

## EFFECTS OF SUPPLY CHAIN PRACTICES, INTEGRATION AND COMPLEXITY ON PERFORMANCE QUALITY OF TIER ONE SUPPLIERS IN THE MALAYSIAN AUTOMOBILE INDUSTRY

**SAFUAN IDRIS** 

**GSM 2015 22** 



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By

**SAFUAN IDRIS** 

Thesis Submitted to the Graduate School of Management, Universiti Putra Malaysia, in Fulfilment of the Requirements for the Degree of Doctor of Philosophy

**FEBRUARY 2015** 

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## DEDICATION

My utmost gratitude to ALLAH Subhanahu wa ta'ala......



Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Doctor of Philosophy

## EFFECTS OF SUPPLY CHAIN PRACTICES, INTEGRATION AND COMPLEXITY ON PERFORMANCE QUALITY OF TIER ONE SUPPLIERS IN THE MALAYSIAN AUTOMOBILE INDUSTRY

By

#### SAFUAN IDRIS February 2015

Chair : Assoc. Prof. Dr. Noor Azman Ali Faculty : Graduate School of Management, Universiti Putra Malaysia

The primary research objectives of the study are to investigate the degree, nature and impact of the Supply Chain Management practices towards quality performance, to investigate the extent of the Supply Chain Integration's role in affecting the relationship between Supply Chain Management practices and quality performance, and to investigate the extent of the Supply Chain Complexity influencing the relationship between Supply Chain Management practices and Supply Chain Integration. As a whole this study is on the Supply Chain Management practices moderated by Supply Chain Complexity, affecting Supply Chain Integration which in turn affects quality performance. This study mainly focuses on the tier 1 vendors in the Malaysian automotive industry sector which plays an important role in the Malaysian economy. This is evident with the launch of the National Automotive Policy (NAP) on 24<sup>th</sup> January 2014. Careful and thorough steps were taken to develop the research instruments and perform the relevant statistical analysis in achieving the research objectives. The primary data collection was through a questionnaire survey. All hypotheses were tested by submitting the model to structural equation modelling after conducting the confirmatory factor analysis (CFA) to address the validity and reliability of the construct. The results indicated that the Supply Chain Management practices in tier 1 vendors in the Malaysian automotive industry have an impact on the quality performance. There are also evidences that this impact is mediated by Supply Chain Integration. Results also reveal that Supply Chain Complexity moderates the effect of Supply Chain Management practices on Supply Chain Integration. This study exposes three important findings which are: 1) as a second order construct, internal and external focus Supply Chain Management practices have an impact on quality performance in the tier 1 vendor of the automotive industry in Malaysia, 2) the supply Chain Integration affect the impact of Supply Chain Management practices on quality performance in the tier 1 vendor of the automotive industry in Malaysia, and 3) the tier 1 vendors need to pay attention on Supply Chain Complexity because it influences the effects of Supply Chain Management practices on Supply Chain Integration. The present study has integrated the input from the automotive specific quality management standard ISO/TS 16946, and review of previous works and relevant theoretical foundation. The study also serves as among the first few attempts to bridge the gap in the literature by providing empirical support that is significant to the body of knowledge.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Doktor Falsafah

## KESAN AMALAN RANTAIAN BEKALAN, INTEGRASI DAN KERUMITAN KE ATAS PRESTASI KUALITI DI DALAM PEMBEKAL PERINGKAT PERTAMA INDUSTRI AUTOMOBIL MALAYSIA

Oleh

#### SAFUAN IDRIS

Februari 2015

## Pengerusi: Prof. Madya Dr. Noor Azman Ali Fakulti : Sekolah Pengajian Siswazah Pengurusan, UPM

Objektif penyelidikan utama kajian ini adalah untuk menyiasat tahap, sifat semula jadi dan kesan amalan Pengurusan Rantaian Bekalan terhadap prestasi kualiti, untuk menyiasat sejauh mana peranan Integrasi Rantaian Bekalan dalam memberi kesan kepada hubungan antara amalan Pengurusan Rantaian Bekalan dan prestasi kualiti, dan untuk menyiasat sejauh mana Kerumitan Rantaian Bekalan mempengaruhi hubungan antara amalan Pengurusan Rantaian Bekalan dan Integrasi Rangkaian Bekalan. Secara keseluruhannya kajian ini adalah mengenai pengaruh amalan Pengurusan Rantaian Bekalan dimoderasi oleh Rantaian Bekalan Kerumitan, ke atas Integrasi Rantaian Bekalan yang seterusnya memberi kesan kepada prestasi kualiti. Tumpuan utama kajian ini adalah kepada vendor peringkat 1 sektor industri automotif Malaysia yang memainkan peranan penting dalam ekonomi Malaysia. Ini terbukti dengan pelancaran Dasar Automotif Negara (NAP) pada 24 Januari 2014. Langkah berhati-hati dan teliti telah diambil untuk membangunkan instrumen penyelidikan dan analisis statistik yang relevan telah dilaksanakan untuk mencapai objektif kajian. Pengumpulan data utama adalah melalui soal selidik. Semua hipotesis telah diuji dengan mengemukakan model ke atas 'structural equation

modelling' (SEM) selepas menjalankan analisis pengesahan faktor (CFA) untuk menangani kesahan dan kebolehpercayaan konstruk. Hasil kajian menunjukkan bahawa amalan Pengurusan Rantaian Bekalan di vendor peringkat 1 industri automotif Malaysia memberi kesan kepada prestasi kualiti. Terdapat juga bukti yang menunjukkan bahawa kesan ini dimediasi oleh Integrasi Rangkaian Bekalan. Keputusan juga menunjukkan bahawa kesan amalan Pengurusan Rantaian Bekalan ke atas Integrasi Rangkaian Bekalan adalah dimediasi oleh Kerumitan Rantaian Bekalan. Kajian ini mendedahkan tiga penemuan penting iaitu: 1) sebagai konstruk peringkat kedua, fokus dalaman dan luaran amalan Pengurusan Rantaian Bekalan memberi impak kepada prestasi kualiti vendor peringkat 1 industri automotif di Malaysia, 2) Integrasi Rantaian Bekalan boleh menjejaskan kesan amalan Pengurusan Rantaian Bekalan ke atas prestasi kualiti vendor peringkat 1 industri automotif di Malaysia, dan 3) vendor peringkat 1 perlu memberi perhatian pada Kerumitan Rantaian Bekalan kerana ia mempengaruhi kesan amalan Pengurusan Rantaian Bekalan ke atas Integrasi Rantaian Bekalan. Kajian ini telah mengintegrasikan input daripada standard pengurusan kualiti spesifik automotif ISO / TS 16946, dan semakan terhadap kajian terdahulu serta berasaskan teori yang relevan. Kajian ini juga merupaka antara beberapa usaha pertama dalam merapatkan jurang di dalam kesusasteraan dengan menyediakan sokongan empirikal yang penting kepada badan pengetahuan.

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I certify that a Thesis Examination Committee has met on 26 February 2015 to conduct the final examination of Safuan Idris on his thesis entitled "Effects of Supply Chain Practices, Integration and Complexity on Performance Quality of Tier One Suppliers in The Malaysian Automobile Industry" in accordance with the Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the degree of Doctor of Philosophy.

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## DECLARATION

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- Supervision reponsibilities as stated in Rule 41 in Rules 2003 (Revision 2012 2013) were adhered to.

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#### CHAPTER ONE

## **INTRODUCTION**

#### **1.1** Introduction to this Research

Supply chain management (SCM) has been discussed widely including its implementation. Among the central issues that remain unresolved are processes to be considered as SCM practices and how they can be measured in order to ensure successful implementation. The main reason to this is that not only SCM is understood as a concept where frameworks and models have been proposed by many researchers as an idea on how it should be implemented, but also, SCM is seen as a business process that seeks to maximize the efficiency of the products, information, and financial flows among and within different business.

SCM becomes more complicated when, despite its complexity, its implementation requires some degree of integration (Lowson, 2003; Barratt, 2004) where all different processes and activities that produce value are involved. SCM becomes more complex when the variety of product and levels of customization increased, product life cycle is shortened, and supply chain partners are dispersed worldwide. In fact complexity has been termed as one of the critical dimensions of supply chain (e.g. Wilding, 1998; as cited in Milgate, 2001). A good grasp on how SCM is successfully implemented, and what structure it should take, is therefore crucial. This is so because a great effort is required for the holistic concept of "seamless end to end" supply management to reach through the supply chain (Storey, Emberson, Godsell,

& Harrison, 2006) or termed as "arcs of integration" by Frohlich & Wesbrook (2001).

Supply chain is also viewed as a network of organizations that are involved, linking different processes and activities upstream and downstream that produce value to customers (Chopra & Meindl 2001). On the upstream, SCM practices need close relationship with suppliers, and on the downstream, with customers. From the SCM perspectives, the ultimate outcomes of this kind of relationship include on-time delivery by suppliers, timely high quality products produced, on-time delivery of products to customers, high customer satisfaction and good firm overall performance.

A network has been described by Borgatti & Foster (2003) as "a set of actors connected by a set of ties" (p. 992). The *actors* within networks include individuals, teams, organizations, groups of organizations, etc. (Cook & Whitmeyer, 1992). In network perspective, actors, resources and activities (also referred to as an ARA framework) are the components of network. The ARA framework allows exploration of business relationships. Business network as a concept, displays the coordination activities in a wider business network among partners in a business relationship where each firm is engaged and coordinates its activities with its partners (Blankenburg & Johanson, 1992; Håkansson & Snehota, 1995). It is this connected relationship that influenced firms commitment to the focal relationship (Anderson, Hakansson, & Johanson, 1994; Kelley & Thibaut, 1978). Ties among organizations, its pattern or structure, it strength and content have a significant effect on firm behavior and performance (Zaheer, Gozubuyuk, & Milanov, 2010). Network

approach posits that firms access resources and capabilities through their networks of inter-firm linkages (Gulati, 1999).

Building from the theoretical roots and concepts discussed above, it is apparent that the insertion of network perspective in SCM can be related to its successful implementation. This is based on the argument that the practice of SCM requires closer ties and not a standalone process (Lummus & Vokura, 1999), management of interconnected business (Harland, 1996) and the understanding that in general, firms themselves are part of a number of supply chains (Mills, Schmitz, & Gerry, 2004).

## 1.2 Research Background

#### **1.2.1** The Supply Chain Management in Business Relationships

Focus on the field of supply management has been an interest in recent years. This is due to some major development such as: 1) rationalization of business portfolio and focus on core business, products and processes and outsourcing others; 2) outsourcing practices were affected by globalization and fierce competition where buying firms become increasingly dependent on their global supply base to deliver products of high quality, in timely and cost-effective manner (Storey et al., 2006; Kraljic, 1983; Krause & Ellram, 1997; Stalk & Hout, 1990); and 3) Just-in-time (JIT) practices has become a popular purchasing strategy in order to reduce inventory costs, shorten lead-times, and improve productivity (Dong, Carter, & Dresner, 2001). Since JIT practices require on-time delivery and supplier quality as part of the critical success factors, and to eliminate traditional inventories (De Toni & Nassimbeni, 2000), buying firms pursuing a JIT approach have much to gain by creating and maintaining a network of competent suppliers who can provide a synchronized flow of high quality goods and customized services (De Toni & Nassimbeni, 2000).

Supply management generally focuses on the buyer-supplier relationship. This, however, does not portray the whole scenario of a business. Business as a whole process needs to consider: 1) the customers' requirements; 2) the supplier who supply the materials; 3) the internal processes required to transform materials to product/services; 4) the delivery of products as required by customers, and 5) obtaining feedbacks from customers as to whether the company has performed as required, and the whole cycle is repeated (Figure 1.1). Oliver (1990) defines business relationships as "the relatively enduring transactions, flows, and linkages that occur among or between an organization and one or more organizations in its environment" (p. 241).



**Figure 1.1: The Business Loop** 

It has been suggested by several theories of relationship marketing that business relationships vary from transactional to highly relational (Gabarino & Johnson, 1999) and the strength of the relationship changes in accordance to the amount of buyer-seller interaction and communication (Crosby & Stephens, 1987).

In business, it is not only the relationship with supplier that matters, more importantly is to ensure a good relationship with customers – considering selling is

much more difficult than buying – as well as relationships with other related organizations in the business environment. In term of materials and information flow, business relationship can be viewed as SCM (Chopra & Meindl, 2001).

Supply chain is about producing and delivering the final product across the supply chain, from supplier to customer. The entire process of SCM need to be viewed as one system (Lummus and Vokurka, 1999). To determine the actual capacity of the process, any inefficiency occurs throughout the supply chain need to be assessed. Earlier to this, Christopher (1998), in his view regarding 'supply chain as one system', explained supply chain as a network of organizations which are linked through upstream and downstream in the different processes and activities that produced value to customers.

#### 1.2.2 Network Perspective in Business Relationship

The influence of network perspective in organization and management research has been reported in many studies (Betts & Stouder, 2004; Frostenson and Prenkert, 2014). The vertical hierarchies have evolved to network forms of organization (Black & Edwards, 2000; Daboub, 2002; Jones, Hesterly & Borgatti, 1997). This could be the reason for the influence of network perspective in organization and management research. There are inter-organizational and also intra-organizational networks (Lincoln, 1982). According to Betts and Stouder (2004), "an inter-organizational network organization is made up of a network of smaller organizations to form large organization while an intra-organizational network organization is a single organization with internal network structure" (p. 6). In the SCM perspectives, 'network organization' is a group of firms working together as supply chains with strategic partnerships and cooperative agreements, working together to produce and distribute products (Betts and Stouder, 2004). Hildebrand e Grisi & Puga Ribeiro (2004) asserted that by interactive network approach, the relationship among organizations is strengthens by increasing the competitiveness along the chains and creating as well as delivering value to the market. This is achieved through cooperative relationships that formed among independent companies.

According to Frostenson and Prenkert (2014), many scholars agree on the need for cooperative approaches in supply chains, but they only consider focal firms managed supply chains from the managerial outlook of the focal firm itself which has been understood as a structurally coherent, top-down controlled unit. Through an illustration from the Swedish retail sector Frostenson and Prenkert (2014) further argue that such a vantage point is problematic. In agreement with Curkovic and Sroufe (2011), they pointed out that scholars have abandoned a confined view of the single company as the autonomous and isolated site of sustainability management.

Synthesizing the above concepts and theories, it can be argued that, in the context of supplier-tier 1 vendor-customer relationships, the 'network organization' environment will improve the supplier's performance in terms of on-time deliveries, quality materials and/or services, good communication etc. In the context of automotive industry where tier system applies, suppliers in different tier levels then, are committed to produce parts and/or components with superior quality, deliver it whenever required by the manufacturer/assembler, and as a whole, enable it to fulfill the manufacturer/assembler expectations and requirements.

As mentioned earlier an inter-organizational network organization is a built-up of smaller organizations to form a larger organization. An intra-organizational network organization is a single organization with internal network structure. Considering the car manufacturer (c), the first tier vendor (v) and the second tier suppliers (s), these three organizations form the smaller organizations (Figure 1.2a) which made up the large organization in terms of network organization (Figure 1.2b).



Figure 1.2: The Inter-Organization Network

In essence, the inter-organizational relationships theories and concept clarify that business relationships require good relationship quality among buyers, suppliers and customers. In the context of car assemblers, all that matters are on-time delivery, and components and/or parts from their vendors are of high quality. Subsequently, in order to fulfill these requirements, the vendors require good and reliable suppliers. These represent an effective implementation of SCM. If the whole sets of chain are laid down, it will form a network of buyer, suppliers and customers.

## 1.3 Automotive Industry in Malaysia

The Malaysian automotive sector began with importation of vehicles which then progressed to assembly operations and the establishment of a wide network of automotive components and parts manufacturers. The incorporation of Ford Motor Company of Malaya in 1962 was the beginning of the automobile industry in Malaysia. The operation began in a rented shop-house in Singapore doing fitting wheels, body repair and paint touch-up work. The Federal Government announced its intention to encourage the establishment of automobile industry as part of industrialization program in 1963, followed by the announcement of government's initial policy on automobile assembly in May 1964 (MITI, 2007). Three years later, the automobile industry was officially launched. The government approved six assembly plants to start operation. By December of the same year, Swedish Motor Assemblies Sdn. Bhd. began its production. Initially, the assembly plants were mainly joint venture projects between European automobile manufacturers and local partners, who were previously their local distributors. Apart from Swedish Motor Assemblies which assembled Volvo, there were also Asia Automobile Industries Sdn. Bhd. which assembled Peugeot and Mazda vehicles, and Tan Chong Motors which assembled Nissan cars (then known as Datsun). Since then, the completely built-up units (CBU) were reduced to completely knock-down (CKD) packs. In 1978, the Malaysian Automotive Components Parts Manufacturers Association (MACPMA) was established with about six parts manufacturers as members. Moving forward, the government announced its intention towards an all-Malaysian car in 1979 through the process known as mandatory deletion of parts of CKD vehicles. Certain components were prohibited to be included in the imported CKD packs by foreign assemblers creating opportunities for local components makers. However, the effort was not very successful because by the early 1980s there were about 15 assemblers that produced vehicles for European and Japanese manufacturers. The demand for a particular component were low because there were too many makes and models, that made it difficult for the manufacturers to achieve

the economies of scale. In addition, inputs for the assembly plants were in the form of imported CKD that lead to high imports. The level of technology transfer and the development of human resources in the industry was still low.

The second phase of the development in the automotive industry in Malaysia was the launching of the National Car Project, Perusahaan Automobil Nasional (PROTON), in 1984. Proton was incorporated on 7 May 1983 with three primary national policy objectives (Proton, 2009):

- To spearhead the industrialization process and manufacturing industries for automotive;
- To acquire/upgrade technology and industrial skills within the automotive manufacturing industries; and
- To strengthen the international competitiveness of Malaysia's industrial capability.

The project was conceived to guide the automotive industry to improve the level of technology development and intellectual property. The Saga was the first model produced in 1985 and has been upgraded since then, with Wira, the Perdana and the Satria added to the range. The PROTON project was a joint-venture program with 30% stake in Proton owned by Mitsubishi Motors Corporation of Japan. However, due to several disputes with Mitsubishi, Proton began to work more closely with local parts suppliers. The Ministry of Trade and Industry set up Joint-Co-ordination Committee (JCC), an interagency group, to pressure the Japanese to use local parts manufacturers. The local part content programs accelerated from 18 percent local contents in 1983 to 40 percent locally obtained parts in 1987 and to 90 percent in 1992. As at the end of March 2009, Proton has 221 first-tier vendors compared to 206 in 2006 (Proton, 2009). With nine models of passenger car in the market, Proton

also made its presence in the regions of ASEAN, China, India Subcontinent, Middle East, Western Europe, Australia, and South Africa.

With the success of the first national car and the agreement between UMW Corporation Sdn. Bhd., Daihatsu Motor Co. Ltd of Japan, Med-Bumikar Mara Sdn. Bhd., PNB Equity Resources Corporation Sdn. Bhd., Mitsui & Co. Ltd of Japan and Daihatsu (Malaysia) Sdn. Bhd, the Perusahaan Otomobil Kedua Sdn. Bhd. (PERODUA) was established in October 1992. Perodua were certified with ISO 9002 and ISO 9001 by the Vehicle Certification Agency (VCA) from the United Kingdom and was the first car manufacturer in Malaysia to achieve the prestigious certification award. Moving forward, there were 161 vendors who supplied parts and components to Perodua in 2007 and 80 percent of Perodua vendors were also supplying Proton (MITI, 2007).

According to the Malaysian Automotive Association (MAA), Malaysian auto market is dominated by Proton and Perodua (MAA, 2014). They jointly accounted for 58.1 percent of the passenger vehicles sold in 2013. Today, the automotive sector is an important industry in the Malaysian economy with significant economic contribution and relationship for the manufacturing and services sectors. During their press conference in 2014, MAA reported that the year 2013 total sales of new motor vehicles or Total Industry Volume (TIV) is 655,793 units. Of this figure 756,657 units are the passenger vehicles and the rest are commercial vehicles. There are nearly 200 manufacturing vendors involved in the supply chain of Proton and Perodua.

#### **1.4** Focus of the study

This research is a study on the inter-organizational relationships which comprises the tier 1 suppliers, its suppliers, and its customers - the car assemblers/manufacturers. The focal organization or company under study is the tier 1 supplier, <u>not</u> the automotive manufacturer/assembler.

Tier 1 supplier (usually termed as 'vendor') is a company that manufactures car parts and/or components, who then deliver it to the car manufacturer/assembler. The car manufacturer/assembler is the car producer and the direct customer to the tier 1 suppliers. Supplier, in general term, is a business entity who supplies goods and/or services to its customers. In the context of this research, supplier is a business entity who supplies goods and/or services to the tier 1 supplier or vendor companies (i.e. tier 2 suppliers within the car manufacturer/assembler supply network). Figure 1.3 demonstrates the supplier – tier 1 – customer relationship environment in this research.



#### Figure 1.3: Supplier-Tier 1-Customer Relationship Environment

This research will be carried out by studying the internal and external focused SCM practices of the tier 1 vendors who manufacture and supply parts and/or components to the car assemblers such as Proton and Perodua. The internal and external focus SCM practices variables are the 'organizational factors'. The internal focus SCM practices comprise of: 1) quality management practices, 2) network commitment, and 3) JIT practices. The external focus SCM practices variables comprise of: 1) Supplier

integration, 2) customer integration, and 3) relationship with non-business organization.

There are reasons for choosing the tier 1 vendors as the focal firm of this research. Firstly, the development of suppliers' clusters, supply chains, and networks are very active in automotive industry (Perez & Sanchez, 2001). In addition to that, according to Bennett and O'Kane (2006), 40 percent of the Toyota's Japanese supply chain competitive advantage is derived from the first tier vendors. Therefore, it is important to know the performance of the first tier vendors in the context of SCM. Secondly, in industries such as the automotive industry, quality efforts are driven by assemblers (Kannan & Tan, 2007). Since the relationship of the first tier vendors and the assembler is part of the study, it is the interest of this research to know, how much these driving factors are affecting the performance of first tier suppliers.

The other reason for focusing on the first tier vendors is to ensure generalization in the conclusion of findings. Generally, suppliers in different tier positions in the supply network may differ in term of strengths and weaknesses, applying different strategy, and having different customers' profiles. Therefore, in order to ensure generalization of findings, it is important to ensure that the organizations under study are in the same tier position.

Fulk and Boyd (1991) used three categories in their network studies namely relational, structural and 'network concept only' as a conceptual approach. Following Fulk and Boyd, this research is within the 'network concept only' category in the network studies. 'Network concept only' has been widely discussed in inter-organization studies. It refers to properties of the network including the properties links, roles, position, and content. As such, issues with regard to the nature

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of the network which is widely discussed in entrepreneurship and inter-personal relationship studies such as structure of network, network ties, network centrality, tie strengths, embeddedness and the like are not in the interest of this research.

Synthesizing SCM practices, network perspective, supply chain integration (SCI), and Supply chain compexity, this research therefore posits that: 1) successful implementation of SCM can be measured by its degree of integration, and 2) the degree of supply chain integration is dependent on the level of its complexity.

The SCM practices of the tier 1 vendor will be studied against their quality performance which also represent the SCM performance. The quality performance measurement to be utilized in this research is the real data of performance results documented when implementing quality management system which are related to two types of quality performances, 1) the product quality, and 2) delivery performance. These two performance measurements are based on the requirements of ISO/TS 16949 QMS standard.

#### 1.5 Research Issues

The field of supply chain and networks contains important problem areas for industrialists. Examples of the problem areas are complexity and queuing theory, inter-organizational trust, the extension of new product introduction from intraorganization focus to an inter-organizational perspective and so on (Mills et al., 2004). It has been reported that Proton, the first Malaysian automotive manufacturer, is currently having 221 first tier vendors within their supply network (Proton 2009). With 221 tier 1 vendors in the supply network, the supply chain related problems asserted by Mills et al. (2004) certainly exist in Proton's supply network. Moreover, it has been reported by the Proton managing director in June 2008 that poor quality components produced by vendors causing defects in Proton cars. Recently the DRB group managing director reported in its Annual Report 2013 that Proton cars have lost its number 1 position in the industry as its market share fell from 60 percent in the 1990s to 20-22 percent. This made the Proton cars lose their appeal. This is definitely a serious and important issue, and needs attention because car assemblers and/or manufacturers are very much relying on high quality components and parts from their vendors.

Toyota, the world leading car producers recognizes that 40 percent of their supply chain competitive advantage is derived by their first tier suppliers (Bennett & O' Kane 2006). There are a total of 264 vendors supplying different types of component and part to Proton. Of this figure 221 are tier 1 vendors (Proton 2009). Poor understanding and implementation of SCM within the supply chain network surely affect the car assembler specifically in terms of in-coming delivery and quality of components and parts from it vendors. There is also an issue on working in closer relationship among related parties in the supply chain including the non-business organizations such as financial institutions and government agencies. Perhaps the closing remarks by the Proton Director of Engineering during the closing session of SIRIM Day with Proton on the 6<sup>th</sup> and 7<sup>th</sup> November 2009 provide an honest view on the importance of this closer relationship. He said that all interested parties in the automotive industry in Malaysia need to work closer together with the spirit of friendship not to be hindered by the scope of MOU's. A study on first tier suppliers in the context of SCM and its performance is therefore deemed important. Integrating network perspectives in SCM will allow a deep understand about the relationships between the firms that are part of the chain (de Camargo et al. 2012).

#### **1.6 Problem Statement**

The American Production and Inventory Control Society (APICS) defines SCM as an intertwined business processes that involves the "design, planning, execution, control, and monitoring of supply chain activities with the objective of creating net value, building a competitive infrastructure, leveraging worldwide logistics, synchronizing supply with demand and measuring performance globally" (APICS, 2015). SCM covers wide business functions and it works with the objective of long term improvement in the processes to make it more efficient and viable. For this, key performance indicators of different aspects involved in the supply chain are measured and analyzed. Therefore, SCM is a business process that strives to maximize efficiency when products, information and finances flow among and within different businesses. To date a great number of studies can be found on SCM including its relationship with technology, trust, collaboration, integration, agility, and green initiatives.

Integrating network perspectives in SCM research has become an interest to many researchers recently because it allows a deep understand about the relationships between the firms that are part of the chain (de Camargo et al. 2012). Example of such studies are Galaskiewicz (2011), Borgatti & Li (2009), Choi & Kim (2008), Carter et al. (2007), Lazzarini et al. (2001). Structurally, supply chain is a network of organization. According to Christopher, (1998); Chopra & Meindl, (2001), supply chain is also viewed as a network of organizations that are involved, through upstream and downstream linkages in the different processes and activities that produced value in the form of products and services in the hands of the end user. In this form of business structure and climate the knowledge and expertise held by

others is required in order to operate effectively (Hiscock and Pearson, 1999; Mankin and Cohen, 2003; Nohria and Eccles, 1998). However network participants may often face with significant challenges which sometimes resulting in either poor performance outcomes or even a breakdown in the collaborative relationship (Medcof, 1997). In this respect, commitment is seen to be the chief means through which effective performance in networks can be maximized (Clarke, 2005). Therefore, in order to be able to guide management decision and specific intervention in network commitment, we need to gain a greater understanding of how commitment within networks may fostered. Despite this increase in interest, there is no study found on integrating network perspective with SCM in the automotive industry in Malaysia.

With a ratio of 200 cars for every one thousand people, Malaysia is positioned as the largest passenger car market in ASEAN. Total vehicle sales in 2010 is 605,156 units, increasing from 548,115 units in 2008 and 536,905 units in 2009. In 2011 600,123 units were sold. In 2012 there are 28 manufacturing and assembly plants producing passenger and commercial vehicles, composite body sports cars as well as motorcycles and scooters. Also, there are more than 800 automotive component manufacturers, producing a wide range of components, such as engine parts, brake parts, transmission and steering parts, rubber parts, electrical and electronic parts and body panels. In 2011, RM 6.9 billion sales was generated by the sub-sector, while imports amounted to RM 4.9 billion and exports RM 2.4 billion.

The statistics indicates that automotive industry is very important to the Malaysian economy. However, trade liberalization within ASEAN has opened up wider regional market, creating opportunities for export for the automotive and component manufacturing companies. Trade liberalization will also enable carmakers to source cost-competitive components and benefit from potential economies of scale from ASEAN countries. The trade liberalization also means that the manufacturers of components and parts for automobile are facing with greater competition and therefore need to enhance their performance in order to remain competitive. With 800 automotive components manufacturers in the supply network, SCM is very crucial and requires attention. This research should be able to provide some insight views of the SCM implementation in the automotive industry in Malaysia. Furthermore, according to Storey et al., (2006), there are substantial gaps between theory and practice in SCM. This research intends to pay attention to Burgess et al., (2006); Storey et al., (2006); and Betts and Stouder's (2004) call by investigating the relationship between SCM practices, SCI, Supply chain compexity, and quality performance in the automotive industry in Malaysia.

The idea of linking SCM practices with performance has been attempted in many studies. Some recent studies include Kim (2006); Li, Ragu-Nathan, Ragu-Nathan, & Rao (2006); Zhao, Huo, Selen, & Yeung (2011); Nyaga, Whipple, & Lynch (2010); Vanichchinchai & Igel (2011); Bozarth, Warsing, Flynn & Flynn (2009); Vijayasarathy (2010).

A great number of studies can also be found on SCM in relation to automotive industry (e.g. Hsu et al., 2014; Azevedo et al., 2012; Thome et al., 2014; Bhattacharya et al., 2014; von Cieminski, 2014; Johnson, 2002; Park & Hartley, 2002). However, studies linking supply chain practices with the automotive specific quality management system standard ISO/TS 16949:2003 and firm performance are scant. For example, Lin, Chen, Jang and Wu (2006) studied the implementation

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performance on the 20 elements of QS9000 standard (the older version of ISO/TS 16949 standard) but not firm performance. Their study focused on the implementation aspects looking at importance and easiness in implementing QS9000. Johnson (2001) studied the quality performance outcomes of a QS 9000 certified tier 1 supplier, while Johnson (2002) studied the quality performance outcome of tier 2 supplier. Both studies look at the relationships between organizational variables and performance outcome and results. Specifically the study is on the effect of QS 9000 certification on quality rating and delivery rating. The TS16949 standard only applies to car manufacturers; other industries may have their own standards (Foster, 2004).

Park and Hartley (2002) explored the relationship between supply management practices and performance from supply chain perspectives. This present research differs from Park and Hartley in two aspects. Firstly, the work of Park and Hartley is only on supplier management. Specifically the study in on whether the way the first tier manages its suppliers (the second tier) ultimately impacts the quality and delivery performance of the first tier supplier. This present research on the other hand study both downstream and upstream relationships of tier 1 vendor with its suppliers and customers, and its effect on quality performance. Secondly, Park and Hartley does not incorporate network perspectives in their work whereas this present study using network perspective to study the nature of the tier 1 vendor relationships with its supplier and customers.

Many studies can be found on SCI and supply chain complexity and they are in many forms. Generally, in term of its effect, both SCI and supply chain complexity are studied either on its direct effect on performances or capabilities, or as an influential variables on the effect of SCM practices and performance. Example of study on SCI direct effect on performances or capabilities are Huo, (2012); Prajogo and Olhager, (2012); and Leuschner, Rogers, & Charvet, (2013). As influential variables, SCI is also studied on it effect as moderating or mediating variable (e.g. Droge, Vickery, & Jacobs 2012; Huo 2012; Wei, et al. 2014).

The complex situation of the supply chain can be explained by the illustration where orders are placed by a supply chain with multiple downstream demand points independently on a centralized supply point, regardless of supply constraints or the needs of other demand points. Depending on the state of the supply chain, the same "input" can result in varying effects. The magnitude of complexity is obviously increased when the orders are for variety of products and from several customers. With the present of opportunities, supply chains extend and this increased complexity which creates many uncertainties and risks. The risks of disruption and failure in supply chain operations is more when a business rely more on networks of multiple suppliers (Gerschberger et al., 2010). Therefore, complexity is an inherent feature of supply chains (Hashemi, Butcher, Chhetri, 2013) which can result in increased uncertainty, risk and consequently unnecessary cost, if it is mismanaged (Christopher, 2011). Therefore it is important to know the effects of supply chain complexity to the SCM practices. There is no study found on supply chain complexity in relation to SCM practices in the automotive industry in Malaysia. This present research is also among the first attempt to study the impact of supply chain complexity on SCI.

In the effort of enhancing competitive performance through SCM, internal functions within a company need to be closely integrated and the external operations of

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suppliers, customers, and other channel members must be linked effectively (Kim, 2009). Supply chain integration (SCI) is defined by the amount of collaboration between a manufacturer and its supply chain partners as well as the extent of internal and external process conducted by a manufacturer (Flynn, Huo, and Zhao 2010). While complexity is an inherent features of supply chain, SCI on the other hand is something that need to be developed in the system (Steven 1989; Christopher 1994) before it can function as driver for successful implementation of SCM. Developing integrated supply chains obviously require efforts together with strategic, tactical and operational perspectives. SCI has been hypothesized as having a positive relationship with performance. In most literature of supply chain management, the conventional wisdom is that "the more integration – the better the performance of the supply chain" (Bagchi et al. 2005, pp 275).

Since integration is an indicator of successful implementation of SCM (Chopra and Meindl, 2001), it is also important to study the influence of the SCI on the effect of SCM practices and performance in the tier 1 vendor of the automotive industry in Malaysia. There are several studies on SCI in Malaysia (e.g. Zailani and Rajagopal, 2005; Alain et al. 2011; Ali, Jaafar and Mohamad, 2008). However, study on SCI focusing on the automotive industry in Malaysia, specifically on tier 1 vendor is still very limited. Therefore, this research should be able to contribute to the body of knowledge.

## 1.7 Research Objectives

Realizing the existing issues in business relationships, and problems with regard to successful implementation of SCM, this research attempts to advance the study of the theoretical linkages between the internal and external focus SCM practices and

climate, supplier management, customer relationship, and firm performance derived from the SCM and network perspectives using an empirical approach suggested by the principal agent theory and network theory.

Taking into account the importance of SCM to the automotive industry as explained in the problem statement, and being one of the most important and strategic industries in the manufacturing sector in Malaysia, the automotive industry is selected to be the focus area for this research. This is evidence with the launched of second NAP and more budget allocated for the automotive industry to speed up the process of industrialization so that Malaysia can be a developed nation by 2020.

Complexity is inherent feature of supply chain while integration is an indicator of successful implementation of SCM and both have an influential characteristic on SCM performance. Therefore supply chain complexity and SCI is also part of the study in this research. As a whole this research will study the SCM practices moderated by supply chain complexity, affecting SCI which in turn affects quality performance of tier 1 vendor in the automotive industry in Malaysia. This study builds on prior research on buyer-supplier relationships (Bemelmans et al., 2011; Mohanty and Gahan, 2012; Kim, 2013; Goffin, Szwejczewski, & New, 2006), supplier management (Kannan & Tan, 2002; Prajogo et al., 2012; Akamp and Muller, 2013; Roseira, Brito and Ford, 2013; Krause, 1999; Vonderembse & Tracey, 1999; Tan, 2001; Wen-li, Humphreys, Chan, & Kumaraswamy, 2003; Zsidisin & Ellram, 2001; Zsidisin, Ellram, & Ogden, 2003), and customer relationship (Ernst et al., 2011; Zainuddin and Malim; 2011; Singh, 2009; Holweg, 2005; Ford, 2007; Osarenkhoe & Bennani, 2007; Szwejczewski, Lemke, & Goffin, 2005). In particular, this study investigates:

Specifically, the objectives of the study are as follows:

- To investigate the effects of SCM practices (internal and external focused) on the quality performance of the tier 1 vendors in the automotive industry in Malaysia.
- To investigate the mediating role of supply chain integration on the effect of SCM practices (internal and external focused) on quality performance of the tier 1 vendors in the automotive industry in Malaysia.
- 3. To investigate the moderating role of supply chain complexity on the effect of SCM practices (internal and external focused) on SCI of the tier 1 vendors in the automotive industry in Malaysia.

## 1.8 Research Questions

The main research question under study here is on the SCM practice of tier 1 suppliers in the automotive industry in Malaysia. That is to what extent the SCM practices affect quality performance. The following research questions would help to further investigate the issues:

- 1. Does the internal and external focused SCM practices affect quality performance in tier 1 vendors in the automotive industry in Malaysia?
- 2. Does the supply chain integration mediates the effect of SCM practices (internal and external focused) on quality performance in tier 1 vendors in the automotive industry in Malaysia?

3. Does the supply chain complexity moderates the effect of internal and external focused SCM practices on supply chain integration in the first tier vendors in the automotive industry in Malaysia?

## **1.9** Structure of the Thesis

This thesis is presented in seven chapters. This chapter has introduced this present research and how its background is established. The need for the research on SCM in tier 1 vendors in the automotive industry was highlighted. This chapter also provides an overview of the Malaysian automotive industry.

Chapter Two presents an overview of the literature on the definition of SCM in general, and SCM practices including the fundamental factors for SCM implementation. The latest literature is considered to ensure issues are current. Chapter Two also discusses the concept and views of SCM, and how it evolved from distinguish experts and researchers. Chapter Three presents the theoretical foundation and the hypotheses development of this present research. Principal agent theory and network theory and perspectives are utilized to explain the rational of relationship among firms in business network. The development of instrument and data collection are discussed in Chapter Four. Chapter Four also reviews on the instrument used to measure SCM practices, SCI, supply chain complexity, and quality performance in this research. The main statistical test for the hypotheses developed using Structural Equation Modelling is also presented in this chapter. Chapter Five presents all results and data analyses. All results are presented according to the research objectives. Chapter Six presents the discussion on all results and its implication to the existing literature. The overall conclusion,

recommendations as well as direction for future research are presented in Chapter Seven.



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