

**THE ANTECEDENTS OF SUPPLY CHAIN TECHNOLOGY ADOPTION  
AMONG SMEs IN JOHOR BAHRU**

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AMONG THE SMES IN JOHOR BAHRU**

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To my beloved father, mother and brother

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## ABSTRACT

The invention and development of Information Technology (IT) have moved forward the concept of supply chain to a recognized strategic component with effective, positive impact on the firm's business. There are very few studies related to the antecedents of supply chain technology adoption on local context. Therefore, the supply chain technology can be adopted by the large companies as well as small and medium enterprises due to advance of technology. The objective of this study is to examine the antecedents of supply chain technology adoption among the SMEs in Johor Bahru using the combination of supply chain technology adoption framework by Patterson *et al.* (2003) and Russell and Hoag, (2004). The framework model determined three antecedents which were environmental factors, organizational factors and communicational factors. Data and information were gathered from 103 respondents through the personal administrated questionnaires for 6 months. Data was analyzed by descriptive analysis, reliability analysis, Pearson Correlation analysis and Multiple Regression analysis via the software Statistical Package for Social Science (SPSS). The results show that were significant and positive correlation between the antecedents of supply chain technology adoption and supply chain technology adoption. The regression analysis shows that out of three antecedents, only the organizational factors have a negative impact to the supply chain technology adoption while the communicational and environmental factors have a positive impact towards the supply chain technology adoption. It is recommended that future study to determine additional antecedents of supply chain technology that pertinent with the current SMEs industry. Further study is also recommended to examine a wider scope to a more geographical data coverage, other nature of businesses and research instruments.

## **ABSTRAK**

Inovasi dan pembangunan dalam Teknologi Maklumat (IT) telah memajukan konsep rantai bekalan kepada komponen strategik diiktiraf dengan berkesan, kesan positif kepada perniagaan firma. Tidak banyak kajian yang berkaitan dengan faktor-faktor aplikasi teknologi dalam rantai bekalan dalam konteks tempatan. Oleh itu, teknologi rantai bekalan boleh digunakan oleh syarikat-syarikat besar serta perusahaan kecil dan sederhana (PKS) untuk memajukan PKS. Objektif kajian ini adalah untuk mengkaji faktor-faktor yang mempengaruhi aplikasi teknologi rantai bekalan di kalangan PKS di Johor Bahru menggunakan gabungan teknologi rantai bekalan rangka kerja yang digunakan oleh Patterson et al. (2003) dan Russell dan Hoag, (2004). Model kerangka ditentukan tiga faktor yang adalah faktor persekitaran, faktor organisasi dan faktor-faktor komunikasi. Data dan maklumat yang dikumpul daripada 103 responden melalui soal selidik ditadbir peribadi selama 6 bulan. Data dianalisis dengan analisis deskriptif, analisis Korelasi Pearson dan analisis regresi berganda yang menggunakan Pakej Statistik perisian untuk Sains Sosial (SPSS). Keputusan menunjukkan bahawa adalah hubungan positif antara latar belakang yang menggunakan teknologi rantai bekalan dan teknologi yang menggunakan teknologi rantai bekalan. Analisis regresi menunjukkan bahawa daripada tiga latar belakang, hanya faktor organisasi mempunyai kesan negatif kepada penggunaan teknologi rantai bekalan di samping faktor-faktor komunikasi dan alam sekitar mempunyai kesan positif ke arah penggunaan teknologi rantai bekalan. Kajian masa hadapan disyorkan menambahkan faktor-faktor rantai teknologi bekalan yang berkaitan dengan industri PKS semasa. Kajian lanjut juga disyorkan untuk memeriksa skop yang lebih luas kepada perlindungan data yang lebih geografi, alam semulajadi yang lain perniagaan dan instrumen kajian.

## TABLE OF CONTENTS

CHAPTER	TITLE	PAGE
	<b>TITLE PAGE</b>	I
	<b>DECLARATION</b>	li
	<b>DEDICATION</b>	iii
	<b>ACKNOWLEDGEMENT</b>	iv
	<b>ABSTRACT</b>	v
	<b>ABSTRAK</b>	vi
	<b>TABLE OF CONTENTS</b>	vii
	<b>LIST OF TABLES</b>	xi
	<b>LIST OF FIGURES</b>	xiii
	<b>LIST OF ABBREVIATIONS</b>	xiv
	<b>LIST OF APPENDICES</b>	xv
 <b>1</b>	 <b>INTRODUCTION</b>	
	1.1 Background of Study	1
	1.2 Statement of Problem	4
	1.3 Research Questions	9
	1.4 Research Objectives	10
	1.5 Scope of the Research	10
	1.6 Significance of the Research	11
	1.7 Limitation of the Research	12

1.8	Summary	12
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## **2 LITERATURE REVIEW**

2.0	Introduction	14
2.1	Concept of Supply chain	15
2.2	Concept of Supply chain Management	17
2.2.1	Objectives of Supply chain Management	18
2.3	IT adoption For SCM	19
2.4	Theory of Diffusion of Innovation	23
2.5	Communication Channels	28
2.6	Organization Factors	29
2.7	Environmental Factors	32
2.8	Supply Chain Technology	34
2.8.1	The Impact and Benefits of Supply Chain Technology	35
2.9	Research Framework	37
2.10	Summary	40

## **3 RESEARCH METHODOLOGY**

3.1	Introduction	41
3.2	Research Design	42
3.3	Population and Sampling	43
3.4	Sampling Design Process	44
3.5	Data Collection Method	45



3.5.1	Questionnaire	45
3.6	Data Analysis Method	46
3.6.1	Descriptive Statistics	47
3.6.2	Reliability and Validity Analysis	47
3.6.3	Correlation Analysis	50
3.6.4	Multiple Regression Analysis	51
3.7	Summary	51

## **4 DATA ANALYSIS**

4.1	Introduction	52
4.2	Demographic Analysis	53
4.2.1	Respondents' Profile	53
4.2.2	Findings on Respondents' Profile	56
4.3	Reliability Analysis	57
4.4	Descriptive Statistics	57
4.4.1	Descriptive Statistics of Questionnaire Item on Supply Chain Technology adoption	58
4.4.2	Descriptive Statistics of Questionnaire Item on Environmental Factors	58
4.4.3	Descriptive Statistics of Questionnaire Item on Organizational Factors	59
4.4.4	Descriptive Statistics of Questionnaire Item on Communicational Factors	61

4.5	Correlation Analysis	62
4.6	Multiple Regression Analysis	63
4.7	Summary	66
<b>5</b>	<b>Conclusions and Discussions</b>	
5.1	Introduction	68
5.2	Discussion of Findings	68
5.2.1	Relationship between Communicational Factors and Supply Chain Technology Adoption	69
5.2.2	Relationship between Environmental Factors and Supply Chain Technology Adoption	71
5.2.3	Relationship between Organizational Factors and Supply Chain Technology Adoption	73
5.3	Conclusion on Findings	75
5.4	Recommendations	76
5.4.1	Suggestions For Future Research	76
5.5	Conclusion	77
	<b>REFERENCES</b>	78
	<b>APPENDIX</b>	90

## LIST OF TABLES

TABLE NO.	TITLE	PAGE
3.1	Advantages and Disadvantages of Personal Administrated Questionnaire	45
3.2	Techniques of Analysis on the Data Tabulation Tables	47
3.3	Likert Scale measure the level of agree with a Statement	49
3.4	Davis(1971) Convention of Correlation Strength	50
4.1	Profile of Respondents	54
4.2	Reliability Analysis for Variables	57
4.3	Descriptive Statistics of Questionnaire Item On Supply Chain Technology Adoption	58
4.4	Descriptive Statistics of Questionnaire Item On Environmental Factors	59
4.5	Descriptive Statistics of Questionnaire Item On Organizational Factors	60
4.6	Descriptive Statistics of Questionnaire Item On Communicational Factors	61
4.7	Pearson Correlation Table	62
4.8	Model Summary	64

4.9	Multiple Regression Table	64
4.10	Result of Hypotheses Test	66

**LIST OF FIGURES**

<b>FIGURE NO.</b>	<b>TITLE</b>	<b>PAGE</b>
2.1	Supply Chain Stages	14
2.2	Process of Procter & Gambler Detergent Supply Chain	15
2.3	Functional Roles of IT in SCM	21
2.4	Research Framework by Patterson <i>et al.</i> (2003)	37
2.5	Research Framework by Russell and Hoag, (2004)	38
2.6	Research Framework of This Research	38

## LIST OF ABBREVIATIONS

SCM	-	Supply Chain Management
IT	-	Information Technology
IS	-	Information System
ICT	-	Information Communication Technology
P&G	-	Procter & Gambler
MNC	-	Multi National Corporation
USA	-	United State of America
WIP	-	Work in Process
ERP	-	Electronic Resource Planning
MRP II	-	Manufacturing Resource Planning
DRP	-	Distribution Resource Planning
EDI	-	Electronic Data Interchange
SCEM	-	Supply Chain Event Management
DOI	-	Diffusion of Innovation
RFID	-	Radio Frequency Identification
XML	-	Extensible Markup Language
HTML	-	HyperText Markup Language
eSCMS	-	Electronic Supply Chain Management Systems
SPSS	-	Statistical Package for Social Science
NSDC	-	National SME Development Council
PKS	-	Perusahaan Kecil Dan Sederhana

**LIST OF APPENDIX**

<b>APPENDICES</b>	<b>TITLE</b>	<b>PAGE</b>
A	QUESTIONNAIRE	92

## **CHAPTER 1**

### **INTRODUCTION**

#### **1.1 Background of Study**

In the age of digitalization, the traditional way of doing business have changed as organizations endeavor to achieve a business advantage by leveraging networking technology and supply chain. However, it might be impossible to achieve efficient supply chain without Information Technology (IT) because suppliers were located at different geographical areas. Thus, it is essential to integrate the activities of the organization with IT. In addition, according to Gunasekaram and Ngai (2004), IT is like a nerve system for Supply Chain Management (SCM). IT provides different applications that enhance not only firms' relationships with partners or consumers, but also their competitive advantages, through the improved internal capacity that results when IT is adopted and used effectively (Humphreys *et al.* 2001).

Gunasekaran and Ngai (2004) considered SCM as an approach that has integrated key business processes from end user through original supplier which the SCM provides products, services, and information and hence it add value for customers. In order to handle these complicated activities, the adoption of IT is needed



to manage various value-adding activities along the supply chain (Byrd and Davidson 2003; Fasanghari *et al.* 2008).

Contemplating the need for organizational interaction, IT has become an integral component for SCM. IT has the potential to manage the flow and to influence many dimension of the supply chain such as cost of the product, quality of the product, delivery of the product, flexibility of the production and then affect the profit of the firms (Brandyberry *et al.* 1999; Byrd and Davidson 2003). Therefore, supply chain managers should effectively manage the information flow within the supply chain. In respect of the contribution on large company in the economic, the SMEs are also important growth engines in many countries, therefore, a great potential can be discovered to develop Malaysian SMEs through the adoption of supply chain technology.

With the increasingly globalized economy, SMEs are now considered to be the primary source of contribution substantially to economic development and employment generation (Koh *et al.* 2007). Additionally, SMEs form as a potential economic back-bone of many industries or regions and make an immense contribution to employment than large firms (Peng, 2009). The creation of SMEs also gives direct benefits to the country because all the SMEs are local firms. Thus, it will certainly help generating the economy growth of the country (Alam and Noor, 2009). However, a similar trend occurs in Malaysia too where SMEs have potential to be a powerful engine growth and innovation with the constitution of 99.2 per cent businesses (RMK10: 2011-2015).

Additionally, with the increasing number of SMEs, it will increase their knowledge of the product and the entire industry as well. This knowledge will help SMEs to innovate their product or process to gain a competitive advantage to generate more profits. Thus, it encourages more people to establish their own business to capture the opportunity markets. In addition, the developments of SMEs also help to

achieve other development goals. For example, SMEs can reduce the unemployment rate of the country by providing a job opportunity to the people around their factory.

According to Basher (2010), the main focus of supply chain management (SCM) is to provide the right product to the right customers at the right time, right cost, right quality and right quantity. Moreover, the short-term strategic goal of SCM is to reduce the cycle time, inventory, therefore, increasing productivity, whereas the long term goal can enhancing profits through market share and customer satisfaction (Tan, 2002). However, in the context of SMEs, a cost effective SCM is critical for the growth and survival of the company in the market. The cost effective SCM means the firms able to reduce the risk associated with the production, inventory reduction and also improved supply chain communication (Quayle, 2003; Meehan and Muir, 2008; Koh *et al.* 2007).

The studies by Patterson *et al.* (2003) and Russell and Hoag (2004) investigate the factors such as organizational, environmental and communications factors that affect the supply chain technology adoption for firms in United States of America. The findings found that organizational, environmental and communications factors positively affect the supply chain technology adoption of the organization. Besides that, Chong *et al* (2009) studied the influence of inter-organizational relationships on SME's e-business adoption in Malaysia. From the study, communication, collaboration and information sharing were found to significant in affecting the supply chain technology adoption. Therefore, the further research on this area may contribute to the related field knowledge. As a result, this study will attempts to bridge the gap in existing literatures by studying the antecedents of supply chain technology adoption in SMEs in Johor Bahru. The antecedents of the supply chain technology adoption can means the factors or determinants which will influence or control the adoption of supply chain technology. Their contribution in this field may help company managers to successful adopt the supply chain technology in their organizations.

## 1.2 Statement of Problem

Firms engaged in supply chain as the role of customers, suppliers, or providers of services need to share a great deal of information in the course of their interactions (Whiteley, 1996). Over the years, companies have managed these information flows in a number of ways such as telephone calls, letters, telex and faxes. More recently, firms have begun using the IT to create more effective communication between their business partners.

Therefore, the powerful and growing use of IT is considered as a tool to control and better manage the complex supply chain. Despite the acknowledged importance of the use of IT for SCM, the number of empirical studies assessing the IT and SCM context is limited. However, there are very few studies related to the factors or determinants of supply chain technology adoption such as environmental factors, communicational factors and organizational factors in organizational level study (Patterson *et al.* 2003; Russell and Hoag, 2004).

Besides that, SCM was recognized as an essential area for implementing the IT innovation and investment (Bowersox and Daugherty, 1995). For example, the IT adoption in firms was about 40% of new capital equipment investment to technology (Brynjolfsson and Hitt, 1996). The use of IT can simplify and facilitate the process of information sharing between the supply chain partners to be more efficient. IT may also increase the organizational productivity, flexibility, and competitiveness and stimulate the development of inter organizational networks (Daugherty *et al.* 1995).

Generally, most researches concentrate in IT adoption at certain levels, sectors, groups or other demographic information. For examples, Daniel & Wilson (2002) have compared the intention and benefits of e-commerce adoption by SMEs in the UK. The findings were internal factors such as communication and information sharing between employees were significantly benefits to the e-commerce adoption by SMEs.

While the external factors such as competitive pressure was the main reasons for the companies to adopt the e-commerce. Thus, both internal and external factors were influenced the decision to adopt the technology.

Furthermore, there have been several research studies the factors influencing the successful adoption and implementing of the new technology. The study by Vijayasathy and Tyler (1997) found that the dominant reasons for firms to adopt the Electronic Data Interchange (EDI) because it was a tool for improving the quality of their communication with vendors and a means for better inventory management. So, communication factors tend to have a positive relationship with the supply chain technology adoption. Liang *et al.* (2004) carried out research in determining the adoption factors of the supply chain technology in healthcare industry, and the result shows that the external factors such as cultural and social, the economic, and the technological were affected the adoption of EDI in healthcare industry in China. The research by Lacovou *et al.* (1995) which focus on a small organization adoption of supply chain technology based on three major factors: organizational readiness, external pressure and perceived benefits. The results were a large number of small organizations tend to lack the high organizational readiness and perceived benefits that were required for the integrated, high-impact system such as EDI systems. Thus, the organizational readiness can be means to have a negative relationship with the supply chain technology adoption, and it will affect them by failed in adopting the supply chain technology.

The organizational factors, also one of the internal factors of the organizational was the inner strengths and weaknesses that an organization exhibits. The organizational factors can strongly affect how well a company meets its objectives, and they might be seen as strengths if they have a favorable impact on business, but as weaknesses if they have a deleterious effect on the business. Size of the organizational has been one of the most researched variables, which has led to some disagreement of the direction of the relationship. However, according to Patterson *et al.* (2003), some scholars suggested that smaller organizations are more likely to be flexible due to their smaller size and lower bureaucracy. Therefore, larger organizations are expected to

possess the strong financial resources and risk capacity necessary for new technology investment, and it will associate with greater levels use of IT. While according to Ghobakhloo (2011), top management support and commitment toward the IT adoption is one of the key cornerstones to the adoption. Thus, top management supports become important factor on the supply chain technology adoption. With the top management support on the adoption, it will have a greater chance that the supply chain technology adoption would be successful. Besides that, organizational structure also views as a significant factor to technology adoption. Centralized and decentralized of the organization structure both have relationship to the supply chain technology adoption. Previous research has provided ambiguous results with some studies indicating positive effects of a centralized organizational structure (i.e., concentration of decision-making) on technology adoption while others have shown negative relationships (Gatignon and Robertson, 1989; Bowersox and Daugherty, 1995).

Then, another internal factors which are communicational factors mean that the communication of an idea from top management to the employees and between employees to employees in an organization whether using formal or informal communication. Supply chain managers are usually less concerned with the mode of communication than with the resources and planning required to create an IT adoption successful (Agarwal and Prasad, 1998). Hence, an understanding of the inner workings of communication channels is essential to make the adoption successful. Besides that, resource-intensiveness is the degree of organizational resources a communication receives. The company will allocated the resources such as time, money and in-house labor to the communication channel. Therefore, company decision on the resources intensiveness will determine the company supply chain technology adoption.

Besides that, environmental factors on supply chain perspectives can be means by the risks occurs outside of the control of organization. The environmental risks from outside the supply chain usually related to economics, social, governmental, and climate control. According to Premkumar *et al.* (1997), there were plenty of studies which have examined a variety of environmental factors that influenced the IT

adoption in supply chains such as transaction climate, global competitiveness, economic conditions, industry concentration and environmental uncertainty. Thus, firms facing above average environmental uncertainty will have a greater incentive to adopt supply chain technology to improve information exchange and manage uncertainty between organizations and their task environment.

However, this study will only focus on the three factors discuss above which were organizational factors, environmental factors and also communicational factors. The research by Patterson *et al.* (2003) focused on the organizational and environmental factors that affected to the supply chain technology adoption in USA companies while another research by Russell and Hoag (2004) study the organizational and communication factors in two aerospace firms in USA. Both of these studies show a positive relationship between organizational factors, environmental factors and also communicational factors and supply chain technology adoption. For example, the higher the environmental uncertainty, the greater the chance the firms would adopt supply chain technology to have the better respond to change environmental conditions (Ahmad and Schroeder, 2001). The most challenging factors in supply chain technology adoption for organization was not the technical aspects but human itself. The adopting process was failed due to lack of user awareness, project management, and industry or firm culture. So, it can be categorized as communication problems (Russell and Hoag, 2004).

A recent study by Ang and Husain, (2012) stated that the potential of supply chain technology still remained underexploited by some SMEs in local Malaysia. Thus, this study will also create the awareness to the SMEs of the importance of supply chain technology to them.

Referring to the Malaysian scenario, the rapidly changing and uncertain environment makes businesses face the biggest challenge that how to capture their competitive advantage in this age of knowledge-based economy. Innovation is the use of new technical and administrative knowledge to offer a new product or service to

customers. Thus, Innovation serve as one of the important tools for businesses to keep their competitive advantage (Lin, 2011). The survival of a business depends on how to improve their technological innovation capability. Hence, the supply chain technology adoption among the SMEs become an important issue because of its significant contribution to Malaysia's economic development (Abdullah, 2002). The ability of SMEs to utilize the technology will enable them to be more competitive and sustainable in the competitive market. However, according to a report by Asia E-commerce conference on year 2013, it was approximately 60% of SMEs in Malaysia do not own a company website. Thus, the local SMEs still not ready to supply chain technology adoption and comparatively slower compared to other countries. This is due to Malaysian tend to be more cautions and conservative in adoption of new technology (Ang and Husain, 2012).

Furthermore, SMEs represent the largest percentage of establishments in Malaysia at 99.2 percent. Moreover, in terms of SMEs economic contribution, they contribute 32 percent to gross domestic products, 56.4 percent to total workforce and 19 percent to total exports of the country (SMIDEC, 2008). So, their existence in the economy is relatively important and shows positive effects to the country. However, SMEs in Malaysia are also facing competitive pressure from various low labor cost countries such as China, India and Vietnam. Therefore, in order to compete with companies from these countries, Malaysian SMEs have to be able to work efficiently. In order to achieve this is to have an efficient supply chain through the implementation of e-business technologies (Hsieh and Lin, 1998). Although many multinational companies in Malaysia have implemented advanced supply chain technology in their supply chain, many Malaysian SMEs are still not embracing e-business technology although a total of RM18.4 billion has been allocate to the SMEs in Malaysia for 2013 (MyBajet, 2013). In order to increase the contribution of SMEs in Malaysia, the government funding amounting to RM2.6 billion in Budget 2014 to support for SME development to revitalize their business through IT usage. These action will contribute towards achieving the goals and raise up the contribution of SMEs to 41% by 2020 (MyBajet, 2014).

According to the economy report of the Johor State, for the first six month of 2013 Johor received a total of RM 7 Billion foreign direct investment (FDI) compared to RM 5 Billion for the whole of 2012 and it has positioned Johor as the top recipient of FDI in the country. Thus, SMEs in Johor Bahru should grab this opportunity to attract the FDI and expand their business. This study will focus the SMEs located in capital city of southern state in Malaysia which is Johor Bahru. This is due to the strategic location at the central region of Iskandar Malaysia and Johor Bahru is an important industrial and commercial hub for Southern Peninsular Malaysia. Thus, it is essential for SMEs in Johor Bahru to equip themselves with the supply chain technology in their business in order to cope with the huge demand from the market for present and future.

Therefore, this study attempts to bring together the environmental uncertainty, top management support, decentralized organization structure, organization size, formal communication and resources intensiveness into the consideration of factors that affecting the supply chain technology adoption for company. Thus, it provides a structure that will hopefully present a better understanding of the adoption. Lastly, the findings of this study might be shed some light on the literature of supply chain technology adoption and seeks to examine these variables with a view to improve the process of supply chain technology adoption for organization.

### **1.3 Research Questions**

In order to investigate the problem of the study, the following research questions were developed.

- (1) Are organizational factors positively related to supply chain technology adoption in SMEs located in Johor Bahru?



- (2) Are environmental factors positively related to supply chain technology adoption in SMEs located in Johor Bahru?
- (3) Are communication factors positively related to supply chain technology adoption in SMEs located in Johor Bahru?

#### **1.4 Research Objectives**

This study has three objectives:

- (1) To examine whether organizational factors are positively related to supply chain technology adoption in Small and Medium Enterprises.
- (2) To examine whether environmental factors are positively related to supply chain technology adoption in Small and Medium Enterprises.
- (3) To examine whether communicational factors are positively related to supply chain technology adoption in Small and Medium Enterprises.

#### **1.5 Scope of the Research**

This study is conducted at the capital city of the Johor, Johor Bahru. Therefore, SMEs in Johor Bahru was the scope of this research. The respondents are the executive and managerial level staffs from the SMEs, and respondents do not involve the operators. This is because only the employees from the top management able to provide the relevant feedback for this research. So this research would not be used to

apply on the perception of antecedents of supply chain technology adoption of the operator level.

The respondents are from purchasing, planning, logistics and operation departments only. This is because these departments are the most important functional area of the organization are to be integrated within the SCM paradigm. The study is only conducted on antecedents affecting supply chain technology adoption. It does not cover other disciplines of SCM such as the critical success factors of SCM, green SCM and SCM performance.

## **1.6 Significance of the Research**

Upon completion of the study, the result of the study can provide the theoretical contribution to knowledge and practice of supply chain technology adoption. This study has extended previous researches conducted in Western countries and local context. This study provides a great potential by confirmation the understanding between the antecedents of supply chain technology adoption and supply chain technology adoption in Malaysia's SMEs. Furthermore, this research has also shows that adoption studies can move beyond studying the factors based on traditional models such as Rogers' (1995) diffusion of innovation (DOI) model, which is only focused on the innovation factors such as relative advantage, compatibility, complexity, trialability and observability.

Besides that, this research can be as the practical contribution to the local SMEs, to the managers, to the employees and to the external parties such as other same industry companies. This is because the organizations will be able to apply strategies based on the findings from this research. As the number of SMEs in Malaysia keep growing over the years and they contribute significantly to Malaysian economy. Thus,

it is important that the Malaysian SMEs are able to work efficiently with their trading partners through the adoption of supply chain technology.

### **1.7 Limitations of the Research**

Due to the resource and time constraint, there are some limitations that need to be considered in this research. The limitations are mentioned below:

- i. This research only covers the SMEs located in Johor Bahru and do not cover the SMEs from other geographical areas. Hence, the findings generated only specific to SMEs located in Johor Bahru and not represent the SMEs in other geographical areas.
- ii. This research only focuses on the three factors which are organizational, environmental and communications that may affected the supply chain technology adoption in organization. Thus, the future studies can also investigate if the technological factors will affect the adoption of supply chain technology among the SMEs. Furthermore, it would also be useful to conduct a follow up studies to find out the financial, operation and relationship benefits of adoption supply chain technology of SMEs in Malaysia.

### **1.8 Summary**

The background of the study and the statement of problems were first being discussed in detail to have a better understanding on this research. The next was the objectives and research questions of this study were discussed which is mainly to

determine the antecedents which affect the supply chain technology adoption in SMEs. Subsequently, the scopes and limitations of the research were also mentioned in the following parts of this chapter. This research is expected to provide implications for top management and also employees in organizations and contribute to the literature by investigating the antecedents affecting the supply chain technology adoption in SMEs.

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