perceived Ease of Use, and Attitude Toward the use of the system. [9] mentioned the main determinant is the attitude of a user because it will affect a user's acceptance of a system. The attitude of a user is further influenced by the perceived ease of use and perceived usefulness. Lastly, both elements were affected by the system design characteristics also known as external variables [10].

Besides, multiple studies highlighted the significance of perceived usefulness and perceived ease of use. For instance, research shows that perceived usefulness had a strong connection with system usage [11]. Another research found out that perceived ease of use and perceived usefulness are important in forecasting behavior [12]. Also, evidence from Davis shows that both beliefs are important behavioral determinants [12]. After all, Davis concluded perceived usefulness as "the degree that a person believes that using a specific system would enhance his or her job performance" and perceived ease is "the degree that a person believes that using a specific system would be free from effort" [12].

2.1. Review of variables

The process of attaining strategic alignment is accomplished through AI-business potentials, customer AI readiness, top management support, AI-process fit, and data-driven decision-making [13]. Firstly, AI-business potentials refer to an organization that is compatible and fit with the innovation of AI [14]. To be more specific, the organization must appropriately use cases to seek new opportunities and solve organizational problems in terms of AI readiness [15].

Secondly, the acceptance and knowledge of customers regarding the use of AI-integrated offerings are referred to as the customer's AI readiness [14]. The lack of knowledge and acceptance towards AI will affect customers assuming AI hard to be adopted, which they get frustrated when using offer from AI [15]. Since customers build acceptance by recognizing one's usefulness. Thus, an organization should provide sufficient knowledge to the customer about what to expect in AI [16]. Next, Jöhnk *et al.* [13] mentioned the support of top management is important to AI adoption. As the top management support is mentioning the beginning of initiate AI support in top-down to bottom-up initiatives. Experts emphasized that only if the top management gives an organization-wide signal, then it will increase the organization's commitment to AI adoption.

Furthermore, AI-process fit refers to the connection between organization's process to boost AI readiness and its AI strategy. The organization's processes are always affected by the changes in AI adoption. In this case, AI process fit is also describing the compatibility of an organization with AI and its mature process landscape, which is the structured and standardized process [14].

Lastly, data-driven decision making (DDDM) is an organization practice to make decision and gain insight through data analytics [14] instead of depending on 'business

instinct or gut feeling. DDDM will improve the performance of an organization and enhance AI readiness as it represents the introductory practice of AI-driven decision-making [15].

Based on Jöhnk *et al.* [13], resources are segmented into three categories, which is company's financial budget, AI personnel, and IT infrastructure. Firstly, the company's financial budget is the financial resources that the company allocated to the adoption of AI [15]. The adopting AI is cost and time-intensive due to the lifecycle of AI application consists of developing unique data and context for the company [16].

Next, AI personnel is those human resources needed in adopting AI such as AI specialist and business analyst. Business analysts have a conceptual understanding towards the capabilities of AI [16]. While AI specialists have special AI-related skills and can use self-build and prebuild models to create AI solutions [17].

Lastly, IT infrastructure is the hardware that an organization needed for AI implementation. The IT infrastructure should possess extensive capacity for data-intensive testing and training techniques associated with AI, and it should be modular to facilitate the integration of the latest AI applications [13]. Therefore, there are three IT infrastructure capabilities for AI that must be developed by organizations. The first capabilities are the data storage needed to store and generate big data. Second capabilities will be networking in terms of the process, access, and transport data quickly. The last capability will be the technical computing power to manage AI workloads [13].

According to Jöhnk *et al.* [13], knowledge here refers to AI awareness among employees, upskilling, and the ethics of AI. AI awareness must be developed among the employees, at least letting them have a brief understanding of the cognitive AI function such as predicting, generating, and perceiving [18]. This is because it enables employees to perceive AI as a multi skilled instrument and the potential to apply it in their specific area of work [13].

Next, upskilling employees will equip them with the interdisciplinary skill sets that are essential for the success of carrying out AI projects [19]. This consists of providing employees with related AI knowledge such as data analytics, data management, data engineering, and statistics.

Lastly, AI ethics provides new methods to avoid any unethical AI outcomes which can lead to input data or biased learning. For example, data sets for AI hiring tools can occur gender bias which causes biased candidate selection [18]. If the organization is not ethically ready, it may blindly depend on biased AI outcomes which easily occur discrimination even if unintentional [18]. Hence, organizations had to develop new protocols and measures to avoid discrimination and thus, reduce the risk for liability and increase AI readiness [19].

The innovativeness of employees, the ability to collaborate work, and change management is describing the culture of an organization towards AI [8]. First, the pace and amount of adaptability that employees can possess is describing their innovativeness [20]. To enable an organization to recognize the full potential of AI, employees must develop innovative behavior to make changes in a fast pace and in different areas [8]. Hence, innovative behavior consists of risk-taking, experimentation, and various problem-solving skills [21].

Moreover, in the context of AI, collaborative work is crucial for managing isolated tasks and identifying scenarios that yield benefits for businesses [20]. Therefore, domain experts like IT departments and AI specialists must actively work and communicate with each other [22].

Finally, employees often assume AI can replace all human jobs and the assumption made is affecting their acceptance of AI. Hence, change management empowers employees to adapt and comprehend organizational changes brought about by AI [23]. According to [10], change management is vital to solving the misunderstandings that employees had in mind regarding the fear of AI will lead to job loss.

Jöhnk *et al.* [13] mentioned to introduce a perfect AI system to the organization, it must have the right data to execute it in terms of its availability, quality, accessibility, and flow. Firstly, the availability of data refers to the amount and types of data needed for AI. AI readiness is influenced by different types of data [24]. For example, structured data is more suitable for standardized AI applications and is typically stored in two-dimensional relational tables. Meanwhile, image, audio, or video files are the unstructured data that can be used in advanced AI applications such as voice recognition [17].

Next, data quality consists of different dimensions of qualities that examine its suitability for use by data users [13]. The appropriate data quality dimensions for AI include correctness and completeness [18]. Organizations had to enhance their universal capabilities such as data processing, data quality assurance, and data preparation to boost data readiness since organizations always encounter data quality issues. Moreover, the accessibility of data allows employees to easily access multiple data sources around the organization [19]. Thus, AI specialists can use the appropriate data to develop and prototype AI models [20]. Additionally, the organization establishes a data warehouse or data lake to centralize their data, simplifying data accessibility instead of dispersing it across distributed data silos [25]. Lastly, a smooth data flow assists AI specialists in transferring data from its source to its utilization. To indicate a good data flow, it must include data pipelines, automated data streams, and able to explain the extract-transform-load process [17,20]

AI is characterized as a general-purpose technology (GPT) due to its wide applicability in helping organizations to seek new business opportunities and to address current problems [16]. However, to successfully adopt AI, organizations had to initiate managerial practices and develop requirements [16,17]. Thus, an organization must first foster digitalisation and AI readiness to adopt AI successfully [17,18]. Specifically, the judgement of AI readiness helps organizations to proactively determine the potential opportunities for successful AI adoption [17]. Such evaluation decreases uncertainty regarding the decision on adopting AI and provides appropriate information to make decisions. Eventually, if an organization can draw precise conclusions before the adoption decision and is capable of correctly determining its AI readiness, it can lower risk and enhance the adoption decision.

3. Hypotheses development

Firstly, according to the study, strategic alignment is one of the variables which is significant to the intention of adopting AI [17]. Besides, study found that company's resources and its

culture will influence the intention of adopting AI as well [18]. Furthermore, the intention of an organization to adopt AI has also been affected by their employee's knowledge of AI [12]. Lastly, based on the study by Jöhnk *et al.* [13], data had a strong impact on the intention of an organization to adopt AI. Figure 1 presents the proposed conceptual framework for this study. It contains of five independent variables and one dependent variable. The following procedure will show the hypotheses development of the relationship between the independent variable and the dependent variable.

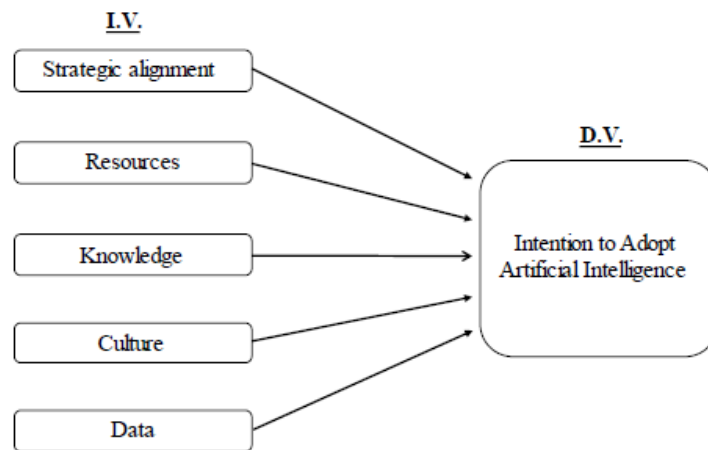


Figure 1. Proposed conceptual framework.

Based on the study by Jöhnk *et al.* [13] for an organization to achieve strategic alignment in terms of AI is through AI-business potentials, top management support, and data-driven decision-making (DDDM). An organization must be aware of using the right cases to help organization to solve problems or address new opportunities to prepare AI readiness [16]. Also, an organization must explore AI-based systems for their related advantages over methods [17]. Due to AI's high adaptability along with its value provided, organizations are encouraged to use AI to explore the potential opportunities that able to bring to their business [16].

As stated by Jöhnk *et al.* [13], top management supports are vital for the success of AI adoption. This statement is proven, as research highlighted a strong support from the top management indicates the organization will adopt AI into their strategy [12] and in the meantime, foster AI awareness and AI knowledge around the company [13].

In another study, shows that DDDM will not just enhance the performance of a company, it also acted as the opening practice for AI-driven decision making, which increase AI readiness [14]. Hence, DDDM must be fostered by an organization as a practice and provide employees AI- knowledge, which AI provides additional insights to support a firm in decision making. Therefore, the hypothesis was made:

H1: Strategic alignment is significantly related to the intention of using AI.

Resources here are referred to the financial budget that companies allocated for AI adoption [13]. To adopt AI, organizations must invest in building expertise and find out their value and conquer any uncertainties about AI capabilities. To execute all of this, organization requires to prepare a sufficient budget so it can effectively adopt AI.

Besides, AI personnel is also one of the resources that organizations needed when adopting AI. For instance, AI personnel is the human resources such as AI specialists and business analysts that work together by using AI to create opportunities and solve issues for the organization. Business analyst has a conceptual understanding of the capabilities of AI which they can apply case discovery to act as a translator between AI specialists and business activities [11]. Conversely, AI specialists have special technology skills and can use self-build and prebuild models to create AI solutions [7].

Furthermore, building the right IT infrastructure is also important when adopting AI. According to Jöhnk *et al.*, IT infrastructure has to be built in modular to ease the inclusion of the latest AI applications and it must have a huge space for data-intensive testing and training techniques related to AI [13]. Therefore, the hypothesis was made:

H2: Resources is significantly related to the intention of adopting AI.

According to Jöhnk *et al.*, [13], he mentioned that by letting employees have a brief knowledge of AI will help them to perceive AI as a versatile instrument and the potential to apply it in their specific industry. As employees realize the significance of high-quality input able to provide a high-quality AI outcome [10], their acceptance towards AI will increase. Consequently, building AI awareness among employees will help them to have sufficient expectations towards AI.

Besides, Davenport mentioned that organization must upskill their employees by equipping them with the interdisciplinary skill sets that are essential for the success of carrying out AI projects [11]. Upskilling employees will help them to develop AI or AI related skills which are essential for the adoption of AI because they are considered as the AI specialist that can execute AI programs effectively. Also, in a study, researchers found out that to enhance AI readiness, companies need to develop new protocols and measures to avoid discrimination and hence, reduce the risk for liability [14]. Therefore, the hypothesis was made:

H3: Knowledge is significantly related to the intention of adopting AI.

Jöhnk *et al.* [13] stated that more innovative employees tend to be more open minded to accept and try something new. Also, the innovative behavior of employees will increase their willingness to change their current situation through the application of AI. Besides, in the case of AI, Davenport stated that IT departments and AI specialists must collaborate well with each other to use the full potential of AI to overcome isolated work and to determine cases that bring benefits to the organization [15].

Moreover, change management is vital to solve any misunderstandings that employees had in mind regarding the fear of AI will lead to job loss [11]. AI does not entirely replace job profiles but instead take over individual process step and repeated tasks. Thus, employees will reduce their misconceptions towards AI and in the meantime increase their acceptance towards the adoption of AI [6]. Therefore, The hypothesis was made:

H4: Culture is significantly related to the intention of adopting AI.

The availability of data includes the relevant types and amount of data that are both essential for AI models to generate precise predictions [14]. Researcher do emphasize on the different types of data will influence AI readiness [15]. Since AI models had to be trained,

they must be input with high quality data to generate good outcomes and eventually increase AI readiness [16]. Besides, Jöhnk *et al.* [13] stated that AI personnel had to access appropriate data sources for deployment. Thus, the accessibility of data ease AI specialist to easily create and prototype AI solutions. Therefore, the hypothesis was made:

H5: Data is significantly related to the intention of adopting AI.

4. Conclusion

This study proposed a conceptual framework to understand the adoption of AI among SMEs in Malaysia. Building on the framework TAM, the study examined the key determinants that significantly influence the integration of AI in these firms. Specifically, the impact of strategic alignment, resources, knowledge, culture and data on the intention to adopt AI were examined. This study provides a detailed theoretical and empirical exploration into the determinants that influence the adoption of AI in Malaysian SMEs. Through this research, it sheds light on the dynamics that influence the intention of these firms to incorporate AI into their operations. Consequently, this research contributes to the ongoing discourse on the adoption of AI in the SME sector and provides important insights that can help entrepreneurs, managers and employees improve their understanding of the transformative potential of AI. The proposed conceptual framework needs to be validated through a quantitative methodological analysis to confirm the hypotheses put forward. Future research could extend this study by exploring additional factors influencing AI adoption, examining barriers to AI integration, and conducting comparative studies across different regions and industries. In this way, the study could make a greater contribution to the existing body of knowledge and expand our understanding of the role of AI in the global SME landscape.

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