

The Contribution of Supply Chain Technology in Malaysian Textile and Apparel Industry

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Abstract—Through the rapid innovation of technology and increasing affordability, it was transformed from a means of convenience to indispensable tools for work, socialization, entertainment, and learning. Given the relevance of the topic, the purpose of this study was aimed to explore the contribution of supply chain technology adoption in Malaysian textile and apparel industry. The nature of this industry is characterized as a huge dynamic flow of physical, information, and financial. Undoubtedly, to handle the delicate nature of this business, the position of supply chain technology has increased not only in the manufacturing sector, but also in smooth movement of upstream and downstream of the supply chain. Thus, the understanding and practicing of supply chain technology adoption has become a crucial prerequisite for keeping competitive in the global race. Even though technology is widely implemented and studied in many industries and countries by researchers, but the study of adoption of supply chain technology in Malaysian textile and apparel industry is insufficient. In view of the significance given to Third Industrial Master Plan by the government Malaysia, it is necessary to recognize the stimulus of supply chain technology adoptions. The results suggest and highlight the extent of supply chain technology adoption and the benefits perceived by textile and apparel companies from supply chain technologies. This study believed that supply chain technology adoption could be beneficial to both internal and external supply chains. The result of this study could be used as a precursor to support future researchers in further investigation on this extent.

Index Terms—contribution, supply chain technology adoption, Malaysian textile and apparel industry

I. INTRODUCTION

The developing country, Malaysia, has one of the competing countries globally for decades. As at 2013, Malaysia economy was ranked 24th in the global competitiveness index [1]. This enables Malaysia to be one of the fastest growing economies in the world. At this point of view, Malaysia economy was declared as the 34th largest economy in the world's gross domestic product (GDP) worth US\$305 billion, in 2012 [2]. Malaysian economy, rapid growth is mostly contributed by manufacturing and service sectors as well as textile and apparel industry. From the perspective of numerals, Department of Statistics Malaysia [3] reported that textile

and apparel industry has contributed 1.70% to the growth of GDP on manufacturing sector in 2012. Based on the prospective of the industry, it has been recognized by the Third Industrial Master Plan (IMP3) for further advancement. Consequently, it has possesses the highest projection of export's annual growth, which is 7.80% annually [4]. Aforementioned shows that the industry is potential to be researched.

II. CURRENT ISSUES

Malaysian textile and apparel industry is highly fragmented with small and medium enterprises (SMEs) [5]. Based on the directory provided by Federal of Malaysian Manufacturer (FMM) [6], Malaysian textile and apparel industry is made up of 1% microenterprise, 30% small enterprises, 44% medium enterprises, and 25% large enterprises. The nature of SME, textile and apparel industry become dynamic competition and short life cycles, tremendous product variety [7], high volatility [5], low predictability [8], high impulse purchasing [9], unclear market boundaries, non-linear direction [10], and colossal number of product codes [5]. Thus, the common issues that usually faced by the industry are related to its business operations such as relational, technological, and organizational culture capability [11]-[14]. Nevertheless, it has a great number of contributions to the country such as economic development, employment opportunities, and resource utilizations. Therefore, Malaysia has allocated a specific attention on the expansion of the industry [15].

The world has kept changing. The role and contribution of technology to the world have been extended rapidly. Supply chain technology is one of the technologies that are very useful to the industry in improving performance. It can be understand as an application that used to transforms the raw data into useful information and knowledge that supporting practitioners to well-organizing and improving their business operations such as easy traceability and multi usage ability [16]. Supply chain technology adoption of the related companies is one of the keys to solve the majority issues in the organizations. However, the situations like complexity, volatile, and dynamic of textile and apparel supply chains has made the studies of supply chain technology adoption more challenges [17], [18]. The result of literatures search shows that there are relatively handful research materials available on supply

chain technology adoption in the industry. Hence, this leads to several questions on supply chain technology adoption in Malaysian textile and apparel industry. What are the benefits obtained from adoption of supply chain technology by textile and apparel companies? What kinds and in what extent the supply chain technology adoption in textile and apparel companies? In general, this study aims to understand the contribution of supply chain technology adoption in Malaysian textile and apparel companies.

III. SUPPLY CHAIN TECHNOLOGY

Although, supply chain technology is universally accepted, but there is no common definition of supply chain technology [19]. Therefore, there are several definitions used to define supply chain technology by several researchers in their study [16, 19–22]. Blankley [20] generally defined supply chain technology as an information technology that is specifically used to manage or support elements or components of the supply chain. Singh [16] defined supply chain technology as an application to transforms original data into information and knowledge that can efficient and effective the business activities. Kamaruddin and Udin [19] defined supply chain technology as “*A technology or a system that use to coordinating and integrating information flow electronically throughout the internal and external supply chain to generate effectiveness and efficiency of business processes*”. However, this study defines supply chain technology as an interconnected electronic applications of hardware or software components used to turns raw data into information or knowledge by which more users adopt the technology as more resources invested increase the usefulness of the technology throughout the supply chain to generate effective and efficient supply chain operations [16], [19], [23], [24].

A. Supply Chain Technology Adoption

New technologies and innovations are constantly changing and improving the way of doing thing and approach problems. Today, technology and the applications and the services support touch human live every second. Technology has aided processes, institutions, and industries around rethought and redesigned. In the current decade, supply chain technology plays an important role in supply chain management. It intelligently provides connection between people, processes, data, and things. It is clear that supply chain technology offers higher benefits such as offering new ways to create value by better and more efficiently organizing the use of physical, information, financial, and human resources. As highlighted in the Global Information Technology Report [25], this study believes that supply chain technology would demonstrated a positive impact on short and long term performance, and this study further believes the next wave of new supply chain technology adoption will further advance the growth effects of the supply chain management. Despite the facts that supply chain technologies are becoming increasingly universal, the queries of implementation,

adoption or usage remains essential, especially for developing countries.

IV. METHODOLOGY

This study employed quantitative research method in testing objective theories [26]. The samples of 201 organizations of this study were drawn by using simple random sampling techniques from the total population of 423 organizations in the directory provided by Federation of Malaysian Manufacturers [6] and Malaysian External Trade Development Corporation (MATRADE, 2013) [28]–[30]. The total population of Malaysia textile and apparel industry includes suppliers, manufacturers, distributors, whole seller, retailers, service providers, and customers. Thus, the unit of data analysis for this study is organization. In this study, the targeted respondents are supply chain, planning, logistics, and procurement manager (some organizations called them as buyer, purchasing or customer service manager whose are direct deal with buyer, supplier, and inventory control) to provide information for the study.

As recommended by Hill [31], the sample size of ten to thirty participants for a pilot study are acceptable. Thus, a total of 201 survey questionnaires were sent through self-administrated, email, web-based, and mailed to the samples. The data was collected through the proper followed of data collection procedure advised by Whitley [32], Mentzer and Kahn [33], and Grant et al. [34]. This was led to the good response rate which is about 60%. This means that 125 survey questionnaires were returned, four were discarded due to the incomplete response, and 121 usable responses were used for the data analysis of this study.

V. FINDINGS

Based on the survey data, Table I shows the finding of the extent of supply chain technology adoption in Malaysia's textile and apparel context. The respondents were asked to specify the extent of each supply chain technology adoption. In measuring the extent of supply chain technology adoption, respondents were requested to choose a response on five-point Likert scales anchor at ‘1=not adopted, 2=little extent, 3=moderate extent, 4=considerable extent, 5=great extent’. The total of 201 survey questionnaires were sent through mail and 125 questionnaires were response. There are total of four questionnaires were rejected and thus, 121 questionnaires were used for data analysis. The finding revealed that most of the textile and apparel organizations were great extent in the adoption of supply chain technology such as bar-coding technology, electronic data interchange (EDI), internet, material requirement planning systems (MRP), radio frequency identification system (RFID), and wireless or mobile devices. However, most of the textile and apparel organizations were moderate extent in the adoption of supply chain technology such as customer relationship management systems (CRM), enterprise resource planning systems (ERP), extranets, intranet, and supplier relationship management systems (SRM).

Surprisingly, about 30% of the organizations in the industry does not adopted computer aided design systems (CAD). The finding further revealed that most of textile and apparel organizations are rely on the supply chain technology in operating their business due to the usefulness of the adoption. The adoption of supply chain technologies are keep increasing and thus the number of benefits from the adoption are keep growing as well, since the power of supply chain technology is improving through the number of user of the application.

TABLE I. NUMBER OF RESPONSE

Supply Chain Technology	To What Extent (n=121)				
	Not Adopted	Little Extent	Moderate Extent	Considerable Extent	Great Extent
	1	2	3	4	5
Bar-Coding	17	8	14	28	54
CAD	41	7	23	25	25
CRM	33	10	35	27	16
EDI	16	8	29	34	34
ERP	19	9	37	26	30
Extranets	25	10	38	18	30
Internet	8	8	21	23	61
Intranet	21	3	35	30	32
MRP	19	7	27	30	38
RFID	36	10	27	13	35
SRM	31	12	39	22	17
Wireless/ Mobile Devices	18	11	13	24	55

Based on the data presented on Table I, Table II is generated to provide reader a clear view on the extent of supply chain technology adoption in Malaysia textile and apparel industry. The number in Table II is generated through multiply the number of response of each extent to the number of extent. The total answers obtained from each supply chain technology were used to divide by the total number of response which is 121. While, the final number were converted to percentage form. Based on the results showed in the Table II, all of the supply chain technology adoption were in the extent between 57% to 80%. The findings revealed that all supply chain technology adoption in this study were in the range of considerable extent.

For the visibility purpose, Fig. 1 is provided to illustrate the visual comparison of the extent of each supply chain technology adoption in Malaysian textile and apparel industry. Based on the Fig. 1, the number of extent anchor at '0%=not adopted, 100%=great extent'. Fig. 1 clearly showed that approximately all of the supply

chain technology adoption was in the range of considerable extent.

TABLE II. THE EXTENT OF SUPPLY CHAIN TECHNOLOGY ADOPTION

Supply Chain Technology	The Extent of Adoption (%)
Bar-Coding	76
CAD	58
CRM	57
EDI	70
ERP	66
Extranets	63
Internet	80
Intranet	68
MRP	70
RFID	60
SRM	57
Wireless/ Mobile Devices	74

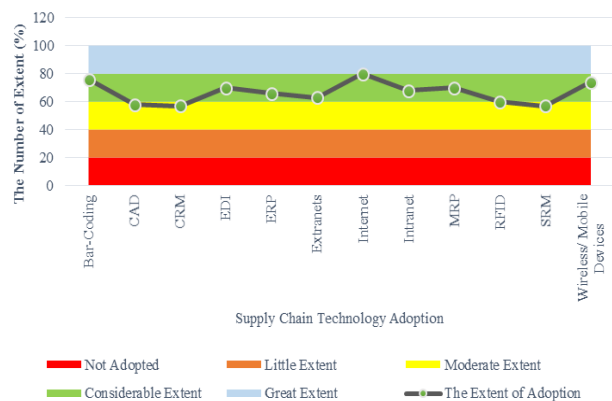


Figure 1. The extent of supply chain technology adoption

VI. BENEFITS OF SUPPLY CHAIN TECHNOLOGY ADOPTION

In today's increasingly globalized economy, supply chain technology adoption has changes the industry structures and rules of competition, creates competitive advantages, and creates new business opportunities [35]. Some competitive advantages and new business opportunities are dyadic or multilateral, depend on both or a number of supply chain parties, and some individualistic [36]. Most of the benefits of supply chain technology adoption are depends on the willingness of both parties in the supply chain to optimal the benefits [11]. However, Auramo, Kauremaa, and Tanskanen [37] found that most of the companies are individualistic as they adopt from an individual point of view. Though, this needs the continuous effort in maintaining operational efficiency of the technology after the adoption process in order to get long term benefits on it. This study found numerous benefits of supply chain technology adoption that has been identified by several researchers in their

study. The researchers found that supply chain technology adoption is lead to better supply chain reliability, increase supply chain responsiveness, improve supply chain agility, minimize supply chain costs, and enhance asset management. Auramo *et al.* [37] further advised that most of the benefits are overlapping and interlinked. Therefore, it is difficult to specify the benefit explicitly. However, some of the benefits are specified and illustrated in Table III.

TABLE III. BENEFITS OF SUPPLY CHAIN TECHNOLOGY ADOPTION

Benefits	Description	Source
Improved Reliability	Enhanced on time delivery	[11], [38]–[40]
	Enhanced customer satisfaction	[11], [21]
	Increased productivity	[11]
	Better product quality	[21], [39]
	Better data accuracy	[39]
	Consistent information	[39]
Improved Responsiveness	Improved forecast accuracy	[21]
	Improved process time	[38]
	Greater efficiency	[38], [41], [42]
	Real time information	[21], [38], [39]
	Reduced delivery time	[38]
	Shorter response time	[11], [21], [39], [43]
	Better service quality	[12], [21], [39], [42]
	Shorter cycle time	[11], [21], [38], [39], [41]
Improved Agility	Improved customer relationship	[44]
	Enhanced collaboration	[21], [38], [40], [44]
	Global order opportunities	[12], [38]
	Rapid react to market changes	[11], [43]
	Broaden market coverage	[12], [44]
	Flexibility in administration	[12]
	Flexibility in communication	[12]
Minimized Costs	Convenience in interaction	[12]
	Reduce supply chain costs	[39]
	Reduced purchasing costs	[11]
	Reduced inventory costs	[11], [21], [38]
	Reduced overall product costs	[11], [42]
Improved Asset Management	Lower transaction costs	[12]
	Improve quality control	[38]
	Reduced risk or credit risk	[38]
	Faster payment operation	[38]
	Lower interest rate	[38]
	Better assets utilization	[11], [43]
	Optimal inventory level	[38], [39], [41], [43]
	Reduced obsolete inventory	[38], [39], [41], [43]
	Precise stock replenishment	[21]
	Improved supply chain profits	[21]
	Reduced bullwhip effect	[21], [41]

Based on Table III, supply chain technology adoption is lead to better supply chain reliability, increase supply chain responsiveness, improve supply chain agility, minimize supply chain costs, and enhance asset management.

VII. DISCUSSION AND CONCLUSION

The results of the literature review revealed that supply chain technology adoption able to give contribution in improving supply chain operational performance of Malaysian textile and apparel industry. Improved supply chain reliability, responsiveness, agility, costs and asset management are some of the benefits of supply chain technology adoption. The enormous benefits of supply chain technology adoption hinges to a large extent on the

ability of the industry to operate more efficiently and effectively in the global competitive market environment. Therefore, Malaysia's textile and apparel companies should pay more attention to adopt proper supply chain technologies to achieve higher performance. However, this study found that most of the textile and apparel company are adopting supply chain technology in the great and moderate extent. This is the initial study that might help future researchers in further exploration of supply chain technology adoption in textile and apparel supply chain in Malaysia.

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