SUPPLY CHAIN COLLABORATION AMONG MALAYSIAN SME MANUFACTURERS

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This thesis is submitted in fulfillment of for requirement for the award of the Degree of Master of Science in Technology Management.

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OCTOBER, 2012
ABSTRACT

Malaysian 3rd Industrial Master Plan was developed to improve the country global competitiveness by positioning Malaysia as a major manufacturing hub and service provider in the global supply chain. To achieve this, it is suggested that Malaysian manufacturers especially SME should be involved in supply chain collaboration in their business operations. However, it is discovered that there are very few reported research on the supply chain collaboration activities among Malaysian SME manufacturers. The objective of this research is to uncover the supply chain collaboration activities among Malaysian SME manufacturers with their trading partners. This is to be done by determining the level of supply chain collaboration of Malaysian SME manufacturer and investigating the reason Malaysian SME manufacturers supply chain collaborations is at that level. In order to achieve the above objective, a mixed method of quantitative approach using survey method is employed to determine the level of supply chain collaboration and qualitative approach using personal interview method is employed to find out the reason for why Malaysian SME manufacturers’ supply chain collaboration is at that level. This research discovered that the supply chain collaboration of Malaysian SME manufactures with their trading partners is at minimal level. This is due to their current business relationship that they have with their trading partners do not required them to collaborate at higher level. On the other hand, Malaysian SME manufacturer are willing to have a high level of supply chain collaboration if long term business relationship could be established. Therefore, it is concluded that the type of business relationship or cooperation with trading partners can determine level of supply chain collaboration.
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CHAPTER 1

INTRODUCTION

1.1 Background

“No man is an island, collaboration is the new way”. This is the statement by Malaysian Prime Minister, Datuk Seri Najib Tun Razak, at the Commonwealth Business Forum during Commonwealth Heads of Government (CHOGM) conference held in Port of Spain emphasizing on collaboration as solutions to address global challenges (Lee, 2009). The Malaysian government encourages Malaysian companies to be involved in supply chain collaboration in their business operations. This has been spelled out in the Malaysian 3rd Industrial Master Plan (MITI, 2006) where one of the main objectives is to improve the country’s global competitiveness. The plan intended to assist and facilitate Malaysian small and medium enterprises (SMEs) toward economic integration regionally and globally. This shows that how important collaboration is to Malaysian government.

Concurrently, Oxford English Dictionary (1999) define collaborate as “to work jointly or to cooperate willingly”. Specifically, collaboration is about integration within and outside the boundaries of individual firms (Min et al., 2005). Collaboration is also about identifying, communicating and achieving a common shared objective (Newing, 2007). Parung (2005) stated that collaboration means working together where individuals or organizations work together towards some common aim.

Previous research in supply chain management and collaboration, emphasized mostly on examining collaboration attributes. Others attempted to measure the
collaboration process and the performance gained from such ventures. However, most of these studies are focusing on collaboration in foreign countries. Extensive literature review (Chapter 2) revealed lack of existence of reported research on the supply chain collaboration among Malaysian manufacturers especially on Malaysian small and medium enterprise (SME).

Therefore this chapter presents context of the study, problem statement, objective of this research, significance of this research, operational definition, structure of the thesis and finally summary of the chapter.

1.2 Context of the study

Malaysian Small and Medium Industries Development Corporation (SMIDEC) define SME as follows:

“Malaysia adopted a common definition of SMEs to facilitate identification of SMEs in the various sectors and sub-sectors. This has facilitated the Government to formulate effective development policies, support programs as well as provision of technical and financial assistance. An enterprise is considered an SME in each of the respective sectors based on the Annual Sales Turnover or Number of Full-Time Employees as shown in the table below (SMIDEC, 2008).”

Table 1.1: Definition of SME by size (Source: SMIDEC, 2008)

<table>
<thead>
<tr>
<th>Sector/Industry</th>
<th>Micro-enterprise</th>
<th>Small enterprise</th>
<th>Medium enterprise</th>
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<tr>
<td>Manufacturing, Manufacturing-Related Services and Agro-based industries</td>
<td>Sales turnover of less than RM250,000 OR full time employees less than 5</td>
<td>Sales turnover between RM250,000 and less than RM10 million OR full time employees between 5 and 50</td>
<td>Sales turnover between RM10 million and RM25 million OR full time employees between 51 and 15</td>
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<tr>
<td>Services, Primary Agriculture and Information &amp; Communication Technology (ICT)</td>
<td>Sales turnover of less than RM200,000 OR full time employees less than 5</td>
<td>Sales turnover between RM200,000 and less than RM1 million OR full time employees between 5 and 19</td>
<td>Sales turnover between RM1 million and RM5 million OR full time employees between 20 and 50</td>
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SMIDEC defines Malaysian SME into 3 sizes which are micro enterprise, small enterprise and medium enterprise. Table 1.1 explains the definition of the sizes of Malaysian SME.

The SME sector has been and shall remain one of the key drivers of the nation’s economic growth accounting for 99.2% of the total business establishment in Malaysia (Ghani, 2007). Datuk Seri Najib Tun Razak (DPM, 2005) during his tenure as Deputy Prime Minister stated during his speech at the ceremony to formalize a strategic alliance between SME BANK & CIMB-BCB on 10th of November, 2005, he clearly stated that

- Small to medium businesses or SMEs are the foundations of any successful economy.
- SME community plays an important part in revitalizing local economies, during times of economic stress
- SMEs also help to accelerate the growth of larger firms whose market competitiveness depends on the products and services of homegrown SMEs.
- Regional supply and distribution chains often bring together networks of SMEs that span across national borders.

He however believed that Malaysian SMEs have not clearly reached their full potential. SMEs collectively employ one third of the total labor force, and yet accounts for a mere 6 percent of our GDP, compared to between 30 and 40 percent in developed economies such as Australia, Japan and Germany.

He highlighted that, although there are a large number of smaller SMEs, very few have graduated to the critical medium-sized strata with real capabilities to support greater diversification and linkages with other SMEs. Fewer still have developed the skills, scale and financial resources to become efficient partners to larger conglomerates and MNC. Malaysian SME cannot afford to be held back by the lack of technological skills, knowledge or funding inadequacies. Due to the importance of SME to the nation, under the Ninth Malaysia Plan, the government has allocated RM623 million for SMEs in the manufacturing sector (Damodaran, 2009).

Malaysian 3rd Industrial Master Plan (3IMP) issued by Ministry of International Trade and Industries (MITI, 2006) launched by the 5th Malaysian Prime Minister Datuk Seri Abdullah Badawi on the 18th of August, 2006, aim is to improve the country global competitiveness from the year 2006 to 2020. The plan intended to
facilitate Malaysian industries to take advantage of opportunities, rising from the growing trend, toward economic integration at regional and global level. The focus will be on transforming industrial businesses and complementary services, especially Malaysian SME, into strong knowledge-intensive and value-creating entities.

To achieve the above plan, various strategies were developed to facilitate collaborations between Malaysian firm including the SME with government link companies and multi-national companies in operating in Malaysia and overseas. The plan also outlined the strategy to encourage industrial growth and raising the level of competitiveness and productivity of the manufacturing and service sectors. This is to position Malaysia as a major manufacturing hub and service provider in the global supply chain. As mentioned earlier the Malaysian 3rd Industrial Master Plan intended to improve the country’s global competitiveness by assisting and facilitating Malaysian small and medium enterprises (SME) toward economic integration at regional and global level. This is to be achieved by encourages Malaysian companies to be involved in supply chain collaboration in their business operations.

Malaysian SME today is facing high level of international competition. This includes competition from Asian Free Trade Agreement (AFTA) member countries and competition from MNC or new competition from India and China. Therefore Malaysian SME need needs to enhance it competitiveness. It is suggested that one option Malaysian SME should consider is networking and forming strategic alliance such as collaboration (Saleh and Ndubisi, 2006).

1.3 Problem Statement and Research Questions.

Malaysian government in 3rd Industrial Master Plan (MITI, 2006) encourages Malaysian companies to collaborate and adopt greater application of e-business in its operations. Asian Productivity Organization (APO) symposium in December 2001, recommended that for SMEs that wish to realize higher productivity should embrace supply chain collaboration (Asian Productivity Organization, 2001). For example, one if the mechanism is joining a non government body, the Exporters Club of Malaysia, where one of the main objectives is to provide a platform for networking
and make profitable working collaboration among SME (Exporters Club of Malaysia, 2009).

SME can embrace supply chain collaboration by adopting e-business (e-commerce or c-commerce). Chong et al (2009) conducted a study on SMEs’ adoption of e-business. The result of the study revealed that communication, collaboration and information sharing all significantly affect the adoption of e-business in the supply chain. It also revealed that organizations that view the importance of collaboration are more likely to adopt e-business in the supply chain. It is discovered that the more SME willing to share vital supply chain information, the more SME likely to adopt e-business.

Despite the above, Malaysian Small and Medium Industries Development Corporation (SMIDEC) reported in 2002 only 16.6% of Malaysian SME adopted e-business solution into their business operations (NST, 2002). In fact findings from a research conducted by Koh and Le (2003) revealed that e-commerce in Malaysia especially in manufacturing firms lack behind and find themselves the least developed in e-business initiatives. The study discovered that business to business (B2B) e-commerce or c-commerce in Malaysia manufacturing sector is still in its infancy stage.

This could be due to the IT knowledge and e-commerce technology knowledge amongst Malaysian SME owners are generally low and Malaysian SME owners expect to see beneficial results of using e-commerce by other SMEs before they commit themselves to this innovation (Hussin and Noor, 2005). Sayuti (2007) stated that supply chain integration has been recognized by many established organization worldwide, are yet to be exploited by Malaysian SMEs.

With the hype surrounding the implementation of e-commerce and c-commerce in supply chain collaboration, there is one main issue that we need to look into before deciding to venture into such activities. The collaboration via e-commerce and c-commerce supply chain model in need to be reviewed closely and elements of enabler and barrier need to be identified in order to ensure such collaboration process to be a success ventures. There exists little reported research on the supply chain collaboration activities among Malaysian manufactures. Previous research by Jutla et al. (2002), Sondoh and Tanakinjal (2002) and Lee and Runge (2001) only focused on understanding the readiness of Malaysian SME towards e-
commerce adoption in supply chain. These researches focused more on looking at technology infrastructure which translates to readiness to adopt e-commerce only.

A research paper argued that the current research agenda regarding supply chain management is driven by efficiency alone (New, 1997). A wider scope of research which account for the social function and political and economic implications of supply chain developments is recommended.

The above discussion revealed that there is a gap on the issue of supply chain collaboration among Malaysian SME. Table 1.2 summarized the discussion which leads towards the development of tentative problem statement.

### Table 1.2: Summary of inquiries which lead to development of problem statement

<table>
<thead>
<tr>
<th>Inquiry</th>
<th>Explanation</th>
<th>References</th>
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<tbody>
<tr>
<td>Why the study on SME?</td>
<td>SME are the foundations of any successful economy. Therefore it is national interest to study Malaysian SME especially manufacturing sector.</td>
<td>DPM (2005), Ghani (2007), Damodaran, (2009), MITI (2006)</td>
</tr>
<tr>
<td>Why the studies on SME supply chain?</td>
<td>One of the 3rd Industrial Master Plan strategy is to position Malaysia as a major manufacturing hub and service provider in the global supply chain</td>
<td>MITI (2006), DPM (2005),</td>
</tr>
<tr>
<td>Why the studies on SME supply chain collaboration?</td>
<td>Malaysian SME faces a high level of international competition. Therefore to enhance competitiveness, it is suggested that Malaysian SME should consider networking and collaboration.</td>
<td>Saleh and Ndubisi (2006), Asian Productivity Organization (2001), Exporters Club of Malaysia (2009),</td>
</tr>
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</table>

However before exploring on wider scope on the supply chain collaboration, there is need to understand the existing situation on the supply chain collaboration itself. In this case, viewing the above literature is discovered that the Malaysian SME manufacturers’ supply chain collaboration activities are still unknown. Therefore a study should be conducted to look into this situation among Malaysian
manufacturers. View to the above a problem statement is developed as the following statement.

“The level of supply chain collaboration of Malaysian SME manufacturers with their trading partners is still unknown.”

In order to solve the above problem two research questions are generated:

Question 1: What is the level of supply chain collaboration of Malaysian SME manufacturers with their trading partners?

Question 2: Why Malaysian SME manufacturers’ level of supply chain collaborations is at that level?

1.4 Objective of the research

The main objective of this research is to uncover the supply chain collaboration among SME manufacturers in Malaysia. Specifically the research is trying to answer the following objectives

1. To determine the level of supply chain collaboration of Malaysian SME manufacturers with their trading partner.
2. To investigate the reason why Malaysian SME manufacturers’ level of supply chain collaborations is at that level.

1.5 Scope of the research

The scope of the research focuses on the collaboration in supply chain activities among Malaysian SME manufacturers only. The supply chain activities are only confined to the Plan, Source, Make and Deliver category within the framework of this research. It also focuses on the information integration only which will indicates the level of supply chain collaboration.
1.6 Significance of the research

This research relates the collaboration issues within Malaysian context. It provides clearer picture on supply chain collaboration among SME manufacturers in Malaysia. It provides knowledge on why Malaysian SME supply chain collaboration activities are at minimal level.

This research also gives indications on which activities in supply chain, Malaysian SME manufacturers prefer to collaborate. Therefore Malaysian SME can select the preferred activities and avoid the least preferred activities when they want to practice supply chain collaboration with their trading partners.

Furthermore the finding could assist the authority to develop more proper policy to promote supply chain collaboration among Malaysian SME. A proper program or incentive could be develop to promote supply chain collaboration among Malaysian SME which could raise the level of supply chain collaboration and assist Malaysian SME to be competitive globally.

1.7 Operational definitions

Malaysian SME: Malaysian company with sales turnover of less than RM250,000 or full time employees less than 5 (micro-enterprise); or sales turnover between RM250,000 and less than RM10 million or full time employees between 5 and 50 (small enterprise); or sales turnover between RM10 million and RM25 million or full time employees between 51 and 15 (medium enterprise)(SMIDEC, 2008).

Supply Chain Management: Management of integrated activities that procure materials and services, transforming them into intermediate goods and final products, and delivering the products through a distribution system (Haizer and Render, 2006).

Collaboration: Collaboration involves change in operational activities within the collaborating organization where the
processes are redesigned, redundancies eliminated and activities are moved to appropriate partner. (NerveWire, 2002)

E-commerce: Practiced in Supply Chain Model which transmit data manually (mail, e-mail, phone or fax) or through Electronic data interchange (EDI) and data usually being transmitted “one-to-one” (Gartner, 1999).

C-commerce: C-commerce is also known as collaborative commerce. It involves working parties to collaborate with each other. C-commerce is when information is being shared through secured internet line to collaborate on decision making, synchronize activities, optimize events, solve problem together, and manage business process across enterprises (Russel and Taylor, 2006).

1.8 Structure of the thesis

This thesis is divided into 6 chapters follow by references section and appendixes section.

Chapter 1, which is this chapter, highlights the background of the research, the context of the study, problem statement and research questions significance of the research, structure of the thesis and chapter’s summary.

Chapter 2 defines and explains the supply chain management concept, explains the link of supply chain management with e-commerce and e-commerce, reviews previous researched and papers published regarding collaboration and collaboration culture, discusses the reviewed researched and papers and concludes the discussion with the aims to identify critical issues, regarding collaboration, in supply chain management.
Chapter 3 justifies the mixed methods which are used in this research. It discusses the research philosophy, type of research, the research framework, selection of strategy and finally the research process itself in relation to the problem statement mentioned above.

Chapter 4 presents the analysis of the data gathered from the survey questionnaires conducted for this research. This chapter discusses the recoding of the items, the validity and reliability of the data, respondents information integration with trading partners and level of supply chain collaboration of Malaysian SME manufactures. The finding from this chapter should be able to answer the research question 1 which is to identify the level of supply chain collaboration of Malaysian SME manufacturers with their trading partners.

Chapter 5 presents the analysis of the data gathered from the field interviews with four Malaysian SME manufactures from various nature of business. This chapter discusses the summary of the interview and the analysis of the interview transcripts. Miles and Huberman (1994) data analysis method is used and the findings are translated into relevant and meaningful conclusion. The findings from this chapter should be able to answer the research question 2 which explain why Malaysian SME manufacturers’ level of supply chain collaboration is at the level mentioned in Chapter 4.

Chapter 6 concludes the findings of this research and reveals the position of Malaysian SME in regards of supply chain collaboration. It also states the recommendation for future research based on the supply chain collaboration.

1.9 Summary

Malaysian 3rd Industrial Master Plan was developed to improve the country global competitiveness by positioning Malaysia as a major manufacturing hub and service provider in the global supply chain. To achieve this, it is suggested that Malaysian manufacturers especially SME should be involved in supply chain collaboration in their business operations. This research provides the insight of Malaysian SME manufacturers supply chain activities. Next chapter will reviews and discusses issues
regarding supply chain collaboration, the Malaysian scenario on supply chain collaboration, if any, and identify critical issues, regarding collaboration, in supply chain management.
CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

The new economy today is driven by demand for higher quality products, faster productions and distribution, and lower price (Allen, 2003). The dilemma facing business enterprise is how to fulfill the demand, and remain competitive and relevant to the current economy. Business decisions are dominated by the globalization of markets and increased competition among enterprises (Meca and Timmer, 2007). One area usually an enterprise focused upon to gain competitive advantage by configure and manage their supply chain operations to meet their business requirement (Chase et al., 2006). Collaboration between two or more organizations has been identified as one way of achieving competitive advantages in supply chain management (Parker, 2000).

NerveWire (2002) stated collaboration involves change in operational activities within the collaborating organization where the processes are redesigned, redundancies eliminated and activities are moved to appropriate partner. Such improvement of supply chain management can reduced operational cost, gain higher customer retention, improved in planning, and respond efficiently in production towards market changes (Lan and Unhelkar, 2006). In addition it can also increased sales, reduced logistics costs, dramatic improvement in product availability and lead times are among the benefits of collaboration in supply chain (Walker, 1994). This research is based on the foundation of Supply Chain Management (SCM), and collaboration which are the background of the supply chain collaboration.
This chapter defines and explains supply chain management, the link of supply chain management with e-commerce and c-commerce, and collaboration. This chapter also reviews and discusses issues regarding collaboration, the Malaysian scenario on supply chain collaboration and concludes the discussion with the aims to identify critical issues, regarding collaboration, in supply chain management.

2.2 Supply Chain Management definitions.

Supply Chain Management is management of integrated activities that procure materials and services, transforming them into intermediate goods and final products, and delivering the products through a distribution system (Haizer and Render, 2006). It encompasses a wide set of interdependent, cross-industry business strategies that can reduce costs, expand revenue and increase market share through improve efficiency and effectiveness (Gartner, 1999). Russell and Taylor (2006) stated that Supply Chain Management requires managing flow of information through the supply chain in order to attain the level of synchronization that will make it more responsive to customer needs while lowering cost.

2.3 Supply Chain Management models.

There are various supply chain management models available and used in the industries. These include; Supply Chain Operations model, SCOR model, Linear and Non-linear Supply Chain Process model, and Supply Chain Collaboration Level model.
2.3.1 Supply Chain Operations model

Hugos (2006) provide detail of Supply Chain Management by describing supply chain operations model. The model consists of four components which are Planning, Sourcing, Making, and Delivering. The model as in figure 2.1 highlighted the functions and activities in each category.

![Supply chain operations model](image)

**Figure 2.1. Supply chain operations model. Source: Hugos (2006)**

2.3.1.1 Plan

Hugos (2006) stated that Plan component consist four main components which are Demand Forecasting, Product Pricing, and Inventory Management, Demand Forecasting is the foundation for any enterprise to plan their internal operations and cooperation activities among supply chain players to meet market requirement. Four major variables that determine market condition that need to be considered in Demand Forecasting are Supply Conditions that determine number
product and producer available and the lead time of the product that can be produced, Demand Conditions that describe the direction of the demand for the product whether it is declining or growing, Product Characteristics that look into product features that influence the demand for the product, and finally Competitive Environment that describe that action of the enterprise and its rival to capture market share (Chopra & Meindl, 2010). Besides competitive environment, general business and economic conditions, market trend, and enterprise’s own plan for advertising, promotion, pricing and product changes are other factors also need to be considered when forecasting (Arnold et. al, 2008). The methodology used in forecasting are Qualitative Methods which depend on subjective view of the market, Casual Methods that relate demand to market factors, Time Series Methods that based on historical demand as indicator for future demand, and Simulation Methods that combine Casual and Time Series Methods to simulate consumer behavior under different circumstances (Chase, 2006).

Product Pricing Planning is basically company strategic planning to influence demand using price where it can be use to maximize either revenue or gross profit (Hugos, 2006). Pricing flexibility is depending on the enterprise’s cost structure Workforce size and productive capacity has bearing on cost structure. Flexibility to vary workforce size and productive capacity could influence pricing structure which will influence demand. Inventory carrying cost also could influence pricing structure (Arnold et. al, 2008).

Inventory Management (IM) objective is minimizing inventory cost while meeting the required service level towards customers. With Demand Forecast and Product Pricing inputs, IM is a continuous process of balancing product inventory level to meet demand and taking advantage of economic of scale to get the best product price (Arnold et. al 2008; Hugos, 2006).

2.3.1.2. Source

Hugos (2006) elaborated that the Source component involves Procurement and Credit and Collections operation. Procurement operations main objective is to source and buy product or materials at lowest price as possible. Procurement functions
consist of five main activities. They are Purchasing, Consumption Management, Vendor Selection, Contract Negotiation, and Contract Management.

Purchasing activities involve buying direct or strategic materials that are required to produce end products for customers or maintenance, repair, and operations (MRO) products that usually utilize as part of daily operations (Fawcett et al., 2007). Consumptions Management is an activity to manage the enterprise products consumption and monitoring the expected level consumptions against actual consumptions. When consumption is notably above and below expectation, appropriate parties should be notified so that possible cause can be determined and corrective action can be taken (Hugos, 2006) Vendor Selection activities are where number of suppliers are narrowed down to acceptable number so that an enterprise can leverage it purchasing power with few reliable suppliers and get better price in return for purchasing higher volume product (Haizer & Render, 2006). Contract Negotiation is where contracts are negotiated based on specific items, prices, and service levels with preferred with each vendor in the vendor list. Finally, once contract are officially agreed and signed upon, vendors performance are monitored and measured against their individual contract. This is where Contract Management activities are necessary. All these contracts need to be managed and monitored and vendors are notified on any shortcomings and corrective actions required (Hugos, 2006).

Another operation in Sourcing is Credit and Collections. The Credit and Collections functions can be divided into three main categories. Firstly, Credit Policy needs to be established. Establishing Credit Policy is where an enterprise financial unit set risk acceptance criteria to respond to the state of its receivables. These criteria are usually adjusted according to economic and market conditions. Once the Credit Policy is set, Credit and Collection Practice, based on the Credit Policy need to be implemented. This involves putting in standard operating procedure to carry out and enforce the Credit Policy. The procedures will give the sales team guideline to give customer credits and also collection of payment forms. Finally, managing Credit Risk, where the enterprise takes intelligent risks that support its business plan. It main objective is to find ways to lower credit risk of selling to customers (Hugos, 2006).
2.3.1.3. Make

Hugos (2006) further explained that Make component involves Product Design, Production Scheduling and Facility Management. Product Design based on supply chain perspective is designing products with fewer parts, simple design, and modular construction from generic sub-assemblies. Technology availability and product performance requirements are factors need to be considered in product designing (specifications) and components selection. Product Design defines the shape of the supply chain and this has great impact on the cost and availability of the product.

Product Scheduling allocates available capacity such as equipment, labor, and facilities, to the work that need to be done with a goal of efficient and profitable utilization of these capacities. Right balance need among several competing objectives need to be done. These competing objectives are High Utilization Rates (long production runs and centralized manufacturing and distribution centers), Low Inventory Levels (short production runs with just-in-time delivery of raw materials) and High Level of Customers Service (high level of inventory or short production runs). Economic lot size (production quantities) will then be calculated where it will balances production set up costs against inventory carrying costs. Finally productions are schedule with the shortest run out times are made first (production sequence) (Haizer & Render, 2006 ; Hugos, 2006).

The third operations activity in Making is Facility Management. All Facility Management decision happened with the constraints set by decisions about facility locations. Therefore ongoing facility management takes location as given and focuses on how best to use the capacity available. This involves making decision on the role each facility will play, on how the capacity is allocated in each facility, and on the allocation of suppliers and markets to each facility (Hugos, 2006)

2.3.1.4. Deliver

Finally Hugos (2006) stated that the Deliver components consist of three operations where two main operations activities is considered as core link between trading
partners in supply chain. There are Order Management which involves receiving customer orders and Delivery Schedule which involves delivering product to customers.

Order Management involves passing information about order from customers to trading partners along the supply chain. These also involve order processing, forwarding order delivery dates, product substitutions and back orders forward through the supply chain to customers. Order processing involves purchase order processing, invoicing and delivery documentation preparation (Arnold et. al., 2008).

Delivery Schedule which usually constrained by the decisions made concerning transportation modes, practice two methods of deliveries which are, Direct Deliveries and Milk Run Deliveries. Delivery made from one originating location to one receiving location is called Direct Deliveries. The main concern when scheduling with this method is to obtain the shortest path between two locations. Deliveries that are routed to either bring product from a single originating location to multiple receiving locations or vise versa is known as Milk Run Deliveries. More complex than Direct Deliveries, Milk Run Deliveries scheduling method need to consider about delivery quantities of different products, frequency of delivery, routing, and sequencing of pickups and deliveries. Delivery scheduling need to consider delivery dates, mode of delivery and cost involved in determining the delivery mode (Chopra & Meindl, 2010).

The third operation is return Processing which activity occurs when customers need to return a product for whatever reason. Also known as "reverse logistics " , which is the result of supply chain inefficiencies that created the need to return products. Most common reasons of product being returned are wrong products being delivered, products damaged during transit, delivery of defect product and more product delivered than what was required by customer. Therefore product retuning process need to be efficient and most decision making in return delivery is almost similar to delivery activities (Hugos, 2006).
2.3.2 SCOR model

There is also other category of Supply Chain Management Model. For instance there is Supply Chain Council’s SCOR model. The above Supply Chain Operations model is slightly different from Supply Chain Council’s SCOR model at level 1. The difference is, Hugo’s model incorporated the Return Processing operations activities in Delivery category of operations, while in SCOR model the Return Processing operations are dedicated as separate operations category due to the high additional cost incurs for the activities. SCOR model combines element of business, process engineering, metrics, benchmarking, and leading practices in a single framework (Bolstorff and Rosenbaum, 2007).

Supply-Chain Council (2008) website describe SCOR model as below:

“The Supply-Chain Operations Reference-model (SCOR) is a process reference model that has been developed and endorsed by the Supply-Chain Council as the cross-industry standard diagnostic tool for supply-chain management. SCOR enables users to address, improve and communicate supply-chain management practices within and between all interested parties. SCOR is a management tool. It is a process reference model for supply-chain management, spanning from the supplier's supplier to the customer's customer. The SCOR-model has been developed to describe the business activities associated with all phases of satisfying a customer's demand. By describing supply chains using process building blocks, the Model can be used to describe supply chains that are very simple or very complex using a common set of definitions. As a result, disparate industries can be linked to describe the depth and breadth of virtually any supply chain. The Model has been able to successfully describe and provide a basis for supply chain improvement for global projects as well as site-specific projects.

SCOR model has three-levels of process detail. Level 1 assists a company in defining scope, level 2 shows type of supply chain and level 3 shows process element details, including performance attributes (Bolstorff and Rosenbaum, 2007). This is illustrates in the figure 2.2.
LEVEL 1 - Sets Scope, and Context Geographies, Segments, And Products

LEVEL 2 - Identifies major Configurations within Geographies, Segments, and Products

LEVEL 3 - Identifies Key Business activities within a configuration

Figure 2.2: SCOR Framework Level Model (Source: Supply Chain Council, 2008; Bolstorff and Rosenbaum, 2007).

The strength of the SCOR model is that it provides a standard format to facilitate communication and it is a useful tool for the upper management to design and reconfigure its supply chain to achieve desired performance (Huan et al., 2004).
2.3.3 Linear and Non-linear Supply Chain Process model

Besides SCOR model and Supply Chain Operations Model, there are other Supply chain process models which map out the supply chain relations among trading partners in the supply chain. There are two distinct supply process models. The models are Linear Supply Chain Process and Non-linear Supply Chain Process model. Figure 2.3 illustrates the differences between Linear Supply Chain Process and Non-linear Supply Chain Process model. Linear Supply Chain Process is the common conventional supply chain practice in supply chain management, where information is passed top down from manufacturer down along the bottom off the supply chain. For example, as illustrated in Figure 2.3, information flow for Component Supplier is only to Manufacturer and vise versa. Other party along the supply chain which is Distributor, Retailer and End User know nothing on any information transmitted between these two parties. This process model is commonly used together with e-commerce applications (Gartner, 1999). Russel and Taylor (2006) define e-commerce as “trade that occurs over the internet or any computer network”. Haizer and Render (2006) define e-commerce beyond trading.

**Figure 2.3: Supply Chain Process Model (Source: Gartner 1999).**
It also involved information exchange. Krajewski et al. (2007) summarized e-commerce as the application of information and communication technology anywhere along value chain of business process. E-commerce practiced in Supply Chain Model usually transmit data manually (mail, e-mail, phone or fax) or through Electronic data interchange (EDI) and data usually being transmitted “one-to-one” (Gartner, 1999).

Non-linear Supply Chain Process is where the information regarding the supply activities being share non-linearly among all suppliers and manufacturer. For example, Figure 2.3 also illustrated that information flow between Reseller and Contract Manufacturer also flows to other trading partners which are Distributors, Component Supplier, and Original Equipment Manufacturer (OEM). Information among these trading partners flow freely and these trading partners collaborate to achieve win-win supply chain operations. This complex information transmission process is commonly used in collaborative commerce applications (Gartner, 1999). Collaborative commerce is also known as C-commerce. It involves working parties to collaborate with each other. C-commerce is when information is being shared through secured internet line to collaborate on decision making, synchronize activities, optimize events, solve problem together, and manage business process across enterprises (Russel and Taylor, 2006). It requires all parties to very closely share information that allow them to understand and deduce each other party needs. NerveWire (2002) refer c-commerce as inter-enterprise integration.

C-commerce optimize supply and distribution channel to make an organization more competitive and more profitable. It helps company collaborate up and down the supply chain (Ulrich, 2001). C-commerce expends the traditional roles in the trading partner community to bring all participants together, both internal and external parties. Instead of each working independently, c-commerce brings these parties into a beneficial network of interdependent collaboration. In other word, c-commerce practitioner benefited from near real time data, rich information, data being transmitted from “many-to-many”, and workflow system or automation of business process (Gartner, 1999).
2.3.4 Supply Chain Collaboration Level model.

NerveWire (2002) stated collaboration can be measured by looking at level of supply chain information integration among trading partners. Information transmitted via such system reveal the level of information integration of an enterprise.

NerveWire (2002) level of collaboration model defined Level 1 and 2 of information integration best described the characteristic of a company that practicing e-commerce or linear supply chain process. While Level 3 and 4 best described a e-commerce practicing company.

Level 1 shows that information being exchanged via meeting, phone, fax, mail and e-mail which is considered as minimal information integration. Level 2 shows that information being exchange via online viewing of information in database and electronic exchange with limited abilities to change each other database and this level is described as moderate information integration. Level 3 shows that information being integrated via automated transaction between each other database and computer application and this level is considered as high information integration. Finally Level 4 shows information being tightly integrated via shared database and application. Further to information integration, the processes are redesigned and redundancies eliminated and activities are moved to appropriate partner. This level is considered as very high information integration with trading partners.

2.3.5 Discussion.

From the above reviews, it can be concluded that Hugos’s (2006) Supply Chain Operations Model and Supply Chain Council’s (2008) SCOR model managed operational issues at micro level which is at each supply chain operations. Hugo’s model is more basic comparing to SCOR model which is more detailed especially in
the making mode and supply chain relations with organizational business activities. Gartner (1999) focused its model on information flow of supply chain operations and NerveWire (2002) look at level of information integration as indication to determine the level of supply chain collaboration. Table 2.1 summarized each individual Supply Chain Model as per mentioned above.

Table 2.1: Summary of Supply Chain Model. Source: (Hugos, 2006), (Supply Chain Council, 2008), (Gartner, 1999)

<table>
<thead>
<tr>
<th>Model</th>
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<tbody>
<tr>
<td>Descriptions</td>
<td>Divided Supply Chain Management into 3 levels where each level has its own operational activities</td>
<td>Illustrate information flow in Supply Chain Process</td>
<td>Takes level of information integration as indication to supply chain collaboration level</td>
</tr>
<tr>
<td>Functions</td>
<td>Categories Supply Chain operations into the following operational categories: - Plan, - Source, - Make, - Deliver</td>
<td><strong>Level 1</strong> (Scope that categories Supply Chain operations into Plan, Source, Make Deliver and Return Processing) <strong>Level 2</strong> (Configure making mode) <strong>Level 3</strong> (Identify key business activities)</td>
<td>-Linear Supply Chain Process (e-commerce) -Non-linear Supply Chain Process (e-commerce) -Very high information integration -Level 2- High information integration Level 2- Moderate information integration. Level 1- Minimal information integration.</td>
</tr>
</tbody>
</table>

The next section will explain the importance of developing collaboration culture on practicing supply chain collaboration in an organization.
REFERENCES


www.supply-chain.org/cs/root/scor_tools_resources/scor_model/scor_model


