

## Determinants influencing Supply Chain Technology Adoption towards the Performance of Micro, Small, and Medium Enterprises in Malaysia

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### Abstract

Supply chain technology (SCT) is a tool to improve MSMEs' performance. Although SCT is widely utilised in various industries, its adoption by MSMEs is limited. Hence, this study aims to determine the relationship and develop the framework of technological, organisational, and environmental factors and MSME's performance using SCT adoption as a mediator. This study will employ the Diffusion of Innovation (DOI) and Technology-Organization-Environment (TOE) theories. Data will be collected through a questionnaire and analysed using (PLS-SEM). This study will provide significant information for MSMEs to further utilize the benefits of SCT adoption for improving organisational performance.

Keywords: Supply Chain Technology; Micro, Small and Medium Enterprises (MSME's); Diffusion of Innovation (DOI); Technology-Organization-Environment (TOE)

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### 1.0 Introduction

Supply chain technology is an important element for the success of the organisation. Investing in technology and sustainability considerations in the supply chain will be critical elements affecting the organisation's performance. Based on past literature, it is proven that organisations with a more robust digital infrastructure outperformed those without. Supply Chain Technology (SCT) is a tool that aids in improving the supply chain's effectiveness and efficiency, making it a competitive weapon for business strategy (Idris et al., 2020). Technology is crucial in assisting supply chains in meeting the demands of a constantly changing environment and different hazards at all levels. Furthermore, because of its potential to integrate multiple operations internally and externally with customers and suppliers, technology has significantly influenced the structure of supply chains. The benefits of technology in a supply chain include improving communication, collecting and transmitting data to and from suppliers and customers, enabling effective decision-making, improving productivity, and improving supply chain performance (Ben-Daya et al., 2019). It is currently unknown which elements will enhance SCT adoption by MSMEs. As a result, the determinants influencing SCT adoption should be recognised to support the growth and widespread adoption of SCT by Malaysian MSMEs. Despite the increasing interest in SCT among practitioners and academics, the SCT literature remains small and terse. Thus, this paper attempts to determine the relationship between technological, organisational, and environmental factors and MSME's performance by using supply chain technology as a mediator. This paper aims to develop a theoretical framework to enhance knowledge and understanding regarding the determinants influencing SCT adoption. The study proposed an integration model based on the Diffusion of Innovation (DOI) and the Technology-Organization-Environment (TOE) theory. It is intended that this paper would provide significant insight into SCT adoption in SMEs, allowing them to further harness the technology's benefits for their businesses.

This paper starts with the existing literature review on supply chain management, supply chain technology adoption and Micro, Small and Medium Enterprises (MSME's), followed by the integration model based on the Diffusion of Innovation (DOI) and Technology-

Organization-Environment (TOE) theory to investigate the determinants that influence SCT adoption. Hence, the proposed theoretical framework is then developed. Finally, methodology, conclusion, research contributions, and several recommendations for future research were discussed in this paper.

## 2.0 Literature Review

### 2.1 Supply chain management

Supply chain management is a complex network encompassing inventory management, planning, customer satisfaction, commodities flow, financing, and information. Without effective supply chain planning, it can disrupt the entire organisational structure, ultimately disrupting firms and the country's economy (Shahbaz et al., 2017). In addition, supply chain management refers to the systemic and strategic coordination of organisation functions throughout the supply chain to enhance individual company and supply chain performance (Mentzer et al., 2001). Meanwhile, Singh (2015) stated that supply chain management (SCM) is a dynamic strategy for 'firms' competitiveness and performance.

### 2.2 Supply chain technology adoption

Supply chain technology adoption is an organisation's critical and essential success factor (Miertschin et al., 2006; Kamaruddin & Udin, 2009). Therefore, the companies that successfully adopted supply chain technology as tools for business activities (Thomas & Griffin, 1996; Kamaruddin & Udin, 2009) would gain a competitive advantage from their competitors (Kamaruddin & Udin, 2009) and get opportunities for cost reduction and also productivity improvement (Thomas & Griffin, 1996). The advancement of information technology makes the flow of information efficient between the components of the supply chain framework. This is supported by another researcher who mentioned that the scarcity of innovation and technology adoption in MSMEs would negatively influence their performance. Due to the intense and competitive business environment, organisations that fail to innovate and implement technology will likely experience decreased performance (Mustafa & Yaakub, 2018). Several previous studies suggested that it is beneficial when MSMEs emphasise innovation and technology adoption, as it will increase the company's performance (Rosli & Sidek, 2013).

### 2.3 Micro, small, and medium enterprises (MSME's)

MSMEs are recognised as a country's economic backbone, particularly in developing countries. Depending on the industry, MSMEs are classified differently. In general, it is determined by two (2) factors: sales turnover and the number of full-time employees. Generally, it is based on two (2) criteria: sales turnover and the number of full-time employees. Based on the manufacturing sector, MSMEs are defined as companies with a turnover of no more than RM 50 million OR fewer than 200 full-time employees. MSMEs in the service and other sectors are defined as businesses with a maximum turnover of RM 20 million OR a number of full-time employees of up to 75. Based on the report provided by the Department of Statistics Malaysia (2021), the contribution of MSMEs gross domestic product (GDP) eased to 37.4% in 2021 with a value-added of RM518.1 billion. The GDP shows that this industry is significant towards the development of the Malaysian economy. Previous studies have found that innovation and technology positively correlate with performance (Rosli & Sidek, 2013; Soon, Ahmad & Kiat, 2017). Thus, it follows that if the MSMEs do not adopt innovation and technology, they risk a negative impact on company performance (Mustafa & Yaakub, 2018). In addition, the report also stated that services and manufacturing remained the main drivers of MSME's GDP activities. Both sectors represent more than 80% of MSME's GDP. The services sector remained the most significant contributor to MSMEs activities with a share of 60.8%, followed by the manufacturing industry with 22.3%, and the agriculture sector contributed 10.5% to MSMEs GDP. Meanwhile, the construction and mining & and quarrying sectors contributed 4.8% and 0.5%, respectively.

### 2.4 Diffusion of Innovation (DOI)

The theory of diffusion of innovation serves as the foundation for this research. Rogers developed the DOI hypothesis in 1962, making it one of the oldest theories in the social sciences. According to (Rogers, 2003), diffusion involves four main elements: innovation, communication channels, time, and the social system. Previous research (Kiwauka, 2015) discovered that diffusion of innovation theory has been widely employed to examine the user acceptability of innovation in various fields, including agriculture, sociology, information systems, manufacturing, and others. This study integrates the DOI-TOE framework to determine the influence of technological, organisational, and environmental factors on Malaysian MSMEs adopting supply chain technology. DOI theory considers the factors of innovation characteristics that attempt to technology factors. At the same time, the TOE framework explores technology adoption at the organisational and environmental levels.

#### 2.4.1 Technological Factors

The technological factors considered influencers of technology adoption in SME supply chains are relative advantage, perceived complexity, and compatibility, as previously used by Kumar Bhardwaj et al. (2021) and Shamout et al. (2022). Therefore, it is proposed that:

H1: Technological factors positively influence 'MSMEs' adoption of the supply chain technology

Recently relative advantage was identified as an indicator of blockchain technology integration in Indian SMEs by Kumar Bhardwaj

et al. (2021) and by Shamout et al. (2022) as an indicator of autonomous robotic technology in SME supply chains and exemplified the utility that firms would drive based on the adoption of the technology. The relative advantage of accepting an innovation is considered through the context of perceived benefits of the organization measured by cost-effectiveness, comprehensive market coverage and economic profitability (Christiansen et al., 2022). Many studies investigating innovations' diffusion process have found a relative advantage to be one of the significant determinants. An advantageous technology enables companies to perform their tasks quicker, easier, and more efficiently. Hence, it improves the company's quality, productivity, and performance (Amini, 2016). Therefore, it is proposed that:

H1a: Perceived relative advantage of technology positively influences 'MSMEs' adoption of the supply chain technology.

The ease of technology usage was identified as a determinant of technology adoption within TAM (Kamble et al., 2019). However, complexity is based on the TOE framework (Hwang et al., 2016). According to Chuang, Nakatani, and Zhou (2009), complexity is the extent to which a technological system or innovation is difficult. Therefore, it is proposed that:

H1b: Perceived complexity of technology negatively influences 'MSMEs' adoption of supply chain technology.

New technologies are often adopted more quickly when they offer compatibility and integration with existing technologies (Awa et al., 2017). In the case of MSMEs, the likelihood of adoption increases when businesses recognise that both soft and hard technology fit into their organisational values, beliefs, and needs. Effortless business enablement and compatibility are the key factors determining whether an organisation adopts a technology (Amini, 2016). In addition to the above, other researchers have mentioned that technology compatibility, technology readiness, top management support, relative advantage, perceived usefulness, and vendor support positively influence the intention of MSMEs to adopt technology in their supply chains (Kumar Bhardwaj et al., 2021). Therefore, it is proposed that:

H1c: Perceived compatibility of technology positively influences 'MSMEs' adoption of supply chain technology.

## 2.5 Technology-Organisation-Environment (TOE)

The TOE framework and DOI theory coupled models have been used in many fields to examine the preparedness, adoption, and deployment of various technology developments (Alsetoohy et al., 2019). DOI is predominantly based on the characteristics of the technology and the 'users' perceptions of the innovation. However, technology-related constructs are not the only factors that influence the adoption of technologies. Other factors (such as environmental and organisational factors) influence the decision to adopt an innovation. These factors, specifically environmental factors, are not considered in DOI theory. TOE is another theoretical framework that overcomes this drawback. This framework uses technical aspects of the diffusion process and non-technological aspects such as organisational and environmental factors. Hence, TOE improves 'DOI's ability to explain intra-firm innovation diffusion (Amini, 2016). The TOE framework and DOI theory have been integrated to develop models that have been used across a wide range of fields. (Alsetoohy et al., 2019).

### 2.5.1 Organisational Factors

The organisational context represents several factors encompassing top management support, financial resources, employee compatibility, and cost management (Shamout et al., 2022). Organisational conditions facilitate the adoption of technological innovation and systems and therefore are essential for successful integration. Therefore, it is proposed that:

H2: Organisational factors positively influence 'MSMEs' adoption of supply chain technology.

Employees are one of the primary competitive resources of organisations; therefore, they need to be on board for adoption (Awa et al., 2017). Competent personnel who are able and willing to learn new processes and systems are less likely to resist change and innovation (Chatterjee et al., 2022; Shamout et al., 2022). Therefore, quality and competent human resources are required to adopt supply chain technologies. Therefore, it is proposed that:

H2a: Quality of human resources positively influences 'MSMEs' adoption of supply chain technology.

Top management support refers to the level of commitment and financial resources available to aid in adopting new technologies. It is critical to effectively adopt and implement technology advances in an organisation. Support from top management has a beneficial impact on technology adoption (Alsetoohy et al., 2019). Other findings show that top management support is further revealed as an essential determinant in the decision of MSMEs to adopt blockchain technology in supply chains. In the context of an Indian SME, top management refers to the owner and ultimate decision-making power. If top management has a positive attitude toward blockchain technology, an SME will be more likely to adopt it (Kumar Bhardwaj et al., 2021). Thus, top management support has also been proposed as an indicator in the present study and is essential for successfully adopting a technological system (Eiriz et al., 2019; Idris, 2019; Ivanov et al., 2019). This suggests that top management support is crucial for adopting technological systems and mechanisms within SMEs. Therefore, it is proposed that:

H2b: Top management support positively influences 'MSMEs' adoption of supply chain technology.

Cost is a significant factor in adopting technological innovations, as Shamout et al. (2022) illustrated for adopting robotic technology in Indian SMEs. According to Cavalcanti et al. (2022), transactional costs are critical for adopting technologies. Numerous other studies have backed up this idea that perceived cost can affect how quickly people adopt new technologies (Kumar Bhardwaj et al., 2021). Therefore, it is proposed that:

H2c: Perceived cost of technology negatively influences 'MSMEs' adoption of the supply chain technology.

### 2.5.2 Environmental Factors

Research has suggested that the external environment is also a catalyst for technology adoption, and therefore these factors need to be considered (Setiawati et al., 2022). Recent research has suggested that vendors influence the technology adoption process (Kumar Bhardwaj et al., 2021; Shamout et al., 2022). The Malaysian government has performed an important role in supporting and designing programs to create a competitive environment for MSMEs by helping MSMEs with innovation and technology adoption, such as sharing knowledge, offering funds, and expert advisory (Mustafa & Yaakub, 2018). Governmental support is an environmental factor influencing the introduction of technological innovation in SMEs and supply chains. The existence of specific laws and regulations can have a significant impact on technology adoption by businesses. When pressure from governments, customers, legal entities, trading partners, and others is high, adopting new technologies tends to happen more quickly (Awa et al., 2017). So existing laws and regulations can encourage or discourage businesses from adopting new technology. Therefore, it is proposed that:

H3: Environmental factors positively influence 'MSMEs' adoption of supply chain technology.

H3a: Vendor support positively influences 'MSMEs' adoption of supply chain technology.

H3b: Government support positively influences 'MSMEs' adoption of supply chain technology.

### 2.6 Supply chain technology adoption and Micro, Small and Medium Enterprises (MSMEs) performance.

The benefits of technology in a supply chain include improving communication, collecting and transmitting data to and from suppliers and customers, enabling effective decision-making, improving productivity, and improving supply chain performance (Kumar Bhardwaj et al., 2021). By investing in the latest supply chain technology, businesses can stay ahead of the competition and improve their chances of success (Tehseen et al., 2021). Therefore, it is proposed that:

H4: Supply chain technology adoption positively and significantly impacts Micro, Small and Medium Enterprises performance.

### 2.7 Supply chain technology adoption (mediator)

Technology is crucial in assisting supply chains in meeting the demands of a constantly changing environment and different hazards at all levels. Furthermore, because of its potential to integrate multiple operations internally and externally with customers and suppliers, technology has significantly influenced the structure of supply chains. The benefits of technology in a supply chain include improving communication, collecting and transmitting data to and from suppliers and customers, enabling effective decision-making, improving productivity, and improving supply chain performance (Ben-Daya et al., 2019). While there is still a lack of focus on SCT as an enforcer of SME performance, if more companies were to adopt technological innovations for their supply chain management, there would be a significant increase in the proper use and effectiveness of the system (Idris et al., 2021). SCT adoption will improve the performance of MSMEs through the indirect effect imposed by organisational factors (management support, quality of human resources, cost perceptions), technological factors (relative advantage, perceived complexity, and compatibility), and environmental factors (governmental support and vendor support).

Therefore, it is proposed that:

H5: Technological factors indirectly affect 'MSMEs' performance through SCT adoption as a mediating variable.

H6: Organisational factors affect MSMEs' performance indirectly through SCT adoption as a mediating variable.

H7: Environmental factors affect MSME's performance indirectly through SCT adoption as a mediating variable.

## 3.0 Methodology

This study will employ a cross-sectional and quantitative approach. Data will be collected through a questionnaire from the Micro, Small, and Medium Enterprises (MSMEs) in Malaysia. The recent listing of MSMEs in Malaysia will be gathered from SME Corporation Malaysia. The unit of analysis of this study is organization. The target respondents are managerial level and above or those responsible for the knowledge and information about this study. The managers are usually involved in all organisational decision-making within the organisation, including adoption decisions involving technological innovations, thus making them the most appropriate representatives of their companies to answer the survey. For this study, the probability sampling technique will be adopted. Probability sampling is when the elements in the population have a known, nonzero chance of being chosen as subjects in the sample. Data collection will be analyzed

using SPSS for the fastest and most accurate analysis. The data will be retrieved through SPSS: mean, mode, standard deviation, reliability and others. For this study, the researcher will apply PLS-SEM since it is better to analyze the study framework and evaluate the hypothesis. As one of the SEM techniques, the PLS procedure has been gaining interest and use among researchers in recent years because of its ability to model latent constructs under conditions of non-normality and small to medium sample sizes. It allows the researchers to specify the relationships among the conceptual factors of interest and the measures underlying each construct. The analysis will use smart partial least squares, which adopt the SEM technique.

#### 4.0 Findings

The study has proposed the research framework as depicted in Figure 1. Based on the literature review, the study suggested that technological, organisational and environmental factors influence supply chain technology adoption, eventually affecting Micro, Small and Medium Enterprises (MSMEs) performance.

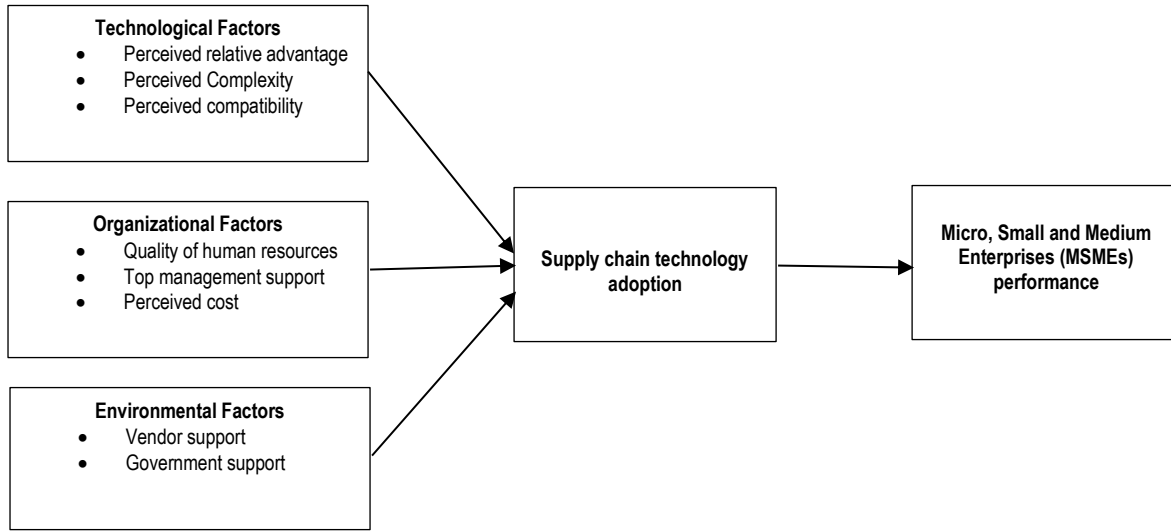


Figure 1: Research Framework

#### 5.0 Conclusion and Recommendations

Adopting supply chain technology is vital for the organization’s success. Based on the literature, it significantly affects how well businesses succeed. Therefore, this study aims to determine the relationship between technological, organizational and environmental factors and MSMEs performance through the use of supply chain technology as a mediator. This study aims to develop a theoretical framework to enhance knowledge and understanding regarding the determinants influencing SCT adoption. Since this study only uses a theoretical perspective on the integration model based on the DOI and TOE, future research should provide extensive literature and understand the concepts through case study methods to acquire comprehensive theoretical knowledge. This study will be conducted in Malaysia. Future studies could explore other countries as comparative studies to better understand the implications of this research. Finally, this study is intended to aid organizations and supply chain practitioners, particularly Malaysian MSMEs, in using SCT to benefit their businesses. Furthermore, this study will provide significant information into the adoption of SCT in MSMEs to further exploit the benefits of technology for future business success. Additionally, it is hoped that this study could be a valuable resource for academics and researchers interested in the supply chain industry, particularly regarding technology adoption in Malaysia.

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#### Paper Contribution to Related Field of Study

First, developing the proposed framework in this study acclaims a novelty. The proposed framework will be helpful for decision-makers at MSMEs to enhance knowledge and understanding of the determinants influencing SCT adoption. Second, this study contributes to the growing body of knowledge on the determinants of supply chain technology. Little is known about the factors influencing supply chain technology adoption. Third, this study can be a guideline for supply chain practitioners in dealing with organisational practices, especially among MSMEs, to deploy appropriate SCT to benefit their businesses. Furthermore, it is hoped that this study will provide a suitable platform for researchers and academics to conduct future research on supply chain technology.

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