
PUSAT PENGAJIAN SISWAZAH PERNIAGAAN

GRADUATE SCHOOL OF BUSINESS

# SCOR QUALITY MODEL AFFECTING MANUFACTURING FIRM'S SUPPLY CHAIN QUALITY PERFORMANCE AND THE MODERATING EFFECT OF QMS

**By**

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**A term paper submitted for ADW 622- Project Management in partial fulfillment of the requirements for the Degree of**

**Master of Business Administration**

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**Universiti Sains Malaysia**
**Penang**
**May 2012**

**Acknowledgement**

It is a hard way for me to complete this project paper as I have to coupe the heavy schedule between work, study, my family and also this paper at the same time. Even thought the process to complete this management project is hard, but there are always people out there who willing to hand me a helping hand and encourage me to complete my study and this paper and they deserve a special acknowledgement for the invaluable support and contributions towards helping me to complete this journel:

- Associate Professor Dr Suhaiza Hanim, my supervisor and also the program manager, for her support and professional guidance in helping me to complete this management paper.
- All the lecturers from School of Management and Graduates School of Business, whom I had the opportunity and honor to be taught by.
- My colleagues who are understanding and willing to give me a helping hand whenever I am not around the company to pursue my study.
- My fellow Online MBA course mates who shared their knowledge, experience and also the friendship together throughout this program.

Finally, I wanted to dedicate my biggest gratitude to my parents who supported me throughout this program.

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## ABSTRACT

The main objective of this study is hypothesis testing to explain the nature of the relationship between the independent variables (The SCOR quality model) and the dependent variable (Supply Chain Quality Performance) and moderated by (QMS).

Correlation study will be used in this study as to determine the delineating of the important variables associated with the problems. The study setting is non-contrived and field study method is proposed to be used in this study. Due to time constraints, in order to answer the research question, cross sectional study will be used in this study on the part of the researcher and data collection for this study can be done in just once. Organization analysis was used in this study.

The study was limited in that it is focused on the Northern Peninsular Malaysia and manufacturing sector only. Another limitation for this study might be that a self administered questionnaire data will be collected. There is concern where in the survey study, the actions done by the respondent might not be the same as being told by them and due personal or organizational reasons and the respondents might not be able to answer the survey questionnaire truthfully.

From this study, the relationship of the SCOR quality model and the supply chain quality performance is established. This will provide further empirical support to existing models of the factor affecting the supply chain quality performance. Besides, the QMS as moderator between the SCOR quality model and the supply chain performance is also established.

This study is useful for managers in a manufacturing industry to practice SCOR quality model into their daily business practices. Managers might identify the most important decision from the SCOR quality model to be implemented to enhance or to improve the firm's performance.

## ABSTRACK

Objektif utama kajian ini adalah untuk menerangkan hubungan antara model SCOR kualiti dengan prestasi kualiti rantaian bekalan sesebuah firma dan QMS memoderasikan huungan model SCOR kualiti dengan prestasi kuality rantaian bekalan.

Korelasi akan digunakan dalam kajian ini untuk menentukan pembolehubah penting yang berkaitan dengan masalah yang dikemukakan. Tetapan kajian tidak dibuat dan bidang kaedah kajian adalah dicadangkan untuk digunakan dalam kajian ini. Disebabkan kesentukan masa, untuk menjawab soalan penyelidikan, kajian irisan akan digunakan dalam kajian ini dan pengumpulan data untuk kajian ini dilakukan hanya sekali sahaja. Analisis organisasi telah digunakan dalam kajian ini.

Tumpuan utama kajian ini terhad di Utara Semenanjung Malaysia dan sektor pembuatan sahaja. Sementara itu, had untuk kajian ini mungkin bahawa data soal selidik kendiri yang ditadbir akan dikumpulkan di mana dalam kajian tinjauan, tindakan-tindakan yang dilakukan oleh responden tidak mungkin sama seperti yang diberitahu oleh mereka dan disebabkan sebab-sebab peribadi atau organisasi dan responden mungkin tidak dapat untuk menjawab soal selidik dengan benar.

Daripada kajian ini, hubungan model SCOR kualiti dan prestasi kualiti rantaian bekalan akan dikenali. Ini akan memberi sokongan empirikal kepada model yang sedia ada di mana mempengaruhi prestasi kualiti rantaian bekalan. Selain itu, QMS sebagai moderator antara model SCOR kualiti dan prestasi rantaian bekalan juga ditubuhkan.

Kajian ini adalah amat berguna untuk pengurusan dalam industri pembuatan SCOR model kualiti dalam amalan harian mereka. Pengurus dapat mengenal pasti keputusan yang paling penting daripada model SCOR kualiti yang akan dilaksanakan untuk meningkatkan atau memperbaiki prestasi firma.

# CHAPTER 1:

# INTRODUCTION

## 1.0 Introduction

Quality is regard as one of the manufacturing's important competitive priority in today's business world. Quality has become the key element for success in the global marketplace (Forker et al, 1996). In today's business world, quality is not only the product quality itself, but also included the services. Hence, the supply chain quality is overtaking the product quality itself which supply chain quality is the overall quality of the raw material quality, production and process quality, delivery quality and the customer service quality.

There are two important tools namely supply chain management and total quality management that widely used among manufacturing companies in achieving competitive advantage (Sila et al, 2006) as the industry acknowledge and aware the change of perspective of quality in the marketplace. Researches done by Rungtusanatham et al (2003) and Tan et al (1999) have revealed the linkage of supply chain to the operational performance of the manufacturing industry.

On the other hand, there was long proven that quality management system does improve the various operation system in an organization and therefore improved the overall organization's performance. Quality management system such as total quality management and ISO 9000 are those management systems that widely used in manufacturing industry to achieve the objective of improving organization's performance.

In view of the similarity of the outcome of the both quality management system and the supply chain management (Vanichchinchai and Igel, 2009), researches done by Chin et al (2010) and Sila et al (2006) have link and related the both management system to a more comprehensive and overall management system – supply chain quality management. The supply chain quality management covered from the raw material from suppliers, in-process and production internally

until the delivery of product to the customers and the return of defected goods. This supply chain quality management has been used in industries since the late 90's. Followed by the implementation of supply chain quality management, the users were thinking of way to measure and justify the successfulness of implementation. Few measuring tools were developed but most are difficult to be applied in the day to day operational. Hence, in order for top management to simplify the complexity of supply chain management, Supply Chain Council (SSC) has revealed the Supply Chain Operation Reference (SCOR) model which act as the strategic planning tool for the purpose. (Huan et al, 2004; Lockamy and McCormack, 2004).

In general, all the above mentioned supply chain management, total quality management and supply chain quality management system are all linked to the final objective for manufacturing industrial users – to improve the performance of the organization which later relate to the improving profit for the shareholders.

In the later part of the chapter, this study will conduct background analysis on the supply chain management, quality management system, SCOR quality model and the supply chain quality performance. From this background study, this study will discuss the problem statement and followed by the research objective, research question and scope of study on the topic.

## 1.1 Background of Study

Since the pass 3 decades, the interest in quality grew at an unprecedented rate and playing a major role in the business world. Deming, Juran and Crosby are the gurus who are in the quality revolution (Evans and Lindsay, 2008, pp. 92), have introduce the modern quality philosophy – Total Quality Management (TQM) which adopted and practice not only by the huge manufacturing industries such as automobile industry in the United State, but also practice widely for the medium small and medium size manufacturing companies (Casadesus and Castro, 2005). As quality become a major focus in the business world throughout the world, International Organization for Standards (IOS) who represent the standards bodies of 91 nations adopted and

standardization a series of written quality standards – the ISO 9000 standards (Evans and Lindsay, 2008, pp. 128). Since the introduction of ISO 9000 standards in the year 1987, from the initial objective of adopting this standard as their quality management system (QMS) is to be more effective and striking on continuous improvement until the recent years which the objective of a company adopting the standard is not only to remain competitive but also to avoid been expel from its own industry (Casadesus and Castro, 2005).

The quality systems which concentrate more on internal process control and continuous improvement program is no longer sufficient in the current business world. Manufacturing firms tend to transfer its non-core or value-adding activities to their suppliers who are technically competent and concentrate only on its core business to remain competitive in the market (Lau et al, 2010). This value transfer activity required the manufacturing firm to work more closely with their suppliers to ensure the quality of supplies is able to meet the internal requirement to achieve customer satisfaction. This has lead to the birth of the supply chain management (SCM) which captured interest from both the business and academic researchers recently (Marcos. A et al, 2007; Kannan and Tan, 2007). The main reason behind the popularity of SCM is greatly related to the operational success for firms who successfully implemented the SCM (Hussein et al, 2010).

In view of the significant contribution and huge number of job opportunities created, the manufacturing sector is hence regards as one of the most important sector in many countries (Islam and Karim, 2011). According to Aris (2006), the number of establishment for manufacturing sector is only amounted to 5 per cent from the major three sectors in Malaysia namely Services sector, Agriculture sector and Manufacturing sector in the year 2003. Although the percentage of establishment is less in number, but according to the report released by Department of Statistic Malaysia (DOS (a), 2011) the output value of the manufacturing sector in year 2008 recorded to RM817.7 billion. In March 2011, the manufacturing sector posting a year-on-year value of RM52.7 billion sales (DOS (b), 2011) which accounted for 27.9 per cent contribution to Gross Domestic Product (GDP).

As mentioned above, firms that successfully applied the SCM is greatly related to the operational success. As pointed out by Poirier and Quinn (2004) there are several potential benefits that can be obtained from the implementation of SCM. These benefits including increases in customer satisfaction, cost reduction, improving revenue and profits, and streamlining of its operations and so on to achieve competitiveness. These benefits have attracted a lot of manufacturing industries to implement SCM in parallel to the TQM or QMS that they applied daily in the business operations.

The existence of TQM was better defined compared to the SCM which there are confusion of the term of the SCM itself although the term to explain SCM become more firm in which IESE defined SCM as *"to interconnecting companies, communities and clusters of companies and users, permanent connection with suppliers and customers, total integration in applications, remote business and the continuous set up and dismantling network"* (Casadesus and Castro, 2005).

## 1.2 Problem Statement

In view of the main objective for both the TQM and SCM is to achieve customer satisfaction (Vanichchinchai and Igel, 2009). The combination of both the TQM and SCM concept has consequently created the supply chain quality management (SCQM) as a new management concept (Sila et al, 2006). According to Sila et al (2006), the SCQM is about all quality improvement activities that take place within a supply chain. SCQM was defined by Ross, (1998) as the participation of all supply channel network in the continuous and synchronized improvement of all processes, products, services and work culture focused on generating sources of productivity and competitive differentiation through the active promotion of market winning product(s) and service dilution that provide total customer value and satisfaction (Vanichchinchai and Igel, 2009).

Researches were done in finding the relation between supply chain quality management practice and organization performance (Kuei et al, 2001; Chin et al 2010); supply chain process integration and firm's performance (Hussein, 2010); standard to implement process management in whole supply chain (Carmigani, 2009); the state of supply chain quality management in manufacturing companies related to the different supply chain partners, attributes that characterize customer-supplier relationships and factors that determine the development quality specification in a supply chain and the effect of supply chain quality management activities of companies on product quality (Sila et al, 2006); and how to improving quality improve supply chain management (Casadesus and Castro, 2005).

The relationship between QMS influencing supply chain (SC) has been widely investigated and analyzed. Analysis done by Kuei et al (2001) has reviewed the impact of supplier quality; Rodriguez and Lorente (2004) have found that QMS practice in purchasing relationship to purchasing operation performance is positively effect the internal customer satisfaction and business performance; and Rahman (2006), has concluded that the QMS implementation is beneficial to the logistics functions.

According to Salvador et al (2001) study on interaction between organization with their suppliers and customers found that time based performance can be further enhanced by providing information that can used to improve operations control and coordination. According to Forker et al (1997), QMS is a powerful tool in effecting the supplier quality performance which is the upstream portion of supply chain while Romano and Vinelli (2001) able to prove that QMS implementation is able to improve the downstream of supply chain. These studies have indicated the quality improvement by implementation of QMS across the supply chain (Sila et al, 2006). According to Gunasekaran (2003) practicing Six Sigma and Black Belt methodologies which parts of the TQM will enhance both the productivity and quality throughout the supply chain.

There are also studies trying to standardize the SCM since there are different stream of term and explanation explaining the SCM. Carmignani (2009) has proposed to develop a standard into the whole supply chain which using a sequential 3 steps methodology:

1. To setup the starting point using ISO 9001:2000;
2. To avoid the limitation for application in supply chain, identify the modified ISO 9001 model; and
3. The supply chain standard framework proposal and their correlated process.

There are researchers analyzing the synergy effect of combining the both QM and SCM – SCQM (Sila et al, 2006). Manufacturing firms are applying SCQM in their operation system to achieve competitive advantage through quality, efficiency and innovation (Sila et al, 2006). The latest study from Kuei et al (2008) has proposed the strategic framework for the development of SCQM by integrating both vision and gap driven change approaches for the implementation and countermeasures.

Manufacturing firms who achieve supply chain integration into their business process, are reported success and remain competitive through lower inventory and material acquisition investment, improvement on cash flow cycle time, reduce production lead time and logistic cost, improve productivity ability to meet customer expectation (Lummus and Vokurka, 1999), improve the manufacturing industry competitiveness in term of revenue growth, operational excellence, and customer relationship (Hussein et al, 2010).

Although there are studies done for the relationship between SCQM with organization performance which firm performance could be enhance through improved SCQM (Kuei, 2001; Azar et al, 2010) and product quality (Sila et al, 2006) but these researches are mainly conducted for the large industries (LIs) such as Taiwan's top 500 corporation and automobile industries. Higginson and Alam (1997) have reviewed the techniques used by the SMEs are vary in extent between industries, and that the organizational structure of SMEs has both helped and hindered

the implementation of SCM and proposed that education abut the benefits, costs and techniques of SCM is required at all level for SMEs for further development.

In view of the establishment of the manufacturing sector in Malaysia is consist of 94.4 per cent of SMEs and the remaining are from LIs but the contribution of the total output from the LIs are about 74.4 per cent for the sector (DOS (a), 2011). SMEs will be equally important because as the increasing contribution of SMEs for the country's economy (Aris, 2006). Hence the study on the relationship between SCQM and the overall manufacturing sector which include the both SMEs and LIs will be more appropriate and meaningful for the study.

SCOR model was developed as a useful tool to measure the supply chain quality performance. This SCOR model simplified the elements consist of Plan, Source, Make Deliver and Return for the management to review the organization performance. Although SCOR model is developed as a measuring tool for the management, but the five decisions contained in the SCOR model in fact are highly affecting the SCQM performance. Hence, the study of the relationship is well worth to be studied. Hence in this study, the decisions in SCOR model will be used as the quality model (SCOR quality model) in finding the relationship of these decisions and the impact to the supply chain quality performance.

## 1.3 Research Objective

The main objective of this study is to examine the effect of SCOR quality model on supply chain quality performance for manufacturing industry in Malaysia and the moderating effect of QMS on the relationship.

Thus, the objectives of the study are:

1) To examine the relation between SCOR quality model and supply chain quality performance;
2) To examine the moderating effect of QMS between the SCOR quality model and the supply chain quality performance.

## 1.4 Research Questions

From the previous discussion, this study infers specific research questions for this study. They are as below:

1) Does the SCOR quality model affecting the supply chain quality performance for Malaysia's manufacturing sector?
2) Does the QMS moderate the SCOR quality model application onto the supply chain quality performance?

## 1.5 Scope of Study

The manufacturing sector in Malaysia was chosen as the study for the impact of SCOR quality model implementation effecting the supply chain quality performance and the moderating effect of QMS onto the relationship. In view of the huge number of job opportunity created and the contribution to national economy in many countries, hence the manufacturing industry is regards as an important sector in many countries (Islam and Karim, 2011). According to the report released by Department of Statistic Malaysia in March 2011, the manufacturing sector posting a year-on-year value of RM52.7 billion sales (DOS (b), 2011) which accounted for 27.9 per cent contribution to Gross Domestic Product (GDP).

Today, efficiency and effectiveness are the two main key words used in the competitive business world. Management is finding the most efficient method in remained competitive in the industry. Hence, quality systems such as QMS systems and SCM in logistic are individually or combine implemented to improve the efficiency of the business operation to achieve better business performance.

In view of the manufacturing sector is an important contributor to the country economy, hence the study of SCQM and quality performance topic related to manufacturing sector can be very useful reference material for economic growth in near future.

The research target for this study will be concentrated on the manufacturing sector in the Northern Peninsular Malaysia (Perlis, Kedah, Penang and Perak). From the data released by DOS total gross output from the 4 states were amounted to RM181.8 billion which is about 22.2 per cent of the total nation's manufacturing output (DOS (a), 2011). The major products output from these 4 states were manufacturing of rubber and plastic products; manufacturing of radio, television and communication apparatus; manufacturing of food and beverage products; manufacturing of electrical machineries; manufacturing of office, accounting and computing machinery and manufacturing of non-metallic mineral products. Industrial park such as Kulim High Tech Park, Penang Free Trade Zone and industrial zones in Perak which consist of huge number of manufacturing establishment will be the research target for this paper.

According to the statistic released by Federal Manufacturing Malaysia (FMM), there are 4 entities in Perlis; 75 entities in Kedah, 236 entities in Perak and 256 entities in Penang registered with the FMM as manufacturing entities (FMM Annual Report 2010). Hence, the target samples will be obtained from the information released by FMM.

## 1.6 Significance of Study

From the initial literature review this study have found that numbers of studies have been done in finding the relation between supply chain quality management practice and organization performance (Kuei et al, 2001; Chin et al 2010); supply chain process integration and firm's performance (Hussein, 2010); standards to implement process management in whole supply chain (Carmigani, 2009); the state of supply chain quality management in manufacturing firms related to the different supply chain partners, attributes that characterize customer-supplier relationships and factors that determine the development quality specification in a supply chain and the effect of supply chain quality management activities of companies on product quality (Sila et al, 2006); and how to improving quality improve supply chain management (Casadesus and Castro, 2005).

The relationship between QMS influencing supply chain (SC) has been widely investigated and analyzed. Analysis done by Kuei et al (2001) has reviewed the impact of supplier quality; Rodriguez and Lorente (2004) have done the research on the QMS practice in purchasing relationship to purchasing operation performance, internal customer satisfaction and business performance; and Rahman (2006), has analyzed the QMS implementation in logistics functions.

According to Salvador et al (2001) the study on interaction among organization with their suppliers and customers found that time based performance can be positively influenced by providing information that can used to improve operations control and coordination. According to Forker et al (1997), QMS is a powerful tool in affecting the supplier quality performance which is the upstream portion of supply chain while Romano and Vinelli (2001) able to prove that QMS implementation is able to improve the downstream of supply chain. These studies have indicated the quality improvement by implementation of QMS across the supply chain (Sila et al, 2006). On the other hand, researchers such as Huan et al (2004); Li et al (2011) and Lockamy and McCormack (2004) have done the studies in finding the relationship between the SCOR model and the firm's supply chain performance.

From these studies by these researchers, QMS system and the SCOR model used as the measuring tool has been individually related to the succession of supply chain quality performance. From previous studies, the SCOR model was used as a measuring tool to measure the supply chain performance Huan et al (2004); Li et al (2011) and Lockamy and McCormack (2004). From the decisions included in the SCOR model, it is likely that the decisions are giving an impact to the supply chain quality performance. Therefore, in this study the decisions in the original SCOR model will be used as the quality factor to determine the supply chain quality performance and in this study the decisions are to be categorized as the SCOR quality model. Hence, the study to relate the SCOR quality model with the supply chain quality performance will be able to close the gap from the previous studies.

Furthermore, all of the previous studies mainly concentrated to the top companies or large industries, there will be worthwhile to study the impact on the manufacturing sector as manufacturing sector is playing a major role in a country's economy growth which contributed to about a quarter of the nation's GDP. Thus, the contribution of both theoretical and practical perspective through this study will be useful for the practitioners in the manufacturing industry.

From this study, the theoretical contribution for the relationship of the SCOR quality model and the supply chain quality performance is established. This will provide further empirical support to existing models of the factor affecting the supply chain quality performance. Besides, the QMS as moderator between the SCOR quality model and the supply chain performance is also established. This has added substantively to relate the literature and addresses arguments which highlight the need for further research to test the moderator between the SCOR quality model and the supply chain quality performance. Specific QMS systems such as TQM and Six Sigma can also be tested into the relationship in future research.

## 1.7 Definitions

Following is the list of definitions on the QMS system and SCOR quality model used in this study:

***Quality Management System (QMS)****:*

According to Kim et al (2010), QMS is refer to the ISO 9000 which was viewed as one of the most important quality assurance program and ISO 9000 implementation is the first step in establishing a quality oriented environment and achieving total quality management (TQM) in organization. According to Evans and Lindsay (2008), the Baldrige Criteria for Performance Excellence, ISO 9000 and Six Sigma are all consider QMS although all the three are different based focus in helping organizations improve performance and customer satisfaction. According to Ronnback et al (2009), QMS was defined by ISO as a "management system to direct and

control an organization with regard to quality" and QMS is interpreted as a comprehensive practice that supports the assurance and improvement of quality. In this study, the QMS will be refer to ISO 9001 system.

The implementation of ISO 9000 international standards has eventually fruitful and benefits industries. According to Saizarbitoria et al (2006), Haversjo (2000) has mentioned that ISO 9000 certified firms are generally generating higher revenue and profit compared t0 those who are not certified; Romano (2000) concluded that ISO 9000 certification contributed to improving quality and production costs besides enhancing the internal and external quality cost; Casadedud (2001) suggested that 65% of the companies obtained improvement, internally as well externally. Merino (2001) mentioned that firms that implementing and obtained highest indexes of QMS implementation are generally reporting best results in term of overall performance.

***SCOR Quality Model:***

SCOR quality model consist of five decisions namely Plan, Source, Make, Deliver and Return. SCOR model was developed and published by the Supply Chain Council (SSC) in 1996, which SCOR model is a strategic planning and diagnostic tool that allows senior managers to simplify the complexity of supply chain management (Lockamy and McCormack, 2004; Huan et al, 2004). Management is able to design and manage the supply chain process of an organization and monitor using the SCOR model (Giannakis, 2011).

In this study, SCOR quality model is used as the independent variable to analyse the effect to the supply chain quality performance. Below are the individual definitions for each of the decision:

***Plan***:

The plan decision is a process to balance between the supply and demand which to develop actions in meeting the source, make and delivery processes (Giannakis, 2011). According

to Supply Chain Council (2011), Plan process is including the demand or supply planning and management. This process required to balance the resources with requirement, establish and communicate plans for the whole supply chain, including the Return and the execution process of Source, Make and Deliver.

Planning also involved the management of business rules, supply chain performance, data collection, inventory, capital assets, transportation, planning configuration, regulatory requirement and compliance, and supply chain risk. Planning also included aligning the supply chain unit plan with the financial plan. Adisak and John (2008) explained that the Plan decision is to balance the supply and demand to meet the source, make and deliver decisions.

***Source***:

Source decision is a process where materials are procured in order to meet the demand (Giannakis, 2011). According to Supply Chain Council (2011), Source process is including the sourcing stocked, make-to-order and engineering-to-order product. Sourcing process involved the schedule deliveries, received, verify and transfer of product; and authorized supplier payments. For engineer-to-order product, the source process is to identify and select supply sources when not predetermined.

Source process also involved in handling business rules, assessing supplier's performance, maintain data, manage the inventories, capital assets, incoming product, supplier network, import/ export requirements, supplier agreement and supply chain source risk. According to Adisak and John (2008), the Source decision is to perform procurement activity for goods and service to meet the planned and actual demand.

***Make***:

Make is the process of which the transformation of material into finished goods (Giannakis, 2011). According to Supply Chain Council (2011), Make process is included make-

to-stock, make-to-order and engineering-to-order production execution. Make process including the scheduling production activities, issue product, produce and test, packaging, stage product and release product to deliver. For the engineer-to-order product, the make process will have to finalized the engineering process.

Make process also involve in manage rules, performance, data, in-process production (WIP), equipment and facilities, transportation, production network, regulatory compliance for product and supply chain make risk. According to Adisak and John (2008), the Make decision is to transform material into finished goods which to meet the planned or actual demand.

***Deliver***:

Deliver decision is the action whereby the distribution of finished goods to the end customer by meeting their demand (Giannakis, 2011). According to Supply Chain Council (2011), Deliver process including the order, warehouse, transportation, and installation management for stocked, make-to-order and engineer-to-order product. Order management including steps from processing queries and quotes to routing shipments arrangement and carriers selection. Warehouse management which includes the receiving and picking, loading and product shipment.

Receiving and verifying products at customer site and providing installation services if necessary, invoicing customer, manage delivery business rules, performance, information, finished product inventories, capital assets, transportation, product life cycle, import/ export requirements, and supply chain deliver risk. According to Adisak and John (2008), the Deliver decision is to distributing the finished goods and services to the customer which meet the schedule or actual demand.

***Return***:

Return is the process of goods return from the downstream to the upstream stage of the supply chain (Giannakis, 2011). According to Supply Chain Council (2011), Return included the

return of raw materials and receipt of return of finished goods. The Return process will be included the return from source of defective product; return maintenance, repair and overhaul product and return excess product.

The Return process is also including manage return business rules, performance, data collection, return inventory, capital assets, transportation, network configuration, regulatory requirement and compliance and supply chain return risk. According to Adisak and John (2008), the Return decision is the activity of returning or receiving returned products for a specific reason.

***Supply Chain Quality Performance***

In this study, the supply chain performance is the dependent variables where consist of cost, time and reliability factors in the performance measurement.

According to Banomyong and Supatn (2011), cost related dimension is related to the efficiency. On the other hand, effectiveness covered the timeliness and reliability. These three dimensions are important to be measured as these dimensions reflect the output of supply chain operation as well as its capability to meet customer requirement at lowest cost, in the shortest time and on time. Hence these three dimensions can be used as the key performance indicator to measure the supply chain quality performance (Banomyong and Supatn, 2011).

***Cost***:

According to Banomyong and Suptn (2011), cost is the main dimension in assessing organization's performance for the business activities and processes. Operating cost such as financial expenses for the supply chain activities help identify if operational change to control expenses and to discover areas for improved asset management. Cost management includes all the expenditures of the organization's operations. The ratio between the cost for each supply chain activity and the total sales is calculated and used as the main indicators for cost performance of the supply chain.

***Time***:

According to Banomyong and Suptn (2011), time is referring to the lead time dimension. They explained that the lead time is the time interval between the beginning and completion of one specific supply chain activity. In view of the time is limited resources, customer satisfaction can be achieved by reducing the supply chain response time. Therefore, lead time is consider as one of the key factor in measuring the supply chain performance. The average time spent for each supply chain activity is used as indicator for lead time performance.

***Reliability***:

According to Banomyong and Suptn (2011), reliability is defined as the ability of one specific event or activity to perform a required function under stated condition for a stated period of time. Consistent lead time or quality of output reflects the quality of each supply chain activity especially from customer's perspective.

## 1.8 Organization of Remaining Chapters

In order to ensure the systematic and organized research to be conducted, literature review will be started in Chapter 2 which is to cover the theories, findings, knowledge, and ideas that had been established and studied by previous scholars and researchers in this particular topic. Theoretical research design framework and hypothesis will be formed followed by the literature review at the end of Chapter 2. In Chapter 3, relevant research methodology will be proposed in order the research can be done systematically and as planned. In Chapter 4, SPSS analysis tool will be used in analyze the collected research data. In Chapter 5, detailed discussions will be conducted based on the support by established

literatures findings. Final conclusions will be made and due recommendations will be suggested for future research.

# CHAPTER 2:

# LITERATURE REVIEW

## 2.0 Introduction

In this section, this study will review the QMS, TQM and SCM individually to understand the basic of the SCQM. Later this study will discuss the SCQM in detail and the SCOR model. Through this literature review, this study is trying to find out the linkage of the QMS, the SCOR quality model and supply chain quality performance. Later this study will relate the SCOR model to the supply chain quality performance. After the literature review from various researchers and scholars, this study will discuss the theoretical framework for this study and setup the hypothesis to relate the dependent variables, moderating variables and the independent variables.

## 2.1 Total Quality Management (TQM)

TQM is originated start from quality inspection, and then included quality control (QC), quality assurance (QA) and then finally TQM (Evans and Lindsay, 2008, pp. 10). According to Haim (1993), the adoption of TQM among large companies are between 75 and 80 per cent. According to Leornard and McAdam (2002), the TQM terminology is inconsistent; an articulated means of achieving a target which set at strategic level and TQM is playing a key role in strategy implementation within the organizations.

Gunasekaran (2003) has defined TQM as a management philosophy "that encourage cost reduction, the creation of high quality goods and services, customer satisfaction, employee empowerment, and the measurement of results". Faisal (2010) has proposed that the TQM is a system where its functioned horizontally across the departments which from top management till the workers level. The TQM is also extend its function which includes the supply and customer chain.

On the research on the impact of the TQM to the organization's performance, Schaffer and Thomas (1992) suggested that many of the companies implemented the TQM without understand their impact. Hence researchers such as Zairi et al (1994) has suggested that the bottom-line results improvement and opportunities offered for companies to carry out improvements and focus on have a close relationship to customers are generally lead by the implementation of TQM practice.

Terziovski and Samson (2000) have concluded that overall, manufacturing organization firms are more likely to achieve high performance with TQM than those without practicing TQM. The TQM also been summarized by Tan et al (1999) that competitive advantage which act as strategic practice can be achieved by concurrently implementation and managing the supply base. So from the above statement from various analysts and researchers, this can summarize that the TQM has been evolved to a system that beneficial to its practitioners.

According to Faisal et al (2010), the integrated approach implant in TQM consist of the objective to improve the goods quality and services provided via consistently meeting or achieve beyond the customer's requirement Prattana et al (2010) has mentioned that, firms will tend to pursue the implementation of TQM as the progressing steps if the firms have successfully implementing the standardization concept in work or processes through obtaining QMS certification. On the other hand, Saizarbitoria et al (2006) cited that Martinez Lorente and Martinez Costa (2002) concluded that TQM has a positive effect on operating results. However the simultaneous implementation of ISO 9000 and TQM cancel those positive effects.

Improving the delivery dependability and reduced the cycle time has indirectly benefits the supply chain performance resulted from the process consistency of TQM practices (Flynn et al, 1995). Evans (1995) has concluded that the dedication exhibited by the senior management team will determine the success of TQM implementation. Guimaraes (1996) has stated that the successful implantation of TQM has shown improvement in role ambiguity, job satisfaction, job involvement, organization commitment and employee turnover intentions but no significant

change in role of conflict, task characteristics and career satisfaction. Firms that adopting the TQM will also possessing higher degree in their leadership, information and analysis, process management, supplier involvement, customer focus, people managing, strategy and planning, and process management (Prattana et al, 2010).

## 2.2 Supply Chain Management (SCM)

A supply chain is including those who deal with the company including suppliers, manufactures, distributors, retailer and customers. Ana et al (2011), has mentioned that SCM is an integrated approach where the system begin with inflow of scheduling, planning and control of raw material, services, logistic and information inflow from supplier towards the manufacturer and later from the manufacturer outflow of distributing finished goods to customer ends. The SCM is regards the most important practice in today's business world.

According to Manning et al (2006) and Turner and Davis (2002), SCM is defined as the management of upstream network of integration with suppliers and considering it as a development of traditional purchasing and supply management activities (Romano and Vinelli, 2001). SCM is also defined to the SCM as "network sourcing", "supply pipeline management", "value chain management", and "value stream management" (Romano and Vinelli, 2001).

Christopher (1994), defined supply chain as a network of organizations that are involved, through upstream and downstream linkages, in the different processes and activities that produce value in the form of products and services in the hands of the ultimate customers. According to Lummus and Vokurka (1999), the supply chain term is defined as "the process from the initial raw materials to the ultimate consumption of the finished product linking across supplier-user companies" and "the function within and outside a company that enable the value chain to make product and provide services to the customer" (Cox et al, 1995). Jones and Riley, (1985); Davis, (1993); van Hoek, (1998); Boyson et al, (1999); Naylor et al, (1999) tend to consider SCM as an

integrated logistic management. This management system will tend to reduce the both inventory holding within and across the firms in the supply chain.

Chopra and Meindl (2001), defined that all stages involved in supply chain, fulfilling customer request directly or indirectly. SCM also involved in the flow management in the supply chain for the products, information, and money to maximize firms' profitability. Kaynak and Hartley (2008) stated that SCM consist of internal and external practices. This has included the SCM practices to be included the internal and across organization boundaries where the customers and suppliers are integrated with the firm.

Lummus and Vokurka (1999) has summarized the definition of supply chain management based on the definition from Supply Chain Council (1997), Monczka and Morgan (1997) and Ellram and Cooper (1993) as: all the activities involved in the delivering a product from raw material through to the customer including sourcing raw materials and parts, manufacturing and assembly, warehousing and inventory tracking, order entry and order management, distribution across all channels, delivery to the customer and the information necessary to monitor all of these activities. Supply chain management coordinates and integrates all of these activities into a seamless process which link all of the partners in the chain including departments within an organization and the external partners including suppliers, carriers, third parties companies and information systems providers and the whole process needed to be treated a single system (Lummus and Vokurka, 1999).

According to Li (2011), SCM is a set of synchronized decision and activities utilized to efficiently integrate suppliers, manufacturers, warehouses, transporters, retailers, and customers so that the right product or service is distributed at the right quantities to the right location, at the right price, in the right condition, with the right information, and at the right time, in order to minimize system-wide costs while satisfying customer service level requirement. Casadesus and Castro (2005), have summarize that for continuous improvement, Business Process Re-engineering (BPR) used for business process and enterprise resource planning (ERP) system

which are the two major aspects that able to enhance the SCM concept and able to bring the SCM to the higher level of performance.

Faisal et al (2010) has stated that the implementation of TQM which integrate into SCM will benefit the practitioners where they are able to gain customer satisfaction and competitive advantages. According to Chin et al (2010), SCM has been widely considered to be an effective management tool for firm to maintain business stability, growth, and prosperity. Thereby, in order to increase customer satisfaction and firms' performance, a successful SCM implementation is expected which to enhance the relationship between upstream suppliers and downstream customers (Chin et al, 2010).

Chang et al (2007) has argue that the well connected business process will definitely enhance the SCM performance via cost reduction, reduced in delivery time, maintain low inventory level, providing appropriate feedback and reliability improvement. Romano and Vinelli (2001) have showed that SCM improved the capacity of the companies to recognize the expectation of the end customer. As pointed out by Poirier and Quinn (2004) there are vast potential benefits that can be obtained. These benefits included reduction in overall cost, enhance the customer satisfaction, increases revenue and profits, improve the firms' competitiveness and operations streamline.

Ana et al (2011) has mentioned that, SCM is regards one of the very important practices for manufacturing to adopt in order to improve their performance. To realize the gain and benefits to improve the firm performance, it is very important for the firm to improve their planning and management for the raw material procurement planning, inventory management, production scheduling and capacity planning and distribution management with the clients and suppliers.

Faisal et al (2011) has done a study between the relationship between SCM and TQM, from his finding it is found that the management support and commitment, supplier partnership and customer focus are the common elements that exist in the two different practices but both are very important especially for the management in enhancing the organization performance. Lee

and Kincade (2003) suggested that SCM is having 6 major dimensions which are: partnership; information technology; operational flexibility; performance measurement; management commitments and demand characterization. The product quality is influenced by all parties dealt with the chain as the product flow from its raw materials to its end customer. Millen et al (1999 cited) has investigated the quality management practices along supply chain and reported that reliable suppliers, on time delivery and total support of customer needs are the three most important elements in supply chain.

Wong et al (1997) commented that quality is enhancing the relationship between supply chain members by factors such as trust, cooperation and long term orientation. According to Mehrjerdi (2009), top management needed to be committed to high standard performance which included to improve competitiveness by reducing delivery lead times to customers, significant inventories reduction, first-class product quality, streamline the manufacturing process and narrow the product variety to make the excellent SCM successful.

## 2.3 Supply Chain Quality Management (SCQM)

In view of the importance of internal quality and external component of quality, the integration of SCM into TQM to become SCQM. Chin et al (2010) have summarized the integration of SCM and TQM practices into three different perspectives:

- Supply chain perspective: firms look beyond the internal organizations and connect downstream customers and upstream suppliers in order to improve collaboration among supply chain members.
- Quality management perspective: firm with effective SCM implementation can realize internal benefits such as improving quality, process and design management.
- Financial perspective: the integration of external supply chain and internal contextual variables can contribute to superior financial performance.

SCQM was defined by Ross, (1998) as the participation of all supply channel network in the continuous and synchronized improvement of all processes, products, services and work culture focused on generating sources of productivity and competitive differentiation through the active promotion of market winning product(s) and service dilution that provide total customer value and satisfaction (Vanichchinchai and Igel, 2009).

Kuei and Madu, (2001) defined SCQM with three simple equations where the letters that make up SCQM is defining the whole term:

- SC = a production-distibution network;
- Q = meeting market demands correctly, and achieving customer satisfaction rapidly and profitably; and
- M = enabling conditions and enhancing trust for supply chain quality

Choi and Rungtusanatham (1999) commented the quality management practice was found that not significantly different across the supply chain. While Chin et al (2010) suggested that firm's internal contextual factors are positively influenced by the external customer-firm-supplier relation management and resulted that firm performance is positively affected. Kuei et al (2001) suggested that the improvement in supply chain quality management practices is associated with improvements in organizational performance. According to Falalvand et al (2010), SCOR model is the best-in-class measuring tool in measuring the supply chain performance and firms are able to compare with each other for improvement or advancement by depending on the SCOR model.

According to Talib et al (2011), TQM and SCM are sharing six major practices namely management support and commitment, training and education, customer focus, innovation and continuous improvement, employee involvement and supplier partnerships are the most common practices found in both TQM and SCM and have strongest impact in the integration of TQM and SCM across organization. Casadesus and Castro (2005) also confirmed that quality management