CHAPTER 2

2.0 LITERATURE REVIEW

2.1 Introduction

A literature review filters the present literature in the area of interest and draws the conclusions about state-of-art in that area. Rowley and Slack (2004) enumerated that the literature reviews are important in, (1) supporting the identification of a research topic, question or hypothesis; (2) identifying the literature to which the research will make a contribution, and contextualizing the research within that literature; (3) building an understanding of theoretical concepts and terminology; (4) facilitating the building of a bibliography or list of the sources that have been consulted; (5) suggesting research methods that might be useful; and in, analyzing and interpreting results. However it is not necessary that every literature review must address all these aforementioned points. Alternatively, the aim of review may be very specific that concerns any one of these points. There have been numerous literature reviews in SCM in the past 15 years.

The purpose of this chapter is to provide an overview of the literature in supply chain management, specifically the area of supply chain management practices, supply chain integration and supply chain performance. This review of literature will initially provide a broad perspective view of supply chain management in general and later towards a narrow schematic view of matters discussed in this study. This chapter is organized into the following sections. This first section discusses the theory adopted in this study and its relevance to the framework. The subsequent section of review of literature is based on the following theme which begins with supply chain management practices, supply chain integration and finally supply chain performance.

2.2 Underpinning Theory of Study

Companies are striving towards more effective business models in order to meet customer's needs better in lieu of competitions (Prakash, 2011). Success depends on building the process that can design, make and deliver innovative, high-quality, low-cost products and services that consumer's demand. As managers try to do this, they often find that their companies lack needed resources and skills. They are therefore beginning to look more proactively beyond their company wall to consider how the resources of suppliers and customers can be used to create value (Pettit, Fiksel, & Croxton, 2010).

Theories concerning supply chain management are presented to formulate an understanding of the framework that firms in supply chain are able to learn to leverage their internal resources to build up the value chain (Caridi, et al., 2010). The practices and implementation of supply chain management, supply chain integration and supply chain performance can be viewed through various theories. Firstly, the contingency theory highlights the need for managers to recognize the implications of a changing environment and to use firm resources (in this case resources in the supply chain) to respond effectively. In other words, the above contingency theory emphasizes the concept of facing challenges due to the changing environment, such as dynamic customer requirement, technological innovation and changing external environment through effective utilization of firm resources (Fawcett, Ellram, & Ogden, 2007; Kayakutlu & Buyukozkan, 2010; Stonebraker & Afifi, 2004).

Building upon the foundation of contingency theory, lies two theories which are industrial organisation theory and resource-based theory. These theories bring the compounding

strength to the overall supply chain model. Industrial organisation theory claims that decision making in business firms is driven by market forces (Fawcett, et al., 2007; Ketchen & Hult, 2007). The mentioned market forces is determined by the power of the five forces that include suppliers, buyers, existing rivals, potential rivals, and providers of substitute products, in which managers are able to comprehend the environment where their firms (as well as their chains) are operating, thereby leveraging their competitiveness in the market (Fawcett, et al., 2007).

In addition, the resource-based theory of the firm emphasizes on the management of internal resources to establish a hard to imitate advantages (Barratt & Oke, 2007; Fawcett, et al., 2007). In this respect, the supply chain organisation needs to focus on the organisational skills and processes enhancement to delivery of distinctive products and services. As such this enables the firms in the supply chain to develop competitive advantage and possess core competencies (Caridi, et al., 2010).

2.3 The History of Supply Chain

Supply chain management (SCM) and other similar terms such as “network sourcing”, “supply pipeline management”, “value chain management’’, and “value stream management” have, in recent years, been receiving increasing attention from academics, consultants and operational managers. These terms are used to refer to the integrated management of a network of entities that starts with the ultimate suppliers and ends with the ultimate customers, for the production and delivery of goods and services to the final consumers (Lee & Ng, 1997; Quesada, Gonzalez, Mueller, & Mueller, 2010).

Supply chain management emerged in the 1990s as companies became more specialized and searched for suppliers who could provide low cost, high quality materials (Vokurka & Lummus, 2000). One of the first articles to use the term “supply chain management” was authored by Houlihan, (1985), who reiterated the basic characteristics of supply chain management. The first is that are it views the supply chain as a single entity rather than fragmented functions responsible for such areas as purchasing, manufacturing, distribution and sales. Secondly, the characteristic infers the requirement for strategic decision making; “supply” is a shared objective of every function in a chain; and, is of strategic importance because of its impact on costs and market share. Next, it provides a different perspective on inventories. Inventories are used as a balancing mechanism of the last, not first resort. Finally, supply chain management requires a new approach to systems integration.

Before the word or term “supply chain management” was popularly used by the practitioners and academics, the industry was applying various terms of supply chain management concept. The initial application of the concept supply chain management was traced under the term of “Quick Response” programme or in short, it is known as QR programme in the textile industry. Quick Response was the strategic solution and action plan to reduce inventory holding and waste elimination in the textile industry in the beginning.

Later this Quick Response or QR programme was followed in 1992 by Efficient Customer Response [ECR] (Vokurka & Lummus, 2000). The Efficient Customer Response was initially traced in the grocery industry. A group of grocery industry leaders created a team of task force named “Working Group”. This team or task force is a joint industry task force,

which is responsible to enhance the competitiveness of the industry supply chain through the discovery of new opportunities. Subsequently, the concept Efficient Customer Response developed and evolved into the concept Continuous Replenishment Programme [CRP] (Vokurka & Lummus, 2000).

Continuous Replenishment Programme is an inventory management strategy to push product or inventory from holding areas and pulling products or inventory onto grocery shelves in line with consumer requirement (Garry & Michael, 1994; Vokurka & Lummus, 2000). Moreover, to further facilitate this Continuous Replenishment Program, retailers will use Point-of-Purchase [POP] transactions via information management system to inform the manufacturer on the current inventory level. This information will enable the manufacturer to keep the retailer replenished and balanced just-in-time.

There are some traces of the beginning of supply chain concepts to Japanese “keiretsu” in the manufacturing industry. The concept of “Keiretsu” brings the meaning of relationships that are based on collaborative manufacturing and partnering with suppliers and subcontractors. These supplier and subcontractor relationships are an integral part of supply chain management (Godsell, Birtwistle, & Hoek, 2010; Melynk, Steven, & Denzler, 1996). As such, supply chain management practices are widely accepted in many industries.

2.4 Definition of Supply Chain

There are three sub-sections in this section: (1) partial list- definition of supply chain, (2) taxonomy of several definitions of supply chain based on previous authors' views and (3) review of definition of supply chain. The list of definition, taxonomy analysis and review of literature could provide a better understanding on conceptual meaning of the term supply chain.

2.4.1 Partial List – Definition of Supply Chain

The terms supply chain and logistics are often used interchangeably. However, logistics is confined to movement of material, storage, and inventory management, whereas supply chain has a larger scope covering issues related to purchase, partnerships, and customer satisfaction in addition to logistics related issues (Varma, Wadhwa, & Deshmukh, 2006). Various definitions of supply chain exist in the literature. Some of these have been summarized in Table 2.1.

Table 2.1
A Partial List of the Different Definitions of Supply Chain

Definition by	Definition of Supply Chain
APICS Dictionary	The processes from the initial raw materials to the ultimate consumption of the finished product linking across supplier user companies; and the functions within and outside a company that enables the value chain to make products and provide services to the customer
Supply Chain Council (1997)	Encompasses every effort involved in producing and delivering a final product, from the supplier's supplier to the customer's customer. Four basic processes - plan, source, make, deliver - broadly define these efforts, which include managing supply and demand, sourcing raw materials and parts, manufacturing and assembly, warehousing and inventory tracking, order entry and order management, distribution across all channels, and delivery to the customer
Lummus and Alber, (1997)	The network of entities through which material flows. Those entities may include suppliers, carriers, manufacturing sites, distribution centres, retailers, and customers
Quinn (1997)	All of those activities associated with moving goods from the raw-materials stage through to the end user. This includes sourcing and procurement, production scheduling, order processing, inventory management, transportation, warehousing, and customer service. Importantly, it also embodies the information systems so necessary to monitor all of those activities
Lambert, Stock, and Ellram, (1998)	A supply chain as the alignment of firms that brings products or services to market
Oliver and Webber, (1990)	Supply Chain is viewed as a single entity rather than tasks to be segmented to various functions
Mabert and Venkataramanan, (1998)	The supply chain is the network of facilities and activities that performs the functions of product development, procurement of material from vendors, the movement of material between facilities, the manufacturing of products, the distribution of finished goods to customers, and after-market support for sustainability

Source: Literature Survey

2.4.2 Taxonomy of Supply Chain Definition

The taxonomy of definitions of supply chain is as presented in Table 2.2. This taxonomy of supply chain definition provides different views and understanding of various authors and thus, indicating different locus of supply chain in terms of business entities, processes, flow of resources, value creation (Wiengarten, Fynes, Humphreys, Chavez, & McKittrick, 2011),

span of relationship (Wolf, 2011) and strategic alliances. Therefore, it delivers sufficient evident that in the past decade, several researchers have attempted to categorize supply chains according to different elements. This concoction of supply chain definition will be used to operationalise the definition of supply chain used by this study.

Table 2.2
The Taxonomy of Supply Chain Definitions

		Coverage of the Definition					
	AUTHOR	**I**	**II**	**III**	**IV**	**V**	**VI**
1	Stevens, 1989		√	√		√	
2	La Londe and Masters, 1994	√		√		√	
3	Beamon and Ware, 1998		√			√	
4	Lambert et al., 1998	√		√		√	
5	Moore, 1998	√			√		
6	Holmberg, 2000	√					√
7	Supply Chain Council, 2000				√	√	
8	Mentzer et al., 2001	√		√		√	
9	Chopra and Meindl, 2003		√				
10	Agrawal and Shankar, 2002		√				√
11	Chan et al., 2003		√		√		√
12	Moberg et al., 2003		√			√	
13	Bacheldor, 2004		√			√	
14	Ellram, 2004		√		√		

Key:

I - Set of three or more entities (firms or individuals);
II - Stages/set of processes/ relationships/ functions involved in satisfying customer request;
III - Information/material/ products/ funds flows,
IV - Value creation/ efforts of producing and delivering products/ services;
V - Spans from supplier's supplier to customer's customer;
VI - Strategic alliances/ cooperation/ shared objectives

Source: Mkumbo, (2008)

2.4.3 Review of Supply Chain Definitions

Although the definition among researchers varies, there is one common aspect which is important to all supply chains, that is the existence of a linkage (chain) between those who are involved in fulfilling the customer's request. Chopra and Meindl, (2003) stated that supply chains has two purpose in ensuring business success, which is to create efficiency and to be responsive towards customer request and complaint. Cigolini, Cozzi & Perona, (2004) improve on this categorization by adding lean type of supply chain. According to Cigolini et al., (2004), lean supply chains focus more on the waste elimination across supply chain and to improve the flow of inventory. This, in turn, improves physical distribution efficiency and effectiveness (Christopher, 2000; Svensson, 2010). Christopher further construes that, it requires multiple collaborative working relationships of members at all levels of the supply chain in order to achieve its supply chain goals in order to be efficient, effective and lean.

Moreover, Sha, Chen & Chen, (2008) detailed that supply chain encompasses totality of functions and stages in the chain to target the same goal of fulfilling customer needs. In a similar endeavour towards defining supply chain, Lejeune & Yakova, (2005) distinguishes supply chain concept and meaning, among them are communicative (characterized by slight dependence among supply chain members, cross-function integration), coordinated (characterized by prominent dependence, lead organisation), collaborative (slight interdependence, common supply chain goals) and competitive (prominent interdependence, cooperation) supply chains. These basically depict the development or evolutionary stages of supply chains. For example, Mentzer et al., (2001) describe the communicative supply chain as one that exists, but is not managed. This is a reflection of

early stages of supply chain development, as it involves short-term (as needed) relationships and the chain can change into any of the three initially discussed supply chain types. With realization of benefits, the chain will definitely develop into higher stages (Quesada, et al., 2010). The approach to manage the supply chain is an additional area that needs to be explored (Cambra-Fierro & Ruiz-Benitez, 2011).

2.5 Definition of Supply Chain Management

There are three sub-sections in this section: (1) partial list- definition of supply chain management and (2) taxonomy of several definitions of supply chain management based on previous authors' views and (3) review of definition of supply chain management. The review of literature and taxonomy analysis could provide a better understanding on conceptual meaning of the term supply chain management.

2.5.1 Partial List- Definition of Supply Chain Management

There are many definition of supply chain management offered by scholars, researchers and industrial practitioners in the past years, as the concept has gained popularity. Existing literature has identified and captured several important meanings of supply chain management. Table 2.3, shows several selected definition of supply chain management.

Table 2.3
A Partial List of the Different Definition of Supply Chain Management

Definition By	Definition Of SCM
Ellram and Cooper (1990) / 1993	SCM is an integrative philosophy to manage the total flow of distribution channel from supplier to ultimate user / customer
Sengupta and Turnbull (1996)	SCM is the process of effectively managing the flow of materials and finished goods from vendors to customers using manufacturing facilities and warehouses as intermediate stops
Zheng et al. (2000)	SCM is the process of optimizing a company's internal practices and improving the interaction with its suppliers and customers
Russell (2001)	SCM is the practice of co-coordinating the flow of goods, services, information, and finances as they move from raw material to parts supplier to manufacturer to wholesaler to retailer to consumer
Shapiro (2004)	SCM as a new business paradigm was motivated by interest in integrating procurement, manufacturing, and distribution activities – integration made possible by advances in IT
Mohanty and Deshmukh (2005)	SCM is a loop It starts with customer and ends with customer Through the loop flow all materials, finished goods, information, and transactions It requires looking at business as one continuous, seamless process This process absorbs distinct functions such as forecasting, purchasing, manufacturing, distribution, sales, and marketing into a continuous business transaction
Institute of Supply Management (ISM) [2000]	The identification and management of specific supply chains that is critical to a purchasing organisation's operations
Monczka and Morgan (1997)	Is about going from the external customer and then managing all the processes that are needed to provide the customer with value in a horizontal way
Giunipero and Brand (1996)	Is a strategic management tool used to enhance overall customer satisfaction that is intended to improve a firm's competitiveness and profitability
Lenders and Fearon (1997),	A system approach to managing the entire flow of information, materials and services from raw material suppliers through factories and warehouse to the end customer
Christopher (1998)	Is the network of organisations that are involved, through upstream and downstream linkages, in the different processes and activities that produce value in the form of products and services delivered to the ultimate consumer

Source: Literature Survey

2.5.2 Taxonomy of Supply Chain Management Definitions

The taxonomy of definitions of supply chain management is presented in Table 2.4.

Table 2.4
The Taxonomy of Supply Chain Management Definitions

	AUTHOR	Coverage of the Definition					
		I	II	III	IV	V	VI
1	Tan et al., 1999		√	√	√		
2	Council of Logistics Management, 2000	√					√
3	Global Supply Chain Forum , 2000		√	√	√	√	√
4	Nunlee et al., 2000	√		√		√	
5	Mentzer et al., 2001						√
6	Spekman et al, 2002					√	
7	Stadtler and Kilger, 2002	√	√				√
8	Larson and Halldorsson, 2002	√		√			
9	Chan et al., 2003						√
9	Chopra and Meindl, 2003	√					√
10	Wisner, 2003	√	√	√			√
11	Trent, 2004	√		√			√
12	Heredia et al., 2004		√	√			√
13	Ellram, 2004	√		√			
14	Ohdar and Ray, 2004		√	√	√		√
15	Fawcett et al., 2007	√	√	√	√	√	√

Key:
I - Management philosophy / managing processes, flows and activities in the supply chain,
II - Integration of key processes;
III - Coverage is from end-user to initial supplier,
IV - Provision of products and / or services;
V - Value addition / creation / delivery;
VI - Collaboration

Source: Mkumbo, (2008)

This taxonomy of supply chain management definition provides different views and understanding of various authors and thus, indicating different locus of supply chain management in terms of management philosophy, process integration, resource flow coverage, collaboration, value addition and provision of product and services. Therefore, it delivers sufficient evident that in the past decade, several researchers have attempted to categorize supply chains management according to different elements. This concoction of supply chain management definition will be used to operationalise the definition of supply chain management used by this study.

2.5.3 Review of Supply Chain Management Definitions

Although the terminology and concept of supply chain management is widely researched and defined by numerous academia and practitioners, there remains some reasonable confusion to its definition. The literature in Table 2.3 and Table 2.4 provides sufficient evidence to conclude that there are many meaning assigned to the concept of supply chain management. Some researchers define supply chain management in terms of flow of resources across and within organization, some view supply chain management as a strategic and operational tool to integrated business operations (Cooper & Ellram, 1993; Mentzer, et al., 2001) and there are also some who view supply chain management as a management philosophy (Tyndall, Gopal, Partsch, & Kamauff, 1998; Wolf, 2011).

Supply chain management is a chain of relationship between various business entities which promotes and foster strong coordination. This effective coordination is made possible through the integration of all the value added activities and processes seamlessly. In addition, it also links all of the partners in the chain including departments within an

organisation and the external partners including suppliers, carriers, third-party companies, and information systems providers (Lummus & Vokurka, 1999a). Furthermore, it is also widely accepted that component customer service is an imported part in the process of conceptualizing supply chain management. Therefore, the key point in supply chain management is that the entire process must be viewed as one system. Any inefficiencies incurred across the supply chain (suppliers, manufacturing plants, warehouses, customers) must be assessed to determine the true capabilities of the process (Lummus & Vokurka, 1999a)

According to Ellram, (2004), the supply chain management processes exist in both service and manufacturing organisations, although the managerial complexity of the chain might vary greatly from industries and different firms. Chopra and Meindl (2003) have their views processes performed in supply chain management as cycle view which defines the processes and flow as an essential element for operational decisions. The importance of understanding the sequence of processes and flows in a supply chain is a strong prerequisite to clearly understand the operational requirement and to fulfill the customer's needs. Kleindorfer & Van Wassenhove, (2004) view supply chain management as a process of integrating several business entities consisting of suppliers, manufacturers, distributors, retailers and customers. These integrated entities are important in managing the flow of resources (Sprague & Callarman, 2010) such as material flows (products, servicing, recycling), information flows (order transmission and tracking, and, coordination of physical flows), and financial flows (credit terms, payment schedules, and, consignment arrangements). Hence, all information is availed to all participants in the supply chain as operating an integrated supply chain requires continuous information flows that assist in

creating the optimum product flow (Hadaya & Pellerin, 2010; Mouritsen, Skjùtt-Larsen, & Kotzab, 2003).

Lambert and Cooper, (2000) believe the identification of chain members, critical to link with, and the processes needing linkage, are part of the implementation of supply chain management, aiming at creating the most value for the entire supply chain network. As seen by Chandra and Kumar (2000), supply chain management, turns out to be a way of improving competitiveness through the reduction of uncertainty and the enhancement of customer service. In addition, Mentzer et al., (2001) postulate that supply chain management is the strategic managerial tool to effectively manage the total flow of inventory from the ultimate supplier to the ultimate customer, which is also important in building capabilities for customization which promises sustainable customer satisfaction.

2.6 Operational Definition of Supply Chain and Supply Chain Management

In defining supply chain and supply chain management, the terms can be used to describe a series of interconnected entities. These incorporate the satisfaction of customer's demand and the management of the flow of materials, funds and information through these entities to and from the end customer respectively, not excluding after sales services and returns, or recycling. Researchers claim that one of the lessons from business experience that has been communicated accurately by literature in the past decade is the fact that producers have to align with suppliers, supplier's suppliers, customers and customer's customers to streamline operations. Thus, this flow has resulted into supply chains becoming the dominant vehicle for competition (Eurich, Oertel, & Boutellier, 2010; Van Hoek, Harrison, & Christopher, 2001).

The main objective of every supply chain, as Chopra and Meindl (2003) state, is to maximize the overall value generated. They assert that, this value is strongly correlated to the supply chain profitability, which is the total profit to be shared across all supply chain stages (Hernandez-Espallardo, Rodriguez-Orejuela, & Sanchez-Perez, 2010). The only source of revenue for any supply chain is the customer. The flows that take place in the supply chain generate costs. It is important to manage these flows appropriately, as this is the key to supply chain success, which is measured, in terms of profitability (Kuei, N.Madu, & Lin, 2001).

In the literature, selected definitions of supply chain and supply chain management are reviewed. These definitions are often mixed up as a definition that can be used to mean several different things. Therefore, for the purpose of this study, the definitions of supply chain and supply chain management are explained on a fundamental level to avoid misapprehensions. Below are the operational definitions, for the purposes of this study:

(1) *Supply Chain* is defined as a set of business entities directly involved in the flow and transformation of goods, services, finances, and/or information from the raw material stage (from supplier) to a finished product stage (to end user). The flow of resources such as goods, services, finance or funds, and information are both up and down the supply chain.

(2) *Supply Chain Management* is defined as a process of integration of various business processes such as procurement, manufacturing, distribution and customer relationship in order to manage the flow of resources from ultimate supplier to ultimate customer for the purpose of improving short-term and long-term performance of an individual organisation and the supply chain.

With the consideration of the above operational definition of supply chain and supply chain management in the context of an individual firm or organization, the study includes both its upstream supplier network and its downstream distribution channel. In this definition, the supply chain encompasses the supply management (sourcing and procurement), information system (information management and dissemination), production process and customer service.

The supplier network consists of various orientation of supply management which also includes all organizations that provide inputs, either directly or indirectly, to focal firm. As such, the supply chain is essentially a series of linked suppliers and customers; however customer is in turn a supplier to the next downstream organization until a finished product reaches the ultimate customer or end-user. It is therefore. The supply chain business processes, includes customer relationship management, customer service management, demand management, order fulfillment, manufacturing flow management, procurement, product development and effective supplier partnering. Supply chain management coordinates all these processes and activities to fulfill customer requests.

2.7 The Importance of Supply Chain

In recent years the growth of world competition, over-capacity in many manufacturing sectors and increasingly demanding customers have created a fast moving environment for many manufacturing companies (Cambra-Fierro & Ruiz-Benitez, 2011; Rich & Hines, 1997). These pressures have stimulated a continuous change process within the factory, impacting on all areas of the business from rapid step changes in the technology employed to a much shortened life cycle of the product itself.

The late 1990s can therefore be characterized by change and uncertainty for manufacturing organisations and their respective supply chains (Womack & Jones, 1996). The common denominator which links the external market changes with internal activities are the need to focus on time, flexibility and responsiveness of the supply chain to survive or create competitive advantage (Cao & Zhang, 2011; Stalk & Hout, 1990).

The concept of supply chain management (SCM) is viewed as a strategic tool (Dale, et al., 1994; Ofori, 2000; Segerstedt & Olofsson, 2010) which is vital to corporate competitiveness and profitability in today's operating environment (Burgess, 1998). SCM can improve efficiency and productivity, and reduce overall operating costs (Lambert, et al., 1998). In an interview with an associate partner in the Accenture Supply Chain Practice (Wimer, 2001) cited in Duclos, Vokurka and Lummus, (2003) p. 24, the partner noted:

> *"…..manufacturers must find a way to align their supply chain partners with a common set of goals and metrics to ensure that all the elements of the supply network are focused on flexibility, speed, and cost"*

As such it is pertinent to study the possibility of using supply chain management to improve the performance of manufacturing enterprises in Malaysia, especially in the electronics industry.

2.8 The Supply Chain Configuration in manufacturing context

It is essential to understand the basic configuration of supply chain in a manufacturing context before proceeding to any form of decisive analysis. Also, it is important to note that

from the focal firm's perspective, the supply chain is consisting of internal function, upstream suppliers and downstream customers (Ibrahim, Zolait, & Veera, 2010). All these three function as a common responsibility of fulfilling customer requirement. This objective is achieved successfully through the existence of strong integration and linkages between business processes and network parties (Lo & Power, 2010). This is imperative as one production unit may have several suppliers, who may have several suppliers of their own and several production units to supply as well as customers who may also have their own customers. Figure 2.1 presents a basic supply chain configuration.

A firm's internal function (production side) or internal value chain includes various processes used in transforming input provided by the supplier network. In the case of manufacturing, this includes all of its parts manufacturing (e.g., wafer molding, light processing, assembly, component), which are eventually integrated together in their final manufacturing operations into finished electronics product. The second major part of the supply chain management involves the management of supplier side or upstream supplier management. The main responsibility of this supplier side is to manage the flow of materials between all of the upstream organization in a supply chain and to ensure that the right materials arrive at the locations, at the right time. In addition, the strategic aspect of this supplier side or upstream supplier management is to ensure the followings, (1) the right suppliers are selected, (2) the supplier performance measurement are fulfilled, (3) appropriate contractual mechanism is employed, and (4) maintaining good supplier partnering relationship.

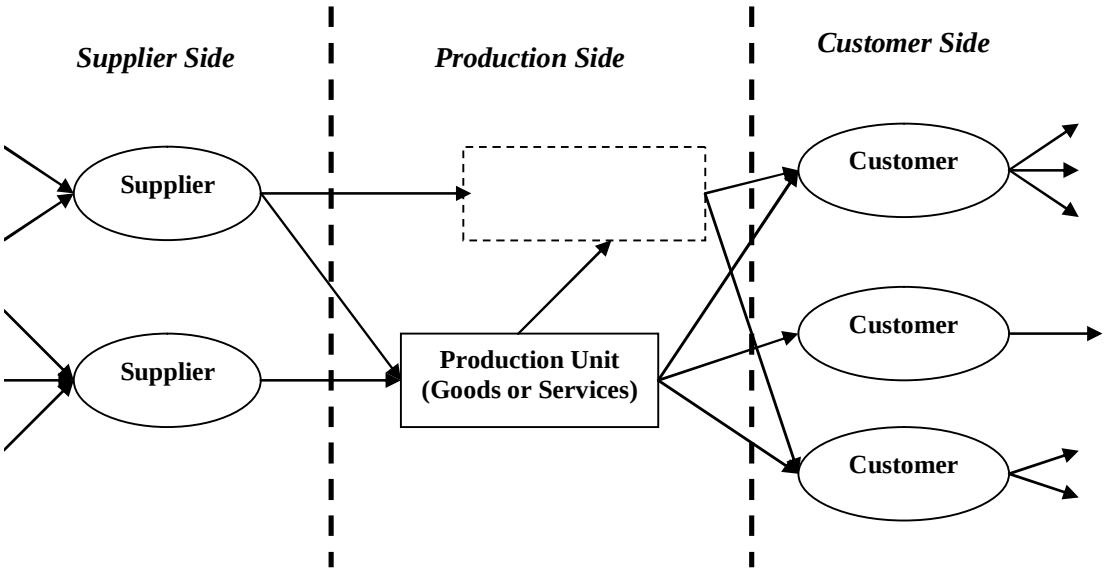


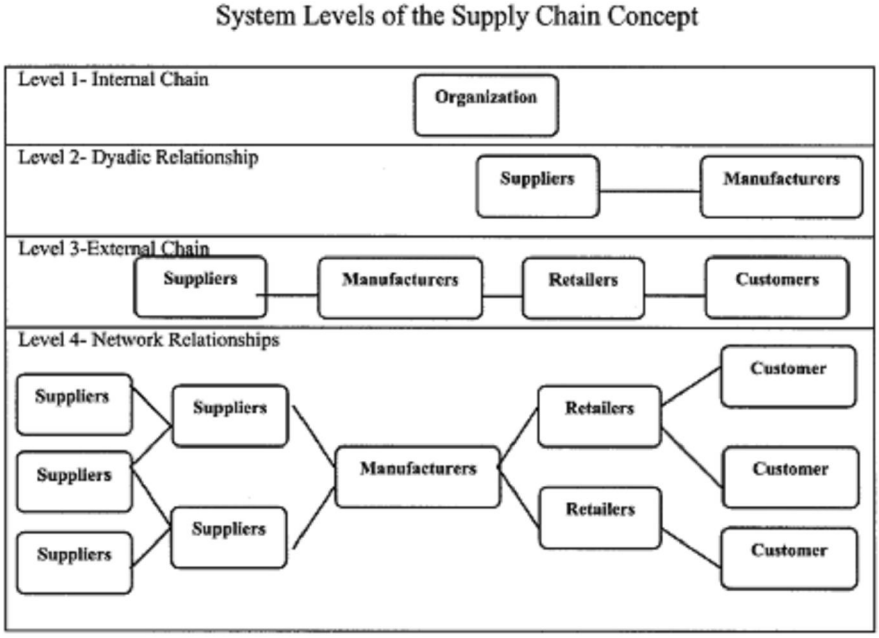
Figure 2.1
A Basic Supply Chain Configuration

Finally, a manufacturing firm's customer side or downstream customer management includes all of the downstream distribution channel, process and function that the product passess through on its way to the ultimate customer or end user. In the case of electronics manufacturing industry, the focal firm's distribution network, this includes its finished goods and pipeline inventory, warehouses, dealer network and sales operation. The supply chain configuration varies according to the nature industry and types of business operations.

There are possibilities whereby the supply chain configuration might vary within the same industry such as within the electronics industry depending on the supply chain design and strategies employed by the organization. An example of this is noted in the supply chain of DELL computer manufacturer (Chopra & Meindl, 2003) whereby, the chain bypasses the distributors and deals directly with the end customers. Essentially, this confers the supply chain an advantage of shorter cycle times, as well as low inventory (due to the procedure of manufacturing only according to orders placed) (Olson, 2010).

2.9 Supply Chain Management Concept

The previous discussion focused on the various elements and essentials of supply chain management. This section will attempt to demystify the concept of supply chain. The concept of supply chain is distinguished at various system levels, as shown in Figure 2.2.



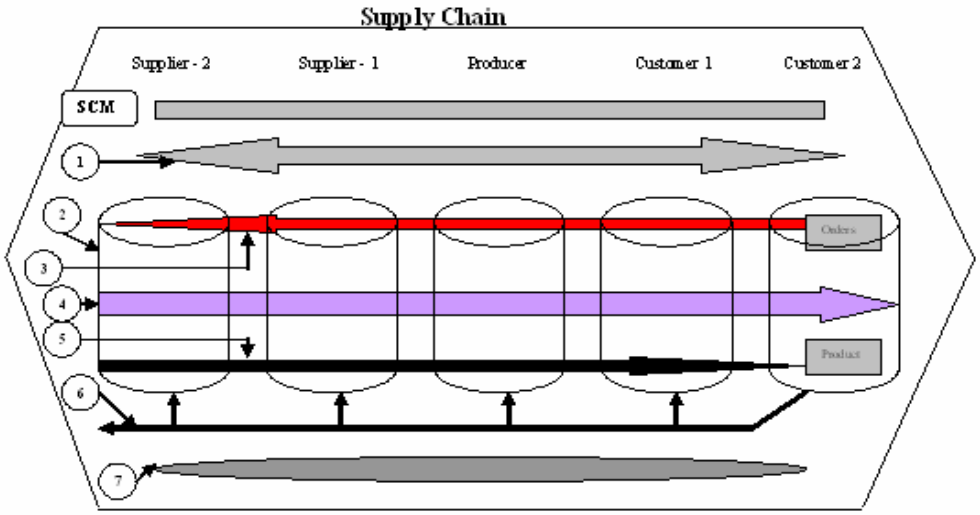
Source: Harland, (1997)

Figure: 2.2
System Levels of the Supply Chain Concept

Some authors (Bhatnagar & Teo, 2009; Kayakutlu & Buyukozkan, 2010; Shapiro, Singhal, & Wagner, 1993; Van Hoek, 1998; Walters & Rainbird, 2007) have used the term to refer to value chain processes of a manufacturing firm from purchasing and receiving of material and component, through the transformation processes of production, to distribute products to the manufacturer's customers (Houlihan, 1988; Shang, Lu, & Li, 2010). In Figure 2.2, this is represented as Level 1. Other authors have used the term supply chain synonymously with purchasing and supply management, or procurement, and described it as the dyadic, or

two party, relationship with supplier, shown as Level 2 in Figure 2.2. Some authors (Lockamy & McCormack, 2004; Matopoulos, Vlachopoulou, Manthou, & Manos, 2007; St.Onge, 1996; Stonebraker & Liao, 2006; Theeranuphattana & Tang, 2008) have viewed supply chain more holistically as the total chain of exchange from original source of raw material, through the various firms involved in extracting and processing of raw material, manufacturing, assembling, distribution and retailing, to ultimate end customer. Recently, attention has been focused on a "holistic view" of supply chain (Boubekri, 2001; Holmberg, 2000). This includes the two concepts shown as Level 3 and 4 in Figure 2.3. In this study, supply chain is considered as a holistic concept of the total chain of exchange from original source of raw material, through the various firms involved in extracting and processing raw materials, manufacturing, assembling, and distribution, to the ultimate end customers. This is represented as Level 3 and Level 4 in Figure 2.2.

The above system level of supply chain concept is identical to what has been presented by Lambert and Cooper, (2000) and these concepts are highlighted clearly through the integrated supply chain model presented in Figure 2.3. The added value of this integrated model is the concept reverse logistics which is more environmental concern (Olorunniwo & Li, 2010). In the model the supply chain focuses on managing the flow of resources which begins with the end customer, or the second tier customer and moves through first tier customer, production, first tier suppliers, second tier suppliers, with commonly agreed vision and goals to meet end customer requirement.



Source: Ellram et al., 2004; Mouritsen et al., 2003;
Korpela et al., 2001; and, Lambert and Cooper, 2000.

Key:
1 - Information System
2 - Organisation (Management, Functional Activities)
3 - Transaction / Financial Flows
4 - Supply Chain Business Processes
5 - Material/Product Flows
6 - Reverse Logistics
7 - Third Party Logistics Providers (3PLP)

Figure 2.3
A Supply Chain Management Model

2.10 Supply Chain Management Practices

In the following paragraphs, key supply chain management practices are outlined and reviewed. The discussion covers the impact of each activity on the management of supply chains. Review of supply chain management practices could be further synthesized by focusing on the relevant definition, development of various constructs and framework of supply chain management practices.

2.10.1 Definition of Supply Chain Management Practices

The primary role of SCM is to meet customer requirement in terms of providing customer with the right product (Dale, et al., 1994) of right quality (Brewer & Speh, 2000; Carmignani, 2009) and quantity (Chan, et al., 2001) from a right source (Carr & Smeltzer, 1999) at right price (Chin, et al., 2004) and finally the utilizing the right technology (Basnet, et al., 2003; Boubekri, 2001). As such, supply chain management practices are regarded as operational functions or activities of an organization which determines the effectiveness and efficiency of its supply chain (Kayakutlu & Buyukozkan, 2010). Besides, supply chain management practices is proven to be a multi-dimensional concept and therefore it should be viewed in a broader concept and comprehensively (Li, et al., 2005).

The strategic nature of supply chain management practices [SCMP] will be able to explain the dual purpose of SCM, namely to improve the performance of an individual organisation and to improve the performance of the entire supply chain (Trkman, McCormack, Oliveira, & Ladeira, 2010; Wong, et al., 1999). In order to be highly competitive and to achieve sustainable profitability growth, SCM seeks close integration of internal functions within the firm and external linking with suppliers, customers and other channel members. This could be achieved through effective construction of various SCMP (Kim, 2006b). Other researchers have highlighted on the need to understand SCMP, which is becoming an essential prerequisite, to stay in the competitive global race and to grow profitably (Moberg, et al., 2002; Power, et al., 2001; Sezen, 2008).

2.10.2 Construct and Framework of Supply Chain Management Practices

Supply chain management practices are regarded as operational functions or activities of an organization which determines the effectiveness and efficiency of its supply chain. Donlon, (1996) identifies several component of supply chain management practices which encompasses supplier partnering, information sharing, process flow and outsourcing. These components are considered the current evolution of supply chain management practices, especially in the manufacturing industry. The empirical work of Tan, Handfield & Krause, (1998) classifies quality management, procurement and customer relationship management in supply chain management practices. Alvarado & Kotzab, (2001) and Wong, Potter, & Naim (2011) selected information technology and customisation through postponement activities as an important aspect of supply chain management practices. Tan, (2001) further supported that information sharing among trading partners in a supply chain, mass customisation and postponement are crucial supply chain management practices to ensure well-integrated supply chain. Therefore, supply chain management practices are regarded as a true recipe for the success of many firms from various industries (Kayakutlu & Buyukozkan, 2010).

Tan et al. (2002) developed six dimensions of supply chain management practices, namely, supply chain characteristics, customer service management, geographical proximity, supply chain integration, just-in-time capability and information sharing. Whereas, Chen and Paulraj, (2004) employed several other dimensions to measure supply chain management practices such as, supplier base reduction, long-term relationship, communication, cross-functional teams and supplier involvement. In addition, Min and Mentzer (2004) includes seven important variables to conceptualise supply chain management practices, namely,

supply chain leadership, risk and award sharing, agreed vision and goals, information sharing, long-term relationship, process integration and cooperation. In order to successfully implement the supply chain management, Mentzer et al., (2001) suggested the following necessary activities: integrated behavior, the integration of processes, mutually sharing of information, cooperation, goal congruence, the same focus in serving customers, and, building (by partners) and maintaining long term relationships. This is in line with what has been proposed by Li, et al., (2006); Kim, (2006b) and Koh, et al., (2007). Although, in terms of integration and coordination, the later suggests that the most appropriate relationships befitting specific sets of circumstances are the only ones closely linked. It is worthwhile to investigate each of these activities to ascertain how each affects the integration and performance level of supply chains.

Hence, the previous literature reveals that supply chain management practices have various dimensions and perspectives which ultimately enhance the performance within and across organization. In total, the literature captured several important dimensions of supply chain management practices which include upstream supply chain, downstream supply chain, flow across supply chain, internal supply chain and supply chain system approach. Although all these dimensions are captured and investigated successfully, they are all tested separately and not in a single setting. As such, the result of previous study will not reveal the actual standing of the total impact of supply chain management practices toward organizational performance and supply chain performance.

The present study, therefore, proposes SCM practices as a multi-dimensional concept. In the following paragraphs, the study has identified and defined the eight constructs of supply

chain management practices. Detailed descriptions of the constructs are presented in the following paragraphs.

Table 2.5
The Dimensions of Supply Chain Management Practices

Author	Identified Supply Chain Management Practices
Donlon (1996)	Supplier Partnership, Outsourcing, Cycle Time Compression, Continuous Process Flow, Information Technology Sharing
Tan et al. (1998)	Purchasing, Quality, Customer Relations
Alvarado and Kotazb (2001)	Core Competencies, Use Of EDI, Postponement
Tan (2001)	Coordination of Flow (Material And Information), Postponement, Mass Customization
Gunasekaran et al. (2001)	Strategic Supplier Partnership, Number of Knowledge Workers, Investment In Information Technology, Use Of Internet And Intranet, Communication
Tan et al. (2002)	Information Sharing, Supply Chain Characteristics, Supply Chain Integration, Customer Service Management, Geographical Proximity, Just In Time (JIT) Capabilities
Wisner (2003)	Supplier Management Strategy, Customer Management Strategy, Supply Chain Management Strategy
Chen and Paulraj (2004)	Supplier Base Reduction, Long Term Relationship, Communication, Cross-Functional Teams, Supplier Involvement
Min and Mentzer (2004)	Agreed Vision And Goals, Information Sharing, Risk And Award Sharing, Cooperation, Process Integration, Long Term Relationships, Agreed Supply Chain Leadership
Li et al. (2005)	Strategic Supplier Partnership, Customer Relationship Management, Information Sharing, Internal Lean Practices, Information Quality, Postponement
Li et al. (2006)	Strategic Supplier Partnership, Customer Relationship, Level Of Information Sharing, Quality of Information Sharing, Postponement

Source: Compiled from relevant literature

Table 2.5 lists these dimensions along with their definitions and supporting literature. A more detailed discussion of the eight selected dimensions is provided below.

2.10.2.1 Strategic Supplier Partnership

Strategic Suppliers Partnership (SSP) is defined as the long-term relationships designed to leverage the strategic and operational capabilities of individual participating organisation to achieve significant benefits to each party (Li, Ragu-Nathan, et al., 2006; Li, et al., 2005). A true supplier partnership, encourages mutual planning and problem solving efforts (Gunasekaran, Patel, & Tirtiroglu, 2001), and is critical in operating a leading-edge supply chain (Lonngren, Rosenkranz, & Kolbe, 2010). Azar et al., (2008) have investigated the impact of supplier management on the performance and have found that effective supplier management is directly related to higher level of performance conformance. Similarly, Boddy et al. (2000) and Bordonaba-Juste & Cambra-Fierro (2009) viewed supply chain partnering which is the broader concept of supplier strategic partnering and asserted such strategic collaboration will definitely enhance performance among supply chain collaborative partners. Hence, strategic partnering with suppliers will be able to enhance the supply chain efforts to better performance.

2.10.2.2 Customer Relationship

Customer Relationship (CR) is defined as the practices to manage customer complaints, build long-term relationships with customers, and improve customer satisfaction (Tan, Handfield, et al., 1998). Close customer relationship allows an organisation to differentiate its product from competitors and dramatically extend the value it provides to its customers and sustain customer loyalty through customer satisfaction (Cox, 2004; Dadzie & Winston, 2007). Analyzing the empirical data collected from Hong Kong, Chin et al., (2004) have identified that maintaining effective customer relationship will be able to promote open communication among members of supply chain and eventually engage in joint problem

solving effort with long term commitment. Therefore, customer relation practices can bring significant impact in managing the total value chain entities across the supply chain in order to improve the performance of the total supply chain.

2.10.2.3 Information Sharing

Information Sharing (IS) refers to the extent to which critical and proprietary information is communicated among supply chain members with regards to market, product and customer information (Li, Ragu-Nathan, et al., 2006; Mentzer, et al., 2001). Furthermore, the effort in providing the information and making it visible to other parties in the supply chain, business decisions can be made fast and accurate as a source of competitive advantage (Ding, Guo, & Liu, 2011; Moberg, et al., 2002). As such, information sharing is regarded as the terminator of "bullwhip effect" (Fiala, 2005) and reduce the total cost of the supply chain in delivering efficient supply chain performance (Gavirneni, 2006).

2.10.2.4 Information Quality

Information Quality (IQ) refers to the extent of which the information flow and exchange is accurate, timely, adequate and credible (Li, Ragu-Nathan, et al., 2006). Numerous studies (Li, et al., 2005; Lyons, Coleman, Kehoe, & Coronado, 2004; Moberg, et al., 2002) have shown that well-managed information quality within and across the organisation will directly lead to improved supply chain performance. In addition, through their recent research, Forslund and Jonsson, (2007) stated that different information quality deficiency could impact the usefulness of forecast and its ability to influence supply chain performance. Hence, this will also provide managers to make precise business decision for effective management of supply chain (Raisinghani & Meade, 2005).

2.10.2.5 Postponement

Postponement (POS) is defined as a process of delaying certain value added activities to a much later stage or point in the supply chain in order to promote operational efficiency and customization. (Beamon, 1998). Nowadays, postponement is extensively employed as a manufacturing strategy at the firm level (Yeung, Selen, Deming, & Min, 2007). Postponement enables an organisation to meet high level of product customization through production flexibility (Kisperska-Moron & Swierczek, 2011; Van Hoek, et al., 2001). Inventories are kept undifferentiated for a certain period until customer demand is certain. Hence, this enables an organisation to be highly responsive towards change in customer demand (Li, Ragu-Nathan, et al., 2006; Li, et al., 2005). Yang, Yang & Williams, (2010), compared the translating implementation of manufacturing postponement to service postponement and its benefit to members of the supply chain in total. Overall, postponement can reduce inventory cost along the supply chain and eventually increase supply chain performance (Yang, Yang, & Wijngaard, 2007).

2.10.2.6 Internal Lean Practices

Generally the term "LEAN" refers to elimination of waste in order to be more efficient (Taylor, 1999). Hallgren & Olhager, (2009) describes, lean, as doing more with less, and it is a term often used in connection with lean manufacturing to imply zero inventory - the just in time (JIT) approach. Lean works best in high volume, low variety and predictable environments.

Borrowing this meaning, internal lean practices are all activities or processes which eliminate waste in terms of resources, finance and time in a manufacturing environment (Womack & Jones, 1996). Accordingly, McIvor, (2001) referred the internal lean practices

as an internal manufacturing system which utilizes minimum resources or input to produce at a maximum production output, while performing excellent customer requirement and fulfillment (Rahimnia & Moghadasian, 2010). As such this provide sufficient evidence that the fundamental idea of any lean approach is to reduce waste and finally achieve "zero waste" (Naylor, Naim, & Berry, 1999). The basic tenets of internal lean practices acknowledged by several researchers (Jayaram, Vickery, & Droge, 2008; Kollberg & Dahlgaard, 2007; Lamming, 1996) are to primarily improve the efficiency of manufacturing firms through waste reduction plan such as (1) focus only on value added activities, (2) seek improvement in all total aspect, (3) focus on value flow without interruption, backflows and scrap and (4) strive to continuous improvement to achieve perfection. Therefore, internal lean practices encompasses several best manufacturing practices such as improved set-up operations; demand-pull production system, shorter lead time on order management and total quality enhancement.

Another point to be considered is that internal lean thinking and practices have essential to develop an effective and efficient supply chain management, primarily in the manufacturing system (Mistry, 2005; Nawrocka, Brorson, & Lindhqvist, 2009; Perez, et al., 2010). To date, manufacturing firms that have not adopted the internal lean practices into the manufacturing system (to enhance quality, improve product value and cost efficiency) will need to face seriously high customer turnover in their total supply chain. Owing to this, internal lean activities are purported to achieve greater supply chain performance through integrated lean supply chain (1) cost efficiency and (2) effective strategic partnering among trading partners in the total supply chain.

2.10.2.7 Risk and Reward Sharing

The term risk is defined as the extent to which there is uncertainty about whether potentially significant or disappointing outcomes of decisions (Eurich, et al., 2010; Finch, 2004). What most definitions of risk have in common are the three dimensions (Juttner, 2005): (1) likelihood of occurrence of a particular event or outcome; (2) consequences of the particular event or outcome occurring; and (3) causal pathway leading to the event. Previous studies (Cooper & Ellram, 1993; Cooper, Ellram, Gardner, & Hanks, 1997; Cooper, Lambert, & Pagh, 1997) regarded the risk and reward sharing among the supply chain partners as collective effort in managing supply chain management. The risk and reward sharing (RISK) practices will help to divide the level of risk and return between strategic partners on technology, customer or market focused initiatives (Hall, 1999; Ritchie & Brindley, 2007) whereby, it provides trustworthy and coordinated relationship partnering among members of supply chain. As a result, risk and reward sharing practices act as an impetus for effective supply chain (Ellram & Cooper, 1990). Consequently, in the long run, this will be able to improve the supply chain performance.

2.10.2.8 Agreed Vision and Goals

Successful supply chain management necessitates strong collaboration among partners (Boddy, et al., 2000; Lambert, et al., 1998). This collaboration is obtained through information sharing, trust and commitment. Unfortunately, this cannot be achieved without agreed vision and common goals (VISN) among members of the supply chain (Spekman, Kamauff, & Myhr, 1998). Some researchers (Cooper & Ellram, 1993; Cooper, Ellram, et al., 1997; Cooper, Lambert, et al., 1997) agreed strongly on the fact that agreed vision and goals are the key components of supply chain management. Therefore, agreed vision and

goals are strongly needed to orchestrate the roles and responsibilities of the supply chain members. Subsequently, this will ensure the success of supply chain practices in capturing high level supply chain performance (Wisner, 2003).

2.11 Supply Chain Integration

In the following paragraphs, key elements of supply chain integration are outlined and reviewed. The discussion covers the impact of supply chain integration towards the performance of supply chain. Review of supply chain integration could be further synthesized by focusing on the relevant definition, development of various constructs and framework of supply chain integration.

2.11.1 Definition of Supply Chain Integration

Combining something in such a way that it becomes a full part of something else is what is known as integration (Flynn, Huo, & Zhao, 2010; Lummus & Alber, 1997). The integration behaviour is seen to be important in supply chain management as the entire process must be viewed as one system (Lummus & Vokurka, 1999b) since supply chain management coordinates. Through coordination it ascertains that decisions of all supply chain members are geared towards one goal of maximizing total chain profits and it also integrates all activities involved in fulfilling the customer request (Jayaram & Tan, 2010; Vokurka, Zank, & Lund, 2002).

As such, supply chain integration is defined as the extent to which all functional activities within an organisation, and the functional activities of its suppliers, customers, and other

supply chain partners, are linked and integrated together (Gunasekaran & Ngai, 2004; Narasimhan & Jayaram, 1998);(Li, Yang, Sun, & Sohal, 2009). More specifically, supply chain integration are network links of an organisation or firm with its business partners such as customers and suppliers by integrating their relationships, functions and processes (Flynn, et al., 2010; S. W. Kim & Narasimhan, 2002).

Stevens (1989) outlined two perspectives of supply chain integration which encompasses internal integration and external integration. According to Frohlich & Westbrook (2001), the aspect or perspective of internal integration involves establishing close relationships between various functions in a business organisation or a firm such as material management, order management, inventory and warehouse management. The perspective of external integration encompasses (1) forward integration of resource flow from ultimate supplier to manufacturer and later to the customer or end-user and (2) backward integration of information from ultimate customers, to manufacturers, to ultimate suppliers (Gimenez & Ventura, 2005).

Byrne and Markham (1991), view that supply chain integration can be achieved successfully by firms in a supply chain through strategic partnering among trading partners in a supply chain and effective knowledge sharing practices. Hewitt, (1994) and Stevens, (1989) suggested that the development of internal supply chain integration should precede the external integration with suppliers and customers in order to ensure successful supply chain integration. Furthermore, this successful and well integrated supply chain could advance organizational performance in terms of diversity capabilities and productivity (Feng, Sun, Sohal, & Zhu, 2011; Narasimhan & Kim, 2002).

2.11.2 Construct and Framework of Supply Chain Integration

There are many research studies conducted in the area of supply chain integration (Fawcett & Magnan, 2002; Neuman & Samuels, 1996; Power, 2005; Rai, Patnayakuni, & Seth, 2006; Sezen, 2008). Considering the above vast and in depth studies in this area, the supply chain integration instrument could be classified into main perspectives or dimensions: (1) internal integration across supply chain (Carter & Narasimhan, 1996), (2) a company's integration with customers (Koufteros, Vonderembse, & Jayaram, 2005) and (3) a company's integration with suppliers (Petersen, 1999; Petersen, Handfield, & Ragatz, 2005). The study adopts the concept of supply chain integration from previous research by using three sub-constructs to (Frohlich & Westbrook, 2001; Narasimhan & Kim, 2002).

Table 2.6 below shows the sub-constructs of supply chain integration. These sub-constructs measure supply chain integration in terms of 1] Integration with suppliers, 2] Integration with customers, and 3] Internal integration across supply chain.

Table 2.6
List of Sub-Constructs for Supply chain integration

Constructs	Definition	Literature
Internal supply chain integration	The degree of coordination between the internal functions of all the trading partners in the supply chain.	Stevens, 1989; Carter and Narasimhan, 1996; Narasimhan and Carter, 1998; Birou et al; 1998; Wisner and Stanley, 1999
External integration with suppliers	The degree of coordination between manufacturing firm and its upstream partners.	Peterson et al., 2005; Koufteros Vonderembse, and Jayaram 2005; Bowersox, 1989; Stevens, 1989; Byrne and Markham, 1991; Lee and Billington, 1995; Hewitt, 1994; Clark and Hammond, 1997; Wood, 1997; Lummus et al., 1998; Stock et al., 2002; Narasimham and Jayaram, 1998; Johnson, 1999; Frohlich and Westbrook,2001; Ahmad and Schroeder, 2001; Kim and Narasimhan, 2002; Narasimhan and Kim, 2002; Frohlich and Westbrook, 2002; Frohlich, 2002.
External integration with customers	The degree of coordination between manufacturing firm and its downstream customer.	Koufteros, Vonderembse, and Jayaram, 2005; Bowersox, 1989; Stevens, 1989; Byrne and Markham, 1991; Lee and Billington, 1995; Hewitt, 1994; Clark and Hammond, 1997; Wood, 1997; Lummus et al., 1998; Stock et al., 2002; Narasimhan and Jayaram, 1998; Johnson, 1999; Frohlich and Westbrook, 2001; Ahmad and Schroeder, 2001;Kim and Narasimhan, 2002; Narasimhan and Kim, 2002; Frohlich and Westbrook, 2002; Frohlich, 2002.

Source: Literature Survey

Internal supply chain integration refers to functional linkages and collaboration within a organisational or firm boundaries, which capture all internal organisational functions involving management of incoming raw material, production and shipping (Jayaram & Tan, 2010; Narasimhan & Jayaram, 1998). This functional collaboration and integration requires full system-visibility from inbound to outbound and finally resulting to achieve customer value and satisfaction (Stevens, 1989). The success of such functional integration is due to the organisational investment towards their information technology and systems, particularly inventory management system and logistic-related operating data. It enhances

various functions in an organisation to optimize system-wide interactions so that the entire organisation becomes more effective (Narasimhan & Kim, 2002; Vries & Huijsman, 2011).

Integration with customers involves all organisational activities or processes in determining customer requirements and fulfilling them (Koufteros, et al., 2005). When a firm attempts to understand their customers and highly committed in meeting their needs, a strong linkage is built between the firm and its customers. As such this vital integration process will ensure voice of the customer [VOC] in bringing creative and innovative process within the organisation (Baharanchi, 2009).

Integration with suppliers encompasses all the activities and processes that involve nurturing and developing long-term commitment and close relationship between the firm and its suppliers. This involvement takes place through effective organisational communication and mutual trust (Koufteros, et al., 2005; Olson, 2010). Such relationship will lead to effective supplier partnering in the long run. Henceforth, suppliers could contribute greatly to firms in the early stages of the product life cycle development. This will entail early supplier involvement in product design or the acquisition of access to superior supplier technological capabilities (Petersen, et al., 2005).

2.12 Supply Chain Performance

In the following paragraphs, the key elements of supply chain performance are outlined and reviewed. Review of supply chain performance is further synthesized by focusing on the relevant definition, development of various construct and framework of supply chain

performance. Furthermore, the review discussion will also focus on the importance of supply chain performance.

2.12.1 Definition of Supply Chain Performance

Measuring performance, seen by some circles as managing for results, can be described in many different ways depending on the way it is performed and the purpose of measuring the performance (Chia, Goh, & Hum, 2009). Thus, it may mean setting performance expectations, comparing actual performance with benchmarking data and continuously improving the processes. As such, performance measurement is defined as a process of quantifying a single task or several activities effectively and efficiently (Atilgan & McCullen, 2011; Neely, 1997). More specifically, measuring performance means interpreting the performance outcome into communicated and reported information that can be useful for the purpose of further improvement (Basu, 2001; Lebas, 1995; Trkman, et al., 2010).

Owing to its importance to current competitiveness in the business environment, even supply chains need monitoring mechanisms for their performance, the same way as individual firms (Bititci, Mendibil, Martinez, & Albores, 2005). For a performance measurement system to be dynamic, it should possess properties that match the dynamic environment (Kim, Kumar, & Kumar, 2010). Bititci, (2000) identifies such properties as to be sensitive to changes in the external and internal environment of an organisation.

Additionally, supply chain performance is referred to as a process of quantifying the performance of the total supply chain operations of an organisation in terms of cost efficiency, capital utilization and customer service (Brewer & Speh, 2000). Besides, supply chain performance projects a set of metrics reflecting activities or tasks pertaining to customer service, corrective actions and preventive action (Gunasekaran, Patel, & McGaughey, 2004). The objectives of developing an effective customer service in a supply chain can be achieved through corrective action (production overtime and emergency or rush order). Meanwhile, preventive action (safety stock and plant extra capacity) is related to supply chain cost operation and capital management. Together, both these corrective and preventive action could deliver excellent customer service.

The purpose of this supply chain performance is to meet its short-term and long-term objectives (Atilgan & McCullen, 2011). The short-term objectives of the supply chain performance involve measures purported to improve productivity of the total supply chain through (1) inventory reduction and (2) shorter lead time. Simultaneously, the long-term objectives of the supply chain performance involve measures purported to (1) increase market share and (2) integration of all trading partners in the total supply chain (Li, Ragu-Nathan, et al., 2006; Lyons, et al., 2004; Tan, Kannan, et al., 1998).

2.12.2 Supply Chain Performance Evolution

According to Johnson & Kaplan (1987), similar to any other performance measurement, from a broad perspective, the supply chain performance measurement has also evolved and developed innovatively to meet the changing and challenging business environment. The

continuous innovative development in the total supply chain performance measurement was further driven by ever pressingly demanding customers (Fisher, 1992).

The previous traditional performance measurement which focuses on the financial metrics has been strongly criticised for giving importance on short term profit orientation and not encouraging continuous improvement measures (Holmberg, 2000; Kaplan & Norton, 1992, 1996; Toni & Tonchia, 2001). This implies that, there is the need for supply chain performance measure that is more significant to the current competitive business era which ensures long-term sustainable growth and continuous improvement (Yee, 2005). Subsequently, this robust performance measurement enables the organisation to continuously evaluate performance, monitor progress and rectify problem (Waggoner, Neely, & Kennerley, 1999). This supports the view of Sink and Tuttle, (1989) that if one cannot be measured, then it can never be managed. In conclusion, the supply chain performance will be able to measure the effectiveness of relationship, networking and integration among the supply chain members (Neely, 1997). Table 2.7 summarizes review of several literatures on the performance measurement system upon considering significant elements of evolution through a comparison approach between traditional performance measurement system and innovative performance measurement system.

Table 2.7
Performance Measurement System Evolution

Traditional PMS	Innovative PMS
Based on cost/efficiency	Value-based
Trade-off between performances	Performance compatibility
Profit-oriented	Customer-oriented
Short-term orientation	Long-term orientation
Prevalence of individual measures	Prevalence of team measures
Prevalence of functional measures	Prevalence of transversal measures
Comparison with standard	Improvement monitoring
Aim at evaluating	Aim at evaluating and involving

Source: Mkumbo, (2008)

2.12.3 Construct and Framework of Supply Chain Performance

Understanding supply chain management is crucial in the quest for corporate survivability and business progress (Kotzab, Teller, Grant, & Sparks, 2011; Storey, Emberson, Godsell, & Harrison, 2006). Many academicians, practitioners and consultants realized the potentials of supply chain management in day-to-day operations management. Dynamic business processes and synergized activity, such as supply chain management (SCM), which has strategic implications for any company, identifying the required performance measures on most of the criteria is essential and it should be an integral part of any business strategy (Chavan, 2009; Godsell, et al., 2010). According to Cooke, (2003), what gets measured gets managed.

Supply chain management has a complex network of business entities with greater number of echelons in the chain and the number of facilities in each echelon (Choi & Hong, 2002; Godsell, et al., 2010). As such, identifying effective indicators for supply chain performance is critical as it is contributed by complexity of context, scope, the extent of

number of organisations, product lines as well as the difficulty in developing appropriate measures (Beamon, 1999). The effective performance monitoring helps firms to ensure that they are on the path to financial stability and service excellence (Whalen, 2002). As Milliken, (2001) points out, an effective performance measurement process is critical to ensure continuous improvement in the supply chain processes. The author argues, what gets measured, gets done is only true if a manageable number of metrics, which focuses on business success, are used.

Many methods have been suggested over the years for SCM evaluation of any organization (Dixon, Nanni, & Vollmann, 1990). However, they often lack the insights for the development of effective performance measures and metrics needed to achieve a fully integrated SCM due to lack of a balanced approach and lack of clear distinction between metrics at strategic, tactical, and operational levels (Gunasekaran, et al., 2001; Hudson, Lean, & Smart, 2001). Therefore, it is clear that for effective SCM, measurement goals must consider the overall scenario and the metrics to be used. These should represent a balanced approach and should be classified at strategic, tactical, and operational levels, and be financial and non-financial measures, as well (Bhagwat & Sharma, 2007). An appropriate performance measurement process should include both cross-functional and up/down alignment (Tompkins & Ang, 1999). Khadem and Lorber, (1986), give the general performance measurement framework as one having the following fundamental system requirements: Accountability, Data system, Feedback, Recognition, and Training. Furthermore, Chan and Qi, (2003a) argue that performance measurement should take a holistic system perspective beyond the organisational boundaries.

Meanwhile, the concept and framework of a supply chain performance measure will definitely vary in relation to the different level of management hierarchy in an organization and its objectives (Holmberg, 2000). This is due to the fact that supply chain performance measures could influence the decision making process at various management level in an organization (Gunasekaran, et al., 2004). As a result, there is a need for different sets of performance measure for different level of management hierarchy (strategic level, tactical level and operational level). Unfortunately, there is difficulty in integrating performance measure across all three level of management hierarchy in an organization.

Table 2.8
The Influence of Different Management Level Measures

Level	Area of Influence of Measures
Strategic Level	Top level management decisions, reflecting investigation of broad based policies, corporate financial plans, competitiveness and level of adherence to organisational goals.
Tactic Level	Mid level management decisions, dealing with resource allocation and measuring performance against targets to be met in order to achieve results specified at strategic level.
Operational Level	Low level managers, set operational objectives that lead to achievement of tactical objectives, measurements and metrics require accurate data.

Source: Gunasekaran et al., 2004.

Apart from this, according to Holmberg, (2000) there are several other lacking in the current supply chain performance measure such as insufficient systems thinking or failure to measure supply chain as a single entity. The author further claimed, that such failure or lacking of system thinking in supply chain performance measure could lead the measurement system to a heavy reliance on financial measures. Unfortunately, evaluation methods that rely on financial measures are not well suited for newer generation of SCM

applications. Gunasekaran et al. (2001) also notes these problems and points out the lack of a balanced approach implementing supply chain performance measurement. Furthermore, these complex supply chains typically seek to provide a wide range of benefits, including many that are intangible in nature. As a result, the researcher sees that it is appropriate to use a balanced approach to measure and evaluate supply chains (Bhagwat & Sharma, 2007).

Realizing this, Gunasekaran et al. (2004) highlighted the importance of adopting holistic system perspective or a system wide balance approach in designing a supply chain performance measure. Eventually, this balance performance measurement facilitates inter-understanding and integration among members of a supply chain (Chan, Qi, Chan, Lau, & Ip, 2003). This, in turn encourages supply chain members to share mutual customer-focused goals in order to achieve changing customer requitements (Chan & Qi, 2003a; Vries & Huijsman, 2011).

Finally, characteristics found in effective performance measurement systems, as identified by Beamon, (1999), includes universality, measurability and consistency that can be used in analyzing the effectiveness of supply chain performance measurement systems as well. Beamon, (1999) states that the key elements in strategic goals involve the measurement of resources (generally cost), output (generally customer responsiveness) and flexibility (Yi, Ngai, & Moon, 2011) (how well the system reacts to uncertainty,). Hence, a supply chain measurement system must place emphasis on three types of measures, which are resource measures (R), output measures (O) and flexibility measures (F).

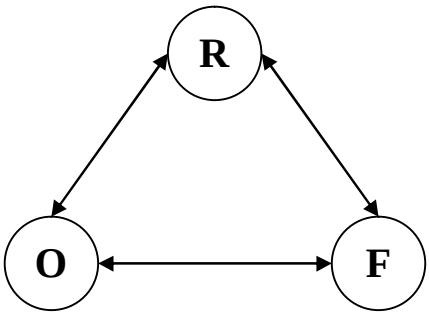
Table 2.9
The Goals of Supply Chain Performance Measure Types

Performance Measure Type	Goal	Purpose
Resources (R)	High level of efficiency	[Maintain] efficient resource management [as it] is critical to profitability
Output (O)	High level of customer service	Without acceptable output, customers will turn to other supply chains
Flexibility (F)	Ability to respond to a changing environment	In an uncertain environment, supply chains must be able to respond to change

Source: Beamon, 1999.

The goals of each of these measures are presented in Table 2.9, showing each to be different. Subsequently, this makes it necessary for a supply chain performance measurement system to measure each type, as each one is crucial to successful performance of the whole supply chain. The other aspect found in these types of measures is that each has important characteristics and the measure of each affects the other. Figure 2.14 presents the illustration of the interrelationship among the three types of measures. As Beamon, (1999) suggests, a supply chain performance measurement system must contain at least one individual measure from each of the above-identified types.

This multi-dimensional measurement is interesting since most of supply chain performance literature does not capture the items pertaining to shipping error and customer complaint (Narasimhan & Kim, 2002) Furthermore, most of the previous literature in supply chain management only focuses in its performance empirically either as a single dimension (Koh, et al., 2007) or dual dimensions such as financial and non-financial (Gunasekaran & Kobu, 2007).



Source: Beamon, 1999.

Figure 2.4
The Interrelationship of Measure Types in a Supply Chain Measurement System

To conclude, supply chain performance measurement that is process-based fits with the nature of supply chain management and contributes much more towards continuous improvement of supply chain management. With process-based measurements, problems in operations can easily be recognized and corrected before they escalate. It makes possible in linking with operational strategies, identifying success, testing the effect of strategies, as well as supporting in monitoring the progress. Also, it helps in directing management attention and resource allocation as well as in enhancing communication of process objectives, resulting in improved trust and common understanding. Chan and Qi, (2003a), believe strong assistance is provided by process-based measurements. Their timely information enhances integration and improvement of the cross-organisational processes. The measurement tasks can be simplified when all processes (even beyond the organisation's boundaries) are viewed in a systems perspective. The perspective also supports global optimization among all interrelated processes. Below is Table 2.10, shows the list of supply chain performance measures which is identified in the literature.

Table 2.10
Measures of supply chain performance identified in the literature

Author	Performance Measures
Levy (1995)	Average finished goods inventory
	Demand fulfillment
Christopher (1992)	Order cycle time
	Order completeness
	Delivery reliability
Lambert and Sharman (1990)	Delivery performance
	Lead time
	Level of defects
	Responsiveness
Cohen and Lee (1990)	Material inventory
	Work in process inventory
	Finished goods inventory
	Fill rates
	Stock-out frequencies
	Lead time
Davis (1993)	Inventory levels
	Inventory investment
	Order fill rate
	Line item fill rate
	Average number of days late
Lee and Billington (1992)	Inventory turns
	Line item fill rate
	Order item fill rate
	Total order cycle time
	Total response time to an order
	Average backorder levels
	Average variability in delivery
Gunasekaran et al., 2001	Strategic Performance Metrics
	Tactical Performance Metrics
	Operational Performance Metrics
Kaplan and Norton (1992)	Customer Perspective
	Internal Business Process Perspective
	Innovative and Learning Perspective
	Financial Perspective
Supply Chain Council (1997) – SCOR Model	Cost
	Time
	Quality
	Flexibility
	Innovativeness

Source: Literature Survey

2.13 Summary

The aim of this chapter was to discuss the literature on what are the comprehensive sets of supply chain practices and factors which promote the overall supply chain performance. Further, the review has been highlighted by considering contingency theory and its two sub-

theories - industrial organisation theory and resource-based theory, both of which has brought about compounding strength to overall supply chain model. In conclusion, based on the literature review and discussion in this chapter, the supply chain performance of the electronics manufacturing firms may be improved through supply chain practices and supply chain integration.

The concept and implementation of supply chain management practices can be further investigated through supplier strategic partnering, customer relationship, information sharing, information quality, postponement, internal lean practices, agreed vision & goals and risk & reward sharing in electronics manufacturing firms.