

## Determinants of Industry 4.0 Adoption Among SMEs In Sabah

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### Abstract

The application of Industry 4.0 technologies is now a key approach to enhancing the productivity, innovation, and competitiveness of the small and medium enterprises (SMEs). Although the government of Malaysia is actively promoting digitization in the country, there is seen to be an unequal distribution of Industry 4.0 implementation across regions especially in Sabah where SMEs experience infrastructural and resource-based issues. This paper examines some of the main determinants of Industry 4.0 adoption of SMEs in Sabah. The study gives priority to technological preparedness, financial capacity and governmental policy support as key determinants, whereas organisational preparedness especially the existence of talented human resource is regarded to have a key enabling influence. The research integrates the findings and concepts in the available literature and theories to analyse the extent these elements influence the willingness and capacity of SMEs to adopt superior digital technologies including automation, cloud computing, and data-driven systems. According to the findings, digitization is set on technological readiness, and financial resources determine the possibility of firms investing in technology innovation. Initiatives by the government policy are also significant as they provide a favourable institutional setting that promotes digital adoption. Moreover, organisational capability is also significant to move the technological resources into practise. The paper proposes the importance of collaborative work in the development of infrastructure, funding, and skill improvement of a workforce to increase the rate at which SMEs in Sabah adopt Industry 4.0.

**Keywords:** Financial Capability, Government Policy Support, Organisational Capability, Industry 4.0 Adoption, SMEs in Sabah, Malaysia, Economic Growth

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### 1. Introduction

Intensive development of digital things has convert the face of the world industry and has brought about what is now popularly known as the Fourth Industrial Revolution or Industry 4.0. Industry 4.0 is the evolution of the inclusion of innovations in the manufacturing and business processes into the world of the Internet of Things (IoT), artificial intelligence (AI), big data analytics, cloud computing, and cyber-physical systems. The technologies are used to provide intelligent automation, real-time data transfer, and interconnected production processes and ensure a high level of operational efficiency, productivity, and decision-making abilities (Ghobakhloo, 2018; Gazi et al., 2025). Additional growing use of digital technologies in the industries, companies must change their strategies and organisational capabilities to keep up with the changing global economy. The Industry 4.0 technologies can greatly revolutionise the activities of SMEs. The incorporation of digital tools and intelligent systems in operations can help SMEs to increase the efficiency of their production process, decrease the cost of operations, and increase the innovation of products and the delivery of services. (Frank et al., 2019). Moreover, the adoption of Industry 4.0 will have the potential to enhance the

integration of supply chains and enhance the responsiveness of the firms to the ever-changing market environment (Dalenogare et al., 2018). Nonetheless, the digitization has the potential to bring great benefits to the activities of SMEs, but the uptake of Industry 4.0 technologies is not equally distributed in regions and industries. Among the most significant issues that SMEs encounter when embracing Industry 4.0 technologies, there is shortage in financial resources, technological facilities, human resources. SMEs may not have the financial strength to invest in sophisticated technologies and digital infrastructure as compared to large companies (Culot et al., 2020). Also, the lack of adequate technical skills in organisations may create an obstacle to the successful adoption of Industry 4.0 systems (Agostini & Nosella, 2020). According to previous studies, technological readiness, financial capability, and managerial commitment are key factors that can make firms implement digital innovations and survive the technological change (Karuppiyah et al., 2023). The SMEs in Malaysia are an important part of the national economy; they play significant roles in generating employment opportunities, economic development, and innovation (Vial, 2021). With the realisation of the role of digitization, the Malaysian government has also

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introduced various measures, including the National Policy on Industry 4.0, to encourage the uptake of technology among the domestic industries (Masood & Sonntag, 2020). The objectives of these efforts are to improve the technological capacities and competitiveness of Malaysian companies in digital global economy. However, extent of Industry 4.0 implementation is significantly different in various areas of the country, especially in underdeveloped areas like Sabah. The SMEs in Sabah also have other problems concerning the lack of digital infrastructure, financial resources, and skilled workers, which limit their capacity to use more sophisticated technological systems (Horváth & Szabó, 2019). Research on SMEs in Sabah shows that human capital and digital skills development are crucial factor that facilitates technological innovation and the sustainability of business (Abdullah & Rosli, 2015; Ming et al., 2018). In addition, organisational resources and internal capabilities are important issues that determine the capability of firms to embrace new technologies and gain competitive advantages (Barney, 1991).

Besides organisational internal conditions, external institutional assistance is also a main factor contributing to the adoption of Industry 4.0. Incentives can be provided by government policies, technological incentives, and innovation systems to stimulate firms to invest in digitization and technology development (Lundvall, 2010). Competitive forces in the industries also transformed due to the adoption of smart and connected technologies in the production systems, and thus the firms have to constantly innovate and change the way they operate (Abdullah & Rosli, 2015; Porter & Heppelmann, 2014). Although there is a growing trend in the application of Industry 4.0, a small amount of

empirical studies has been conducted to determine The factors that influence digitization among SMEs in Sabah. Majority of the literature available deals with analysis at national level or developed areas and so there is a gap in the perception of the regional scenario of Sabah. Thus, this paper explores the effect of technological preparedness, financial ability, and government policy support on the implementation of Industry 4.0 in SMEs in Sabah, where the organisational capability will be a moderating variable.

**2. Literature Review**

**2.1 Industry 4.0 Adoption among SMEs**

Industry 4.0 is the term used to describe the incorporation of novel digital technologies into industrial and business activities, namely, IoT, artificial intelligence (AI), Cloud computing, cyber-physical systems, and big data analytics. The technologies allow automation, smart exchange of data and interconnected systems of production that result in efficiency, flexibility and decision-making. Consequently, Industry 4.0 has turned into a very important productivity and competitiveness driver in contemporary economies. In the case of SMEs, application of Industry 4.0 technologies can provide the opportunity to increase the efficiency of operations, decrease the costs of production, and become more innovative. Digitization enables SMEs to combine data-driven processes, automate the functioning, and enhance the coordination of supply chains. Nonetheless, application of Industry 4.0 technologies in perspective of SMEs is not even, especially in developing regions where companies are limited by the infrastructure, finances, and technical skills are shown in Figure 1.

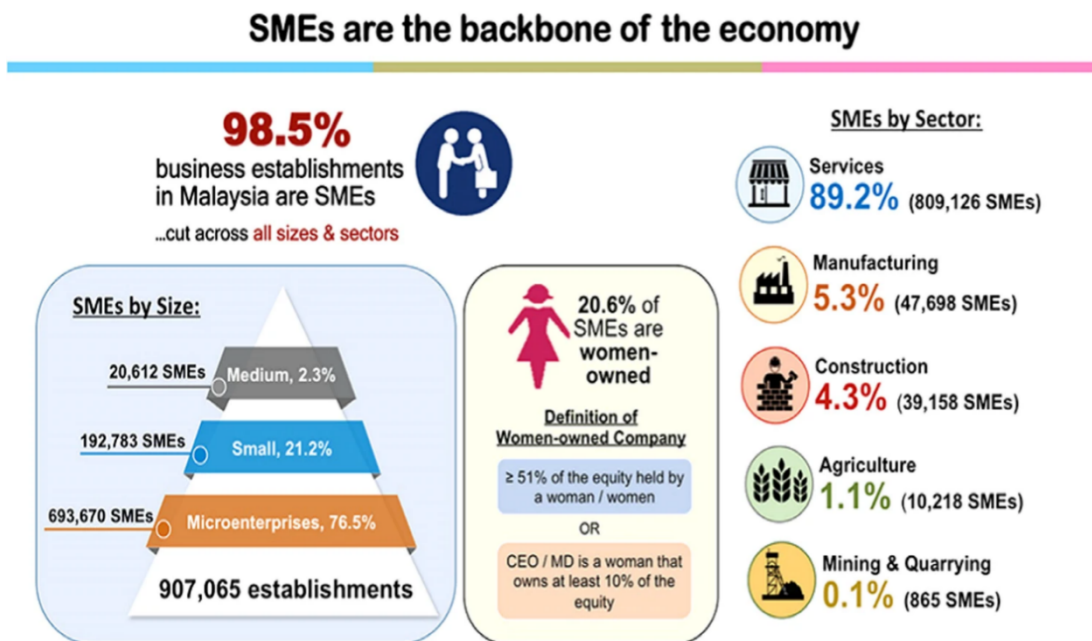


Figure 1. Distribution of SMEs in Malaysia by Size and Sector

Source: (Julienti, 2022; SME Corporation Malaysia, 2022).

Elements that affect how SMEs employ technology constituents of the national economy in Malaysia. The

Malaysian government has developed the National Policy on Industry 4.0 (Industry4WRD) to boost the ability to use technology and promote innovation in the local industries. Adoption of Industry 4.0 by SMEs differs greatly in various states despite these efforts. SMEs in Sabah are particularly affected by the lack of digital infrastructure, financial constraints, and a lack of skilled labour, which makes it difficult to use advanced digital technologies. Therefore, to promote adoption of Industry 4.0 among SMEs in Sabah, the determinants that have an impact on its adoption in the region need to be understood. Figure 1. The above indicates that microenterprises take the highest percentage of SMEs, after which there are small and medium enterprises. Concerning industry distribution, the service sector is the leading SME activity with over 80% of the SMEs, followed by manufacturing, construction, and agriculture with smaller proportions.

**2.2 Theoretical Foundations of Industry 4.0 Adoption**

The perception of the application of the Industry 4.0 technologies viewed through the prism of the theory that elucidates the effect of organisational resources, technological acceptability, and environment on decisions of firms to introduce the digital innovation. This research paper refers to three significant theoretical point of view : the RBV, the Dynamic Capability Theory (DCT), and the Unified Theory of Acceptance and Use of Technology (UTAUT). Overall effect of these theories is that internal resources, adaptive capabilities and technological perceptions are the factors that influence SMEs' use of technology.

**2.2.1 Resource-Based View (RBV)**

RBV implies on effective use of valuable and strategic resources helps firms gain a competitive edge. This study suggests that financial resources, technological

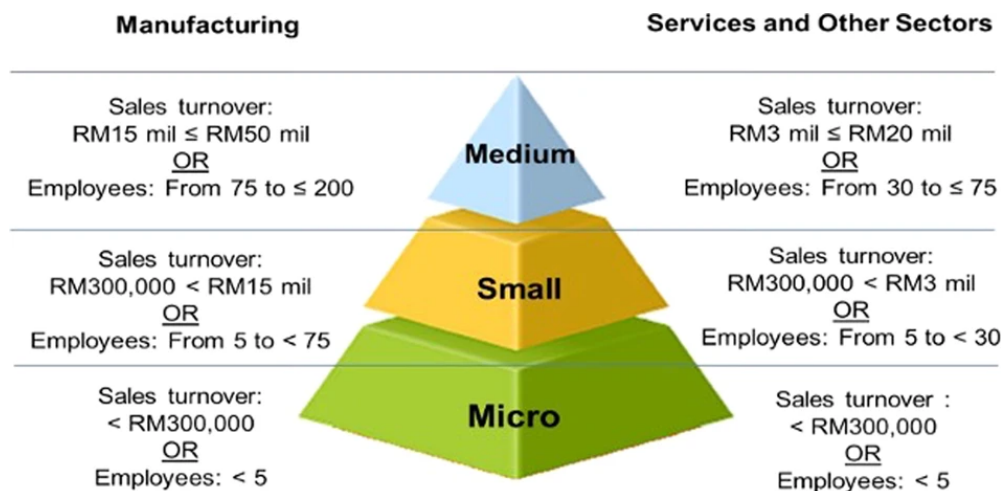
infrastructure, and skilled employees are organisational resources through which firms can adopt innovative strategies and enhance performance (Barney, 1991). Within the framework of Industry 4.0, those SMEs that have an above level of internal resources will be better equipped to invest in new technologies and adopt the digitization programmes.

**2.2.2 Dynamic Capability Theory**

This theory focuses on how firms can adapt and reorganise their resources when they react to modifications in technology and the market. According to (Teece et al., 1997). Firms have to keep on developing capabilities whereby they can embrace new technologies and react to the new business environments effectively. In the case of SMEs, innovation, learning, and adaptability as dynamic capabilities are necessary in the effective application of Industry 4.0 technology.

**2.2.3 Unified Theory of Acceptance and Use of Technology (UTAUT)**

UTAUT and Use of Technology describe the effects of behaviour and its impact on the use of new technologies. It found four significant factors that influence deployment, including social influence, performance expectations, effort expectations, and enabling circumstances. These variables affect how people and organisations understand the usefulness and ease of moving to technological innovations, hence the uptake of Industry 4.0 technologies in SMEs. (Venkatesh et al., 2003). Microenterprises are mostly defined by fewer than five staff members and a lower sales turnover of less than RM300,000 as shown in Figure 2. Small business enterprises employ 5 to 75 workers, with annual turnover levels set higher depending on the industry whereas medium business enterprises have a fuller workforce and greater revenue.



**Figure 2. Classification of SMEs in Malaysia**

Source: (Julienti, 2022; SME Corporation Malaysia, 2022).

**2.3 Measurement of Industry 4.0 Uptake**

A cheque of Industry 4.0 uptake can be established through the extent to which digital technologies are used in organisations regarding the operations carried out.

The earlier researchers have quantified digitization using technologies like IoT systems, automation tools, artificial intelligence applications, and cloud computing solutions.

This study discovered that companies that have greater financial investments, managerial dedication, and technological foundation portray greater degrees of Industry 4.0 uptake (Agostini & Nosella, 2020). The extent of uptake is generally measured by the survey instrument in cases of empirical research where the respondent assesses the use of digital technologies by their organisations. Industry 4.0 uptake in this research is assessed with the help of the Likert-scale questionnaire which will describe the degree of the utilisation of technologies in SMEs, i.e. IoT, cloud computing, and automation.

### **2.4 Determinants of Industry 4.0 Uptake**

The prior studies point to several external and internal elements that influence Industry 4.0 uptake by SMEs. These are technological preparedness, financial competence, organisational and institutional. Researchers have demonstrated that companies that possess greater technological infrastructure, a robust financial ability, and a favourable policy climate have more chances of leveraging modern online technologies. On the basis of the current data and the dynamics of the region where the study is performed, i.e. Sabah, this research is dedicated to three primary forces behind Industry 4.0 uptake including technological readiness, financial capability, and government policy support. Also, organisational ability in terms of human resources is also deemed as a mediating variable in the uptake of technology.

### **2.5 Technological Readiness**

Technological readiness denotes access and sufficiency of technological infrastructure that is required in the execution of digital innovations. According to the Technology-Organisation-Environment (TOE) framework, technological preparedness is a major determinant in the uptake of new technologies by firms. Small and medium enterprises that have highly developed technological backgrounds, well-integrated IT solutions and stable communication channels can implement Industry 4.0 technologies better. Research indicates that technological preparedness is a key factor that helps companies to apply digital tools in their business operations and improve their productivity. On the other hand, poor technological Infrastructure could serve as an impediment to the application of highly developed technologies.

### **2.6 Financial Capability**

Financial resources are the capacity of companies to spend on technological investments and initiatives of

digitization. The application of Industry 4.0 technologies can be quite costly in view of the finances allocated to equipment, software systems, and employee training. Studies have found that digital technologies are more likely to be used by SMEs that have a high financial strength and maintain technological innovation. Nevertheless, financial limitations are still a significant obstacle to most of the SMEs especially those in the developing world. The lack of finances can make companies unable to invest in new technologies, which will slow down the application of Industry 4.0 systems.

### **2.7 Government Policy Support**

The government policy facilitation is significant in facilitating the digitization among SMEs. Governments tend to have programmes of incentivising financially, offering training, as well as developing technological infrastructure so that technology can be adopted.

Barriers concerning the application of Industry 4.0 can be minimised with the help of institutional support. The enabling environment is formed by policies that include grants, subsidies, and digitalisation programmes, which enable SMEs to use the latest technologies and engage in the digitization programmes.

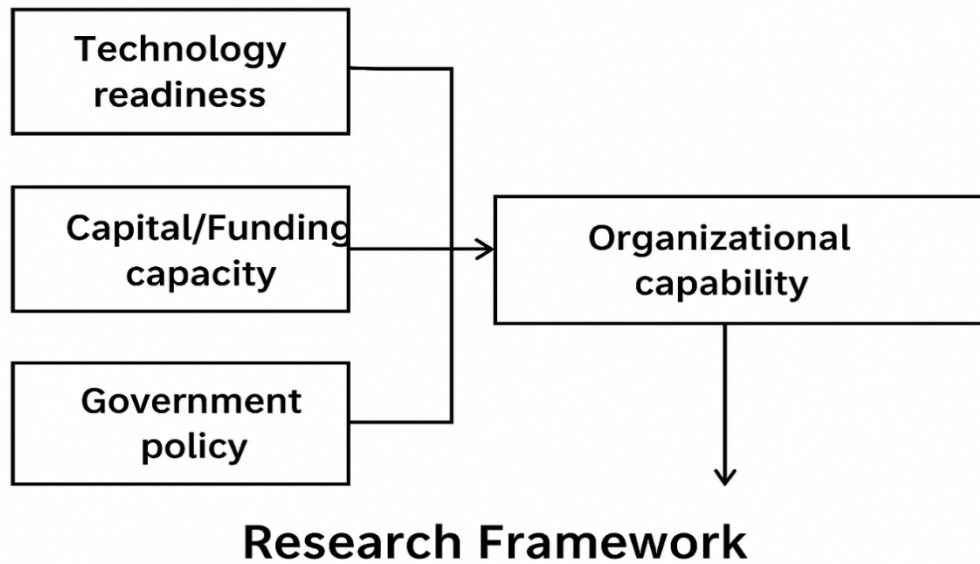
### **2.8 Organisational Capability and Human Resources**

Human resources, as an aspect of organisational capability, are very important in the successful deployment of Industry 4.0 technologies. Advanced technological systems and technological changes require skilled employees who have digital competencies to manage them.

Studies indicate that the ability of employees, their knowledge, and The success of digital convert is greatly influenced by flexibility. Companies investing in employee training and skill building are better placed to apply Industry 4.0 technologies in business. So, human resources can be viewed as an intermediary variable between the technological preparedness and financial capacity and the effective application of Industry 4.0.

### **2.9 Literature Review Summary**

The literature shows that there is a complex of technological and financial, organisational, and institutional Factors influencing Industry 4.0 uptake in SMEs. Technological preparedness offers the technology required to undergo a digitization, whereas financial ability allows companies to invest in more high-tech methods. The uptake is also supported by government policy aid that offers institutional incentives and digitalisation initiatives.



**Figure 3. Research Model Linking Technological, Financial, and Policy Factors to Industry 4.0 Uptake**

Moreover, organisational capability as human resource skills is a mediating factor between technological readiness and financial resources and the successful uptake of technology. Although the importance of Industry 4.0 uptake has been increasing, there is scant literature that has explored these determinants in the SMEs in Sabah and research framework shown in in Figure 3. Thus, by examining the factors influencing Industry 4.0 adoption among SMEs in the area, this study seeks to close this research gap.

### 3. Methodology

#### 3.1 Research Design

This paper will use a thematic research review method to examine the factors that affect the uptake of Industry 4.0 technologies by small and medium enterprises (SMEs) in Sabah. Using thematic approach is suitable as it helps the researcher to determine common concepts, patterns and relationships among already available academic literature and theoretical discourses. Thematic research does not concentrate only on numerical data because it focuses on the meaning of the major concepts and the relationships made up of concepts that explain the process of technological uptake in a given context. This approach will be aimed at the systematic study of existing research, theoretical frameworks, and policy discourse on the uptake of Industry 4.0. Thematic analysis helps the study to list key determinants upon which digitization is determined in SMEs and to explain how the determinants interact in the region environment of Sabah. The thematic design will enable the research to combine the knowledge of various fields, such as technology management, organisational theory, innovation research, and digitization research. The methodology will assist in obtaining a holistic view of the determinants that define the willingness and ability of SMEs to embrace Industry 4.0 technologies.

#### 3.2 Data Sources and Literature Selection

Peer-reviewed academic articles, industry reports, policy reports, and previous empirical studies concerning the uptake of Industry 4.0, digitization, and SME evolution were sources of data used in this thematic review. The choice of literature depended on its suitability to the main variables identified by the research such as technological preparedness, financial capability, support of government policy and organisational capability. Particular emphasis was placed on the research papers that analysed the application of Industry 4.0 in third world Economies and Southeast Asia because the settings they investigated also have similar structural issues with SMEs in Sabah. The selection criteria included literature that explained the theoretical details, empirical research, and conceptual understanding of how SMEs would adopt advanced digital technologies. Besides international literature, regional based studies that have addressed Malaysian SMEs were incorporated in order to have contextual relevance. These sources were useful because they presented information on the technological preparedness, digital infrastructure issues, and the policy programmes that shape digitization in Malaysia.

#### 3.3 Thematic Analysis Procedure

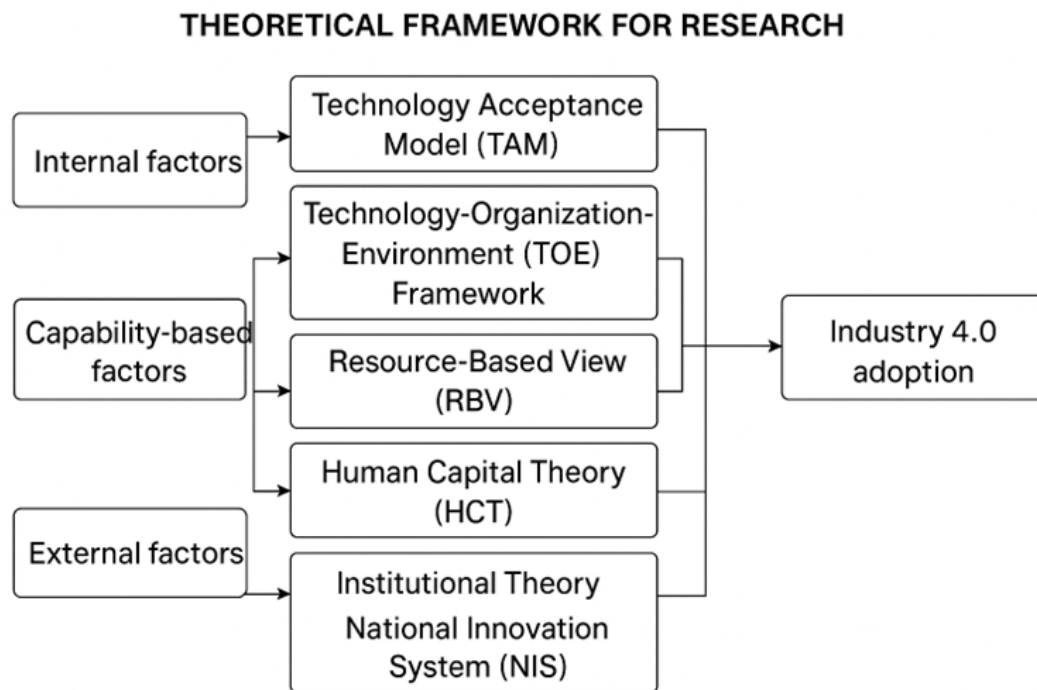
The thematic analysis was a systematic procedure that aimed at finding and sorting common concepts in the chosen literature. To begin with, there was the review of identical studies to derive pertinent concepts pertaining to the uptake of Industry 4.0 and digitization within SMEs. In this phase, the researcher critically reviewed theoretical discourses, theoretical conceptualizations and empirical results of other research done in the past. Second, the concepts retrieved were summarised into more general themes. The themes displayed are the

key drivers of Industry 4.0 uptake among the SMEs. Some of the common recurrent themes that were identified during the analysis constitute technological preparedness, financial capacity, governmental policy conduciveness, and organisational ability. These themes were also constantly addressed in several studies as significant ones that matter in the digitization process. Third, these themes were also investigated to look at their interactions as they occurred in the greater context of SME digitization. This step entailed the examination of the overall impact of the internal organisational resources and external support in the form of institutions on the acceptance of advanced technologies. Lastly, the themes were synthesised to create a conceptualisation of the uptake of Industry 4.0 by the SMEs in Sabah. The theoretical framework and research model were later developed based on the thematic findings through which the study would take place.

**3.4 Conceptual Framework Development**

This study's theoretical framework was created in accordance with the themes revealed in the literature review. The model combines the most important

elements that influence Industry 4.0 adoption and shows how they inter-relate to define the digitization of SMEs. The model determines technological preparedness, financial ability, and government policy assistance to be the main factors that affect the uptake of Industry 4.0. These variables are the internal organisational resources and the external support systems of institutions that allow SMEs to participate in the digitization. Furthermore, the organisational capability especially the human resource and employee skills are regarded as an important enabling factor that enables the uptake of advanced technologies. Organisational capability plays the role of a mediator between technological preparedness and actual use since it ensures that companies has the skills required to incorporate and use digital technologies in a sound way. The framework thus shows the interplay that exists between the technological infrastructure, financial resources, workforce capabilities, and institutional support in developing the digitization of SMEs. The theoretical framework that will be applied in this study is presented in Figure 4 that reveals the impact of external, capability-based, and internal factors on Industry 4.0 uptake among SMEs.



**Figure 4. Integrated Theoretical Framework for Industry 4.0 Uptake**

**4. Results**

**4.1 Overview of Industry 4.0 Uptake among SMEs**

The findings demonstrate that the use of Industry 4.0 technology in small and medium-sized businesses in Sabah is in its early stages. Whereas some of the businesses have started using digital technologies in their operations, the level of application differs among the firms. The use of digital applications in their attempts to enhance efficiency and competitiveness has seen many organisations venture into digital tools like

automation systems, cloud and other digital communication technologies. But the process of moving towards more sophisticated Industry 4.0 is slow.

The discussion points to the fact that SMEs are becoming more and more aware of the role of digitization in ensuring their competitiveness in a fast-changing business environment. However, integration of the uptake process seems to be affected by various organisational and external factor that determine the

willingness and ability of firms to incorporate new advanced technologies in their operations.

### 4.2 Technological Readiness

The technological preparedness is one of the core determinants in the process of Industry 4.0 deployment. Organisations that have a better technological infrastructure, information systems, and digital tools are more prompt in adopting better technological solutions to their operations. The most likely companies to consider technologies like automation, cloud computing, and data-driven management systems are those that have already acquired a digital basis. The evidence shows that the process of technological readiness does not only encourage the primary uptake of digital technologies but also contributes to the integration of these systems into the workflow of the organisation. Companies that have higher levels of technological environments also seem to be in a better position to test new developments and adjust to the digitization programmes. Simultaneously, the uptake is uneven due to differences in technological capability among SMEs. There are those companies that have fairly developed digital infrastructure and there are companies that are still in the traditional systems of operations. Such differences also indicate that technological preparedness is a precondition to successful digitization.

### 4.3 Financial Capability

The financial capability is another factor that can be significant in influencing how SMEs can become an adopter of Industry 4.0 technologies. Having digital systems entails the financial contribution in infrastructure, software, technological equipments, and training employees. The firms that have more funds seem to be more flexible in their ability to fund technological advancement and innovation. Companies with a stable financial situation are more ready to invest in new technologies and modernise their systems of work. Conversely, companies with limited financial means tend to take a more prudent stance on digitization because of the apprehensions about the cost of investments and the risky technology.

The results, thus, point towards the fact that financial capability has an impact on the rate at which SMEs embrace digitization. Weak financial resources can slow down the uptake of technology as well as those organisations that have stronger financial resources can embark on more encompassing innovation strategies.

### 4.4 Government Policy Support

The other significant factor that determines the uptake of Industry 4.0 technologies is the government policy support. National and regional programmes that aim at facilitating digitalisation offer SMEs a chance to receive financial support, training services, and technological support services. These campaigns are to help minimise the hindrance that comes with the uptake of technology and make firms adopt digital solutions in their

operation. The discussion indicates that policy efforts are influential in the evolution of the environment within which SMEs conduct their business. The confidence of firms to use new technologies can be boosted by a supportive policy and evolution programme through availing information, resources and institutional direction. Nevertheless, the effects of policy programmes seem to be determined by the level of awareness and access to these support systems that businesses possess. Since awareness and accessibility differ, they might affect the impact of the government effort to adopt Industry 4.0 among SMEs.

### 4.5 Organisational Capability and Human Resources

Another important aspect that can contribute to the successful application of Industry 4.0 technologies is organisational capability, especially presence of skilled human resources. To incorporate the sophisticated digital systems, they need to have the required technical expertise, as well as be able to change with technology. Companies that have a workforce of high digital competence seem to be in a better position to incorporate and process the emerging technologies into their working systems. The relevant technical skills of employees play an important role in implementing and supporting digital platforms, automation tools and data-driven management processes. More so, organisational capability acts as an intermediary between the technological preparedness and the practise. The lack of qualified staff can inhibit the proper utilisation of digital technologies even in situations when companies have sufficient technological facilities and financial backup. Consequently, the evolution of the workforce and the ongoing improvement of skills contribute greatly to the achievement of successful uptake of the technology.

### 4.6 Interaction of Key Determinants

The results indicate that a combination of various organisational and external factor affects the Industry 4.0 uptake in SMEs. The capability of firms to adopt digital technologies is influenced by technological preparedness, financial strength, government policy, and organisational preparedness. Digital innovation is supported by technological infrastructure, financial ability allows making investments in new systems, and governmental support offers favourable conditions for technological progress. The organisation's ability, especially regarding the skills of employees and their flexibility, helps firms to make these resources into feasible technological use. These findings, in turn, suggest that Industry 4.0 technologies could not be adopted due to one factor. Rather, the co-operative effects of internal organisational preparedness and external institutional backing are what can make digitization effective. In sum, the findings indicate that there are a few important aspects that affect the uptake of Industry 4.0 by the SMEs in Sabah. Digitization depends on technological preparedness and financial ability defines the scope to which companies are able to allocate funds to technological innovation. The

contribution of the government policy support is the creation of a favourable environment to use in the digital uptake process and organisational capability is that firms have the human resources to carry out and maintain change in technology. Combined, these elements demonstrate that the process of implementing Industry 4.0 technologies is complicated and should be developed in technological, financial, organisational, and institutional aspects.

## 5. Discussion

The outcomes of the study have valuable information on the factors that are used in determining the uptake of Industry 4.0 by SMEs in Sabah. The Research reveal that technological preparedness, financial ability, and government policy support play a big role in willingness and capacity of the SMEs to embrace Industry 4.0 technologies. These results can be compared to the previous literature, which emphasises the role of technological readiness and corporate capabilities in facilitating digital change within the small and medium enterprises (Sony & Naik, 2020; Xu et al., 2018). Specifically, the technological readiness seems to be one of the very essential forces of Industry 4.0 uptake because with more powerful technological infrastructure and digital capabilities, SMEs have a greater chance of adopting more advanced technologies including IoT, automation, and artificial intelligence in their activities. Moreover, the results support the significance of the internal organisational resources in supporting the digitization (Abd Shukor et al., 2022). The Resource-Based View and Dynamic Capability Theory also suggest that competitive advantages are more likely to be brought about by technological innovation by firms that have valuable resources and adaptive capabilities (Teece et al., 1997). Regarding the case of SMEs in Sabah, technological infrastructure, financial resources, and skilled employees are key organisational resources that shares to the uptake of Industry 4.0. By investing in these resources, SMEs are in a position to adjust well to the fast-changing technological environments and emerging competition in the market (Davis, 1989). Another key determinant that was discussed and identified as an important contributing element to Industry 4.0 uptake is financial capacity. The uptake of the industry 4.0 technologies frequently involves significant financial resources in equipment, digital platforms, and training of employees and integration of the systems (Rajnai & Kocsis, 2018). SMEs that have a better financial base will therefore find it easier to embrace emerging advanced technologies and maintain digitization programmes. The same data were obtained in the past research that stresses that financial limitations are considered among the biggest obstacles that do not allow SMEs to implement Industry 4.0 technologies (Dalenogare et al., 2018; Karuppiyah et al., 2023). In turn, constrained financial means of SMEs in Sabah can be a partial cause of the rather poor results of Industry 4.0 uptake in the area. The other important conclusion of this study indirect effect of sufficient human resources in the

uptake of Industry 4.0. The advanced digital technologies require the application and management of skills and flexible employees (Mittal et al., 2018). This result aligns with the previous literature that argued that human capital is a key factor that facilitates the digitization process in SMEs (Tang et al., 2024; Tuselim & Yaacob, 2022). Also, research findings have demonstrated that the capabilities of employees affect the effectiveness of the uptake and use of emerging technologies by the organisation (Yaakub et al., 2023). In side of SMEs without a certain level of technical skills and digital capabilities, it is possible that they will not be able to capitalise on Industry 4.0's full potential technologies despite the required infrastructure. The role of government policy support is also important in enhancing the SMEs' preparedness for digitization The government policies, incentives, and digitalisation programmes can be used to support SMEs to take up the new technologies and break the barriers to uptake. Institutional theory is used as an explanation that regulative structures and favourable policies can determine the behavioural and decision-making underlying the uptake of technology in organisations. (Scott, 2005). Malaysia has come up with national programmes to enhance digitalisation to boost the readiness of SMEs in Industry 4.0. The result however indicate that these initiatives may not be as effective for SMEs in Sabah because they may not be available or even known. All in all, this study indicates that the uptake of Industry 4.0 by the SMEs in Sabah depends on an interplay of internal organisational factors and external institutional assistance. The reinforcement of the technological infrastructure, easier access to financial resources, raising the digital skills of employees, and government support programmes are vital measures that should be implemented to facilitate the digitalisation of SMEs within the region. The result shares to the existing structure on the uptake of Industry 4.0 and offers important information to policymakers and business executives who want to increase the pace of SMEs' digitization in Sabah.

## 6. Conclusion

This study has analysed the predictors of Industry 4.0 uptake within SMEs in Sabah based on technological preparedness, financial ability, government policy facilitation, and organisational preparedness. The results reveal that the use of Industry 4.0 by SMEs in Sabah is mediocre, meaning that although individual companies have begun to adopt digital tools and systems, their application is still limited due to structural and organisational barriers. Technological readiness was revealed to be the most powerful of the determinants, with the other two being financial capability and government policy support. It indicates that if SMEs have proper digital infrastructure, financial resources, and access to favourable policy interventions, they are more prone to implement Industry 4.0 technologies. This research also ascribed significant mediating point of organisational capability especially on the aspect of

human resources. An experienced and versatile workforce will be involved in transforming technological preparedness and investment in finances into real results of digital uptake. This points out the fact that technology does not initiate digitization, but the internal capability of firms to address, execute, and maintain innovation does. All in all, the study is relevant towards a comprehension of Industry 4.0 uptake in a SME regional context or Sabah where the empirical evidence is limited. The results indicate that expenditures for digital infrastructure, financing support, and workforce evolution should be the priorities of policymakers and SME leaders to make SMEs better prepared for Industry 4.0 and more competitive in the long run.

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