DETERMINANT FACTORS OF SUPPLY CHAIN TECHNOLOGY (SCT) ADOPTION AMONG SABAH SMES: LENGTH OF TIME IN SCT ADOPTION AS MODERATOR

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DECLARATION

I hereby declare that the material in this thesis is my expectations for questions, experts, summaries, and references, which have been duly acknowledged.

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ABSTRACT

Small and Medium Enterprises (SMEs) were the key industry in Malaysia which often contributed to innovation to the country. However, the SMEs in Malaysia still face great challenges such as limited technology access, low productivity, and poor managerial capabilities. Specifically, in Sabah, technology adoption still at a low level. There were numerous studies on technology adoption. Unfortunately, there still have limited evidence provided that deals with supply chain technology (SCT) in organizational perspective, thus, it would be difficult for the SMEs to sustain in their market share and continue affecting the overall operation of Sabah SMEs. As Sabah SMEs have the biggest contribution to Sabah's development and provide many job opportunities, therefore, this imperative for this study to identify the determinant factors that influence the SCT adoption among Sabah SMEs such as perceived usefulness, complexity, compatibility and top management support. The length of time in SCT adoption also was explained as a moderator variable. This study used diffusion of innovation (DoI) theory as an underpinning theory and employed a quantitative approach through a survey questionnaire distributed purposefully to Sabah SMEs. Data were obtained from a cross-sectional study using a self-administrated survey questionnaire and the data were analyzed through the Statistical Package for Social Sciences (SPSS) and Structural Equation Modelling (SEM) via Partial Least Squares (PLS). Based on a sample of 106 survey respondents with 26.37% of response rate, the results showed that the level of SCT adoption among Sabah SMEs was moderate. The influence of perceived usefulness and top management support upon SCT adoption was found to be positive while the influence of complexity and compatibility upon SCT adoption was found to have no significant differences. The moderating effect of length of time in SCT adoption was found to be no interaction. These findings showed that both innovation and organizational characteristics could influence SCT adoption and provides empirical evidence to the limited research of SCT adoption in Sabah. These findings also might help SMEs to realize the importance of SCT in the operation and guides policymakers in the process of developing and implementing suitable initiatives to the Sabah SMEs. Suggestions for future research were provided.

Keywords: Supply Chain Technology Adoption, Diffusion of Innovation, Sabah SMEs, Length of time in SCT Adoption.

ABSTRAK

FAKTOR-FAKTOR PENENTU PENGGUNAAN TEKNOLOGI RANTAIAN BEKALAN (SCT) DALAM KALANGAN SME DI SABAH: JANGKA MASA DALAM PENGGUNAAN SCT SEBAGAI MODERATOR

Perusahaan Kecil dan Sederhana (PKS) adalah industri utama di Malaysia yang sering menyumbang untuk inovasi ke negara ini. Walau bagaimanapun, PKS di Malaysia masih menghadapi cabaran besar seperti akses teknologi terhad, produktiviti yang rendah, dan keupayaan pengurusan yang lemah. Secara khusus, di Sabah, penggunaan teknologi masih pada tahap yang rendah. Terdapat banyak kajian mengenai penggunaan teknologi. Malangnya, masih ada bukti yang terbatas berkaitan teknologi rantaian bekalan (SCT) dalam perspektif organisasi, oleh itu, ia akan terus memberi kesan kepada keseluruhan operasi PKS Sabah. Oleh kerana PKS Sabah mempunyai sumbangan terbesar kepada pembangunan Sabah dan menyediakan banyak peluang pekerjaan, oleh itu, sangat penting bagi kajian ini untuk mengenal pasti faktor penentu yang mempengaruhi penggunaan SCT di kalangan PKS Sabah seperti tanggapan kebergunaan, kerumitan, keserasian dan sokongan pengurusan atasan. Tempoh masa dalam penggunaan SCT juga dijelaskan sebagai pemboleh ubah moderator. Kajian ini menggunakan penyebaran inovasi (DoI) teori sebagai teori pendorong dan menggunakan pendekatan kuantitatif melalui kajian soal selidik yang diedarkan secara sengaja kepada PKS Sabah. Data untuk kajian ini diperolehi daripada kajian keratan-rentas menggunakan kajian soal selidik sendiri dan data dianalisis melalui Pakej Statistik untuk Sains Sosial (SPSS) dan Model Persamaan Struktur (SEM) melalui Sisi Separa Kuadrat (PLS). Berdasarkan sampel 106 responden kaji selidik dengan 26.37% daripada kadar tindak balas, keputusan analisis menunjukkan bahawa tahap penggunaan SCT di kalangan PKS Sabah adalah sederhana. Pengaruh tanggapan kebergunaan dan sokongan pengurusan atasan diatas penggunaan SCT didapati positif sementara pengaruh kerumitan dan keserasian diatas penggunaan SCT didapati tiada perbezaan signifikan. Kesan moderator tempoh masa dalam penggunaan SCT didapati tiada interaksi. Penemuan ini menunjukkan kedua-dua ciri inovasi dan organisasi dapat mempengaruhi penggunaan SCT dan memberikan bukti empirikal kepada penyelidikan penggunaan SCT yang terhad di Sabah. Penemuan ini juga dapat membantu PKS menyedari betapa pentingnya SCT dalam perniagaan dan membimbing

pembuat dasar dalam proses membangun dan melaksanakan inisiatif dan dasar yang sesuai kepada PKS Sabah. Cadangan untuk penyelidikan masa depan disediakan.

Kata kunci: *Penggunaan Teknologi Rantaian Bekalan, Penyebaran Inovasi, PKS Sabah, Tempoh Masa dalam Penggunaan Teknologi Rantaian Bekalan.*

TABLE OF CONTENT

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

2D	-	Two-Dimensional
3D	-	Three-Dimensional
AQC	-	Automated Quality Control
AVE	-	Average Variance Extracted
CX	-	Complexity
COVID-19	-	Coronavirus Pandemic
COX	-	Complexity (Decode)
CAD	-	Computer-Aided Design system
CR	-	Composite Reliability
CRM	-	Customer Relationship Management
DFRM	-	Demand Forecasting Management
DFTZ	-	Digital Free Trade Zone
DoI	-	Diffusion of Innovation
EDI	-	Electronic Data Interchange
ERP	-	Enterprise Resource Planning
GCTS	-	Geo-Coded Tracking System
GDP	-	Gross Domestic Product
HRM	-	Human Resource Management
HTMT	-	Heterotrait-Monotrait Ratio

ICT	-	Information and Communication Technology
IR	-	Industrial Revolution
IS	-	Information System
IT	-	Information Technology
MCO	-	Movement Control Order
MES	-	Manufacturing Execution System
PDA	-	Personal Digital Assistance
PDM	-	Product Data Management
PLS-SEM	-	Partial Least Squares-Structural Equation Modelling
PU	-	Perceived Usefulness
RFID	-	Radio Frequency Identification
R&D	-	Research and Development
SCE	-	Supply Chain Event
SCM	-	Supply Chain Management
SCP	-	Supply Chain Planning
SCT	-	Supply Chain Technology
SEM	-	Structural Equation Modelling
SMEs	-	Small and Medium Enterprises
TAM	-	Technology Acceptance Model
TMSs	-	Transportation Management System
TMS	-	Top Management Support

UMS	-	Universiti Malaysia Sabah
VIF	-	Variance Inflator Factor
VMI	-	Vendor-Managed Inventory
WMS	-	Warehouse Management System

LIST OF APPENDICES

CHAPTER 1

INTRODUCTION

1.1 Background of Study

Small and Medium Enterprises (SMEs) were the key business not even in Malaysia yet around the world which they play a significant financial and social job and perceived as the primary factor in changing Malaysia into a created country (Hanifah, Halim, Ahmad and Vafaei-zadeh, 2017). SMEs were firms or organizations that running pioneering exercises (Lucky and Olusegun, 2012) and they have the greatest commitment to the nation's financial development (Lim and Kimura, 2010). While in Malaysia, there is 98.5 percent of the whole business elements partook by SMEs whereby this rate spoke to 907,065 of the complete SMEs and the most recent commitment of SMEs expanded up to 5.2 percent of the Malaysia GDP development in 2017 contrasted with 2016 (Ministry of International Trade and Industry Malaysia 2017, 2018). Without appropriate getting ready for the improvement of Malaysian SMEs, it would be hard for SMEs to support their piece of the pie.

The importance of the SMEs sector was well recognized worldwide due to its significant contribution to gratifying various socio-economic objectives, such as higher growth of employment, output, promotion of exports and fostering entrepreneurship. According to the Ghassibe, Appendino and Mahmoudi (2019), SMEs boost economic and employment growth to a higher level in the develop and developing countries. In the developing countries such as in India the contribution of small and medium enterprises (SME) sector to manufacturing output, employment and exports is quite significant. It is noted that in terms of value, the SME sector of India accounts for 45 per cent of the manufacturing output and 40 percent of the total exports (Mavrodieva, Budiarti, Yu, Pasha and Shaw, 2019). SMEs in Indonesia also play a significant role in economic and social development (Padmadinata, 2007). As noted by Mahmood (2008), total number SMEs in Indonesia were 42.4 million in total and the contribution of the

same was 56.7% of GDP, 19.4% of total export, and employed 79 million of work force.

In the developed countries, SME enterprises are often called foundation enterprises which as are the core of the country's industrial base (OECD, 2007). The scenario of United State (US) SMEs, it is noted that more than 99 percent of U.S. businesses are SMEs. BY analysing the composition of SMEs in US, it found that real estate and leasing service is having highest share out of total SME sector. Similarly, the whole sale trade contributes as a second largest segment which is 17 per cent of total US SMEs (Kachembere, 2011). In the case of Japanese economy, the contribution of small or medium-sized enterprises is more than 99% of total business. However, most of the SMEs are not as well-known as Japan's giants. But they play significant role as the backbone of the service sector and support as an essential part of the manufacturing and especially as strong export supply chain (The Economist, 2010).

In managing an exceptionally serious market, SMEs should be more inventive to make to offer fantastic support to the shoppers. In accordance with Malaysian government's drives to improve the advancement of SMEs, the administration was concentrating on development and innovation, framework, advertise get to, credit access just as human capital advancement to connecting the innovation holes, efficiency upgrade and fortifying industry position in the higher-esteem portion of the flexibly chain (Ministry of Finance Malaysia, 2017). The Malaysian government that all around perceived with the significance of innovation to the nation's financial development has declared 2017 as "long periods of the web economy" and developed Digital Free Trade Zone (DFTZ) to support the development of nation's internet business among Malaysian business members (Ministry of Finance Malaysia, 2017). For this propelled upheaval, the Ministry of International Trade and Industry (MITI) has declared the Fourth Industrial Revolution in 2018 where it is known as an advanced change of the modern market.

The Industrial Revolution (IR) 4.0 is a mix of physical framework and digital system that causes business members to survey their hazard all the more successfully (Ministry of International Trade and Industry Malaysia 2017, 2018). In particular, IR 4.0 alludes to the ongoing or new innovations that go about as an emotionally supportive network to join and fortify the physical apparatuses, machines, individuals, items and exercises inside the firm so as to make new sort of savvy, association and nimble worth chain

(Moeuf, Pellerin, Lamouri, Tamayo-giraldo and Barbaray, 2017). Because of the SMEs frequently face issue in their advancement, the Malaysian government keeps on grasping and bolster the SMEs with innovation reception (SME Corporation, 2018a).

In Sabah explicitly, about 6.14 percent of all out SMEs spoke to by nearby SMEs (Ministry of International Trade and Industry Malaysia 2017, 2018). Sabah SMEs have positioned at the seventh-most noteworthy number of the whole Malaysian SMEs where it demonstrated an expected critical for Sabah SMEs to add to the nation's financial development. It has been featured by Idris and Idris (2017) where Sabah has recorded large changes in the development of Malaysia, for example, numerous foundations advancement and GDP per capita of Sabah quickly expanded. Furthermore, Sabah SMEs have contributed around 98 percent of business advancement in Sabah and gives many openings for work to the state (Yusa, 2017). Malaysian government that worry with the improvement of SMEs every now and then, particularly in Sabah and Sarawak, has propelled a fare advancement program for Bumiputera in 2016 to upgrade the quantity of high playing out Bumiputera's organizations with potential fare showcases just as make a superior systems administration and flexibly chain among Bumiputera's SMEs (Ministry of International Trade and Industry Malaysia, 2017). Notwithstanding, Joseph (2017) affirmed that Sabah SMEs were confronting low creation levels and needed to hinder the advancement of items and administrations because of inadequate innovation, constrained markets, and restricted financing.

Malaysia has been blessed with abundant innovation, resources, as well as government supports (Malaysian Investment Development Authority, 2016; Hanifah, Halim, Ahmad and Vafaei-Zadeh, 2020). Despite these high interest, the Malaysian SMEs still face great challenges within their supply chain such as limited technology access, low productivity as well as poor managerial capabilities (Muhammad, Char, Yasoa' and Hassan, 2010; Lucky and Olusegun, 2012). Moeuf et al. (2017) found the SMEs did not utilize the resource provided to implement the IR 4.0 and often restrict themselves in technology adoption. Based on Figure 1.1 shows that the usage of ICT among SMEs in Malaysia still low especially in the supply chain area. As Hanifah, Halim, Ahmad and Vafaei-Zadeh (2019) emphasized that innovation was recognized as an important thing to reinforce the competitive advantage and remain productive among SMEs, it is important for the SMEs to aware and adopts the technology. With uncertain

circumstances, SMEs must be well-prepared by enhancing their innovative capabilities over time. For instance, SMEs should have a suitable digital infrastructure in order to create business resilience, thus, helping them survive in unpredicted circumstances (Fitriasari, 2020). Therefore, this is needed for SMEs especially, in Sabah, to adopt the technology in their business operation.

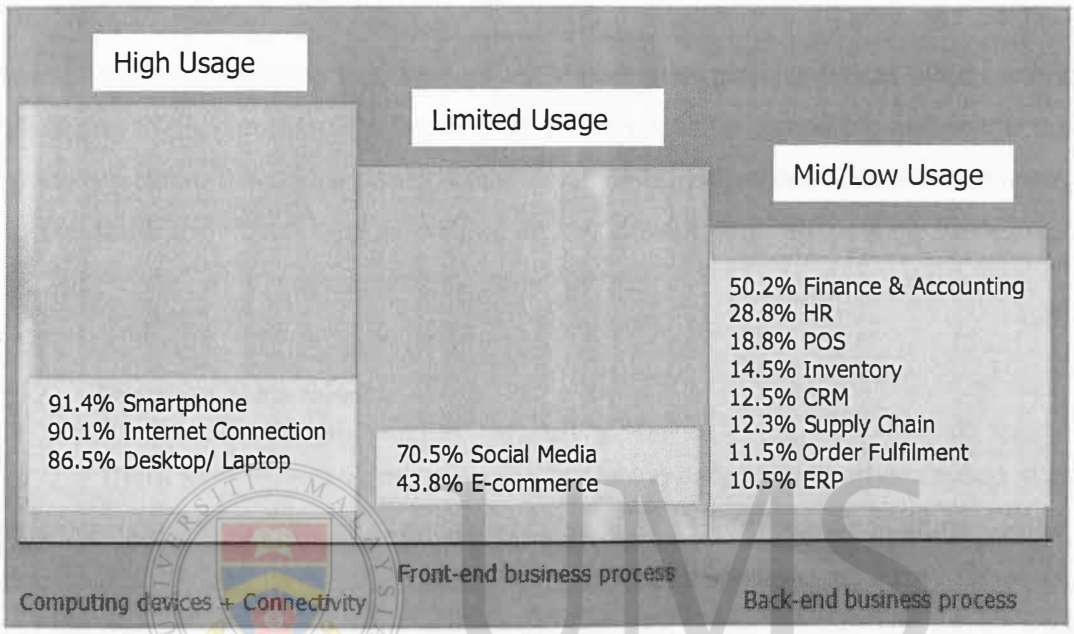

Figure 1.1: ICT Tools or System Usage (%)
Source: SME Corporation (2018b)

Bosona and Gebresenbet (2013) featured that innovation was progressively assuming an essential job in the coordination of the flexibly chain all through the utilization of equipment and programming to catch, store, and communicate the information. Equipment innovation alludes to the physical gadgets, material taking care of hardware, and system foundation while programming innovation alludes to the calculations, naming and coding methods, and framework reconciliation. The equipment innovation, typically utilized in the zones of shipment and conveyance while the product innovation utilized in the territories of the gracefully chain, for example, following the request and conveyance arranging just as flexibly chain system (Myerson, 2016). It is difficult to accomplish a compelling gracefully chain without innovation. The innovation causes the flexibly chain to assemble the two firms and individuals closer in this worldwide economy (Myerson, 2016). The gracefully chain was a system that begins with the providers to the producers, until to the end shoppers (Kleab, 2017). The system requires to help three kinds of streams so as to have cautious arranging and close coordination which are material streams, data streams and cash

streams (Sacristán-Díaz, Garrido-Vega and Moyano-Fuentes, 2018). Simultaneously, this system, thusly, must be upheld by three columns which were business forms, structures in the association, and advancements. So as to arrive at a real adequacy of item being showcased to the commercial center, flexibly fasten advancements were worked to improve discernibility and straightforwardness. Thus, the flexibly chain innovation (SCT) use prompts a superior business activity.

Taking everything into account, SCT utilization plays a critical effect among Malaysian SMEs particularly in Sabah state to accomplish a compelling and productive gracefully chain. It is on the grounds that Sabah SMEs can roll out huge improvements, at the state and nation level as well as at a worldwide level also. Along these lines, SCT appropriation is required among Sabah SMEs.

1.2 Problem Statement

There are numerous articles on the technology adoption in other aspects such as marketing (Dahnil, Marzuki, Langgat and Fabeil, 2014; Abu Bakar and Ahmed, 2015) and banking (Al-Jabri and Sohail, 2012; Martins, Oliveira and Popovic, 2014). However, studies that attempt to examine technology adoption in the supply chain were found very few in a number (Kamaruddin and Udin, 2009). Collins et al. (2010) highlighted that an effective and efficient supply chain can be achieved if the firms use supply chain technology (SCT). There have some studies have discussed SCT adoption from a firm perspective (Wang, Wang and Yang, 2010; Lee, Udin and Hassan, 2014; Ali and Haseeb, 2019). However, there still has limited empirical research in the adoption of SCT among SMEs (Migiro, 2013; Zafar, Almaleh, Alshahri, Alqahtani and Alqahtani, 2015). Prior research explained that the rate of using IT adoption among Malaysian SMEs still low compared to the large firm of such technology (Hairuddin, Noor and Malik, 2012). Hanifah et al. (2019) have mentioned that larger firms are more likely to innovate as compared to smaller firms due to the significant financial and formal infrastructure. Due to majority studies of technology adoption concerned on large firms (Wang et al., 2010; Tarofder, Marthandan, Mohan and Tarofder, 2013), it is needed to identify determinant factors that can influence the SCT adoption among SMEs. Additionally, with the Covid-19 pandemic, using a suitable technology was crucial to create digital transformation in the business which allow the business to create a resilience capabilities for both national and regional growth (Fitriasari, 2020).

In the Sabah context, the development of SMEs in Sabah considered slower as compared to the SMEs in Peninsula Malaysia (Krishna et al., 2012). Muhammad, Masdek, Ponari, Makup and Dardak (2017) revealed that the technology adoption among entrepreneurs in Sabah was still very low. Meanwhile, the Chief Minister of Sabah, Datuk Seri Musa Aman, has openly advised that SMEs in Sabah need to aware and embrace the technology to remain competitive and boost their business successful (The Sunday Daily, 2017). However, Ming, On, Rayner, Guan and Patricia (2018) argued that there still have less research highlighted on determining factors influencing the technology adoption in the context of Sabah SMEs.

The technology adoption among Sabah SMEs considered still at a low level (Ming et al., 2018). The researchers highlighted that Sabah SMEs still hesitant to adopt the technology into their business operation although there have many benefits provided. This situation might stunt the growth of Sabah SMEs. With this new revolution IR 4.0, there have a lot of factors affecting the technology adoption that might encourage Sabah SMEs to improve their business operation, especially in supply chain activities. As Mustafa and Yaakub (2018) highlighted that future research must be conducted among Sabah SMEs to identify the determinant factors that might influence technology adoption. Thus, this study intends to fill this gap, in which, this would more focusing on Sabah SMEs irrespective of whether they are from manufacturing, services, agriculture, or other industries.

The rate of technology usage can be influenced by innovation characteristics (Kaminski, 2011). Based on Rogers, five main innovation characteristics that can influence technology diffusion which was a relative advantage, compatibility, complexity, trialability, and observability (Al-mamary, Al-nashmi and Ghaffar, 2016). However, the SMEs manager and the workers were not really understanding with the usefulness and convenience of a particular technology that causes them to be less interested in adopting the technology. Therefore, Malaysian SMEs perceived difficulties of using the technology. Chong, Darmawan, and Ooi (2010) highlighted Malaysian SMEs often face a complexity when using a particular technology, thus, influencing the rate of technology usage in their supply chain.

Furthermore, the firm will refuse to adopt the SCT due to the incompatibility of the current system among others. The significant incompatibility of existing tools will likely not perceive the technology to be easy to use (Cheung and Vogel, 2013). This because the lack of familiarity with technology will lead to the resistance to use it (de Kerviler, Demoulin and Zidda, 2016). The familiarity with technology usage helps the firm to be compatible with the kind of technology, thus, use it continuously. Rogers highlighted that the early adopter has less concern on the technology compatibility, instead, the fits more closely with the existing situation.

It has been asserted by Khalique, Isa, Shaari, and Ageel (2011) that the mortality rate of SMEs in Malaysia was approximate 60 percent. Chong (2012) highlighted, irrespective of country, SMEs were facing common challenges to survive and improve their business operation whereby the researchers believe that Malaysian SMEs can be collapsed within their first five years of operation. SME Corporation (2018) mentioned that Malaysian SMEs were highly aware and understand to use the main function of the technology but they witness the difficulties to digitalise their business by using a particular technology in depth. Sabah Skills & Technology Centre (2019) also emphasized that the cultural mindset to change and lack of awareness about technology among SMEs in Sabah still low which leads to the barriers in technology adoption. Hence, Shah and Ganji (2017) highlighted that the lack of top management support became a major challenge for the firm practices.

These challenges can continue to affect the overall operation and competitiveness of SMEs, especially for Sabah SMEs. As the existing literature on this dimensions remains unclear, especially related to the length of time in taking SCT, where the time dimension is very important to examine the actual usage of SCT (Liu and Forsythe, 2010) while at the same time, that the SMEs itself only look upon the current operation instead of thinking about the future planning (Dimick, 2014), therefore, this study imperative to be conducted to identify the level of SCT adoption by Sabah SMEs, the relationship between the determinant factors such as perceived usefulness, complexity, compatibility and top management support with SCT adoption among Sabah SMEs, and the moderating effect of length of time in SCT adoption, particularly in organizational perspective.